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ENERGY IN EUROPE

Energy policies and trends in the European Community

Number 5 September 1986

Commission of the European Communities □ Directorate-General for Energy

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Contents

Abbreviations and symbols

:	no data available
-	nil
0	figure less than half the unit used
kg oe	kilogram of oil equivalent (41 860 kjoules NCV/kg)
M	million (10^6)
t	tonne (metric ton)
t = t	tonne for tonne
toe	tonne of oil equivalent (41 860 kjoules NCV/kg)
MW	megawatt = 10^3 kWh
kWh	kilowatt hour
GWh	gigawatt hour = 10^6 kWh
J	joule
kJ	kilojoule
TJ	terajoule = 10^9 kJ
NCV	net calorific value
GCV	gross calorific value
ECU	European currency unit. The ECU is a composite monetary unit consisting of a basket of the following amounts of each Community currency:

0.719	DM	3.71	BFR
1.31	FF	0.14	LFR
0.0878	UKL	0.219	DKR
140	LIT	0.00871	IRL
0.256	HFL	1.15	DR

EUR 10	Total of member countries of the EC
I or —	discontinuity in series
of which	the words 'of which' indicate the presence of all the subdivisions of the total
among which	the words 'among which' indicate the presence of certain subdivisions only

The Chernobyl accident and Euratom

The Chernobyl accident is the worst ever to have happened in the nuclear industry. Several dozen people have died as a result of the effects of radiation and the accident, which occurred over 1 000 km from the closest Member State, has spread radioactive contamination over large parts of Community territory. These events have considerably disturbed the general public and the media and elicited responses from those in the highest political office. Against this background the Commission, which under the Euratom Treaty has certain responsibilities in nuclear matters, has ad opted a framework communication to the Council on the consequences of the Chernobyl accident[1] setting out what actions and studies the Commission has decided to carry out.

Information on the accident

The Soviet authorities have communicated some details about the accident to the Board of Governors of the IAEA in particular, on 21 May 1986.

The accident itself happened on 26 April at 01.23 hours in number four reactor at the Chernobyl power station during a planned shutdown when the reactor was running at 7% of nominal power. For reasons not explained by the Soviet authorities, the reactor's power output increased rapidly. The cooling water evaporated and considerable amounts of steam were generated. The reaction between the steam and the zirconium present in the reactor resulted in the formation of hydrogen which exploded. This explosion caused a fire, considerable damage to the building, equipment and reactor core and resulted in the release and dispersion in the atmosphere, of fission products (mainly iodine-131).

To reduce the amount of fission products released, a protective layer of sand, clay, mud, lime and lead was dumped on the core by helicopters. They dropped 4 000 tonnes of these materials and by 13 May the emission of radioactive products to the atmosphere had stopped. At the same time the foundations of the reactor were cooled down by pumping in massive amounts of nitrogen.

The information available is still fragmentary and we therefore do not yet fully understand the accident. In particular, there is still uncertainty as to what set it off. Experts all over the world have worked out many speculative scenarios but at present no confirmation is available for any of them.

The Soviet authorities have stated that they are willing to provide detailed information as soon as it is available and to discuss the accident at a meeting of international experts to be organized by the IAEA. The intention is to hold the meeting in August 1986.

Protecting the public against ionizing radiation in the European Community

The Chernobyl accident resulted in the dispersal of radioactive products over large areas of the Community.

Generally speaking, radioactive products can affect the public:

(i) through an increase in background radiation (external effect),

(ii) through contamination of the air that is inhaled or the food that is ingested (internal effect).

Under the Euratom Treaty the Community has laid down basic standards for the protection of the general public and workers against dangers arising from ionizing radiation. They have been issued in the form of a Council Directive first adopted in 1959 and then revised in 1962, 1966, 1976, 1980 and, most recently, 1984 to take account of increased scientific knowledge, better radiation-protection techniques and the experience gained in implementing the earlier Directives.

The Commission based its proposals on the recommendations of the International Commission for Radiological Protection (ICRP) whose members are scientists of the highest reputation whose ability and independence is recognized throughout the world. The Commission of the European Communities is assisted by a selected number of the Member States' experts. Its proposals are submitted to the Economic and Social Committee for opinion — as the latter represents the workers and employers professional associations in the Community — and then to Parliament.

The Directive laying down the basic standards contains, in particular, provisions aimed at limiting the individual

and collective doses resulting from controllable exposures. This limitation is based on three general principles:

— The principle of justification, following which every activity resulting from an exposure to ionizing radiation shall be justified by the advantages which it produces;

— the principle of optimization, following which all exposures shall be kept as low as reasonably achievable; and

— the principle of not exceeding those limits, following which the sum of the doses and committed doses[2] received shall not exceed the dose limits laid down for exposed workers, apprentices and students and members of the public. For whole body exposure, the dose limit for the public has been laid down as 5mSv (0.5 rem) per year.

Whilst quantitative dose limits resulting from the principle of not exceeding certain limits can easily be transposed into mandatory national laws, the principles of justification and optimization are more generally worded and of a qualitative nature and each implies, *inter alia,* a value judgment.

An activity of any sort is regarded as justified by the mere fact that a Member State has a law regulating that particular activity or is drawing up such a law.

The principle of optimizing exposures was introduced to take account of the hazardous effects of radiations (see box). Following this principle, exposures are kept as low below the prescribed limits as is reasonably achievable, whilst at the same time taking account of economic and social factors. Where improvement can be achieved easily without a large outlay in resources it is a reasonable improvement and should be made. On the other hand, where improvement would require a major outlay in resources and merely result in a small reduction in exposure, the activity involved would be excessive and therefore inappropriate.

In view of the combined scientific, economic and social considerations involved, it has so far been considered appropriate to require them all to be taken into account in the decision-making procedures used in the Member States and to let the latter select their method of applying the principles. In particular, the basic standards set no contamination limits for food put up for sale (e.g. meat, milk, broad-leaved vegetables, etc.) and make no specific provisions with regard to their production (e.g. whether or not to put animals out to pasture).

The very widespread contamination caused by the Chernobyl accident has brought the Member States face to

The hazards of radiation

The hazardous effects of radiation are cancer, leukaemia and genetic defects. They appear, apparently at random, without anyone being able to say which individual in an exposed population will be affected.

They differ from the non-hazardous effects for which it has been possible to establish exposure thresholds and determine how serious will be the condition resulting from the dose received.

Where hazardous effects are concerned, it has been demonstrated that a strong dose will result in more frequent appearances of the effect as the dose received increases but that the seriousness of the condition does not depend on the dose level received by a given individual. It is not possible precisely to quantify the relationship between frequency of appearance and dose received where doses are low, or to determine a threshold below which radiations are totally harmless. At low doses it is impossible to determine which cases in a given population are due to radiation and which would have occurred naturally in any case.

For instance, it is generally estimated that cancer due to radiation affects some 100 000 people exposed to the natural annual level of radioactivity (1mSv). At the end of the lifetime of this population there would therefore be some 75 deaths due to natural radioactivity out of the total of 20 000 cases of cancer which would in any case have occurred in the population concerned. An accident which, at a given moment, would result in a dose equivalent to the natural annual dose (or ten times the natural monthly dose) would cause one additional case of cancer in that population.

face with a new problem. Each State has made its own value judgments and it is hardly surprising that the resulting measures have differed. In certain areas the Commission has been authorized to take measures which are immediately applicable throughout the Community. It did so immediately, particularly as regards stopping imports of meat from non-Community countries.[3] Elsewhere, defining uniform measures for the Community requires consensus in the Council and, in view of the different measures already taken at national level, this has proved difficult. The public was very concerned about the apparent differences in the levels of protection required.

The Commission has now taken steps to work out acceptable contamination limits which will in future apply to the above products.[4] It is essential that such limits should be laid down in advance so that they do not cause controversy and are consistently applicable to both domestic and imported products.

System for the rapid provision of information and mutual assistance in the event of a crisis

The Chernobyl accident has demonstrated the need at a wider international level for very rapid exchange of information on developments in the event of a nuclear accident. It has also shown up the need for an international system of mutual aid.

At the Tokyo Summit held on 5 May 1986 only a few days after the accident, the participants, including Mr Jacques Delors, President of the Commission, recommended negotiating an international convention based on IAEA directives, to oblige all parties to report and exchange information on any nuclear incident or accident. They also encouraged the IAEA in its work to improve the organization of mutual emergency aid.

The IAEA is an intergovernmental organization which is independent but works under the auspices of the United Nations. It has 100 member states, including all the Community countries and all those of Eastern Europe. China became a member in 1985. Under its statute it is required to speed up and extend the application of nuclear energy to peaceful purposes and to ensure the health and prosperity of mankind. The IAEA's main task is to define or adopt safety standards aimed at protecting public health and reducing to a minimum the dangers to which persons and property are exposed and to do so in consultation and, where appropriate, collaboration with the competent bodies of the United Nations and specialist institutions.

The IAEA is therefore the appropriate framework within which to collaborate internationally in the field of nuclear endeavour. The Commission fully supports the initiative of this body and will take whatever steps are necessary to enable the Community as such to participate in the work that has now started.

At its meeting of 21 May 1986, the Board of Governors of the IAEA requested that:

(i) a meeting of experts be held in three months to examine in detail the cause of, and the sequence of events during, the Chernobyl accident;

(ii) groups of experts are to be set up:

  (a) to transform into international conventions the IAEA guidelines on rapid information and mutual assistance in the event of accidents;

  (b) to evaluate what additional measures should be taken to improve cooperation in the field of nuclear safety;

(iii) an intergovernmental conference be held in order to study all problems arising in the field of nuclear safety.

In addition to the steps taken at a wider international level, the Commission is convinced that more rapid and more ambitious complementary action at Community level is both possible and desirable because of the large-scale nuclear programmes already implemented there and the extensive knowledge the Community has accumulated with regard to radiation protection and combating nuclear accidents.

It has therefore announced its intention of proposing an interim Community system for the rapid provision of information in the event of a nuclear accident. The aim is to guarantee that the national authorities provide each other with sufficient information and to ensure that it is consistent. It would also deal with the problem of the lack of information available to the general public, consumers and the media which was very noticeable after the Chernobyl accident.

In consultation with the Member States, the Commission also intends to go into the possibility of setting up a Com-

munity system for providing mutual assistance in emergencies. For this purpose it should be able to take advantage of the firm links already existing between the Member States.

The Community's experience of cooperation between States should be of benefit to any initiative taken by the IAEA.

Safety in nuclear installations

The Chernobyl accident showed that the nuclear power plant in question was unsafe. There is no equivalent power plant in the Community. Every country embarking on a nuclear programme has the responsibility of selecting the type of reactor to be used and laying down safety criteria and standards. From the outset, those Community countries using nuclear energy have applied very strict safety criteria and standards.

The European approach to safety is under examination as a result of the Chernobyl accident. In this connection, the IAEA's evaluation of the accident is of major importance. It will enable us to understand to what extent the event which triggered the accident, and, therefore, the major sequence of events during the accident, was due to characteristics specific to the Chernobyl reactor (e.g. placing the high-temperature graphite moderator in the vicinity of steam and water circuits, the intrinsic difficulty of controlling the reactor, the presence of a large quantity of zirconium and therefore the potential for generating hydrogen, the dimensioning of the containment).

If the Chernobyl accident cannot be attributed to one or other of these specific characteristics it will be possible to draw certain conclusions relating to the European approach to safety, as was the case after the Three Mile Island accident.

In accordance with the basic standards, all Member States using nuclear energy have established systems for examining and authorizing nuclear projects. A consistent body of safety criteria has been laid down in each Member State but the rules vary from one Member State to the next. The resulting heterogeneity means that certain national markets are closed.

The Commission is making an effort to promote consensus between the Member States on the various safety criteria relating to nuclear power stations. Harmonization of the criteria should give the general public in the Community the feeling that the safety rules in each country are equivalent to those in others and should also help create a common market.

So far, action on this front has always been taken under the Council Resolution of 22 July 1975 on the technological problems of nuclear safety (OJ No C 185 of 14 August 1975). Whilst taking into account the prerogatives and responsibiities assumed by the national authorities on nuclear energy, the Council, in this Resolution:

(i) recognized that, by aligning safety requirements, the national authorities responsible for nuclear safety and constructors and energy producers will be able to benefit from a harmonized approach to the problem at Community level;

(ii) stressed that nuclear safety problems extend beyond the frontiers not only of Member States but of the Community as a whole, and it is incumbent on the Commission to act as a catalyst for initiatives to be taken on a broader international plane;

(iii) agreed to a course of action in stages in respect of the progressive harmonization of national safety criteria.

This course of action is beset by serious difficulties arising from the complexity of the problem to be solved, but it can be facilitated by two favourable factors.

The first of these is that the safety criteria are essentially of a general nature and in consequence lend themselves to approximation.

The second derives from the fact that the nuclear reactor market tends to centre on light water reactors (LWRs), to which may be added in the long term liquid-metal-cooled fast breeder reactors (LMFBRs). The light water reactors are based on a common design, and, although they were developed independently in certain Member States, the European models are closely related to one another. It should therefore not be an impossible task to approximate the safety criteria for such reactors within the Community with the ultimate objective of harmonizing them. As regards fast-neutron reactors, they are being developed in Europe — on the basis of a single design — through close cooperation between the Member States and firms which are particularly interested. This means that it should be possible to lay down criteria and standards jointly. The Commission expects that the willing-

ness recently shown by the Member States to increase international cooperation will also extend to achieving significant progress in the harmonization of safety criteria, and it intends to pursue and intensify its activities.

Conclusions

The emotions stirred up by the Chernobyl accident in the Community and throughout the world — eloquently reflected in the number of official statements made by persons holding the highest positions of responsibility — shows how politically-sensitive the present situation is and emphasizes how important it is that action should be taken. Action is all the more necessary as nuclear energy is already an essential component in the Community's energy balance. It covers one-third of electricity production and saves us the equivalent of over 120 million tonnes of oil a year. It is essential, therefore, to pay very special attention to the situation created by the Chernobyl accident.

Against this background the Commission recently adopted a framework communication in which it gives notice of its intention to transmit to the Council before the end of the year a whole range of proposals, a number of which are listed below.

The communication covers the following five general areas:

(i) health protection, particularly setting limits for the radioactive contamination of foodstuffs;

(ii) the safety of nuclear plants, in particular reviving work on the harmonization of safety criteria;

(iii) establishing emergency procedures for the exchange of information and mutual assistance;

(iv) coordination at Community level to ensure that on the international plane the Member States speak with one voice in the discussions about to begin, particularly within the IAEA;

(v) a Community research programme to provide back-up for actions relating to risk evaluation and radiation protection measures.

These studies and actions should go a long way towards allaying the fears expressed after the Chernobyl accident.

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1 COM(86)327 final. Framework Communication from the Commission to the Council on the consequences of the Chernobyl accident.
2 The doses received are those absorbed by the body of an individual exposed to ionizing radiation; the committed doses are those received by an organ or a tissue over a period of 50 years resulting from the ingestion or inhalation of one or more radioactive particles.
3 Commission Decision, OJ L 120, 8. 5. 1986.
4 The present Council Regulation on the subject expires at the end of September (Regulation 1707/86, OJ L 146, 31. 5. 1986).

How much oil will the European Community need in 1990 if oil prices stay low?

Energy in Europe No 4 *outlined in qualitative terms the main factors influencing oil and energy demand in the European Community in the medium and longer term if oil prices stayed low. This article gives a first* **quantitative** *assessment through to 1990. If the cost of crude oil imports were to stabilize at around $15 per barrel (1986 prices), energy demand in the Community of Twelve could rise by between 8 and 12% by the end of the decade compared with 1985; oil demand by between 7 and 14%; and net oil imports by 1.3-2 Mb/d, raising oil import dependence to 35-38%. This would be an important change over previous expectations which suggested flat oil demand to 1990. The implications for energy policy of such a scenario would need further consideration.*

Projections made by both Member States and by the Commission staff in 1984 and early 1985 pointed to flat or declining oil demand in the Community in 1990. Figures transmitted to the Commission last year by Member States suggested a very modest increase in total primary energy demand by the end of the decade (+4%) compared with 1985 outturn, and static oil requirements for the Twelve. The Commission's own study *Energy 2000*[1] gave even more striking figures: in its reference scenario it projected a slight **fall** in oil demand over the 1983 level compared with an increase of some 14% in energy demand as a whole. All these projections were based on the assumption that high oil (and energy) prices would continue for the period, with *Energy 2000* supposing, typically, the maintenance of an average crude oil import price of around $27 per barrel in real (1983) terms to 1990.

The staff of DG XVII have recently reexamined their projections to 1990 in the light of changes on the energy markets in the past two years, and taking as a **working hypothesis** that crude oil import prices would stabilize at around $15 per barrel (1986 prices). This new hypothesis was combined with a more optimistic outlook for European currencies than used hitherto and the prospects of a more buoyant economic climate. Taking all these factors together, the new projections point to a sizeable potential upturn in oil and energy demand (projection c in Table 1):

Table 1

Energy demand in the European Community (EUR 12): projections compared

Mtoe

	1985 (provisional)	(a) 1990 (Member States' 1985 submissions)	(b) 1990 (Energy 2000)[1]	(c) 1990 (oil at $ 15/bbl)
Gross energy demand[2]	1048	1094	1131	1128-1169[3]
Oil[2]	484	486	496	520- 554
Natural gas	184	186	194	194- 207
Solid fuels	238	254	266	233- 245
Nuclear, hydro, etc	142	167	175	168- 169
Net oil imports	335	360	381	400- 434

[1] *Energy 2000* for EUR 10; national projections for Spain and Portugal.
[2] Including bunkers.
[3] The range given for total primary energy demand is smaller than the sum of the ranges given for each of the fuels. This is because of interfuel competition. Thus the high end of the range for oil assumes natural gas and coal demand below the maximum and vice-versa.

The building blocks of the analysis

The aggregates are presented in terms of ranges so as to reflect the major uncertainties in the new price environment. They were built up from an examination of each of the main sectors of **final** energy demand (residential and commercial, industry, transport, and non-energy — i.e. feedstock requirements). This was made with the help of the medium-term energy model *Midas* (Medium-term Integrated Demand and Supply Model) currently being completed under the Community's non-nuclear research and development programme. A less detailed analysis was made of the requirements for different fuels in **power-generation** (see below) and of the likely impact of low prices on **Community energy production** over the next 5 years.

The analysis concentrated on EUR 10 (on which the Commission staff have the most experience) but figures for Spain and Portugal (based inevitably on less sophisticated analysis) are also incorporated in the results. The key assumptions used are set out in the box below.

Energy demand by sector

The main results for each sector are given in separate tables below, together with our earlier projections to 1990.

Residential and commercial sectors

This is the largest sector of final energy demand, accounting for 38% (EUR 10) of the total in 1984[2]. Some two-thirds is used for **space-heating**; the remainder **cooking, water-heating** and **electrical appliances.**

The higher economic growth associated with lower oil and energy prices should give a fillip to construction and help to bring more energy-efficient housing into being. But there will be less incentive to improve the energy efficiency of the **existing** housing stock. This, combined with more rapid growth of output (and therefore energy demand) by the commercial sector in a more bullish economic climate should push up overall demand for heating. There could also be some increase in requirements for water-heating, and an extension of the electrical appliance inventory is likely to be stimulated by higher consumers' expenditure. All in all we would expect demand to be up by 7-9% compared with the 1984 level.

Natural gas seems likely to take the largest share of this increase as a result of continuing growth in new gas-fired housing in Germany and France and important extensions to the distribution networks in countries such as Italy, Ireland and Denmark. The outlook for natural gas use in **new** housing should not generally be affected significantly by falling oil prices, but oil will be backed out of **older** housing more slowly and may even make some new inroads in some countries. Electricity demand will be raised both by increased energy demand in the commercial sector, by increases in the household appliance stock and by the continuing prospect of penetration in new housing in France.

Main assumptions

Apart from the central hypothesis about the path for crude oil imports prices ($15 per barrel in 1986 prices), the other main assumptions were as follows:

(i) **macro-economic growth.** An average rate for EUR 12 of 2.7% in 1986, 2.9% in 1987, then 2.5% per year 1988-90 as the initial impact of falling oil prices weakens. Figures for 1986 and 1987 reflect projections by the Commission's Directorate-General for Economic and Financial Affairs available in spring 1986. Figures for 1988-90 are simply a working hypothesis;

(ii) **exchange rates.** The value of the dollar in relation to European currencies was assumed to stay at its projected average 1986 level ($1 = approximately 1.07 ECU);

(iii) **oil product taxation.** Several Member States had already increased the taxation of oil products when the analysis was made. Changes up to mid-April 1986 were taken into account. Thereafter it was assumed that specific taxes would rise in line with inflation and no more.

(iv) **trends in the price of other fuels.** How quickly and how far other fuels respond to the fall in oil prices will clearly have an important impact on the balance between fuels. Particular attention was given to the pricing of natural gas. The main hypothesis taken was that natural gas prices to the end consumer would respond rapidly and flexibly to the challenge from competing oil products where this was necessary to preserve competitiveness. But the analysis also looked at the effects of less flexible application of the existing formulae linking gas prices, with a lag, to those of oil;

(v) **the energy policy framework.** The analysis assumed the maintenance of the *status quo ante* in the regulatory and policy environment as it affects energy saving and inter-fuel substitution (eg. building regulations, temperature limits in public buildings, financial support programmes). The projection also assumed no radical change in policy in power-generation (continuing limitations on oil and gas use, completion of planned nuclear stations).

Table 2
Residential and commercial energy demand — EUR-10

Mtoe

	1984	1990 Energy 2000	1990 $ 15 per barrel
Total	252	267	270-275
oil	97	90	97-103
gas	83	92	90-92
solid fuels	17	16	13-14
electricity	54	63	60-62
heat	2	6	5-6

Industry

Industry (excluding non-energy uses) is the second largest sector of final demand (29% of the total). Consumption is dominated by five industrial groups (**iron and steel, chemicals, non-ferrous metals, non-metallic minerals, pulp and paper**) which currently account for 130 mtoe or two-thirds of the total (EUR 10). All five groups have shown sharp declines in energy intensity since 1979, although the energy intensity of the iron and steel industry appears to have broadly stabilized in the past two years.

For the foreseeable future overall industrial energy demand will remain dominated by these five groups. So the outlook for industrial energy demand depends heavily on how they will fare in the more satisfactory economic environment engendered by low oil prices. Chemicals and non-metallic minerals seem likely to be much more buoyant than the others over the coming years, but the energy-intensive industries as a group are expected to continue to lose their share of GDP to sectors such as engineering, electronics (and, of course, services) where energy use is low and intensity declining sharply. Lower energy prices will not reverse these structural trends or have a significantly adverse effect on energy-intensity in these industries in this time-scale (there is known to be a good deal of new energy-efficient investment in the pipeline in many of them). So we would not expect industrial energy demand as a whole to rise more quickly than GDP.

As far as the balance between fuels is concerned, **coal** is expected to lose ground to **oil** and **natural gas**; and the expansion of industrial **electricity** demand will be constrained a little by higher relative prices. It is particularly difficult, however, to assess the outcome of competition between oil and natural gas. The table below gives a relatively wide range for natural gas demand which reflects the uncertainty on this score (and also uncertainty about the size of the market for which gas will be competing). Despite the short-term difficulties facing gas in some interruptible markets, our assessment is that the balance of probability is towards the higher rather than the lower end of the range below:

Table 3
Industrial energy demand — EUR 10

Mtoe

	1984	1990 Energy 2000	1990 $ 15 per barrel
Total	194	216	205-215
oil	46	57	57-65
gas	63	66	62-70
solid fuels	39	40	28-30
electricity	43	48	46-48
heat	2	4	2-3

Transport

Energy demand in the transport sector in 1984 amounted to 161 Mtoe, with oil products accounting for 158 Mtoe and the remainder essentially electricity. Road transport took 85% of the total and air a further 10%. Transport is the only sector of demand to have grown substantially since 1973 (by 25% or 33 Mtoe) and the only one where oil use has increased. The growth has been more pronounced for **diesel** (the bulk of which is consumed for freight transport), consumption of which has grown every year but one since 1974; whereas **motor gasoline** demand (essentially, though not exclusively for passenger cars) has broadly stabilized until recently, fluctuating in a relatively narrow range of 82-85 Mtoe ever since the second oil shock in 1979 (after increasing significantly in the mid-1970s).

The level of demand for road transport fuels is the net result of three factors:

(i) average fuel efficiency of vehicles;
(ii) the number of vehicles on the road (the vehicle stock);
(iii) average distance travelled per vehicle.

Only the latter is susceptible to significant changes in the **very** short term in response to oil price changes and higher GDP growth. But over a period of five years (to 1990) average fuel efficiency could develop in a less satisfactory manner than previously expected because of more trading up to larger new cars (this has been the tendency already in Germany, and lower petrol prices and higher consumers' expenditure may push more generally in this direction), and more stringent environmental legislation.[3]

Our assessment is that value-added in the transport of **goods** will grow broadly in line with expected GDP growth. Taking into account expected improvements in the energy efficiency of the commercial fleet we would therefore expect demand for diesel fuel to be up by **over 10 Mtoe** by 1990 in EUR 10;

The prospects for **motor gasoline** are more difficult to assess. The indications are that in the short-term (1986) vehicles are being driven more as a result of lower petrol prices and higher incomes. We now believe that for the Community of Ten motor gasoline demand will be up this year by as much as 3% on the 1985 figure. But it seems unlikely that such a rate of increase would be sustained over the coming years (implying as it would an addition of well over 10 Mtoe to mogas demand over 5 years) in the absence of continuing sharp falls in price (which are not postulated here). A more modest rate of increase seems therefore more likely on this price scenario:

Table 4
Transport sector energy demand — EUR 10

Mtoe

	1984	1990 Energy 2000	1990 $ 15 per barrel
Total	161	169	178-183
oil	158	166	175-180
electricity	2.5	3	3
others	0	0	0

Non-energy use (petrochemicals and other feedstocks)

This is the smallest sector of demand, but of considerable importance for oil which accounts for three-quarters of total fuel inputs.

Falling naphtha and natural gas prices, together with a more buoyant economic climate, should improve the prospects for the European petrochemicals industries (which currently account for over two-thirds of demand in this sector). But given competition from other supply sources, notably the Middle East, it was assumed in the analysis that output would not grow very much faster than GDP as a whole (perhaps a conservative assumption), with feedstock requirements growing more or less in line with output. Over the same period we do not expect to see more than a modest growth in consumption of other oil products (bitumen, lubricants, etc) whose demand has been flat or declining for a number of years:

Table 5
Non-energy use — EUR 10

Mtoe

	1984	1990 Energy 2000	1990 $ 15 per barrel
Total	60	62	66-68
oil	48	50	53-55
gas	10	10	11-12
solid fuels	2	2	1- 2

Electricity generation

In the electricity generating sector there has been a major shift away from oil over the past 12 years. In 1973 the electricity industry of EUR 10 was consuming 1.6 Mb/d (80 Mtoe) of oil, which provided 32% of the fuel used in power stations. Since then nuclear power has been introduced on a large scale in several countries and it now meets well over 30% of EUR 10 electricity requirements. Coal and other solid fuels have also grown substantially in importance.

Taken together, nuclear and solid fuels provided some 72% of the inputs to electricity generation in 1984 (in line with the Community's objective for 1990). In the same year (when residual fuel oil consumption was boosted artificially by the UK miners' strike) the industry consumed less than 1 Mb/d (46 Mtoe) of oil, which provided only 15% of total fuel requirements. The figure for EUR 12 was even lower because of the importance of solid fuels, nuclear and hydropower in Spain and hydropower in Portugal.

Low oil and energy prices themselves should have no effect on projected **nuclear** output to 1990, which is still expected to lie around 140 Mtoe (EUR 10). The implications of the accident at Chernobyl for the longer-term development of the nuclear programmes of Member States will, of course, need further assessment (see separate article in this issue). But given that the bulk of new stations due on stream in the time-scale of this paper are at least 50% completed, it seems reasonable at this stage to suppose that available capacity in 1990 would lie close to previous projections.

We also discounted any significant shift back towards the use of existing **oil-fired** generating stations, despite the short-term competitiveness of residual fuel oil in some Community electricity generating markets. In Germany, the long-term agreement (*Jahrhundertvertrag*) between

the coal industry and the electricity industry will ensure that solid fuels remain the base for power-generation. In the United Kingdom, the availability of significant oil-fired capacity was vividly demonstrated during the miners' strike in 1984; but it seems unlikely on this price scenario that much of this capacity will be brought back into service as long as coal prices are adjusted as necessary to reflect the changing market conditions. In Italy, where the electricity system is still heavily oil-based and new oil-fired stations are coming on stream this year, oil use may fall more slowly than we projected earlier because of some retiming of alternative capacities. But overall we do not expect oil use to rise significantly and the utilities have indicated to the Commission their own wish to avoid this happening.

Some increase in gas burn may be more likely as a result of lower gas prices, availability of surplus supplies of gas and environmental pressures, although this too should be constrained by existing Community legislation. We do not foresee any very major changes in the 1990 time-scale.

Community energy production

In *Energy in Europe No 4* the Commission staff expressed concern about the impact of low oil prices on the development of **new oil and gas fields** in the North Sea (and in other high cost areas). But most of the consequences of this will not be felt within the time-scale examined here. Expected output of oil and gas in 1990 reflects field developments already under way or committed. There could be, of course, some adjustments to the production profiles from existing fields because of reduced development drilling, but the information available to date does not suggest that the impact by 1990 will be great at this price level. Community oil and gas production was already expected to decline from existing levels by 1990 and we still expect it to do so. But we do not believe that the decline will be accelerated significantly by lower oil prices.

This is a marked contrast to the more rapid effect on some **onshore** production in North America.

The prospects for the Community **coal** industry under a low price scenario are much more difficult to project. World coal prices have already moved down and further reductions are foreseeable given excess capacity worldwide. To the extent that this continues and is translated into coal prices at the pit-head there will be important implications for the finances of the Community coal industry. But it would be premature to forecast the possible consequences for capacity. The energy balances given below assume **for illustrative purposes only** a fall of 5-10 Mtoe in output compared with previous projections.

Issues for further analysis

The tables below (Tables 6, 7 and 8) summarize the projections for final energy demand (EUR 10) and for primary energy demand (EUR 10 and 12), and compare them with figures for 1984. The major uncertainties reflected in the ranges are set out in the box below.

The central question-marks

- **Prices**

(i) how quickly the **prices of other fuels** will adjust to those of oil products;

(ii) the future evolution of **taxation of oil products.**

- **Final energy demand**

(i) the likely growth, structure and energy-intensity of **industrial output;**

(ii) whether and how far **householders** will respond to lower energy prices by seeking higher comfort levels; will the plans of **housebuilders** as to heating installations, insulation be affected?

(iii) how far the **private motorist** will use his car more, simply because he has more in his pocket and prices are lower. Will he be tempted to 'trade-up' to larger models?

- **Electricity and coal**

(i) the balance of fuels in **electricity-generation.** Will oil and gas make some inroads? Are there any real risks to nuclear in the period to 1990?

(ii) the outlook for **coal use and production;**

These results, together with the supporting analysis, recently formed the basis for a fruitful informal exchange of views between the Commission staff and experts from Member States.

The analysis was widely welcomed by officials from Member States who raised no major points of disagreement. But it was felt by many that further work was desirable in a number of areas, notably the transport sector (which is such a critical element in overall oil demand), and in reviewing the outlook **beyond** 1990 in the context of the Community's 1995 energy objectives.

A fundamental question underlying all of this future work is whether the maintenance of low oil prices into the medium and longer term is a reasonable hypothesis in itself. A number of recent studies both in the US and Europe have questioned whether crude oil prices could stay at $15 per barrel for more than a few years even in the absence of a new OPEC agreement. This is because of the likely reductions in non-OPEC supplies of crude (notably US crude) at this price level, and prospective increases in oil demand world-wide. This is a complex assessment, involving evaluations of possible shut-ins of capacity in different non-OPEC producing areas, likely availability of exports from the planned economies, demand requirements in LDCs and the other industrialized countries as well as the Community, and OPEC 'willingness to produce'. The questions raised are being evaluated separately by the Commission staff who will report on them in a future issue of *Energy in Europe*.

Table 6[1]
Sectoral energy demand EUR 10 1990
Oil at $ 15 per barrel

Mtoe

	Oil	Gas	Solid fuels	Electricity	Heat
Totals:	382-403	163-174	42-46	109-113	7-9
Non-energy use	66-68	53-55	11-12	1-2	-
Industry	205-215	57-65	62-70	28-30	46-48	2-3
Residential/ commercial	270-275	97-103	90-92	13-14	60-62	5-6
Transport	178-183	175-180	-	-	3	-
Total final energy demand: 719-741						

Table 7[1]
Primary energy demand and supply EUR 10 1990
Oil at $ 15 per barrel

	Total	Oil	Gas	Solid fuels	Nuclear	Hydro, etc.
Production	556- 561	120	115	165-170	140	16
New imports	470- 510	344-373	75- 88	47-58	-	(-1)
Bunkers	26- 27	26-27	-	-	-	-
Gross inland consumption:	1005-1040	438-466	190-203	212-223	140	15
of which: power stations	365-374	25-30	32-34	150-155	140	15
Oil dependence (share of oil in total primary = 45-48%						
Energy import dependence = 47-51%						

Table 8[1]
Primary energy demand and supply EUR 12 1990
Oil at $15 per barrel

	Total	Oil	Gas	Solid fuels	Nuclear	Hydro, etc.
Production	585- 593	120-122	116	180-185	148-149	21
Net imports	543- 584	398-434	78-91	53-65	-	(-1)
Bunkers	28- 29	28-29	-	-	-	-
Gross inland consumption:	1100-1140	492-525	194-207	233-245	148-149	20
of which: power stations	398-406	29-34	32-35	162-170	148-149	20
Oil dependence (share of oil in total primary demand) = 46-48%						
Energy import dependence = 48-52%						

[1] Because of interfuel substitution the total ranges given in the rows of each table are smaller than the sum of the ranges for individual fuels.

1 See *Energy in Europe* No 1, April 1985.
2 Figures for final energy demand in 1985 are not yet available.
3 The question of energy savings in road transport is under detailed examination by the Commission and a document on the subject will be presented shortly to the Council.

What are the prospects for the Community's oil refining industry?

In May 1986 the Commission adopted a working paper entitled 'The Community oil market, its oil refining industry, and the external trade in petroleum products' (COM(86)263 final). On 3 June 1986 the paper was presented to the Energy Council which agreed with the line taken and with the main conclusions.

The report updates the previous communication from the Commission to the Council on the refining industry and imports of petroleum products (COM(85)32 final, March 1985). This is the first such report to cover the Community of Twelve and it analyses the situation in the Community oil market, the effect of imports of oil products from non-Community countries, trends in capacities and the balance in the refining industry as well as the problems involved in establishing the internal market by 1992.

The Community's oil market

Prices for crude oil and petroleum products have decreased rapidly in 1986 and created a new situation in the Community oil market. If oil prices remain low for a prolonged period, the trend towards lower oil consumption — uninterrupted since 1980 — may stop. With low oil prices consumption could begin to increase helped along by a bigger increase in GNP and energy demand. Oil could also begin to substitute for some other fuels.

The Commission has established three scenarios for trends in oil consumption between now and 1990 based on different oil price levels:

(i) if the price of crude stabilizes at $US 15 per barrel, oil consumption in the Community could increase to around 530 Mt (10.6 Mb/d) in 1990, i.e. an increase of 10% over 1985;

(ii) if the price rises again to $US 20 per barrel, consumption in 1990 could be the same as in 1985, i.e. 485 Mt (9.7 Mb/d);

(iii) if prices rise again to US$ 25 or more, consumption could continue to decrease to a level of 460 Mt (9.2 Mb/d) by 1990, i.e. a decrease of 5% as compared with 1985.

This difference of some 15% between two extreme scenarios may seem wide but it should be remembered that a decrease in the price of oil from $US 25 to $US 15 means that the cost of supplying the Community with oil decreases by some 40% when priced in dollars and by some 50% when priced in ECU.

Although the drop in prices for crude has not been fully reflected in prices for finished products, prices paid by consumers have decreased considerably in most Member States in the last few months.

Industry profitability and structure

Except for short periods, the last 10 years have been characterized by low returns in the refining and marketing of products. The companies have responded to declining volume and poor profitability by rationalizing the whole of their downstream operations. This has enabled them to reduce their costs, but prices for products have remained low because of worldwide surpluses in crude oil production, shipping, refining and distribution. Fierce competition in the market has also helped to depress prices.

Since the end of 1985 the industry's situation and prospects have altered significantly as a result of the drop in oil prices and the introduction of netback contracts which allow refiners a margin, albeit often slight, on their operations.

Trends in capacity

Over the last few years rationalization of the Community's refining capacity has depended on decisions made by the oil companies, following the broad guidelines that the Commission has proposed and the Council agreed.

Table 1
EUR 12: Nominal primary capacity, quantities processed, excess capacity and rate of utilization.

(in million tonnes/year)

	Nominal primary capacity at[1] January	Nominal primary capacity at mid-year	Quantities processed	Capacity required to cover the quantities processed at 80% utilization	Excess capacity (2-4)	Rate utilizator % (3:2)
	1	2	3	4	5	6
1973	800	810	682	855	-	84
1975	860	880	550	690	190	63
1977	915	920	592	740	180	64
1979	925	925	632	790	135	68
1980	920	905	570	715	190	63
1981	875	870	510	640	230	59
1982	835	810	475	595	215	59
1983	760	745	464	580	165	62
1984	700	680	465	580	100	67
1985	655	640	450	565	75	70
1986	615					

As a result of those decisions, EUR 12 primary distillation capacity was reduced from 925 million t/year in 1979 to 615 million at the end of 1985, i.e. a reduction of one-third. These closures have meant a considerable reduction in surplus capacity but the average rate of use of existing capacity is still unsatisfactory.

Closures of primary distillation capacity planned by the industry between now and 1990 should reduce installed capacity to 575 million t/year by the end of the period. Should oil consumption increase as forecast in the $US 15/bbl scenario, capacity would be in balance with demand. If consumption remains constant or decreases further, closures will be required — with installed capacity possibly decreasing to 520 million t/year by 1990.

Whilst rationalizing primary distillation capacity, the industry is also engaged on a major programme of investment in conversion units for the refineries in order to be able to cope with the constant trend towards using lighter sections of the barrel. At present conversion capacity represents 25% of primary capacity (compared with only 9% in 1981).

More recently the need for further new investment has arisen to deal with the trend in product quality standards.

The introduction of lead-free petrol means that refiners have to produce more compounds with a high octane number or use certain alcohol (e.g. methanol, ethanol, TBA) or ether (MTBE) additives.

The existing or projected units for the production of additives should be able to satisfy the demand for lead-free petrol up to 1990. Where low sulphur gasoil is concerned, existing capacity and capacity under construction will enable the companies to produce a gasoil with a 0.3% sulphur content.

Imports of finished oil products

Over the last decade imports into the Community of finished oil products have steadily increased whilst, overall, exports from the Community have remained unchanged. This has led to a deterioration in the EEC's external trade balance in these products since the Community (EUR 12), from being a net exporter of 27 million t in 1973, became a net importer of 30 million t in 1984 and 1985.

For the period 1986 to 1990 the report forecasts an increase of some 10 million t in the net quantity of finished products imported into the Community. This will be the result of the commissioning of export refineries built in the North African and Middle Eastern producer countries. The estimate is based on the assumption that the total production of these new refineries, at an average capacity utilization rate of 80%, will be spread equitably over the world market and that the other large-scale consumers (particularly the USA and Japan) will not prevent these products from penetrating their markets because they will be actively helping to liberalize the international oil trade, as they undertook to do within the IEA (see *Energy in Europe No 2*, 1985).

The Community's balance in refining

To conclude, the trend in the balance for the Community's refining industry over the period 1973-85 clearly shows a decrease in consumption (down 25%), an even bigger decrease in the total volume refined (down 34%) as a result of the increase in imports of finished products and a low rate of capacity utilization.

A certain increase in net imports of finished products is expected between 1985 and 1990, but the most important factor in the balance remains consumption. An increase of some 10% over five years (the $US 15/bbl scen-

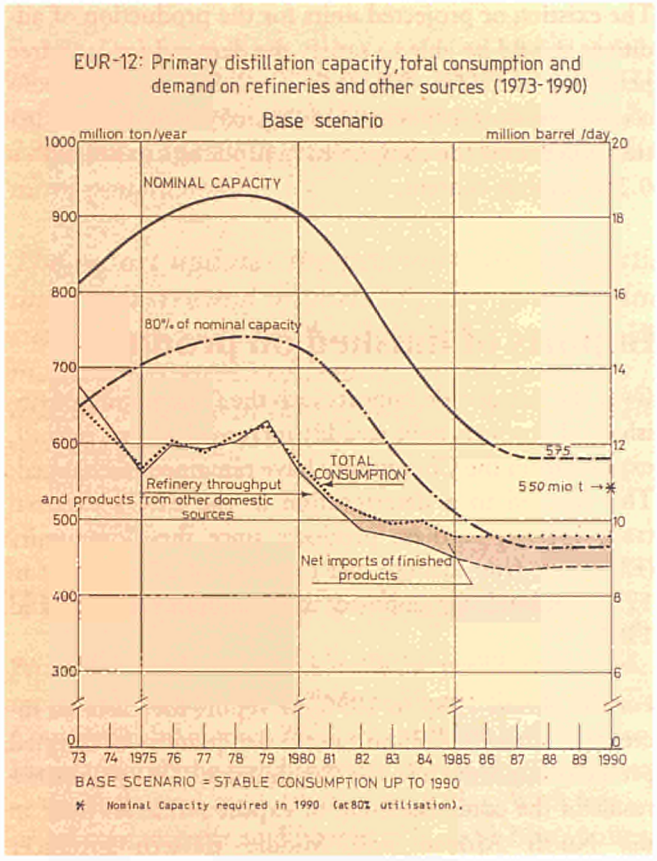


Table 2
EEC-12: The Community Refining Industry 1973-90
(in million tonnes/year)

	1973	1984	1985 [1]	Baseline scenario 1986	1990 20$	Secenarios 1990 15$	1990 20$
Total consumption [2]	648	501	485	485	485	530	460
Net imports of finished products	– 27	30	30	40	40	40	40
Primary energy sources [3]	1	5	5	5	5	5	5
Drawn from stocks	– 3	1	-	-	-	-	-
Crude oil and feedstocks processed by the refinery	682	465	450	440	440	485	415
Nominal primary capacity (mid-year)	810	680	640	600	575	575	575
Utilization rate (%)	84	68	70	73	77	84	72
Surplus primary capacity	-	100	75	50	25	-	55

[1] Provisional figures for 1985.
[2] Including bunkers and in-house consumption by refineries.
[3] Directly usable associated products, including those from the production of natural gas.

ario) would absorb the excess capacity and enable the industry to embark on the next decade in a favourable position. On the other hand, if consumption continues to decrease (the $US 25/bbl scenario), rationalization would have to continue and there would then be further plant closures.

Establishing the internal market

This time the report also stresses the problems involved in establishing the **internal market** through the programme the Community set itself to complete by 1992. Although there are relatively few obstacles to the free movement of oil in the Community market, a special effort will have to be made to avoid the negative effects of:

(i) adopting differing specifications and standards concerning the environment and product quality which would create differences in refining costs and make trade more difficult;

(ii) different national practices as regards financing security stocks;

(iii) the same product being subject to different taxes in different countries which results in even bigger differences in consumer prices in the various countries.

Conclusions

The report concludes by proposing that the Commission's previous policy on refining should be continued. That is the refining industry itself has the responsibility to decide how to restructure, that Governments should adopt a positive attitude to decisions made for this end, and that the Commission has an important surveillance and monitoring role as the industry restructures. The Commission's role takes on extra importance if oil demand is weak or declining. The international dimension of the problem is noted — as well as the need to maintain close contacts with the other industrialized countries and with the new exporters of petroleum products (in the Middle East and North Africa) — so as to avoid a big build-up of exports disturbing the Community's oil market.

The history of Community energy policy

The Washington Conference: 11 February 1974

This occasional series of articles traces the history and development of the Community's energy policy. Following on from the articles on the 1964 Luxembourg Protocol and the Commission Memorandum to the Council on energy policy in 1966 which appeared in **Energy in Europe** *editions 2 and 3. This article sketches the Washington Conference of February 1974 which led to the setting up of the* **International Energy Agency** *in Paris.*

The years between 1970 and 1973 witnessed a succession of measures by the oil-producing countries to increase their tax take on output and to gain control of oil companies' assets. In the process, the oil-producing countries built up a rapidly-growing share of output from their oilfields and signalled their determination to capitalize on this strength in order to deal directly with importers and to safeguard their own economic development. In 1973 the Middle East producers' decisions to curb production and raise prices at the same time exposed how vulnerable the industrialized economies were.

The worldwide energy crisis precipitated by these events in 1973 forced the energy-consuming countries to seek closer cooperation with the oil producers in a bid to bring greater security of supply to the world energy market.

The Commission repeatedly stressed this need, notably in its communication to the Council on 27 April 1973 entitled 'Priority guidelines and action for the Community energy policy'.

In a speech in London on 12 December 1973 Henry Kissinger, US Secretary of State, in turn put the accent on cooperation as he proposed setting up an energy action group comprising representatives from Europe, North America and Japan to piece together a preliminary action programme covering all sectors of the energy market. To follow up the idea, President Nixon invited the Community to an energy conference in Washington on 11 February 1974.

The US Secretary of State's opening speech to the conference clearly expressed the US Government line:

(i) the energy crisis had created such serious economic and political problems in every country that it was impossible for any one country to solve them by going it alone;

(ii) concerted international action was the only response to this challenge with any chance of success;

(iii) the developing countries faced the bleakest future. Consultations and collaboration with them must therefore start without delay;

The Community Member States had to take a Council decision to endorse the principle of a Community response to the US invitation.[1] Then a mandate was drafted for the Commission representatives.

From the Community's point of view, the top priority at these talks with other energy-consuming countries was to seek the best possible form of dialogue, to avoid any confrontation between oil-consuming and energy-producing countries and to take due account of the interests of the developing energy-consuming countries. Particular attention would have to be paid to the needs of the developing countries, many of which had special ties with the Community, and to the price they would have to pay for their energy.

The official communiqué released in Washington on 13 February 1974[2] runs to seventeen paragraphs[3] under three headings: 'Summary statement', 'Analysis of the situation' and 'Establishment of follow-on machinery.'

'Foreign Ministers of Belgium, Canada, Denmark, France, the Federal Republic of Germany, Ireland, Italy, Japan, Luxembourg, the Netherlands, Norway, the United Kingdom and the United States met in Washington from 11 to 13 February 1974. The European Community was represented as such by the President of the Council and the President of the Commission (Mr F. Ortoli). ... The Secretary-General of the OECD also participated in the meeting. The Ministers examined the international energy situation and its implications and ... agreed on specific steps to provide for effective international cooperation. The Ministers affirmed that solutions to the world's energy problem should be sought in consultation with producer countries and other consumers.'

The 'Analysis of the situation' section marks the inception of the International Energy Agency[4]: 'They (the ministers) affirmed, that, in the pursuit of national policies,

whether in the trade, monetary or energy fields, efforts should be made to harmonize the interests of each country on the one hand and the maintenance of the world economic system on the other. Concerted international cooperation between all the countries concerned, including oil-producing countries, could help to accelerate an improvement in the supply and demand situation, ameliorate the adverse economic consequences of the existing situation and lay the groundwork for a more equitable and stable international energy relationship...

They concurred[5] in the need for a comprehensive action programme to deal with all facets of the world energy situation by cooperative measures. In so doing they will build on the work of the OECD. They recognized that they may wish to invite, as appropriate, other countries to join with them in these efforts. **Such an action programme of international cooperation would include, as appropriate, the sharing of means and efforts** ... in such areas as:

(i) the conservation of energy and restraint of demand;

(ii) a system of allocating oil supplies in times of emergency and severe shortages;

(iii) the acceleration of development of additional energy sources so as to diversify energy supplies;

(iv) the acceleration of energy research and development programmes through international cooperative efforts.'

Finally, in the third section ('Establishment of follow-on machinery') the Ministers agreed to establish a coordinating group headed by senior officials to direct and coordinate the development of the actions referred to above[6] and that the preparations for such meetings should include consultations with producer countries.

The coordinating group met for the first time in March 1974, with the Belgian Ambassador, Mr Ockrent, in the chair.[7] It set up three working parties — one on research and development, one on uranium enrichment and one on the role of the oil companies — and defined their mandates. The coordinating group itself remained responsible for economic and financial affairs.

At this inaugural meeting, the group agreed a joint communiqué on relationships with the producer countries without, however, touching on the fundamental questions dear to the USA: price, quantity and conditions of supply. The working party on uranium enrichment was instructed to compare all the potential sources of enriched uranium supplies on a broad international front, including not only capacity in the Community but also sources in other parts of the world, and in particular in the USA.

Finally, the working party on the future role of the oil companies was asked to produce a clearer picture of the companies' activities in such areas as prospecting, research, production, transport and distribution.

Thereafter, the working parties met regularly until the Organization for Economic Cooperation and Development (OECD) set up an autonomous body to look into all these issues in the form of **the International Energy Agency, which was designed to implement the International Energy Programme adopted by the members on 18 November 1974.**

1 COM(74)110 of 24 January 1974; Commission recommendation on the Community position to be taken at the Washington Conference on 11 February 1974.

2 Council working paper R/510/714 (ENER 16) of 21 February 1974.

3 France did not accept all or part of some of the paragraphs.

4 The International Energy Programme was adopted by the IEA signatories on 18 November 1974.

5 France refused to endorse this paragraph and is, therefore, not a member of the IEA.

6 France did not accept this paragraph nor the next one on the tasks that might be addressed in existing organizations and on the establishment of *ad hoc* working groups.

7 Without France.

Energy markets in the European Community

Short-term outlook 1986-7[1]

Since the last short-term energy forecast for the Community published in **Energy in Europe** *in April — oil prices have fallen even further. The average price paid by the Community in July was probably not much above $10/barrel (fob) for imported crude oil compared to an average of $27/barrel in 1985. Taking into account the strong revaluation of the ECU against the dollar in 1986, this means that the cost of the Community's oil imports is currently some 70% lower than in 1985. As a result average consumer oil prices in the Community have fallen sharply (although by less than for crude oil) and this has driven down the prices of other fuels — particularly coal and gas.* **Energy price changes of this magnitude and velocity are unprecedented.**

Energy forecasting in such circumstances is hazardous and uncertain. Not only is the price of oil itself extremely difficult to predict with the critical question being whether OPEC will eventually achieve an oil production sharing agreement but there are also a number of other important uncertainties affecting the analysis. For instance if prices remain low, will there continue to be significant behavioural changes by consumers? Is it likely that Governments will increase taxation on oil products significantly to offset the effects of falling prices? Is it correct to assume that other energy prices will fall enough to maintain their competition with oil?

Falling oil prices have provided the Community with a windfall gain on its balance of payments, but how significantly will economic growth in the Community be affected, and when? Furthermore, what will the economic agents do with their windfall — consume, invest or save? (This could have important implications for energy efficiency trends in the medium term). Lastly, there are major uncertainties involving the Community's electricity industry. Will Governments allow more fuel oil to be burnt in Community power stations while prices are low? All these questions render the present forecast particularly uncertain.

For the purposes of analysis *two oil price scenarios are considered for this forecast. One assumes that the latest limited agreement in OPEC sets prices on an upward track to a $15 per barrel average in 1987.* **The other assumes** *that oil prices remain at around $10 throughout the forecast period 1986-7. These two scenarios by no means exhaust the range of possible outcomes. The extra uncertainty surrounding this forecast is reflected by showing the Community's energy balance in 1987 in ranges of figures.*

Community energy demand *is expected to increase by about 3% in 1986 on both scenarios — reflecting the highest economic growth in the Community for 7 years and much lower energy prices which have themselves induced some significant behavioural changes. In 1987 energy demand could increase by a similar amount but the outcome will be strongly influenced by the level of oil prices, economic growth in general, the performance of the energy intensive industries and the weather.*

In 1986 **Community oil demand,** *as foreshadowed in* **Energy in Europe** *No 4, could increase by 2-3% — the first underlying increase in oil demand since 1979. The key elements explaining this increase are a predicted strong increase in demand for the transport fuels (motor gasoline, diesel fuel and aviation jet fuel), the possibility of further consumer stocking giving rise to a 'one-off' increase in oil deliveries and some limited switching to fuel oils from other fuels — mainly in industry rather than in power generation. In the lowest price scenario oil demand is forecast, at most, to increase by 2-3% in 1987. The share of oil in total energy consumption would be unchanged in 1986 and 1987. The largest share of the incremental energy demand in 1986 will be taken by nuclear energy.*

Provided oil prices stabilize or even increase, 1987 could be a better year for **natural gas** *than 1986. In 1986 gas has temporarily lost some interruptible business to fuel oil — but by 1987 the indexing formulae in the Community's natural gas import contracts would have worked through and this should help natural gas sales. As it is, in many Community countries industrial gas prices have been adjusted downwards faster than expected — but domestic gas prices, to date, have adjusted much more slowly.*

The outlook for **coal** *in the short term is constrained by three factors:*

Firstly, *coal is currently more expensive than fuel oil in many bulk heat markets.* **Secondly,** *nuclear energy is continuing to increase its share in the power generation sector, and* **thirdly** *environmental issues have induced extra uncertainty for coal's clients. With oil prices so low, and the dollar weaker, state aids for current production in the Community's coal industry will probably increase substantially in 1986. At best, relatively flat coal demand is foreseen in the 1986-7 period.*

As for electricity, *after slow demand growth in the first quarter of 1986 — electricity demand could end up around 3% higher in 1986 and in 1987 — slightly higher than previously forecast. Nuclear based electricity could be producing as much as 35% of the Community's electricity in 1986 and slightly more in 1987.*

On the **supply side** *— the Community's oil production this year will be around the 1985 level at 3.0 Mbd — with only very small quantities expected to be shut in as a result of low oil prices. By 1987, however, Community oil production is expected to decline very slightly, due only to a limited extent, to falling oil prices. Nuclear energy in 1987 is expected to be contributing as much to the Community's energy balance as Community oil production. The Community's net import dependence in 1987 could be slightly higher than in 1986 — at around 43% of energy consumption.*

The table below summarizes all the energy forecasts published in *Energy in Europe* to date.

Comparison with previous forecasts

EUR 10: Energy consumption (Mtoe)

		Energy in Europe				
		No 1 (Apr 85)	No 2 (Aug 85)	No 3 (Dec 85)	No 4 (Apr 86)	No 5 (Aug 86)
Total primary energy consumption	1985	936.4	936.7	941.1	945.3	944.0[1]
	1986	:	964.0	965.1	966.3	967.2[2]
	1987	:	:	:	:	990-1005[2]
Oil	1985	421.7	415.6	418.9	415.6	415.5[1]
	1986	:	419.5	422.6	421.9	428.5[2]
	1987	:	:	:	:	428-438[2]
Gas	1985	183.6	182.3	180.8	182.1	181.2[1]
	1986	:	187.7	186.5	183.2	182.9[2]
	1987	:	:	:	:	186-189[2]
Nuclear	1985	116.4	120.1	113.4	116.4	116.4[1]
	1986	:	140.0	131.9	132.7	130.7[2]
	1987	:	:	:	:	150
Coal	1985	201.0	204.5	213.8	218.2	218.0[1]
	1986	:	202.4	209.6	215.0	214.1[2]
	1987	:	:	:	:	212-216[2]
Electricity demand (TWH)	1985	1338.0	1346.5	1347.5	1343.4	1343.7[1]
	1986	:	1380.8	1385.9	1381.4	1385.8[1]
	1987	:	:	:	:	1425-1435

[1] Actual.
[2] Forecast.
: = not included.

The remainder of this article presents in more detail the Commission's Directorate-General for Energy's (DG XVII) latest short-term forecast for the Community. Whilst use has been made of the short-term forecasting model (Stem) developed with the Directorate-General for Science, Research and Development, there has been more reliance than usual on market information in the present uncertain situation.

Forecasting assumptions

The key assumptions underlying this forecast are shown in the box below:

Forecasting assumptions
EUR 10

Macro economic	1985	1986	1987	Comments
GDP	2.3	2.7	2.8	Most optimistic
Consumer expenditure	2.1	3.5	3.4	scenario
Industrial production	3.1	3.0	3.1	for many years
Inflation	5.8	3.3	3.1	

(*Source:* Directorate-General for Economic and Financial Affairs: Economic Forecasts 1986/1987 April-May)

Community oil production

in Mtoe	147	149	146	Slight decline in
in Mbd	2.94	2.98	2.92	1987 expected
Average net nuclear capacity (in Gw)	60	73	84	12 Gw extra capacity expected in 1987
Temperature				Average temper-
Average degree days	236	236	232	ature assumed in 1987

Average Community crude oil import price (FOB)

Scenario 1	$	27.05	13.2	10	Crude oil prices
	ECU	35.05	13.8	10	remain at around $ 10/barrel average
Scenario 2	$	27.05	13.2	15	Latest limited
	ECU	35.5	13.8	15	OPEC agreement sets prices on an upward track to $ 15 average in 1987

Energy prices

(a) Crude oil prices

Crude oil and product prices have collapsed in 1986 following OPEC's December 1985 decision to increase its market share of the world market. Successive failures of OPEC conferences to agree to production sharing and quotas and continuing supply overhang have driven oil prices lower and lower. The recent trends in (fob) average crude oil import prices into the Community are as follows:

	$	ECU	% change on previous quarter in ECU
Q1 1985	27.31	39.9	+ 5.2
Q2 1985	27.27	37.6	- 5.8
Q3 1985	26.37	33.6	-10.6
Q4 1985	27.27	31.9	- 5.1
Average 1985	27.05	35.75	
Q1 1986	20.1	21.8	-31.7
Q2 1986 (provisional)	13	13.2	-39.4

For the purposes of analysis two scenarios are considered for this forecast.

Scenario 1 assumes that the average price of imported crude oil will remain at $10/barrel from now until the end of 1987.

Scenario 2 assumes, however, that the limited agreement in OPEC produces an average price of oil of $15 in 1987.

The average annual crude oil import prices under the two scenarios therefore, will be as follows:

	1985		1986		1987	
	$	ECU	$	ECU	$	ECU
Scenario 1	27.05	35.75	13.2	13.8	10	10
Scenario 2	27.05	35.75	13.2	13.8	15	15

In real terms, if **Scenario 1** turned out to be correct, the price of imported crude oil in 1987 will be barely higher than in 1973 prior to the first oil shock and 75% below the 1985 level. Under **Scenario 2**, the real price of crude oil in 1987 would still be 60% lower than in 1985.

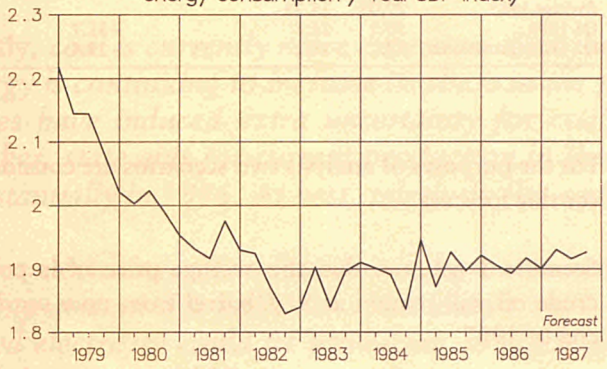
Inherent in both scenarios, therefore, is the continuation of very low real oil prices.

(b) Oil products prices

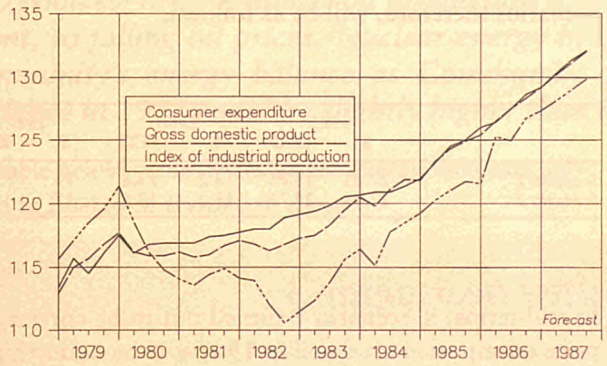
Rotterdam spot market quotations for the main products have fallen very sharply since the end of 1985. Falling product prices have had a ratchet effect on the price of crude oil since large volumes of crude oil are sold on net-back formulae tied to the price of refined products. An indication of Rotterdam spot market price movements in 1986 can be seen from the following table:

The Community's energy situation 1986-7

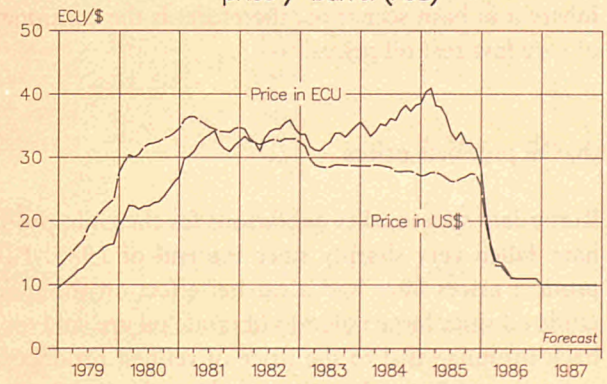
Graph 1 – EUR 10: Quarterly energy ratio trend (volume of seasonally adjusted inland energy consumption / real GDP index)



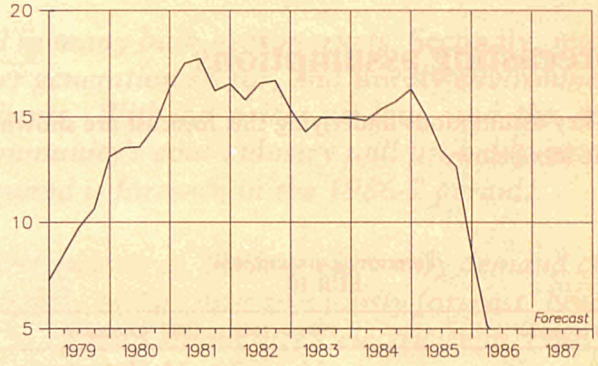
Graph 2 – EUR 10: Quarterly macroeconomic indicators (1975 = 100)



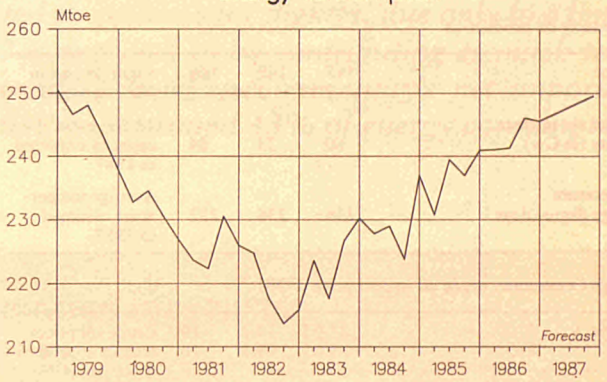
Graph 3 – EUR 10: Average crude oil import price / barrel (FOB)



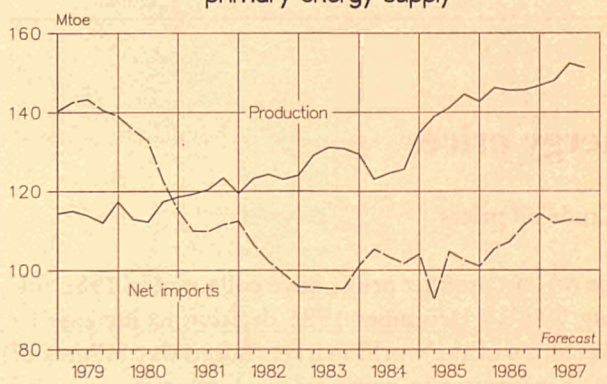
Graph 4 – EUR 10: Real price of imported crude oil / barrel (FOB) in ECU 1975



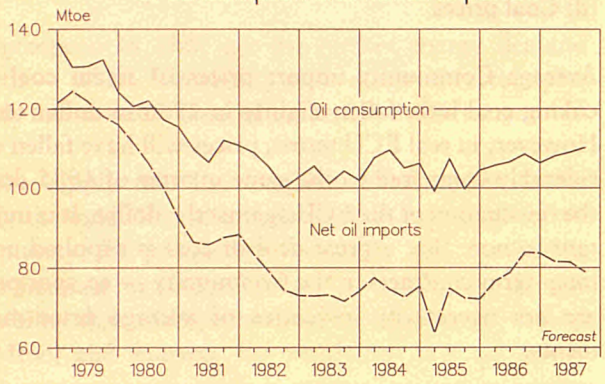
Graph 5 – EUR 10: Seasonally adjusted quarterly energy consumption



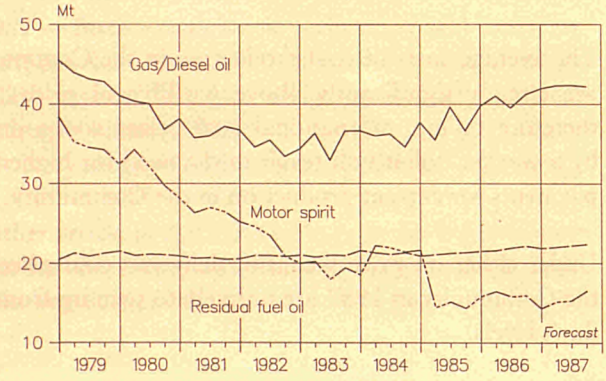
Graph 6 – EUR 10: Seasonally adjusted quarterly primary energy supply



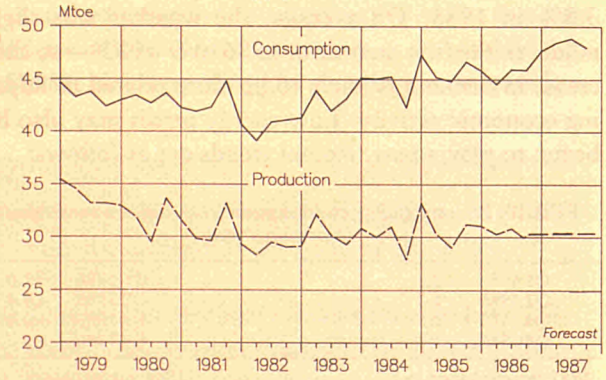
Graph 7 – EUR 10: Seasonally adjusted quarterly oil consumption and net oil imports



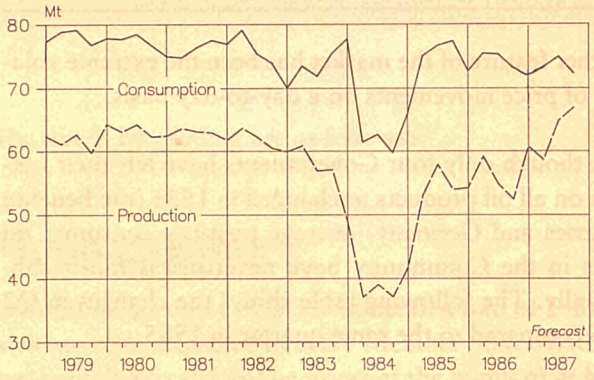
Graph 8 – EUR 10: Seasonally adjusted oil products consumption



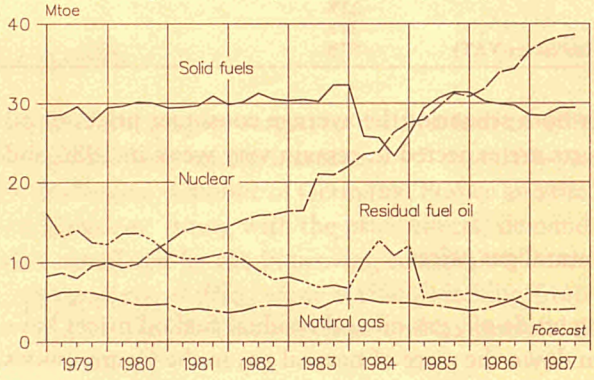
Graph 9 – EUR 10: Seasonally adjusted natural gas supply and demand



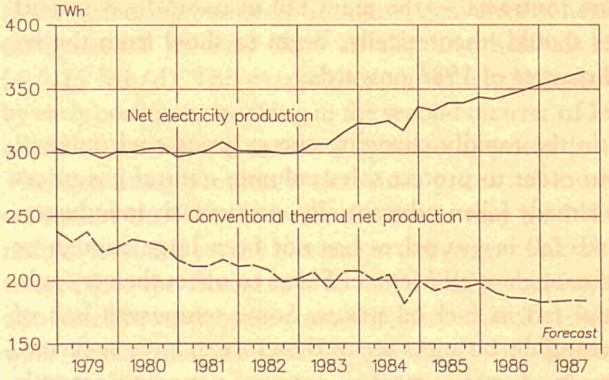
Graph 10 – EUR 10: Seasonally adjusted hardcoal consumption and production



Graph 11 – EUR 10: Quarterly inputs for electricity generation (seasonally adjusted)



Graph 12 – EUR 10: Seasonally adjusted electricity production



Approximate average monthly spot market quotations ($/tonne)
Barges (fob) Rotterdam

	Motor gasoline (premium)	EEC Gasoil	RFO (3.5%s)
December 1985	264	249	137
January 1986	229	213	120
February 1986	177	200	100
March 1986	158	183	95
April 1986	161	164	65
May 1986	197	144	54
June 1986	169	117	54
29 July 1986	128	94	41

Another feature of the market has been the extreme volatility of price movements on a day-to-day basis.

Even though only four Governments have left their taxation on all oil products unchanged in 1986 (the Benelux countries and Germany) average post-tax consumer oil prices in the Community have nevertheless fallen substantially. The following table shows the changes in Q2 1986 compared to the same quarter in 1985.

% change in average consumer oil prices in the EEC (all taxes included)

	% Q2/1986 / % Q2/1985
Motor gasoline	--22%
Derv	--22%
Gas oil	--34%
Heavy fuel oil (ex-VAT)	--57%

Under both scenarios the average consumer prices of oil products are expected to remain very weak in 1986 and 1987.

(c) Natural gas prices

Falling crude oil, gas oil and residual fuel oil prices have driven down the price of natural gas in the Community's energy markets. For example, the average Community price of imported natural gas was about 17% less in the first quarter of 1986 compared to the same period in 1985. However, given the lagged formulae of most gas import contracts — the main fall in natural gas import prices should, theoretically, begin to show from the second quarter of 1986 onwards.

But, in the rapidly changing energy price environment, and in order to protect sales volume, natural gas prices have already fallen substantially, particularly in industry. But the fall in gas prices has not been large enough or rapid enough in all Member States to offset the very substantial fall in fuel oil prices. Some temporary loss of 'interruptible' business seems therefore to have occurred. As for the domestic market, national gas prices are only moving slowly downwards.

Depending on the oil price scenario chosen, natural gas import prices, after an expected average 25% fall in 1986, could halve again in 1987; prices to the consumer in 1987 could fall very sharply as a result — and if oil prices stabilize or *a fortiori* harden — gas could be temporarily in a very favourable position.

(d) Coal prices

Average Community import prices of steam coal and coking coal have fallen slightly in 1986 in dollar terms. However, in real ECU terms, prices will have fallen considerably compared to the same quarter of 1985 due to the revaluation of the ECU against the dollar. It is important to note that a great deal of coal is supplied under long- term contracts in the Community — so spot prices are not necessarily indicative of average price movements.

The international coal market is still oversupplied; demand is sluggish with the steel sector showing signs of a slight slump in the second half of 1986. As well, some industrial coal business has also been lost to fuel oil.

The average costs of coal production in the Community are already significantly above world coal prices and therefore falling international coal prices compounded by a weaker dollar will result in the need for higher aid payments for current production in the Community.

Under either oil price scenario, delivered coal prices in the Community in 1987 are unlikely to turn up from today's levels.

Overall energy

The Community's energy consumption grew by 2-2.5% in the first quarter of 1986 — following on an increase of 3.8% in 1985. On average, the weather was slightly milder in the first quarter of 1986 over 1985 — so the increase in demand is likely to be more related to improving economic activity. Low energy prices may also have begun to play a part. Recent trends are as follows:

EUR 10: Primary energy consumption % change on same quarter of previous year

Q1 1985	+3.1	Q1 1986	+2.0
Q2 1985	+1.3	Q2 1986[1]	+4.4
Q3 1985	+4.8	Q3 1986[1]	+0.9
Q4 1985	+5.6	Q4 1986[1]	+3.7
1985 annual change: +3.7		1986 annual change: +2.7	

[1] forecast

With GDP and industrial production forecast to increase by around 3% in 1986 — the brightest economic scenario for years on top of very weak energy prices — Community energy demand is set to increase again for the fourth year in succession. In 1986 energy demand could increase by around 2.5% to 3.0%, slightly higher than previously forecast because of the unexpected increase in consumer oil stocks.

The prospects in 1987 are for further energy demand growth — which, depending on a range of factors previously mentioned, could be in the 2.5-3.0% range.

On the supply side four features stand out in 1986. **Firstly** the unlikelihood of a more than negligible fall in Community oil production, **secondly** the continuing sharp increase in nuclear energy (+10%), **thirdly** the probability that oil imports could increase by 0.5 Mb/d (26 Mtoe) and **fourthly** the possibility that oil stocks could increase — especially if market expectations point towards firmer prices in the near term. Overall Community net energy import requirement will be about 43% of overall supply, slightly above 1985.

In 1987 — further tranches of nuclear capacity come onstream, but the Community's oil production could begin to fall slowly. In 1987 total energy production could approach 600 Mtoe (12 Mb/d), over 70% more than in 1973. Net energy imports should remain little changed.

(Another article in this edition looks at the medium-term effects for the Community's energy balance if oil prices remain low until 1990).

Oil

Although data for the first semester is incomplete, it is clear that the Community's oil deliveries in the first half of 1986 are at least 2.5% higher than in the parallel period of 1985. However, there are two important qualifications:

(i) Netting out the effects of the UK mining dispute the increase in deliveries is about 5%.

(ii) The figures measure **oil deliveries and not oil consumption** even though they are often loosely referred to as oil consumption.

Although oil company, government stocks and in most cases power station stocks are taken into account in the measurement of deliveries into consumption, changes in final end consumer stocks are usually not. This is important because there is reason to believe that there have been significant changes in consumer stocking behaviour in 1986.

The trends by product are as follows:

Motor gasoline

Deliveries were up by over 3% in the first half of 1986 — with increases expected in every Member State. With an average fall in real gasoline prices at the pump of at least 20%, discretionary driving has increased. The stock of cars is increasing alongside additional numbers of people of driving age.

Gasoils

Gasoils for transport surged in the first half of 1986 — with particularly strong increases (+7 to +12%) noted for the Federal Republic of Germany, France and the United Kingdom. Along with the price effects, demand has been stimulated by the improving economic climate (increasing goods traffic), some traffic switching from rail to road and the increase in private and commercial diesel motor vehicles.

Gasoils for heating

In the Federal Republic of Germany, deliveries of heating oil increased by over 40% in the first half of 1986 (+0.15 Mb/d). This exceptional movement is explained by early consumer stocking in the second quarter of 1986 ahead of the normal seasonal increase in stocks in Q3. The interesting question is that since prices are low will consumers choose to increase the stocks they hold above normal levels? If so, the increase in deliveries could be sustained into the second half of 1986. Early stocking was also noted in some other countries, although the volumes were much smaller. Overall gas/diesel oil deliveries could have increased by around 10% in the first half of 1986.

Heavy fuel oil

Netting out the effects of the United Kingdom's mining dispute, Community deliveries of fuel oil in the first half of 1986 were higher than the corresponding figure in 1985, — the first time since the beginning of 1979 that this has been the case. There has not been a significant switch back to fuel oil in power stations (although utilities may have increased their stocks of fuel oil). However, there has been some limited switching back into fuel oil in industry (with corresponding falls in gas and coal to match). This movement does not appear to be large at present but could grow if fuel oil prices continue to remain at very low levels. In the first half-year solely due to the effects of the UK mining dispute, Community deliveries of fuel oil were about 15% lower than in 1985.

Prospects 1986 and 1987

1986

Both oil price scenarios assume the maintenance of the $10/barrel until the end of 1986 and so oil product prices are assumed to remain at around today's levels.

If the Community's deliveries of oil increased at the same underlying rate as in the first half of 1986 (+5%), then total Community deliveries of oil in 1986 would be between 3% and 4% higher than in 1985. However, because consumer stocks have been already substantially rebuilt especially in the Federal Republic of Germany the underlying rate of increase could slow. Much will depend on consumer expectation of continued price weakness. Taking these factors into account it seems possible that Community oil demand (measured by deliveries) should be between 2% and 3% higher than in 1985 — the same range of figures reported in *Energy in Europe, No 4* in April this year. Tentative annual projections 1986/1985 by product suggest motor gasoline +3%, gas oils +7 — +8%, residual fuel oil —4% (flat excluding effects of the UK mining dispute).

1987

The outlook in 1987 is very uncertain. Assuming oil prices remain at $10/barrel — a simple calculation would yield the following forecast:

	Increase in oil consumption
Assume short-term price elasticity (−0.1) x change in consumer oil prices in 1987 (−10% max)	+1 %
Assume short-term income elasticity (.25) x increase in GDP in 1987 (+2.8%)	+0.7%
Implied increase in Community oil consumption	**+1.7%**

(These elasticities have been derived from some current research work the Commission is undertaking and are calculated from historical data. They are purely illustrative 'rule of thumb' approximations).

The major uncertainty, of course, is the evolution of consumer oil prices. If OPEC manages an agreement — consumer oil prices could rise by 10% or more — which would largely offset the income effect on demand. However, if prices were to fall by 20% — the rate of increase in oil consumption would be nearer 3%. On the other hand, these approximations could also be overstating the potential increase in demand if it turns out that most of the decrease in oil consumption is irreversible. The consumer stock effect could also play a role in 1987. A prudent forecast, therefore, covering the two oil price scenarios would suggest a range of oil demand in 1987 of 430—440 Mtoe (8.6 Mb/d — 8.8 Mb/d)

OR, a range of 0-2.5% growth in 1987

Natural gas

Natural gas consumption declined by about 0.5% in the first quarter of 1986. Netting out gas used in power stations, gas consumption could have slightly increased. Early statistical evidence suggests that gas in power stations will not increase in 1986 although the outcome will be determined in some Member States by the volume of excess contracted supplies.

In the domestic and industrial markets little growth is foreseen. Degree days were slightly lower in the first quarter of 1986 thereby depressing domestic demand — and in the industrial market some interruptible sales will be temporarily lost to fuel oil. Overall demand is still expected to grow slightly (+1-2%) but this could prove to be optimistic.

As gas prices weaken and catch up with falling oil prices — so 1987 should be a better year for gas. Rising Community GDP and industrial production also point towards this trend. A 3% increase in demand is possible.

Coal

Solid fuel demand increased by around 7% in the first quarter of 1986. However, significantly, if the adjustments are made to take account of the UK miners' dispute, the underlying trend of solid fuel demand is downwards (-2%). Although coal prices are weaker, solid fuel demand is being constrained by the shrinking volume of conventionally produced electricity as the Community's nuclear electricity output increases, which is braking solid fuel demand growth. Increased fuel oil competition, and a slowdown in the steel industry are also limiting coal demand in the short term.

In 1986, solid fuel demand should be close to the 1985 level of 218 Mtoe — but if fuel oil prices remain low (as they are assumed to in both the two oil price scenarios), solid fuels could struggle to hold the 1985-1986 demand levels.

Community hard coal production could increase by 7% in 1986 — and coupled with more limited stock movements this means that net imports of coal could be substantially lower than in 1985.

Electricity

Electricity demand in the Community expanded by 2% in the first quarter of 1986 — the lowest quarterly increase since Q4 1984. Electricity demand is particularly buoyant in the United Kingdom and France. However electricity growth is expected to pick up in the rest of 1986 and in 1987 as both GDP and industrial output are forecast to grow at 3% annual rates. Electricity demand could grow by 3% in 1986 and by a similar amount in 1987. Average electricity prices in the industrial sector are forecast to fall by about 5-10% in real terms although domestic electricity prices will probably fall by less.

Once again, as previously reported in *Energy in Europe*, the main feature on the supply of electricity is the expansion of nuclear power in the Community. In 1986 and 1987 a further 18 nuclear power stations should begin commercially producing electricity — thereby lowering the requirement for conventionally generated electricity. In this period nuclear electricity will be covering over 35% of the Community's electricity production. In 1986 coal-fired generation will slightly increase but oil and gas consumption in power stations are expected to weaken. However if oil prices remain low in 1987, the economic attractions of increasing the hydrocarbon burn could be substantial.

[1] Manuscript completed 4 August 1986.

TABLE 1 — Primary energy balance for the European Community

(Mtoe)

	1980	1981	1982	1983	1984	1985	1986	1987
Primary production								
Solid fuels	186.5	186.8	183.8	175.7	131.8	157.9	166.2	165-170
Oil	91.5	101.7	115.1	131.4	144.2	147.0	149.1	145
Natural gas	129.4	125.5	116.1	119.9	119.2	125.5	121.9	122-125
Nuclear	40.5	54.7	61.5	74.5	95.6	116.4	130.7	148-150
Hydro	12.6	12.8	12.6	12.5	12.2	11.8	11.8	12
Total	**460.6**	**481.5**	489.1	514.0	503.0	558.7	579.8	592-602
Net imports								
Hard coal	48.9	44.2	46.1	38.4	51.9	56.0	50.5	46-47
Oil	435.7	354.0	326.5	292.2	300.4	287.6	313.0	309-319
Natural gas	43.5	46.2	45.8	50.1	57.9	59.3	60.4	64
Electricity	1.2	1.9	1.7	1.9	1.3	1.1	1.5	2
Total	529.3	446.2	420.1	382.6	411.5	404.0	425.4	421-432
Change in stocks								
Hard coal/coke	11.0	8.9	10.6	1.8	- 16.5	- 4.0	2.6	—
Oil	15.6	- 17.9	- 10.3	- 15.3	- 3.2	- 4.2	6.2	—
Natural gas	3.9	6.7	3.4	4.9	2.9	3.6	- 0.6	—
Bunkers	23.8	25.9	24.2	22.3	21.2	23.3	27.3	26
Estimated gross inland consumption								
Solid fuels	224.4	222.0	219.4	212.3	200.2	218.0	214.1	212-216
Oil	487.8	447.6	427.7	416.6	426.5	415.5	428.5	428-438
Natural gas	169.0	164.9	158.5	165.1	174.3	181.2	182.9	186-189
Nuclear	40.5	54.7	61.5	74.5	95.6	116.4	130.7	150
Hydro	12.6	12.8	12.6	12.5	12.2	11.8	11.8	12
Total	935.6	904.0	881.3	882.9	910.0	944.0	969.7	990-1005
Net imports as % of consumption[1]								
Hard coal	21.8	19.9	21.0	18.1	25.9	25.7	23.6	
Oil	85.2	74.7	72.3	66.6	67.1	65.5	68.7	
Natural gas	25.7	28.0	28.9	30.3	33.2	32.7	33.0	
Total	55.2	48.0	46.4	42.3	44.2	41.8	42.7	41.4-41.9

[1] Net imports/(gross inland consumption + bunkers).

TABLE 2 — Primary energy balance for the European Community

(Mtoe)

	1985				1986			
	I	II	III	IV	I	II	III	IV
Primary production								
Solid fuels	35.4	38.9	40.4	43.3	43.1	42.5	38.6	42.1
Oil	37.7	36.0	35.4	38.0	38.9	36.1	36.3	37.8
Natural gas	46.1	25.0	17.9	36.5	43.2	24.9	19.0	34.8
Nuclear	31.1	25.9	26.0	33.3	34.8	29.4	29.9	36.7
Hydro	3.0	3.7	3.0	2.2	2.7	3.4	3.0	2.8
Total	153.2	129.5	122.7	153.2	162.7	136.3	126.7	154.1
Net imports								
Hard coal	13.5	13.9	13.8	14.8	12.5	14.1	12.7	11.3
Oil	76.0	62.9	71.5	77.2	72.4	75.8	75.1	89.8
Natural gas	16.1	14.6	12.5	16.2	17.4	14.0	12.1	16.9
Electricity	0.2	0.4	0.5	0.1	0.1	0.5	0.7	0.3
Total	105.7	91.7	98.3	108.4	102.4	104.4	100.5	118.2
Change in stocks								
Hard coal/coke	- 6.8	0.3	5.0	- 2.6	- 3.5	5.2	4.2	- 3.3
Oil	- 5.9	- 1.4	- 0.5	3.6	- 7.7	4.7	3.4	5.9
Natural gas	- 4.5	4.8	3.9	- 0.7	- 5.8	3.1	4.0	- 2.0
Bunkers	5.1	6.2	6.2	5.8	6.4	7.1	7.3	6.7
Estimated gross inland consumption								
Solid fuels	55.6	52.5	49.1	60.7	59.1	51.4	47.0	56.6
Oil	114.4	94.0	101.3	105.9	112.7	100.1	100.7	115.1
Natural gas	66.7	34.7	26.5	53.3	66.4	35.8	27.1	53.7
Nuclear	31.1	25.9	26.0	33.3	34.8	29.4	29.9	36.7
Hydro	3.0	3.7	3.0	2.2	2.7	3.4	3.0	2.8
Total	270.9	211.2	206.3	255.5	275.7	220.6	208.3	265.1
Net imports as % of consumption[1]								
Hard coal	24.2	26.5	28.1	24.4	21.2	27.5	26.9	19.9
Oil	63.6	62.7	66.6	69.2	60.8	70.7	69.5	73.7
Natural gas	24.1	41.9	47.1	30.4	26.2	39.2	44.6	31.5
Total	38.3	42.2	46.2	41.5	36.3	45.9	46.6	43.5

[1] Net imports/(gross inland consumption + bunkers).

TABLE 3 — Hydrocarbons: supply and disposal in the European Community

	1980	1981	1982	1983	1984	1985	1986
1. Oil (Mt)							
Primary production	90.6	100.7	113.9	130.1	142.7	145.5	147.6
Change in stocks [1]	15.6	- 17.8	- 10.2	- 15.2	- 3.2	- 4.2	6.2
Net imports [1]	433.5	352.4	325.1	291.0	299.1	286.6	311.9
Bunkers	24.5	26.8	25.0	23.0	21.9	24.1	28.2
Apparent consumption	484.0	444.1	424.3	413.3	423.2	412.2	425.1
Inland deliveries:							
Motor gasoline	84.5	82.6	83.3	83.7	85.2	84.5	87.1
Gas/diesel oil	158.6	147.5	140.3	140.4	143.3	149.1	161.6
Heavy fuel oil	128.0	108.1	93.6	77.8	83.3	66.6	64.0
Other production	85.0	80.4	80.5	85.4	86.5	85.9	89.3
Total	456.2	418.6	397.8	387.3	398.2	386.1	402.0
Power stations:							
Consumption	53.9	44.7	40.0	31.2	41.2	31.6	23.0
Change in stocks	- 0.4	0.6	- 1.4	- 2.7	- 0.1	- 1.2	1.3
2. Natural gas (Mtoe)							
Primary production	129.4	125.5	116.1	119.9	119.2	125.5	121.9
Imports[2]	43.5	46.2	45.8	50.1	57.9	59.3	60.4
Apparent consumption	169.0	164.9	158.5	165.1	174.3	181.2	182.9
of which:							
in power stations	20.3	16.9	16.6	18.8	20.6	18.0	17.9

[1] Crude oil and petroleum products.
[2] Imports from third-party countries.

TABLE 4 — Solid fuels: supply and Disposal in the European Community

	1980	1981	1982	1983	1984	1985	1986
1. Hard coal (Mt)							
Primary production	253.6	252.2	248.4	235.2	161.9	205.9	220.2
Change in stocks							
Collieries	10.7	8.9	4.2	0.5	- 8.3	- 10.4	- 4.6
Power plants	6.7	6.2	9.5	0.9	- 13.6	8.8	6.4
Net imports	74.2	66.5	70.0	57.0	78.9	86.5	77.3
Apparent consumption	310.3	303.6	304.6	290.8	262.7	294.0	295.8
Deliveries to:							
Power plants	179.2	176.5	184.0	175.8	131.9	172.9	171.9
Coking plants	88.4	85.2	80.1	69.7	69.8	76.3	74.9
All industries	22.7	24.0	24.5	25.4	26.1	28.6	26.8
Households	18.0	16.0	16.5	15.9	14.5	17.7	16.6
Total	308.4	301.7	305.2	286.8	242.2	295.5	290.2
2. Hard coke (Mt)							
Coking plants							
Production	66.6	64.2	60.2	53.5	52.8	57.1	54.6
Change in stocks	0.8	- 0.1	3.8	1.4	- 5.3	- 3.9	2.8
Deliveries to the iron and steel industry	54.3	52.6	46.3	41.8	48.5	49.8	47.1
3. Lignite							
Production (Mt)	157.0	162.4	159.3	158.7	162.0	159.2	156.8
Consumption in power stations (Mtoe)	26.2	27.6	26.6	27.3	27.0	25.7	25.6

TABLE 5 — Electricity: Supply, disposal and generating structure in the European Community

	1980	1981	1982	1983	1984	1985	1986
Electrical power (TWh)							
Total generation	1 277.6	1 274.6	1 271.4	1 299.8	1 360.7	1 425.7	1 460.5
Total net production	1 208.7	1 206.1	1 202.9	1 229.1	1 286.7	1 347.3	1 380.9
of which:							
Hydroelectrical	146.1	149.1	146.1	144.8	141.5	137.7	137.6
Nuclear	149.4	201.7	226.9	275.0	352.8	429.4	482.5
Conventional thermal	913.1	855.2	830.0	809.3	792.4	780.2	760.8
Gross inland consumption	1 291.7	1 296.8	1 290.8	1 321.6	1 375.3	1 438.5	1 478.2
Available for internal market	1 213.9	1 217.4	1 212.0	1 237.9	1 287.5	1 343.7	1 385.8
Input to thermal power stations[1] (Mtoe)							
Hard coal	92.9	91.9	94.7	96.1	80.8	90.9	95.8
Lignite	26.2	27.6	26.6	27.3	27.0	25.7	25.6
Petroleum products	51.7	43.0	38.4	29.9	39.6	30.3	22.1
Natural gas	20.3	16.9	16.6	18.8	20.6	18.0	17.9
Derived gas	1.7	1.8	1.5	1.3	1.5	1.5	1.4
Total	193.7	182.2	178.2	174.0	171.7	167.7	163.8
Net Nuclear capacity (GW)	26.7	34.4	40.2	43.8	50.7	60.3	72.8

[1] Conventional thermal plants in the public supply system.

Energy efficiency in industry

The Commission has adopted, on 16 May 1986, a new Communication to the Council entitled 'Towards a European Policy for Energy Efficiency in Industrial Firms'. It describes how energy has been used in industry in the past, indicates the main energy saving technologies available and their potential, analyses the main obstacles for investments in rational energy use, and, finally, gives an overview on energy conservation initiatives financed and managed by public authorities and by the European Community. The Commission has also proposed to the Council the adoption of a political Resolution which underlines the need to continue energy saving efforts and policies in a time of lower oil prices. This Communication is summarized below (it is available in all Community languages, reference COM(86)264).

Twelve years after the first oil crisis some of the most severe constraints on the energy markets have been overcome, due in no small way to effective policies for the rational use of energy (RUE).

From 1950 to 1973 the Member States of the European Community (EUR 10) doubled their energy consumption to 932 Mtoe, becoming heavily dependent on imported oil.

In 1984 the primary energy consumption of the 10 Member States was 912 Mtoe while GDP has risen by over 20% since 1973, implying that energy efficiency had improved by 20%.

Industrial energy consumption was 211 Mtoe in 1984 or 32% of the Community total (42% including non-energy consumption (essentially chemical feedstocks).

The industrial sector has cut its energy consumption per unit of output by 24% between 1975 and 1983 — more than the other large energy-consuming sectors.

Structural changes in industry and the effects of the economic crisis go a long way towards explaining this trend. Energy savings have also played a significant part. Three industries dominate industrial energy consumption: iron and steel, chemicals and non-metallic minerals. In these sectors energy costs account for more than 20% of production costs and account for more than 60% of industrial energy consumption. Economic recovery in steel and chemicals largely explains the 2% increase in industrial energy consumption in 1984.

The way firms use energy has been examined in detail through various national and Community programmes (energy audits of major sectors, energy bus etc), and clearly there is still a very large potential for further energy savings which could be achieved using known technologies that have a short payback period. **Potential energy savings in the industrial sector are put at some 25% of specific consumption between 1985 and the end of the century, i.e. about 60 Mtoe/year — or the equivalent of over 1 million barrels of oil consumption per day!**

A large part of this potential can still be harnessed without any major investment, such as by stricter monitoring of consumption, reducing heat losses and heat recovery using proven techniques.

In the long run the greatest energy savings will be achieved by the turnover of the capital stock thus replacing outdated production machinery and equipment, introducing microelectronic control systems and converting to radically new manufacturing processes.

Research and development programmes and demonstration programmes at both national and Community level have given considerable impetus to RUE initiatives in industry and have contributed to the development of energy saving equipment manufacturing. As a result, European industries have become more competitive and new jobs have been created in a sunrise industry.

Many techniques for a more rational use of energy exist (helped along by Community RD&D measures), but their industrial application is hindered by a series of obstacles. These, which have been known about for some years, relate to informing and training industrial engineers and managers, the decision-making process for energy saving investments and financial difficulties.

National and Community authorities have introduced a range of measures to overcome these obstacles, including programmes of information, advisory services, demonstration and financial assistance for investment. Some of these programmes have now come to an end in several countries or have been cut back for budgetary reasons, so that the time has come to examine the best ways of pursuing and stimulating RUE investments in industry.

The present fall in energy prices threatens to discourage RUE investments. Any relaxation of the RUE effort

would make industry more vulnerable in the medium term in terms of energy supply (short-term price levels do not represent long-term supply costs), and would also cause major difficulties for the RUE equipment sector and seriously threaten its future.

On the other hand, vigorous economic growth in the Community stimulated by lower energy prices could speed up the replacement of production plant, when more energy-efficient machinery could be installed.

Current energy price trends could therefore have contradictory effects, but in any case control over energy remains an essential objective. Here the dissemination and application of RUE experience, through energy technology projects for example, is of primary importance, the more so in that one of the main obstacles to RUE investments is industry's general ignorance of its energy consumption figures and of the techniques for reducing them.

The Commission is at present preparing a broader campaign for dissemination and application of the results of demonstration programmes through project monographs, information workshops, conferences, etc.

A databank on R&D projects, demonstration projects and hydrocarbon technology projects has been set up. It is known as Sesame and contains not only Community projects but also a growing number of national projects. It is planned to open public access to information on the technology projects under Community programmes (energy demonstration projects and hydrocarbon projects) through the intermediary of the major European databank centres. Sesame could be usefully developed as the core of a documentation centre on RUE technologies. This centre, in cooperation with European producers, could at a later date store information on European RUE machinery and equipment.

A European Federation of Energy Management Association (EFEM) was set up recently. Its members are associations of experts on energy conservation in several Community countries, and it could help to disseminate RUE technologies.

Work on the analysis of energy consumption should also be continued both in industry audits and under the energy bus programme. The results of the earlier programmes are most encouraging and it has been decided to continue the programme over the period 1985-87, concentrating on a more detailed analysis of energy-intensive sectors and sectors where small businesses proliferate. The Commission will soon be assessing, using a sample of the audits carried out, how far firms have made the investments recommended after an audit.

Apart from the information barrier, which also stems from the training received by industrial engineers and managers (there is little teaching on energy and its uses in colleges and universities), the main obstacles to the penetration of RUE techniques are financial.

Most firms cannot themselves finance energy saving investments, or else they prefer to use their capital for development or expansion projects. Capital expenditure on RUE usually ranks after other expenditure, considered more important, such as the replacement of old machinery or rationalizing the workforce.

RUE investment is therefore subject to extremely stringent profitability criteria. A payback time of less than two years is almost the general rule. This very high profitability requirement also stems from the weak financial structure of firms. When a large part of operating capital is borrowed, banks are reluctant to make further loans to firms, or at any event long-term reduced-interest investment lending, even for RUE projects with high profitability and low risk.

Firms are therefore concerned to make RUE investments without a major financial outlay. New financing mechanisms devised in recent years are an answer. In 'third party financing', an agency outside the company studies the problem, proposes a technical solution and contributes the investment funds required (see *Energy in Europe No 4*). This agency monitors the performances and maintenance of installations. It is reimbursed on the basis of a given percentage of the energy savings achieved by the customer over a period stipulated in the contract, at the end of which the ownership of the machinery may be transferred to the customer firm.

This financing mechanism made its appearance around 1980 in North America. It has been slower to emerge in Europe, but is now arousing growing interest. The initial successes have been achieved in the building sector but a recent study has discovered a large potential in industry also, especially in non-process installations such as central heating systems, cogeneration, space heating, lighting, remote controls etc. The Commission will make sure that these new financing mechanisms become better known.

Other possibilities for promoting RUE investment in industry lie in systems of credit insurance as a means of facilitating access by firms to the financial market on favourable terms. This system could have a considerable leverage effect. Commission staff are now considering whether to propose a credit insurance scheme for RUE equipment manufacturers. The aim would be to cover part of the investment and marketing risk inherent in selling a new product or a new energy saving technology.

The Member States could also usefully consider such a mechanism for users of RUE equipment.

Major energy savings can be achieved by recycling raw materials, from paper to plastics to non-ferrous metals. A boost to initiatives in this area could have a considerable impact.

To increase energy efficiency will demand further R&D and demonstration efforts. Future research should be increasingly multidisciplinary as the line between energy optimization in the strict sense, on the one hand, and product quality and the use of new materials or technologies, on the other, is increasingly blurred. Control over energy is a major element in the modernization of industrial firms and warrants continuing and expanding the effort at national and Community levels.

After 12 years of difficulties in the energy economy, the potential and the means for greater energy efficiency are better known. **The time has now come to disseminate and exploit the knowledge gained so as to help harness industry's still vast energy saving potential.** With the prospect of renewed economic growth, the challenge for industry is how to maintain the drive to save energy against a background of a temporary fall in energy prices. An effective response from industry is vital for our energy future.

Community news

Energy Council 3 June

The Council of Energy Ministers met on 3 June in Luxembourg under the chairmanship of Mr van Aardenne (Netherlands). Commissioner Nic Mosar represented the Commission.

Although it was not possible to reach agreement at the meeting on the new State aids for coal regime, sufficient progress had been made by Ministers to enable it to be resolved a few weeks later by Coreper. (See article in *Community news* further on). The new regime, which sets down the Community criteria for the payment of State aids to domestic coal production, came into effect on 1 July 1986. The proposed new 1995 Energy Objectives have been accepted except for one point relating to nuclear energy which is being considered at Coreper in September.

The Council returned to consider again the refinery situation in the Community and the outlook for oil product imports on the basis of an updated analysis presented by the Commission. Ministers agreed that the industry should be left to continue with the restructuring process and that our open-market policy should be maintained. The improvements that had taken place, notably in the Japanese market, were welcomed but the need for continued vigilance to ensure openness of world markets was stressed. Technical aspects of the Commission's analysis, such as internal market consquences of differing standards for oil products, differing levels of taxation etc., have been referred to Coreper for further examination.

The result of recent Commission analysis of the effects of lower oil prices were outlined by Commissioner Mosar. The Commission is now refining its analysis to see how lower oil prices may affect the achievement of our long-term energy objectives.

Ministers had a discussion on the nuclear accident at Chernobyl. They stressed the importance of the follow-up work being undertaken at Community level and at the International Atomic Energy Agency in Vienna. A Commission Communication setting out proposed lines of follow-up at EC level has since been sent to the Council and was subequently considered by the Heads of Government at the end of June.

Among the other issues discussed on 3 June were the Community's lignite and peat industries. The Commission has been requested to look at the effectiveness of the various Community financial instruments in assessing the development of these fuels. The Council had its first consideration of the Commission's new Communication on the rational use of energy in industry. This Communication, which looks at the outlook for improved energy efficiency in industry, will now be examined in detail by Coreper.

Over the past couple of months, work has been proceeding at technical level, on the basis of a Commission Communication, drawing up a Resolution for Ministers to adopt on new and renewable energies. Ministers welcomed the draft prepared for them, but they will have to wait until the Opinion of the European Parliament is received before they can adopt this Resolution which is designed to maximize the potential contribution of these important energy sources.

European Parliament: Activities of the Committee on Energy, Research and Technology (CERT)

The main concern of CERT over the last three months has been the safety of nuclear installations in the light of the Chernobyl accident.

Immediately after the accident, Mr Poniatowski, Chairman of CERT, convened a special meeting to which were invited the three Commissioners most concerned — Mr Mosar (for energy), Mr Clinton Davis (for nuclear safety) and Mr Narjes (for research). Following this meeting, the Committee addressed a series of questions to Mr Delors, President of the Commission, covering the main points of concern that had been raised within the Committee:

(i) does the accident call into question the Commission's energy objectives for 1995?

(ii) is it now not time to recast entirely the Euratom Treaty?

(iii) the Commission should now draw up a detailed report on the current state of the nuclear installations in the Community giving particular attention to those without secondary confinement, and more than 20 years old?

(iv) the Commission should activate discussions on the establishment of common standards, in particular as regards radioactivity levels in the air, water, earth and fire;

(v) the Commission should insist that the Member States follow application of Chapter III of the Euratom Treaty, particularly as regards notification procedures;

(vi) the Commission should supply a comprehensive report to the Parliament on the Chernobyl accident;

(vii) the Commission should address the problem of nuclear power stations sited in trans-frontier zones;

(viii) the Commission should elaborate a proposal for a new directive concerning procedure in the case of nuclear accidents along the lines of the 'Soweso' directive;

(ix) the Commission should receive full information and make public any incident at any of the Community's nuclear power stations.

Of course, the Committee was most anxious that the Commission should play a very active role in the International Atomic Energy Authority which should be pressing for adequate safety and monitoring procedures at world level.

Following the replies to these points, the Committee will be drawing up a series of reports connected with the future of nuclear energy, its financing, the revision of the Euratom Treaty, the question of private ownership of nuclear installations, the future of fast breeders, and the possible violation by the United Kingdom of the Euratom Treaty as regards inspections at Sellafield.

As regards this last point, the Committee has been informed that the Commission has reached an agreement with the United Kingdom allowing Community inspections of the nuclear installation at Sellafield.

CERT at work

ECSC Consultative Committee: main activities in the energy field

At its 257th session on 20 June 1986, the Committee looked at the Commission's overall policy on ECSC social, technical and health and safety research (Article 55 of the Treaty) and passed a resolution in which it called for an increase in the money available for these types of research.

The Committee also examined the 5th supplementary agreement to the agreement of 21 March 1955 providing for international through rates for the transportation of coal and steel by rail (this was one of the early achievements of the ECSC, which was aimed at enabling producers of coal and steel to pay one single rate for the total distance involved, whether or not national boundaries had to be crossed).

The Committee was also consulted under Article 60(2) of the ECSC Treaty on a draft Commission Decision modifying Decision 72/443/ECSC on the alignment of coal prices in the common market. The purpose of the Commission's new decision is mainly to take account of the accession of Spain and Portugal to the Community.

Meeting of the Environment Council on 12 and 13 June 1986

The agenda for this Environment Council included many items having a direct effect on the energy sector. For instance, the Ministers discussed:

(i) the disposal of waste oil;
(ii) reducing the sulphur content of heating oil and diesel oil;
(iii) limiting emissions from large combustion plants.

The aim of the proposal to amend Directive 75/439/EEC on the disposal of waste oils is to tighten up current rules on the subject. In particular, the Ministers discussed the cutoff point (capacity of the combustion plant) from which the Community emission limit values should apply. Below this point national provisions could be introduced which could also include prohibitions on the burning of certain fuels. In spite of the work of a specially-instituted working party many details have still not been resolved and the matter was therefore referred to the Permanent Representatives Committee.

Pending the opinion of the European Parliament, the Council continued to work on the amendment to Directive 75/716/EEC on the harmonization of the **sulphur content of heating oil and diesel oil.** It should be remembered that the present provisions lay down a sulphur content of 0.3 and 0.5% for the Community. There was general consensus in the Council on reducing these values to 0.2 and 0.3% respectively. The aim is to attain a uniformly-harmonized sulphur standard for the Community after a limited transitional phase. Consultations on the subject were postponed until Parliament's opinion was available as no agreement could be reached on what sulphur content levels to lay down.

No progress was made on the proposal for a Directive on the **limitation of emissions from large combustion plants.** The Ministers discussed a compromise proposal put forward by the President of the Council which differed considerably from the Commission's proposal. The new compromise proposal provides for reducing emissions in two stages (1995 and 2005) and would oblige Member States to reduce SO_2 and NO_x emissions in such a way that the resulting levels would differ from Member State to Member State. As agreement could not even be reached on the principles underlying this proposal the matter was referred to the Permanent Representatives Committee.

The Council further noted two Commission proposals on reducing emissions from diesel vehicles and adopted a Resolution on the Chernobyl reactor accident calling for better international cooperation over peaceful uses of nuclear energy. The Heads of Government were called upon to give detailed attention to the question of Chernobyl at the Council meeting of 26-28 June 1986.

Decision on new Community system for State aids to coal industries

The Commission's proposals of September 1985 (see *Energy in Europe* No 3 of December 1985, pp. 11-13) for a new Decision to replace the provisions of Commission Decision No 528/76/ECSC were submitted to the Council, the European Parliament and the Consultative Committee of the ECSC. Consultations within these bodies have taken place over the last nine months; there were also contacts with industry and trade unions. Both the European Parliament and the ECSC Consultative Committee made a number of recommendations which were partly taken into account by the Commission. As regards the consultation of the Council, whose unanimous consent was required, some modifications of the Commission's proposals had to be made.

The final version of the decision was adopted by the Commission on 30 June 1986 and will cover the period from 1 July 1986 to 31 December 1993.

EC/Canada coal conference

A conference was held in Brussels on 5 and 6 June on coal trade between Canada and the EC, coinciding with the 10th anniversary of the EC/Canada framework agreement on industrial cooperation. The Conference was hosted jointly by the Canadian mission to the EC and the Commission. Invitations were extended to 9-10 guest speakers and some 60 coal producers and consumers. The speeches and other, less formal, contacts enabled Canadians and Europeans to form an idea of European coal policy and market trends, on the one hand, and the potential for increased exports of Canadian coal on the other.

Research update: Article 55 ECSC technical coal research

Article 55 of the ECSC Treaty provides, *inter alia*, for the financing by the Community of technical and economic research relating to the production and increased use of coal. Important areas of this research in-

clude techniques of coal extraction and the upgrading of coal to remove impurities. A total of 19 MECU was committed by the Commission to research projects in 1985.

For research in 1986, discussions of projects took place in the second half of 1985. 90 projects were considered by the various Committees of Experts which graded them for suitability. The Coal Research Committee subsequently (January 1986) proposed to finance 60 projects for a total of 22 MECU representing 60% of total research costs, including the publication of results and any patents in all the major world languages.

The Commission's decision approving the 60 projects was taken on 25 February 1986. The programme was then discussed and approved by the ECSC Consultative Committee and the Council. The Commission's final decision to go ahead with the programme was taken on 9 June 1986.

Projects chosen include eight concerning roadway drivage techniques in coal mines, to a total value of 5.8 MECU, three concerning mine gases, ventilation, climate (total value 0.8 MECU), 11 concerning methods of working and techniques of coal-winning (total value 8.3 MECU), five concerning mine infrastructure (total value 2.2 MECU), 11 concerning modern management (total value 6.4 MECU), seven concerning preparation and transport of products (total value 4.9 MECU), 11 concerning coking of coal (total value 5.3 MECU), and four concerning coal upgrading (total value 2.7 MECU).

Medium-term guidelines for technical coal research (1986-90), including definitions of the various types of research for which Community funds may be granted, are published in the Commission's document SEC(85)652 final of 23 May 1985.

Hermes, a European model analysing interrelationships between energy and the economy

As it is felt that there is a need for the Community and each Member State to have at their disposal instruments capable of describing in sufficiently-fine detail the interaction between energy and the macro-economy, the Commission decided to undertake the construction of an econometric, dynamic and macrosectoral model in which energy would play a major part.

The model, known as **Hermes**, has been developed as part of the non-nuclear energy research and development programme and analyses systems administered by the Directorate-General for Science, Research and Development (DG XII). Economists from all Community countries have contributed to its construction.

The specifications for the Hermes model were based on the following principles:

(i) **It is to be a model geared to studying interrelationships between energy and the economy.**

The Hermes model is intended to deal in great detail with energy which has been integrated both as a production sector and as one of the factors of production (others being investment, employment and intermediate consumption). As a category of household expenditure it also figures as a consumer product and, elsewhere, as a product traded between countries. It is therefore possible to measure the proportion of energy in sectoral costs and, through them, the pathway of an energy price increase and its effects on the economy.

(ii) **The model is to be dynamic and macro-sectoral.**

The Hermes model is designed to permit analysis of the productive systems of the major industrial sectors. The concept of subdividing the model into nine sectors makes it possible to take account of structural changes in the production system and of differences in the behaviour of different sectors.

The model is dynamic. It is designed for short to medium-term analyses of one to ten years and makes it possible to investigate how balance is achieved in the various markets in the short term, and to study growth and how balance is achieved in the medium term.

(iii) **It is to be a multinational model.**

The idea is that Hermes should be developed simultaneously (to a common design) in all the Community countries. Each national model is intended to be completely integrated into the multinational model for 18 countries and zones. The link between the

different national models will be provided by a fine-tuned modelling of bilateral trading flows and the resulting prices.

Most countries should have completed construction of their **Hermes** model by the end of 1986. In some countries it is already operational and has been used, among other things, to evaluate the effects of the drop in oil prices on the macro- economic aggregates of Belgium and France.

In order to illustrate the use of the model, two working hypotheses were used for developments in oil prices:

	1986		1987		1988		1989		1990	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Price per barrel of oil (in $)	25.0	18.0	25.0	18.0	25.0	19.0	26.3	20.0	27.6	21.0

(1) reference position
(2) 'oil price' variant

The macro-economic results are shown in the box below:

The model also provides more disaggregated results, particularly as regards sectoral trends in energy demand. Finally, the results as a whole indicate that the effects of the drop in oil prices on the economy in fact depend a great deal on what use is made of the oil profits, e.g. whether it is invested by the companies concerned.

The **Hermes** model will be similarly applied to all the other Community countries as soon as possible. There are also plans for using it to analyse the effects of energy policies in the course of 1987.

In the light of this first application of the **Hermes** model, it would appear that, once the model has been completed for all countries, the Commission and the Member States will have at their disposal a very useful instrument for analysing energy forecasts and preparing energy policies that are consistent from the point of view of the economy.

Eurostock – now Euroilstock

After 18 months of trial operation coordinated and financed by the Commission, this rapid oil stock reporting system for Europe was taken over by the oil industry which will be responsible for running it in the future. This will be done by a newly established non-profit Dutch foundation (a *stichting*) which was registered in Rotterdam on 27 June 1986. The name of the *stichting* is **Euroilstock.** The Members of the Council of **Euroilstock** are as follows

1. S.P. Anketell, delegate for BP Oil Ltd
2. M. Berger, delegate for Elf Aquitaine
3. J. Brackman, delegate for Texaco Services Europe Ltd.
4. J.P. Carrié, delegate for CFP-Total
5. Dr A. Fiorillo, delegate for Montedison/Montedipe-Analisi di Mercato
6. G. Lawson, delegate for Conoco Continental Oil Company Ltd.
7. Dr M.P.K. Lefeldt, delegate for Wintershall AG/Veba Oel AG/Union Rheinische Braunkohlen AG
8. L. Long, delegate for Exxon International
9. M.W. Mayall, delegate for Kuwait Petroleum International Ltd.
10. K. Pringle, delegate for Shell Nederland Verkoopmaatschappij B.V.
11. M.C. Scarnera, delegate for AGIP Petroli
12. Th. Verougstraete, delegate for Petrofina

'Drop in oil price' variant in relation to macro-economic results (relative differences in relation to the base case simulation)

	1986		1987		1988		1989		1990	
	(B)	(F)	(B)	(F)	(B)	(F)	(B)	(F)	(B)	(F)
GDP and components (constant francs)										
GDP	0.4	0.7	0.8	1.2	1.0	1.5	1.1	1.7	1.2	2.0
Private consumption	0.5	1.0	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3
Investments	0.3	2.2	0.7	2.7	1.5	3.0	2.2	3.5	2.8	3.9
Exports	0.7	0.0	1.2	1.3	1.4	2.3	1.4	2.4	1.5	2.5
Imports	0.7	2.0	1.1	2.8	1.3	2.6	1.5	2.2	1.6	2.0
Inflation (consumer prices)	– 1.3	– 2.2	– 1.6	– 2.8	– 1.7	– 3.4	– 1.7	– 4.1	– 1.8	– 4.8
Job market										
Total number of jobs (in thousands)	+ 6.4	+ 46	+ 12.2	+ 75	+ 16.3	+ 101	+ 19.0	+ 101	+ 20.8	+ 139

(B) Belgium
(F) France

The Council has elected as its President Mr Th. Verougstraete and as Vice-President Mr J. Brackman.

In addition to the participants that have been reporting during the last 18 months there will be some expansion of coverage. Apart from additional companies in countries already covered, attention will be given to Greece, Spain and Portugal. The Commission will continue to follow Euroilstock developments with great interest and has offered its assistance to the Council when necessary. In particular it is anticipated that the Commission will be most helpful on questions relating to the comparability of Euroilstock numbers with figures determined by national statistical services and international bodies like the OECD/IEA and of course, the Commission itself.

EC/GCC relations

On 26 and 27 April 1986, in Riyadh, a second round of high-level discussions took place between a GCC delegation led by H.E. Mr. Mamoun Kurdi, General Coordinator of Negotiations for the Gulf Cooperation Council and a delegation from the Commission of the European Community led by Mr Jean Durieux, Adviser Hors Classe in the Directorate-General for External Relations and by Mr Christopher Audland, Director-General for Energy.

A meeting at Ministerial level between the GCC and the European Community held in Luxemburg on 19 October 1985 decided that both sides would aim to conclude a comprehensive, mutually beneficial agreement to foster the broadest possible commercial and economic cooperation between the two regions. During the high level discussions and in accordance with the decision of the meeting that there should be exploration in depth of the areas to be covered by such an agreement, both sides examined the trade, energy, industrial cooperation, investment, science and technology and training aspects of an agreement.

The discussions clarified the views of both sides. As a result they agreed that the meeting concluded the phase of high-level exploratory discussions. Both sides felt they were now in a position to report to their respective authorities on the options which were open to them with the aim of opening formal negotiations at an early stage.

Energy Demonstration Programme

1986 call for proposals

The 1986 Call for Proposals organized earlier this year brought 584 proposals for energy demonstration projects.

This is roughly the same number as in 1985, and includes 67 proposals from the new EC Members Spain and Portugal. The Commission is now evaluating the proposals and will select those with the most promising innovatory technologies in the areas of energy saving; renewable energy sources; and the use of solid fuels (including liquefaction and gasification). The Community grant may cover up to 40% of eligible costs.

A first breakdown by sectors shows the energy efficiency projects' share remaining at 30%. Proposals for biomass projects show a substantial decrease while the number of wind energy project proposals has increased by 35%. A first impression indicates that the proposals are of the same or a slightly higher quality than those of last year.

Given the overall positive response to this year's Call for Proposals the Commission is envisaging publishing a new invitation by the end of 1986.

Alternative Energies' Exhibition in Lisbon

From 13 to 18 May an International Salon on Alternative Energies was held in Lisbon. This event drew considerable interest from most consultants and engineers active in the field of alternative energy as well as from many students.

The Commission stand provided information on the EC demonstration programme in general and on the results of specific demonstration projects. Parallel to the exhibition a round table was organized on 'The Situation of Renewable Energy in Portugal'. Among the many visitors was the President of Portugal, Mr Mario Soares who showed a particular interest in the EC demonstration programme.

1 MW wind generator demonstration project

On 19 June 1986 a workshop was organized to inform interested parties of the results of a succesful demonstration project at Wieringermeer near Alkmaar, in the

President Mario Soares at the EC Stand

Netherlands. The project was a new 1 MW wind turbine produced by Stork-FDO. All manufacturers engaged in the realization of this type of machine (NEWECS 45) in the Community were represented as well as electricity producers. Another 10 projects of this size under the EC Wind Demonstration Programmes are in the course of construction.

Energy network conference

The annual meeting of the 'EC-network' on energy planning in developing countries took place in Argentina from 14-18 April. Some 30 researchers from 15 energy institutes or institutions who were invited to assist at this meeting exchanged results of their research programmes in energy policy and planning.

The main areas of common research within this network are

(i) energy policy and energy planning in general;

(ii) pricing policy;

(iii) energy analysis and forecasting techniques;

(iv) energy management;

(v) development of indigenious resources, in particular new and renewables;

(vi) sectoral analysis (e.g. industrial energy use).

The methods used by the research institutes are : joint studies, training of energy planners and the exchange of experts.

For the first time an intensive exchange of views took place on the utilization of the 'Network-Methodology' for concrete energy planning exercises in Developing Countries, such as Argentina, Brazil, Gabon, Thailand, China, etc.

The EC supports the activity of the network institutes with about 2.5 Mio ECU/year, mainly for studies, training and establishment of energy balances or energy plans. This meeting was held in close cooperation with the annual meeting of the UN-University also involved in energy planning.

The next annual meeting of the EC-network will take place in May 1987 in either Brighton or London.

Energy planning conference in Luxembourg

The Commission is organizing its annual conference on **regional energy planning** from 30 September to 3 October 1986 in Luxembourg.

The first two days will be devoted to discussion of problems related to **European regional energy analysis**. Some 60 European experts involved in 35 EC-funded regional studies or projects will discuss items such as :

(i) the role of energy planning in energy policy, the contribution of the Commission of the European Communities;

(ii) instruments for establishing energy balances and techniques for forecasting;

(iii) the utilization of results for energy in investments and energy policy;

(iv) the utilization of micro-informatics in the energy planning process.

During the third day 20 experts and senior energy officials from Developing Countries (in particular Argentina, Brazil, Ecuador, Jordan, Thailand and China) will report on energy planning activities funded by the Commission. On the last day European and Developing Country experts will exchange experiences and define areas of common interest for joint research activities.

This conference will be hosted by EC Energy Commissioner, Mr Mosar and Luxembourg's Minister for Energy, Mr Schlechter.

Technology focus

Wind power: Ilfracombe demonstration project

Wind power has shown such great promise, particularly for electricity generation, that the Commission of the European Communities has embarked on an extensive demonstration programme on the subject.

At the moment 76 projects are receiving financial support from the Commission under the management of the Directorate-General for Energy. One of the first to start was conceived by the *Wind Energy Group* (WEG).

Wind Energy Group aerogenerator

Building on the experience gained with the prototype turbine in the Orkney Islands, WEG engineers have designed an economically viable 250 kW aerogenerator 25 metres in diameter and ideally suited to sites with moderate wind speeds. To minimize production costs, standard, comercially-available components have been used wherever possible.

The unit has been set up on the North Devon cliffs, where the wind pattern matches those found at many other wind farms all over the world.

The basic aim of the project is to demonstrate that:

(i) medium sized aerogenerators can operate with low maintenance costs and high equipment reliability;

(ii) aerogenerators can be operated profitably, as financial overheads decline with time;

(iii) operating and maintenance costs remain within the break-even limit;

(iv) the unit combines high equipment availability and reliability (the project will also bring out other factors influencing economic viability);

(v) aerogenerator construction and installation costs make the units competitive with diesel-powered generating sets;

(vi) aerogenerators can be operated completely safely and compatibly with power stations supplying the mains grid.

Aerogenerator design

Since the project started in April 1984, a team of engineers from Taylor Woodrow, British Aerospace and GEC, the three partners in WEG, have been drawing on their wealth of experience from the project in the Orkney Islands to design a generator for series production and export, at WEG offices at Taylor Woodrow's Southall plant.

The key components and subassemblies were assembled at Taylor Woodrow Plant Company's Southall workshops before being transported to the site in time to start up in December 1984.

By carefully considering the cost constraints of potential buyers, the objective was to keep assembly costs, tower erection costs and installation costs to a minimum. The generator was also designed to be as light as possible. All these objectives have been attained. At the same time the designers have managed to build a highly reliable generator which will keep operating and maintenance costs low throughout its 20-year lifespan. All the key subassemblies have been rigorously tested to ensure that they comply fully with specifications.

For instance, the first blade made in the purpose-built mould was subjected to a whole series of tough tests at Taywood Engineering Laboratory, Southall.

Appearance

Aesthetic considerations played a big part in the design. Part of the beauty of the generator is its slender 25 metre truncated conical steel tower. A door at the foot of the tower, steps and steel landings allow access to the nacelle, which, together with the rotor at the top of the tower, weighs 7 tonnes.

The North Devon District Council gave permission for the generator to be built on Slade Farm Hill, an area of outstanding natural beauty overlooking Ilfracombe.

Operating results

From the moment the wind turbine was brought into service, it has been producing satisfactory results, with output even surpassing the forecasts.

At likely future manufacturing costs, this model could pay its way if connected to a network supplied by a diesel motor, where it could save around 150 tonnes of gas oil a year. Reliability and maintenance costs will be assessed when the turbine is in use.

The project has demonstrated that the chief advantage of the aerogenerator's newly-designed ball-screw pitch-control system is that it can be used to limit power output, and hence input to the grid, when supplying small islands at off-peak periods. This makes the aerogenerator particularly attractive for small grids, where it can also make a major contribution at peak-load times, allowing extra total fuel savings.

Further details of this project can be obtained from the Commission's Directorate-General for Energy (please quote reference number WE/289/83) or direct from:

Wind Energy Group
345 Ruislip Road
Southall
GB — Middlesex UB1 2QX

Community support scheme for oil and gas projects

Response to the 1986 invitation

In response to the invitation issued by the Commission in *Official Journal of the European Communities* No C 1 on 3 January 1986, some 103 firms from all over the Community have applied for support for 122 technological development projects in the oil and gas sector. In all, these projects add up to an investment of 247 million ECU.

A first look showed that the United Kingdom has submitted the most applications (43), followed by France with 26 and then Germany on 23. However, the potential investment of all projects submitted by France was the largest at 30% of the total, followed by the United Kingdom on 27% and Germany on 17% (see Table 1).

In the other countries, there has been a noticeable drop in applications from Italy, with only 4 projects for a total investment worth 28 million ECU, and a big increase in proposals from Denmark, Greece and Ireland compared with previous years.

The chief objectives of the 1986 projects are to reduce costs, improve safety and increase the efficiency of operations in all the priority areas listed in the invitation. Production has generated the largest number of applications (27%), followed by transport (14%) and then prospecting (11%) (see Table 2).

Compared with the 1985 round, there has been a clear shift towards greater cooperation with promoters in other countries plus an increase in proposals from small businesses.

In conformity with the procedures laid down in Regulation No 3639/85 before selecting the projects to receive support, the Commission must consult a committee of experts nominated by the Member States. All applicants will be personally informed of the outcome. The next invitation to submit projects for the 1987 budget round will be published in the Official Journal of the European Communities at the end of July/beginning of August 1986. Closing date for applications is 28 November 1986.

Table 1: 1986 invitation - results

Total projects and investments submitted, by Member State

Country	Number of projects	Investment (ECU)	%
Belgium	1	9 302 326	3.76
Denmark	10	12 364 363	5.00
Spain	1	1 501 081	0.61
France	26	73 422 604	29.71
Greece	5	4 602 080	1.86
Ireland	5	3 488 186	1.41
Italy	4	27 945 481	11.31
Netherlands	3	5 422 991	2.19
Portugal	1	676 701	0.27
Federal Republic of Germany	23	41 747 861	16.90
United Kingdom	43	66 621 174	26.96
Total	122	247 094 848	100.00

Table 2: 1986 invitation - results

Projects and investments, by type

Field	Number of projects	Investment (ECU)	%
Geophysics and prospecting	22	28 570 668	11.56
Drilling	4	7 371 204	2.98
Production systems	32	67 885 659	27.47
Secondary and enhanced recovery	12	31 425 272	12.72
Impact of environment on off-shore structures	8	12 104 190	4.90
Support vessels and submersible craft	5	13 243 641	5.36
Pipelines	8	15 427 377	6.24
Transport	11	19 597 589	7.93
Natural gas technology	1	1 834 517	0.74
Storage	2	10 769 682	4.36
Others	17	38 865 057	15.73
Total	122	247 094 857	100.00

Single well oil production system: Swops

Since the early 1970s, North Sea oil producers have been showing the way to tap large deep-sea oil and gas fields. These developments have transformed the region into one of the leading oil-producing centres in the world. At the same time spectacular technological innovations have been made.

However, recent studies suggest that in the future North Sea oil will have to come from fields with less than 100 million barrels of recoverable reserves. New production systems are needed for marginal fields like these.

As part of the Community support scheme for oil and gas projects, the Community has been helping to fund work to devise operating systems for this type of application.

Swops project

BP Petroleum Development Limited has developed a production system for oil fields uneconomic to work conventionally.

It takes the form of a floating production system, in which tankers collect oil from underwater wellheads via a rigid riser. Full tankers offload the oil at a terminal on the coast.

Two support contracts (TH. 03.101./80 and TH. 03.126/82) have been concluded, making it possible to complete the following phases of the Swops project:

(i) the feasibility study;

(ii) a detailed study of the vessel and of the associated underwater monitors;

(iii) tests on a scale model;

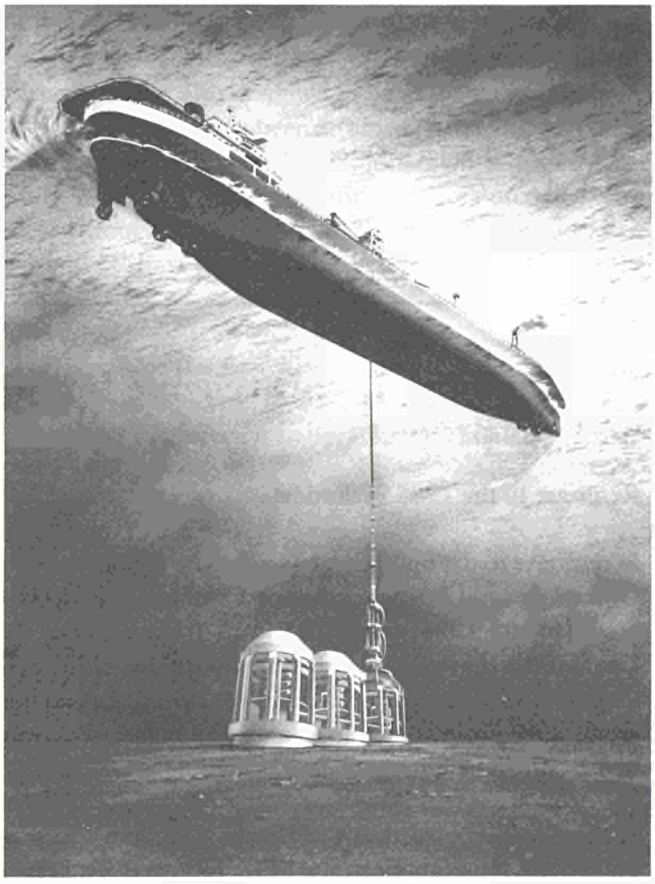
(iv) tests on the riser re-entry gear, on land and at sea.

Technology developed

The Swops production system uses a tanker with a carrying capacity of 42 000 tonnes. Studies showed that it would not be enough simply to convert an existing tanker but that a newly-built boat was needed to satisfy the economic criteria applied. The vessel is fitted with a dynamic positioning system to keep it stationary even in the severe North Sea climate. It can treat 15 000 barrels of effluent a day.

The riser can be lifted into an opening in the midship deck. A swivel joint at the top of the riser allows the entire system to rotate. At the bottom of the rigid riser a universal joint allows sideways movement under the control of the dynamic positioning system.

Conventional underwater gear is used, though a connection pin has been fitted so that the riser can be attached to the wellhead from any angle. Television cameras monitor the link-up.



Artist's impression of BP's Swops (Floating Oil Production, Storage and Transport System)

Results

These Community-backed studies by BP Petroleum Development Limited have demonstrated that the Swops system is particularly efficient for exploiting small oil fields. In the light of these studies, the contractor has de-

cided to install a Swops system in the Cyrus field. It is scheduled to come on stream by the end of 1987.

Community support for the Swops project has resulted in significant technological progress in production systems for marginal fields.

For further details contact:
BP Shipping Limited,
Swops Systems Group,
Britannic House,
Moor Lane,
London EC2Y 9BU
Tel. (01) 920.6001.

Document update

Main Commission energy documents, proposals, directives, etc. in 1986

Energy saving

COM/86/12 Draft Council resolution on a Community orientation to develop new and renewable energy sources

COM/86/15 Report from the Commission to the Council and the European Parliament — Assessment of RD&D programme achievements

COM/86/264 Council resolution on improving energy efficiency in industrial firms in the Member States

Solid fuels

COM/86/51 Draft fifth supplementary agreement to the agreement of 21 March 1955 on the establishment of through international railway tariffs for the carriage of coal and steel

COM/86/95 Second report on the lignite and peat industries of the European Community

SEC/86/292 Commission staff paper — Technical research, development and demonstration in the solid fuels sector

Oil

COM/86/263 Commission Staff paper — The Community oil market, its oil refining industry and the external trade in petroleum products

Energy policy

COM/86/278 Amendment to the proposal for a Council regulation (EEC) instituting a Community programme for the development of certain less-favoured regions of the Community by exploiting indigenous energy potential (Valoren programme)

Nuclear

COM/86/327 Framework communication from the Commission to the Council on the consequences of the Chernobyl accident

SEC/86/609 Communication from the Commission to the Council — memorandum of understanding between the European Atomic Energy Community represented by the Commission of the European Communities and the United States of America, Department of Energy, concerning cooperation in research on the health and environmental effects of radiation

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