

ENERGY IN EUROPE

Energy policies and trends in the European Community



Number 14 December 1989

Commission of the European Communities

Directorate-General for Energy

ENERGY IN EUROPE

Energy policies and trends in the European Community

Number 14 December 1989

**For further information concerning articles or items in this issue
please contact:**

The Editor
Energy in Europe
DG XVII
Commission of the European Communities
200 rue de la Loi
B-1049 Brussels
Belgium

Telex: COMEU B 21877
Fax: Brussels 235.01.50

Manuscript completed in October 1989

Luxembourg: Office for Official Publications of the European Communities, 1989

Catalogue number: CB-BI-89-002-EN-C

Reproduction of contents is subject to acknowledgement of the source.

Printed in the FR of Germany

Contents

Introduction	5
Europe's energy policy after 1992	6
Towards completion of the internal energy market	8
Thermie programme	11
Spain	14
Oil and gas technology projects	24
Supplying the Community with natural gas	25
Combined heat and power in the EC	29
Utilization of waste heat from power stations	32
Transport of radioactive materials within the EC — Part II	33
Community news	38
Energy Council — 11 May 1989	
Energy Council — 30 October 1989	
ECSC Consultative Committee	
Gordon Langridge retires	
New organization chart of DG XVII	
The use of natural gas in power stations	
Nuclear news (<i>European file</i> , Nuclear safety, PINC, Radiation and you, Plutonium)	
Seminar on oil crisis measures	
Regional Energy Conference, Newcastle-upon-Tyne, April 1989	
Symposium in Morocco	
Seminar on EC geothermal energy research	
Mission to Algiers	
Director-General visits USA	
Latin America: High-level meeting between the Commission and Olade	
World Energy Conference (Montreal)	
Major themes in energy	
India/EC Energy Management Centre	
Energy cooperation with Algeria and Mexico	
Forthcoming event — European conference on energy efficiency in buildings	
Forthcoming event — The Commission's natural gas seminar	
.... and finally — 1992	
Document update	51

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 (10⁶)
- t** tonne (metric ton)
- t = t** tonne for tonne
- toe** tonne of oil equivalent
(41 860 kjoules NCV/kg)
- fob** free on board
- cif** cost-insurance-freight
- MW** megawatt = 10³ kWh
- kWh** kilowatt hour
- GWh** gigawatt hour = 10⁶ kWh
- J** joule
- kJ** kilojoule
- TJ** terajoule = 10⁹ 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:
- | | | | |
|-----|-------|-----|---------|
| BFR | 3.71 | HFL | 0.256 |
| DKR | 0.219 | IRL | 0.00871 |
| DM | 0.719 | LIT | 140 |
| DR | 1.15 | LFR | 0.14 |
| FF | 1.31 | UKL | 0.0878 |
- USD** US dollar
- EUR 10** Total of member countries of the EC before accession of Spain and Portugal in 1986
- EUR 12** 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

Introduction

It is sometimes difficult to try to find the right words to introduce the latest issue of Energy in Europe. These words should capture both the flavour of the issue and, to some extent, the mood in the Community energy sector at the time of going to press. However, for this issue, the Editor's task was made much easier and the first article — 'Europe's energy policy after 1992' — not only achieves both these aims but also manages to describe the Community's short, medium and longer-term objectives all in a few paragraphs.

The second article — first released as an information note by the Commission's Spokesman's Service — is a summary of four documents which all passed the Commission in the first half of July 1989 and are now before the Council. All four are aimed at helping to achieve the one principal objective — the completion of the internal market. There will be more on these in future issues of Energy in Europe.

Energy in Europe No 13 contained two reports on our energy demonstration programme — both present ('Energy technology programmes') and future ('Thermie'). This issue also contains two articles on this sector indicating the importance we place on this aspect of our activities and emphasizing the need for continuing R&D on energy technology at Community level.

The articles on the energy situation in Spain and on the use of gas in the Community are the next in the series of country reports and fuel supply reports respectively.

A technology which is receiving increasing favourable attention in the environmental debate is combined heat and power — CHP — especially because of the high efficiencies that can be achieved. The article in this issue reviews what is happening in CHP in Europe and indicates the Commission's support for its further development.

Waste heat from power stations is a source of energy which is little used at the present time. But it is one which has considerable potential. In March 1989 a seminar was held in Gembloux (Belgium) to examine the state of the art of the technologies employed and their economic viability. The conclusions and recommendations of the seminar are presented here in a short article.

The last article is the second, and concluding, part of the report on the transport of radioactive materials within the Community. This part deals with the basic principles of the regulations covering transport of radioactive materials, the types of packaging used and the applications of these regulations. It also includes a summary of the Commission's proposals for the future programme in this area.

Finally, in the 'Community news' section we would like to draw attention in particular to two items. The first is the new structure or organization chart for DG XVII which became effective on 1 September following a reorganization. The second is the item on 'Major themes in energy' which was the subject of a press conference given by the Commissioner for Energy, Mr Cardoso e Cunha, and also includes a short corrigendum to the special issue of Energy in Europe on this topic published in September this year.

Europe's energy policy after 1992

While there remains a great deal to be done in the energy sector before 1992, it is now only three years away and certainly time for policy makers and planners to start giving some thought to the post-1992 period. In this article¹ Clive Jones, the Commission's Deputy Director-General for Energy, indicates the direction the Community's energy policy could go and some of the actions the Commission is taking to smooth its path.

In every field the European Community is now on the road, and in many cases well along the road, to greater integration. Not only are national attitudes and national policies changing, but so also must Community policies change to meet the new situation that will exist after 1992. Energy policy is an area where this transition now has to be made. The initiatives which are being taken to integrate Europe's energy market will have to be followed by efforts to create an integrated energy policy at Community level.

Until now, Community energy policy has essentially been a matter of coordinating the national energy policies of the 12 Member States. Common action, in the real sense of that phrase, has been limited to a few special fields — most notably perhaps the centralized energy research, development and demonstration programmes. Another field of common action has been the collective strategy for dealing with oil crises. But beyond that the heart of Community energy policy has been a political consensus on long-term energy objectives; most recently the Community's energy objectives for 1995 which were adopted unanimously by the Council three years ago. It was specifically acknowledged in that agreement that each country would pursue the 1995 objectives in its own way and by its own choice of policy measures.

But the integration of Europe's internal energy market is now underway. The Commissioner for Energy, **Antonio Cardoso e Cunha**, has already launched a number of new initiatives since taking over responsibility for energy at European level at the beginning of this year. These include new schemes clearing the way for greater cross-frontier trade and competition in the gas and electricity sectors; a mechanism for taking into account the European dimension in the planning of major energy investments; and a new Community-wide system for ensuring the transparency of gas and electricity prices. Other measures will follow to ensure that the unification of the EC energy market keeps pace with the 1992 deadline and the wider integration of Europe's market as a whole.

But will market integration necessarily mean that energy policies have to be integrated? In fact the inescapable logic is that one must progressively follow the other. Energy policies are, at the end of the day, market interventions, and

such interventions by an individual country would obviously risk distorting trade and competition with other Member States.

Perhaps the best illustration of this is to consider some fairly common types of energy policy measure. A country might for instance decide to reduce its reliance on imported oil by putting a heavy consumer tax on oil products. But the Commission has already proposed, in the internal market context, that taxes and duties on oil products should be harmonised. A second example might be where a country decided in the interests of energy conservation that, say, domestic refrigerators should meet certain energy consumption standards. It could impose such a standard on its own refrigerator manufacturers but it could not, in an integrated market, put up trade barriers to prevent the importation of refrigerators from other Member States which did not meet the standard. A third obvious example would be the use of State subsidies to promote domestic energy production, which again could risk distorting competition with other Community countries.

None of this means that energy policy interventions of this type must be ruled out. What it does mean is that interventions of this type should in future be decided at Community level and applied equally in all member countries. In that way no unacceptable distortions would be created in trade and competition.

For the future, then, it will be our task in the European Commission to propose to the Member States a common framework for an effective Community energy policy. We shall not do that in a vacuum. In the Commission's Directorate-General for Energy (DG XVII), we have just completed a new review of long-term energy prospects — the 2010 or 'Major themes' study. We shall be discussing the results of this work with a wide range of governments, companies and experts in the energy field.

The purpose of this work is to guide decisions on energy policy by identifying the constraints likely to have an impact on the Community's longer-term energy situation. It is too early to predict what the results of this debate will be, but it is not unreasonable to expect that one of the key future constraints identified will be the impact on the environment of energy production and use. It will follow from that percep-

¹ Based on an article by Mr Jones first published as guest editorial in *Sun at Work* No 8 (October 1989).

tion, I am sure, that two of the essential planks of future Community energy policy must be energy efficiency and the development of renewable energy sources.

A variety of measures will of course be needed to pursue both these and other requirements for the long-term health of the Community's energy sector. But it is worth noting that one such measure has already been proposed and should be in place in 1990. The existing Community energy demonstration and hydrocarbon technology programmes will come to an end this year. The Commission has proposed that their replacement should be the Thermie programme, a new programme for demonstrating innovative energy technologies and promoting their commercialization in the European market. As is the case in the current programmes, Thermie will concentrate on the stage beyond R&D by providing risk finance for the testing of new energy technologies on a commercial scale. It will be more selective than its predecessor schemes and give more emphasis to the promotion and

replication of successfully demonstrated technologies. The current plan is that the Energy Council and the European Parliament should give their consent to this new programme in time for it to start at the beginning of next year.

Thermie will cover a wide range of energy technologies including most renewable energies and energy efficiency technologies, as well as clean coal combustion and hydrocarbon projects. These technologies will certainly have a key role to play in assuring the Community's energy future and preserving its environment. They will also be of benefit to other countries outside Europe, particularly in the Third World where DG XVII also has cooperation and technology transfer programmes. I have no doubt that companies and all those working in the Community in the renewable energy and other energy technology fields will find that Thermie provides a valuable new impetus to, and support for their pioneering activities.

Towards completion of the internal energy market

The Commission starts the first stage of a step-by-step approach

On 12 July 1989 the Commission of the European Communities approved a number of communications to the Council¹ on the completion of the internal energy market. The Commission's proposals are concerned with:

- (i) increasing intra-Community trade in gas and electricity;
- (ii) transparency of gas and electricity prices to the final consumer;
- (iii) information and consultation on investment projects in the energy sector.

The Commission's proposals are the first stage in a step-by-step approach towards completing the internal market in this sector of strategic importance to the Community. According to Mr Cardoso e Cunha, Member of the Commission responsible for energy, the package of measures 'testifies not only to the Commission's determination to see the completion of an internal energy market, but also to its desire to adopt a pragmatic and progressive approach in consultation with the interested parties'.

The main points in the communications are as follows:

Trade in gas and electricity

- (i) Proposals for directives under Article 100a EEC introducing rules for the application of the right of transit between integrated electricity and gas grids in order to increase and liberalize trade;
- (ii) establishment by the Commission of two Advisory Committees (made up of representatives of the Member States and industrial parties concerned) for each of the two sectors to discuss further the possible implementation of the principle of third party access to grid systems, an advanced stage in the liberalization of trade in electricity and gas.

¹ COM(89) 332 — transparency;
COM(89) 334 — natural gas;
COM(89) 335 — investment projects;
COM(89) 336 — increased intra-Community electricity exchanges.

Price transparency

Proposal for a directive, under Article 213 EEC, obliging gas and electricity distribution companies to send price information to the Commission every six months; prices will be published by the Statistical Office, without breaching the confidentiality of contracts, and disseminated to consumers, so promoting competition and freedom of choice between types of energy and suppliers.

Investment projects in the energy sector

Modification of the 1972 Regulation on notifying the Commission about investment into projects important to the Community when these are at the feasibility stage. The Member States could then be informed and consultations lead to optimization of investments in the energy sector.

The decisions taken by the Commission are summarized below:

I. Increasing intra-Community trade

1. Electricity

There are regions of the Community where generating capacity can hardly satisfy demand — and then with high marginal costs. In other regions, however, highly competitive excess capacity is underused. Yet intra-Community trade accounts for less than 4% of total consumption. Clearly, therefore, there are many obstacles to trade in electricity within the Community and full competition is lacking.

The results of studies on the 'cost of non-Europe' in the electricity industry show that full rationalization of the system could generate the following annual savings:

(ECU 1 000 million)

1992	2000	2010
1.3	2.3 — 5.3	6 — 13

In the light of these findings, the Commission is proposing a step-by-step approach, in three sections, in order to liberalize transfrontier trade in electricity and thereby increase competition to the advantage of the consumer.

The implementation of this programme should above all create throughout the Community the right of access to high-voltage electricity transmission networks, as provided for in the EEC Treaty. The conditions of transit are laid down as part of the application of a Directive attached to the communication and based on Article 100a EEC.

Under this Directive, the Member States would be required to organize and enforce observance on their territory of the right of transit of electricity via one or more public or private high-tension networks. The obligation faced by the companies concerned would clearly depend on the existence of a transmission capacity surplus to their needs for areas where they have been granted exclusive rights and on contractual conditions of supply, removal and payment negotiated between the interested parties. The Commission would have to be informed should no agreement be reached between the parties. If the parties' grounds appeared unfounded or insufficient, the Commission would implement the provisions of Community law, after consulting with the industry interests concerned, in order to make trade possible.

The Directive would have to be applied in the Member States not later than 1 July 1990.

The second stage of the programme would see the setting-up of an information and consultation procedure between the Member States on their future investments for the generation and large-scale transmission of energy of possible Community interest. This procedure is covered in a separate communication (see point III).

In the third stage, the Commission is proposing discussions on what would be a suitable form throughout the Community for the obligation to allow transmission by third parties. This would entail major changes in the existing situation and the Commission wishes to tread carefully. It is seeking the most appropriate solutions in consultation with all directly involved parties in the framework of the two Advisory Committees to be set up to discuss whether network access for third parties needs to be organized and, if so, under what conditions in order to guarantee quality of service and security of supply.

Without prejudice to the powers of the Commission, the Council should adopt additional conditions governing transit rules in the Community by 1 January 1993.

2. Gas

A similar, parallel approach is proposed for the gas industry, where real obstacles to intra-Community trade have been found to exist, even though the situation is less serious than

in the electricity industry (22 % of gas consumed in the Community originates from intra-Community trade). Studies will be carried out, however, according to a procedure like the one planned for the electricity industry.

II. Price transparency

Following its communication in March and the discussion at the Energy Council meeting on 11 May, the Commission, assisted by a committee of experts, has been looking at ways of improving the transparency of prices to final consumers of gas and electricity. The proposal has grown out of the realization that gas and electricity price transparency is unsatisfactory for the Community's industries and therefore jeopardizes completion of the internal energy market.

In contrast to the voluntary approach taken until now, a proposal for a Directive sent to the Council places an obligation on gas and electricity distribution companies to send price information twice a year to the Commission, which will disseminate it as widely as possible to actual and potential consumers.

The Directive guarantees observation of the confidentiality of contracts (through the system of reference consumers and reference prices) and increases the number of categories of consumers covered.

III. Investment projects in the energy sector

The Commission highlights the decisive role of investments in the process of completing the internal energy market, inasmuch as they influence the structure and working of the markets, often for several decades.

The importance of investments was recognized by the Council in 1972, when it adopted a Regulation on notifying the Commission of investment projects of interest to the Community in the petroleum, natural gas and electricity sectors.¹

The Commission thinks that, in the context of completing the internal energy market, a further step in the coverage of information on energy investment projects and their use should be taken. The amendment to Regulation (EEC) No 1056/72 will make the Commission aware at the feasibility

¹ Investments in the coal and nuclear sector are covered by Article 54 (ECSC Treaty) and Article 41 (EAEC Treaty) respectively — Editor.

study stage of investment projects in the sectors covered by the Regulation and enable it to inform the other Member States of aspects of those projects which are of Community interest.

The ultimate objective of this information procedure is consultation between the Member States with an eye to greater coherence in Community energy investments and the best possible allocation of available resources.

The Commission will publish each year a report summarizing the information gathered and assessing the Community interest of projects and their effects on supply and demand in the internal energy market.

This article was first published as an information notice (No P-38) by the Spokesman's Service of the Commission on 12 July 1989.

European energy technologies — Thermie programme

For the past decade the Energy Directorate-General of the Commission has operated energy demonstration and hydrocarbon technology programmes¹ as an integral component of its policy of achieving the Community's energy objectives. Demonstration is the essential link between research and commercialization. The aims of the demonstration programme have been to support the initial commercial-scale use of innovative technologies where the inherent risks are perceived as being too high for commercial entrepreneurs, and thus to promote the widespread use in the market of successful technologies. The aims of the hydrocarbon technology programme are to enhance the development of technologies in order to reinforce oil and gas supply security for the EC.

During the course of these two programmes EC financial support of over ECU 1 350 million² has been given to over 1 700 demonstration projects and 640 hydrocarbon technology projects.

These programmes have to be seen in the broader context of the achievement of the Community's energy policy objectives. The most recent Community energy objectives were adopted in 1986 to cover the decade to 1995.³ These envisage, among other things, continuous promotion of technological innovation. Encouraged by the progress in energy efficiency which had already been made, the goal was set of improving the efficiency of final energy demand by a further 20 % by the end of this 10-year period. However, since then two critical factors have emerged to change radically the European (and world) energy situation. Firstly, the much lower level of oil prices has been maintained in the second half of the 1980s and, together with the decline of the USD, has considerably reduced the financial incentive to conserve energy. For example, EC energy consumption actually began to increase again between 1984 and 1987 (by 7 %) after a period of decline.

Secondly, the rapid growth of concern over environmental issues — acid rain, global warming, depletion of the ozone layer — and the awareness of the major role played by energy consumption, production and transformation in these issues, has given fresh impetus to the development of new, efficient, environmentally sensitive energy technologies, over and above the merely financial benefits of such developments.

Much remains to be achieved in the implementation of new energy technologies in the Community. In anticipation of the expiry of the current regulations for both programmes at the end of 1989, the Commission has had independent evaluations conducted on both of them.⁴ The conclusions from these evaluations reinforce the Commission's view that a further initiative should be taken in this area. Taking into account their recommendations, the Commission has proposed to the Council a new single programme for European technologies: Thermie, to run for the five-year period 1990-94.

Why a new energy technology programme?

The movement towards the single European market has now become irreversible, but to take full advantage of it, Community industry must have access to secure and competitive energy supplies. Despite the present rather relaxed state of world energy markets, the Community's energy situation remains vulnerable, with over half of its energy requirements presently being imported (70 % in the case of oil), and many uncertainties about political tensions in areas of major oil production, public acceptability of nuclear power and growing environmental constraints on coal. To underpin the achievements of the single market, it is vital that new energy technology development be stimulated, in order to develop indigenous energy resources, improve energy efficiency and diversify energy supplies.

The need stated in the Single European Act to **strengthen the technological basis of Community industry** applies in the energy field as much as in any other area. For industry to gain maximum benefit from the single market, there must be free transfer of technology throughout the Community. In the case of energy technology, however, this is often not happening. It is necessary therefore to take an initiative to stimulate such energy technology transfer, especially across national boundaries, thus helping to remove trade barriers and to facilitate European integration. This technology transfer should further be extended to the Community's Third World trading partners, to help in resolving the serious energy and environmental problems which they face and to help European industry market its technology.

⁴ Evaluation of energy demonstration programme:
(i) 'Energy efficiency and renewable energies projects', November 1988: Mr Caprioglio and March Consulting Group;
(ii) 'Solid fuels', November 1988: Mr Thurlow and Mr Kallenbach;
(iii) 'Evaluation of the European Community's programme of support on technological development in the hydrocarbons sector, August 1988: Smith REA Energy Associates Ltd.
Copies of these reports are available in all official Community languages from the Editor.

¹ The most recent instruments governing these programmes are Council Regulations (EEC) Nos 3639 and 3640/85 of 20. 12. 85.

² ECU 1 = USD 1.10.

³ Council Resolution, 16.9.1986, OJ C 241 p. 1.

Energy technology also has a key role to play in meeting the **environmental challenges**, which have lately become of such concern worldwide. Almost 95 % of air pollution comes from thermal combustion, and a substantial part of thermal pollution is created by energy consumption, production and transformation.

Development of energy technology can play a most important role in improving the quality of our environment, for example, by increasing energy efficiency and thus reducing SO₂, NO_x, and CO₂ emissions; by developing non-pollutant new and renewable energy sources such as wind, solar, hydro and geothermal; and by reducing emission levels through fuel substitution (e.g. nuclear or gas). It is by these means that we will be able to achieve the Community's energy objective calling for balanced solutions as regards energy and the environment, and the requirement of Article 130 R of the Single European Act to ensure a prudent and rational utilization of natural resources.

The development and dissemination of energy technology has an important role to play in **strengthening economic and social cohesion** within the Community, which is essential to ensure that all regions share in the benefits of the single market.

The new Thermie initiative will help to transfer technology to the more disadvantaged regions, thus encouraging economic growth and confidence in these areas, increasing the efficiency of their energy use, and enabling them to exploit their local energy sources, particularly renewable sources, which are often readily available in such areas.

Social benefits can also be obtained from the implementation of new energy technologies, in particular in the energy efficiency field by, for example, improving thermal insulation in buildings occupied by low-income households and creating employment opportunities. It has been estimated that increased efforts to save energy and to use waste heat and renewable energy sources could lead to the creation of as many as 530 000 supplementary jobs by the year 2000.⁵

The scope of the new energy technology programme

It is clear therefore that there are substantial benefits to be obtained from a new programme to promote the develop

ment and implementation of energy technology. The independent evaluations referred to above confirm the continuing need for such a programme at Community level.

Furthermore, the Commission agrees with the conclusions of the evaluations which indicate that a new programme should concentrate not only on promoting innovative technological development, but also on the **dissemination** of such technologies throughout the Community and beyond, encouraging investment in technologies which have been successfully demonstrated and publicizing their results. In this way the new programme will reinforce other Community activities, such as these carried out under the Sprint and Value⁶ programmes. The proposal from the Commission to the Council for the new Thermie programme therefore incorporates the following features.

The promotion of three types of projects are envisaged in the new programme:

- (i) *Innovatory projects* to demonstrate for the first time that new technologies can be successfully exploited on a commercial basis.
- (ii) *Dissemination projects* to encourage the wider use in the Community of new technologies which have been successfully demonstrated.
- (iii) *Targeted projects* to be instigated by the Commission itself. This means that the Commission would no longer be reliant on whichever projects happen to be submitted, but could seek companies willing to carry out specific projects where particular needs were perceived. In such cases these projects would be achieved through cooperation between companies from two or more Member States.

The new proposal also foresees that the Commission should undertake 'associated measures' to encourage the application and marketing of energy technologies, such as:

- (i) evaluating and analysing market features and potential;
- (ii) circulating information and results of projects for wider dissemination within the Community;
- (iii) monitoring and auditing projects;
- (iv) encouraging industrial cooperation with third countries;
- (v) creating or supporting fora for technological cooperation;

⁵ Employment aspects of energy conservation investments in EC countries, November 1984: Fraunhofer Institute

⁶ 'Strategic programme for innovation and technology transfer' and 'Valorization and utilization for Europe programme'.

- (vi) training staff;
- (vii) using regional institutions to help with these activities.

This second major axis of Thermie would therefore be consolidation activities, undertaken in collaboration with other Community programmes such as Joule, Eclair, Sprint and Value, to disseminate results and facilitate the replication of successful projects. Feedback from these activities will be vital in framing a strategic approach to the new programme as a whole and in identifying future innovation priorities.

The programme would cover the following fields:

- (a) *Rational use of energy*, in particular in:
 - buildings;
 - industry;
 - transport and urban infrastructure;
 - combined heat and power and the energy industry.
- (b) *Renewable energy sources*, in particular:
 - solar energy, including both thermal and photovoltaic applications;
 - energy from biomass, agricultural products and waste;
 - geothermal energy;
 - hydroelectric energy;
 - wind energy.
- (c) *Coal and other solid fuels*, in particular promotion of the clean use of coal, tackling effluent problems, and electricity production by coal gasification integrated with a combined gas/steam cycle.
- (d) *Hydrocarbons*, in particular exploration, production, storage and transportation technologies.

Preference would be given to projects which were joint ventures involving undertakings from at least two Member States; to small and medium-sized enterprises; and to the less prosperous regions of the Community. Financial support from the Community would cover up to 40 % of the cost of innovatory and targeted projects and up to 30 % of dissemination project costs. The present once-a-year call for tender for projects would be replaced by a more flexible procedure, better related to the needs of industry, and the procedures for granting financial support to smaller projects would be simplified.

Progress of the new programme

The Council of Energy Ministers meeting in Brussels on 11 May 1989, had a first exchange of views on the Commission's proposal for the Thermie programme. The Council welcomed the proposal and agreed with the basic conclusions of the Commission, recognizing the need for a new programme to follow on directly after the expiry of the current programmes at the end of the year.

Spain

Energy profile

Spain has an area of 504 800 km², approximately twice that of Germany (248 700 km²), and is the Community's second largest Member State. It has a population of 39 million and a population density of 76 inhabitants per km², compared with a Community average of 164.

After Greece (75 inhabitants/km²) and Ireland (51.7 inhabitants/km²), Spain is the Community's least densely populated country. 34.7 % of the population are economically active, the lowest rate in the Community; this is due in great part to the low level of employment amongst women (29.6 % of the civilian labour force, against 38 % for the Community). Unemployment, although declining significantly, still affects 20 % of the labour force.

The 1985 per capita gross domestic product (GDP), at constant 1980 prices, stood at 6.058 PPS (purchasing power standard rates) compared with 8.431 PPS for the Community as a whole, and represented 9.2 % of total Community GDP. The Spanish economy is growing by 5 % every year, one of the highest rates within the OECD.

According to national accounts data, Spain occupies fifth place, just below Italy, in the Community's economic league table. The structure of employment (70 % wage-earners and 30 % self-employed) differs markedly from the Community average (80 % and 20 % respectively).

A sectoral breakdown of employment shows 17 % in agriculture (8.6 % in EUR 12), 32 % in industry (33.8 % in EUR 12) and 51 % in services (57.6 % in EUR 12).

While the trade balance shows a growing deficit, the current-account balance of payments, by contrast, has for a long time shown a healthy surplus because of tourist revenue. Spain's accession was followed by a flood of foreign investment and a considerable increase in capital goods imports. Bearing in mind that in recent years a rigorous economic policy has brought down inflation and strengthened the peseta's position on the international currency market, Spain would appear to have a promising development outlook.

Accession to the European Communities

As a founder member of the International Energy Agency, Spain set energy policy objectives similar to the Community's and is party to the Agency's crisis mechanisms. This has helped Spain to adapt to the common energy policy since ac-

cession. The problems posed to the energy sector by membership were mainly centred on the application to the oil monopoly of Article 37 of the EEC Treaty, relating to monopolies of a commercial character.

Article 48 of the Act of Accession of Spain to the Communities introduced a six-year transitional period; by the time it ends on 31 December 1991, all discrimination between nationals of the Member States regarding the conditions under which goods are procured and marketed must have ceased. The opening-up of the Spanish market to imported petroleum products of Community origin is provided for by annual quota increases culminating in total liberalization in 1992.

In order to adjust the Spanish market to the new circumstances arising from accession to the Communities, the Spanish Government has adopted a series of laws and regulations governing wholesale and retail trade in petroleum products. In practice, these measures have led to the creation of two parallel sales networks: one for products from Spanish refineries and another for imports from the Community.

The recent liberalization of fuel oil sales by authorized dealers to industrial consumers of over 25 000 tonnes pa testifies to the continuing adjustment of Spanish law (Decree 588/89 of 19 May 1989).

There is reason to believe that the pricing of some products could be liberalized, with a price ceiling, before the deadline, i.e. within two years following liberalization of the market in these products.

Some problems remain to be resolved between now and the end of the transitional period, if all operators are to be able to compete under equivalent conditions before the period of adjustment introduced by the Act of Accession ends.

Spain's energy situation

Spain depends on imports for over 60 % of its total primary energy requirements. However, considerable progress towards curbing this dependence has been made by reducing the share of oil imports in meeting primary energy requirements from 70 % in 1973 to 52 % in 1987.

This is largely due to increased production of solid fuels and nuclear energy, and to a reduction in the use of oil in power stations, which has reached the technical minimum.

It is, however, unlikely that the share of oil will continue to decline in the years ahead, in the light of increasing demand

for motor fuels (up 8.5 % in the first five months of 1989) and for electricity (up 7.6 %) which could necessitate the reopening of some oil-fired power stations.

Spanish energy policy continues to be based on the 1984 national energy plan. The NEP's three main objectives were rationalizing energy consumption, reducing dependence on oil and reducing the vulnerability of energy supply.

Energy consumption is being rationalized by encouraging energy saving and energy efficiency. To this end the IDAE (Institute for the Diversification and Conservation of Energy) makes grants to reduce expenditure on energy imports, and firms' costs by increasing their competitiveness.

It is hoped that dependence on oil will be reduced by the growth of natural gas's market share with continued investment in the pipeline network, including links to the European network, and increasing use of domestic gas production to meet demand.

At the same time Spain's oil refineries are being rationalized and modernized.

Spain is pursuing a policy of diversification and of expanding the production of energy of domestic origin to reduce the vulnerability of its energy supply.

The Community's Valoren programme and the IDAE's financial instruments provide aid to domestic energy production.

All these schemes are intended to approximate Spanish energy consumption patterns to those of the Community.

A new NEP is being drafted, but it will not be adopted before the next general elections in October 1989. The forward fuel requirement patterns for electricity production, and in particular the future of the nuclear moratorium affecting a capacity of 4 800 MW, is making drafting difficult.

Table 1

Domestic primary energy consumption — (Mtoe) Spain - total

	1973	%	1987	% ¹	1988	% ¹	88/87
Solid fuels	9.8	16.9	19.4	26.2	15.9	20.5	— 18.0%
Oil	39.5	68.0	38.8	52.4	42.0	54.2	+ 8.2%
Natural gas	0.7	1.2	2.8	3.8	3.6	4.6	+ 28.6%
Primary electricity	8.1	13.9	13.0	17.6	16.0	20.7	+ 23.1%
Total	58.1	100.0	74.0	100.0	77.5	100.0	+ 4.7%

Source: Eurostat monthly energy statistics, 4/89, p. 48.

The determination to reduce dependence on oil — enshrined in the NEP — and to adjust national energy objectives to Community objectives and rules was manifested by constantly declining oil consumption and its replacement by solid fuels and especially nuclear power in electricity generation, and by the development of natural gas, whose share, however, of the energy balance remained modest.

In 1988 the trend was reversed; oil consumption rose by 8.2 %, while that of solid fuels, including lignite, fell by 18 % in the face of increasing consumption of natural gas (up 29 %) and above all of primary electricity — nuclear and hydro — which rose by 23 %. Total domestic primary energy consumption increased by 4.7 %, while GDP grew by 5.4 %.

The plan for the introduction of natural gas in Spain (gasification), adopted in June 1988, will contribute appreciably to diversifying energy. The 1986 renewable energy plan (PER) is being revised to take account of the evolution of energy prices which are lower than initially forecast. This plan will run from 1989 to 1995.

In 1987 the new electricity price legislation was introduced, better known as the 'statutory regulation', and the new system of steam coal contracts, drafted in 1986, came into force.

Coal

According to SOEC¹ data, domestic coal production (hard coal and lignite), which stood at 13.3 Mtoe in 1987, fell by 14 % to 11.4 Mtoe in 1988.

Coal imports from outside the Community rose slightly from 5.3 Mtoe in 1987 to 5.4 Mtoe in 1988.

Because of difficult mining conditions, the production of deep-mined coal is more costly than the price of coal imports. The problem is particularly acute in the mines of Central Asturias, whose production, representing 20 % of the total, absorbs 80 % of all State subsidies to the coal sector.

A high proportion of coal production (80 %) is used in power stations. Since December 1986 a vertical agreement has bound the coal producers (Carbuni3n) who do not have a special contract with the State and the association of electricity distributors (Unesa). This agreement guarantees a market for approximately 7 Mtoe of deep coal while the production from open cast mines depends on the free market.

¹ Statistical Office of the European Communities.

The objective of this agreement is, in principle, to allow the rational adjustment of future supply and demand; to improve the competitiveness of the sector leading to a more healthy economy of the companies; create a secure system of supply; bring about some protection from extreme price fluctuations and increase exploration and R&D and improve conditions of safety. Prices are adjusted annually using a formula designed to bring them into line with those paid by electricity companies in the Community's top four coal-producing countries.

The Ministry for Industry and Energy sets an annual quota for coal imports from outside the Community, based largely on users' expressed requirements.

Ocicarbon is attempting to promote the use of fluidized-bed combustion by industry and electricity producers. It is hoped that this will perpetuate the industrial use of coal with less damage to the environment. With Community backing, Ocide and Ocicarbon are financing the construction of a 76.4 MW pressurized fluidized-bed combustion demonstration project, in the hope that the process will be widely used in large power stations. This process will permit the use of low-grade coal with a sulphur content over 5 %, and reduces, the emission of pollutants.

Hunosa² is currently developing, also with the help of the Community, a demonstration project involving an atmospheric fluidized-bed boiler which uses coal, mixed with wood chips and shale from coal tips to produce 50 MWe.

The shape of supply is going to change considerably, with increases in open-cast production and imports. Domestic production will probably be maintained at or above current levels. Despite rationalization of deep mining, production could rise to between 11 and 13 Mt by 1995 as a result of expanding opencast operations. Imports are then expected to account for about 50 % of total coal supply.

Oil

Spain's seven oil refineries are mostly privately owned and sell their production to a State monopoly, Campsa, which then markets it. After 60 years of life, the system is having to adjust to the new conditions of Community membership, which will affect the marketplace and competition.

The first step in this adjustment was to sell the State's oil assets to the private and public-sector refiners, enabling them to take over ownership of Campsa.

The National Hydrocarbons Institute (INH), for its part, became an integrated company, regrouping the whole State petroleum sector under the name of Repsol to compete with oil companies inside and outside Spain on normal market terms. In 1989 a quarter of Repsol's stock was privatized, three quarters remaining in State ownership.

Meanwhile, foreign oil companies, granted quotas to import products under the Act of Accession, are gradually gaining access to Spain's retail market for petroleum products.

The situation remains fluid; there are plans to transform Campsa into two companies, one of which will take over logistics, i.e. the network of pipelines and the storage and transport infrastructure, while the other handles trading, and in particular the management of the filling stations.

Some companies have signed agreements with Campsa to use its infrastructure at the rates being paid by Spanish refiners. These agreements are based on the principle of reciprocity, whereby Spanish refiners can use these companies' networks in their own countries. In this way, for example, Repsol is planning to open 40 filling stations in Central Italy and Italy's AGIP is considering a similar network along the valley of the Ebro, in Navarre, Aragon and Valencia.

In 1988 refinery capacity stood at 62 Mt with a utilization rate of almost 80 %, following decommissioning of 10 Mt of capacity in 1985 and 1986.

Future refinery capacity will depend essentially upon Spanish refineries' competitiveness on domestic and export markets when the current liberalization process is completed, taking into account environmental standards. Current conversion capacity stands at 24.9 Mtoe/ya and is expected to reach 25.4 Mtoe in 1990. In 1987 Spanish refiners, who have always been export-oriented, sold 14.4 Mtoe abroad and expect to maintain this level in the future.

Natural gas

In this energy sector the Spanish Government faced the problem of developing demand for natural gas in line with contractual obligations to Algeria. In 1985 a protocol was signed between the Ministry of Industry and Energy, the NHI, the public-sector companies and the major private distributors.

² Hulleras del Norte, SA — a public sector subsidiary company of INI, employs 20 000 of Spain's mining workforce of 44 000.

This document set the conditions for the development of natural gas in Spain and the economic parameters needed to guarantee the viability of enterprises in this sector.

These measures were introduced by Law 10/1987 of 15 May 1987 on gaseous fuels, which, in particular, regulates the concession scheme for public-sector natural gas distributors. The IDAE has vigorously supported the development of the natural gas market, with major subsidies for converting industry to natural gas, and substituting natural gas for petroleum products. This development has noticeably reduced the share of natural gas which electricity companies were obliged to take up.

The 1983 NEP encouraged natural gas's penetration of the Spanish market as a substitute for petroleum products. A key instrument in this is natural gas pricing policy. The new system of charges for natural gas since January 1985 is based on linking natural gas prices to petroleum products. The June 1988 gasification plan, supplementing the 1987 gasification law, provides for a total investment of ECU 2 billion to develop gas infrastructure up to the year 2000. The target is to cover 6.3 % of primary energy requirements with natural gas; this percentage, featured in the gasification plan, could easily be exceeded.

The national gas company, Enagas, a public-sector company within Repsol, is responsible for developing the gas transport network which currently links Barcelona, Bilbao and Madrid.

Development of the Gaviota gas-field has improved the export/import ratio for domestic gas, which stood at 22 % in 1987. The NEP provides for a penetration rate of 6.3 %, but the market, which now extends to northern Asturias and will soon include the Alicante region in the South, with the new Cartagena terminal, is expanding so fast that this percentage could be surpassed.

In April 1988 Enagas signed a contract with Norway for the annual supply of 1 billion cubic metres of natural gas. From 1996 it will be transmitted through the European network. The quantities could steadily increase and account for one third of Spain's total gas imports by 2005.

In 1988 the Government decided to link Seville and Madrid, and to join the European network by linking the Spanish Serrablo gasfield to the French field at Lacq, mainly to ensure security of supply. For the same reason the equivalent of 40 days' natural gas consumption will be reinjected into the Serrablo deposit and will serve as a strategic reserve. A reservoir near Seville is currently being studied as a potential site for a strategic reserve.

Liquefied petroleum gas

Lacking natural gas resources, Spain had developed a nationwide LPG distribution network. Consumption of LPG, distributed by Repsol-Butano, remains high, despite the growth of the natural gas distribution network. Repsol-Butano is an active shareholder in the natural gas distribution companies.

Considering the growing problems caused by pollution in major cities, there is a potential market for LPG fuel, the sale of which is currently restricted by Spanish law to bus and taxi fleets.

Electricity

In 1988 Spain's total electricity generating capacity reached 44.5 GWe, and 19 new power stations with a combined capacity of 2.5 GWe were commissioned: 0.5 GWe in the hydro and thermal (coal-fired) sectors and 2 GWe in the nuclear sector.

Table 2

	1988		1973
Thermal power stations	52.5 TWh	37.8%	52.7%
Nuclear power stations	50.4 TWh	36.3%	8.6%
Hydro power stations	36.1 TWh	25.9%	38.7%
Total	139 TWh	100.0%	100.0%

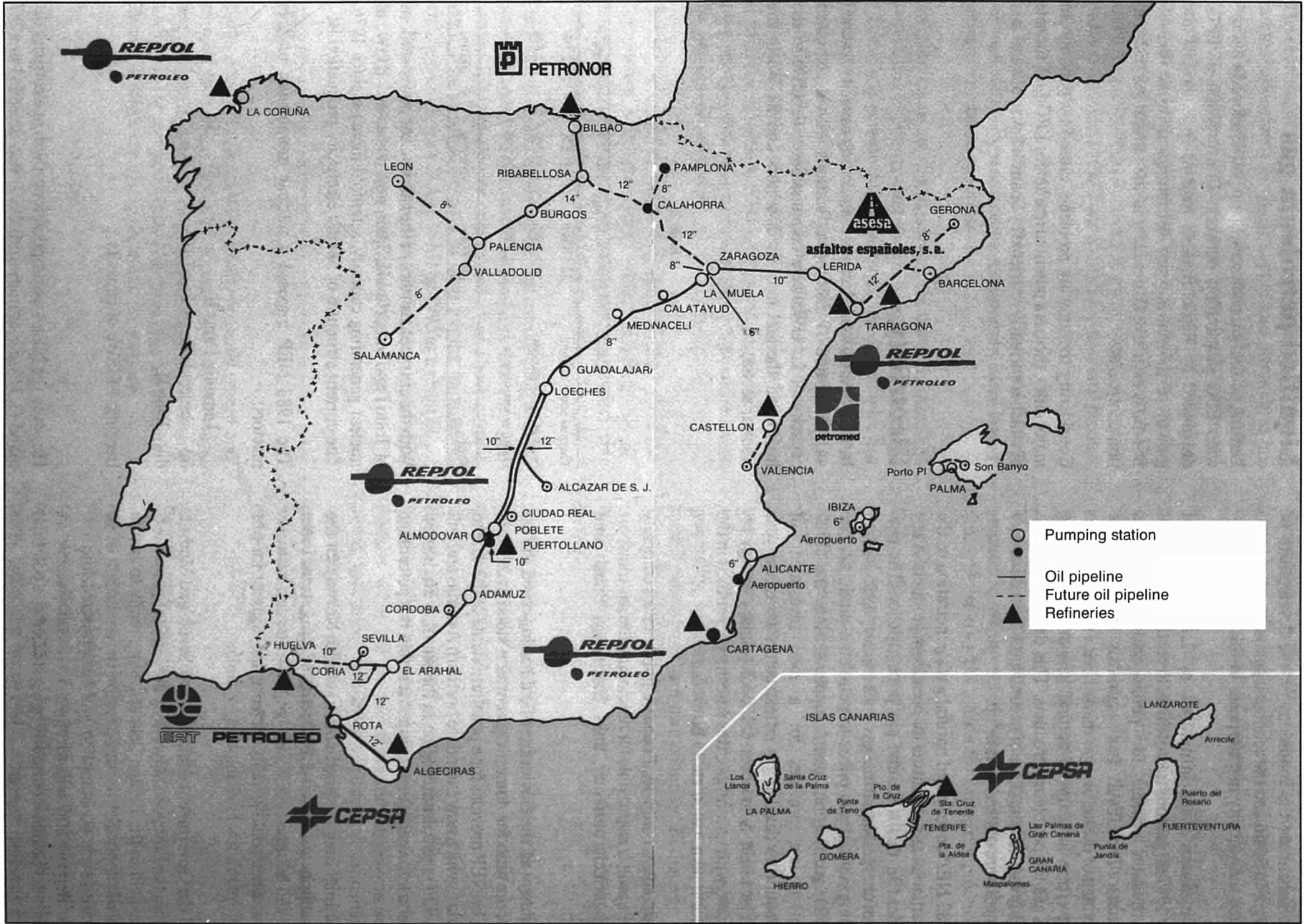
With the entry into service of the two nuclear power stations of Trillo I and Vandellos II, Spain now possesses 7.8 GWe of nuclear generating capacity, a tenfold increase since 1976. The current structure of Spain's electricity production is:

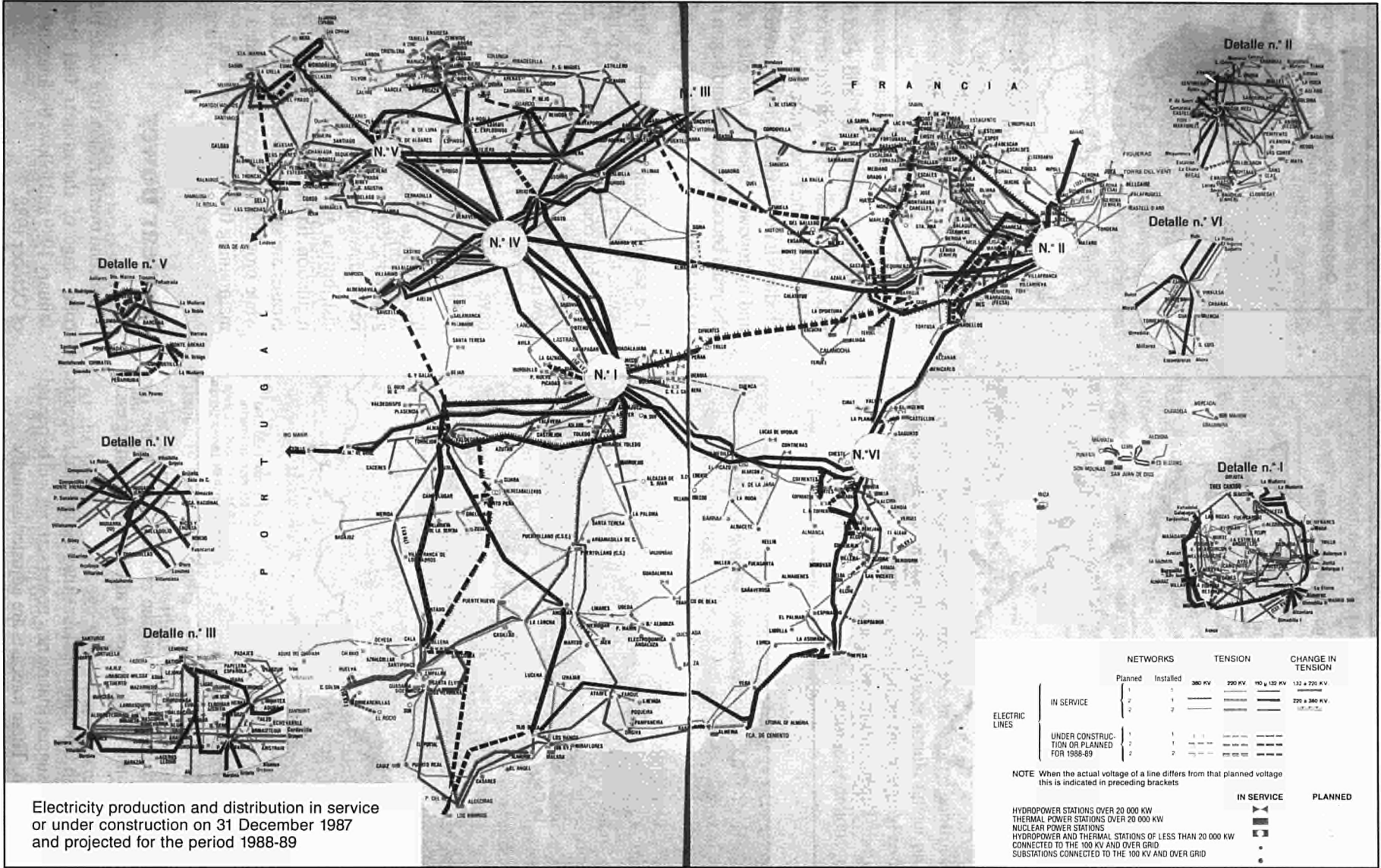
The 1983 NEP imposed a nuclear moratorium on five reactors:

- (i) Lemoniz I and II,
- (ii) Valdecabelleros I and II,
- (iii) Trillo II,

freezing 4.8 GWe of capacity.

However, the NEP's assumption for growth in electricity demand (3.3 % per annum until 1992) was exceeded in 1987



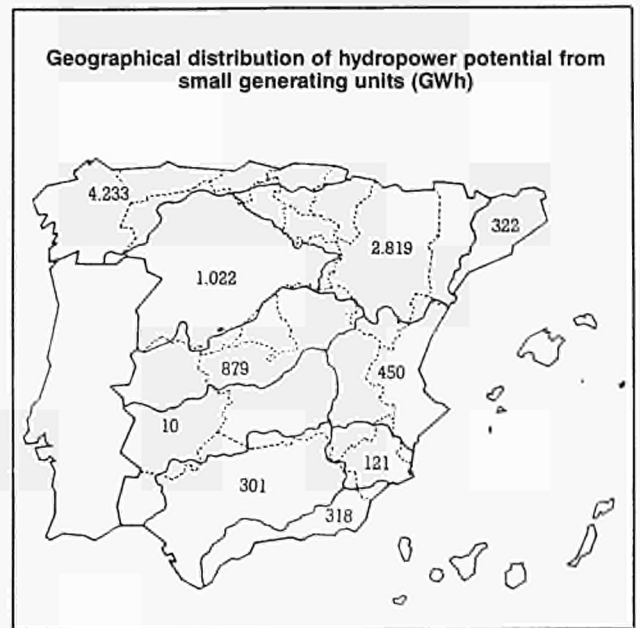
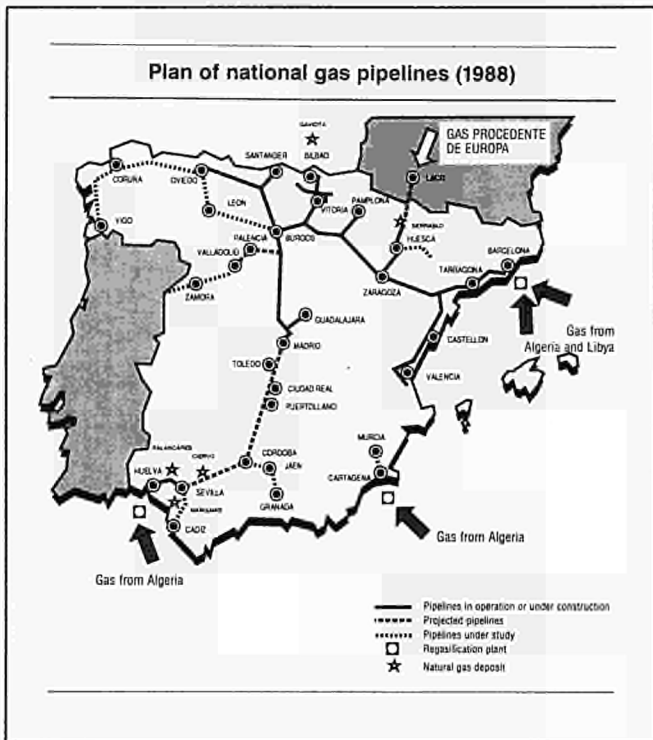


Electricity production and distribution in service or under construction on 31 December 1987 and projected for the period 1988-89

	NETWORKS		TENSION		CHANGE IN TENSION
	Planned	Installed	300 KV	220 KV	
ELECTRIC LINES	IN SERVICE				
	1	1	---	---	132 a 220 KV
ELECTRIC LINES	UNDER CONSTRUCTION OR PLANNED FOR 1988-89				
	1	1	---	---	220 a 300 KV

NOTE: When the actual voltage of a line differs from that planned voltage this is indicated in preceding brackets

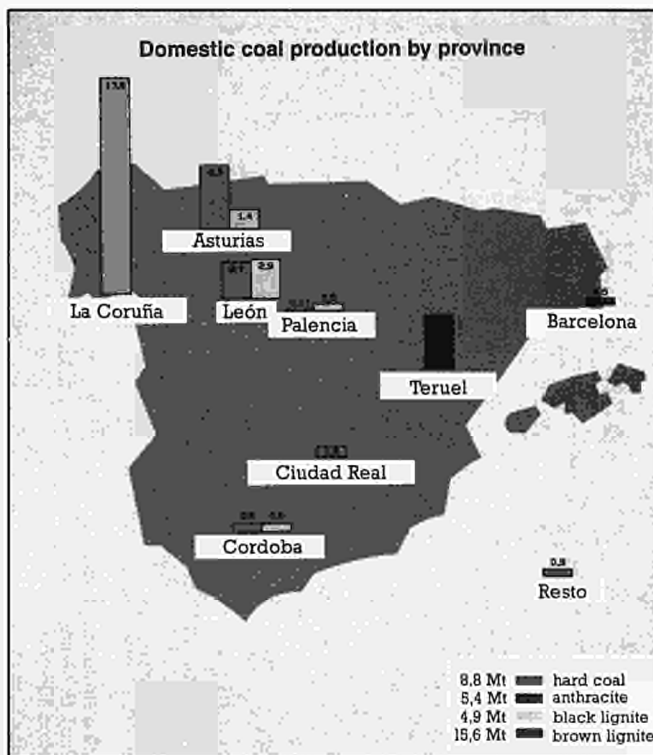
IN SERVICE **PLANNED**
 HYDROPOWER STATIONS OVER 20 000 KW
 THERMAL POWER STATIONS OVER 20 000 KW
 NUCLEAR POWER STATIONS
 HYDROPOWER AND THERMAL STATIONS OF LESS THAN 20 000 KW CONNECTED TO THE 100 KV AND OVER GRID
 SUBSTATIONS CONNECTED TO THE 100 KV AND OVER GRID



The Spanish Government and electricity companies are making progress in solving the structural problems of the electricity sector. Production, once dominated by petroleum products is now divided equally between nuclear power, coal and hydropower. There is a problem of debt which has over the years become excessive and begun to pose a grave threat to the sector.

The sector's financial situation is improving due, in particular, to share swaps, which have permitted the most heavily indebted companies to refloat. The debt structure has also improved: external debt, which stood at 46% in 1981, is down to 29% and the dollar share of the debt has been cut from 70% to 37%. At the same time, interest payments have noticeably decreased and thus reduced the sector's financial burden.

According to Unesa, the phase of investment in converting generating capacity is almost over and the emphasis will now be on developing and modernizing the transmission and distribution network. The application of the 'statutory regulation', fixing electricity prices, has ensured that price increases are strictly related to the cost of electricity supply, while providing the resources needed for development and maintaining the quality of service.



(3.4%) and 1988 (5%) and the rate continues to rise (up 9.7% by June 1989), rendering all forecasts meaningless.

The Spanish Government claims that the original forecasts of demand suggest that no new power stations will be needed before 1996. These forecasts are adjusted annually.

Nuclear power

The second overall radioactive waste plan, relating to the second stage of the nuclear fuel cycle, was approved in January 1989 and follows the line established in the first plan of October 1988.

Current policy involves storing spent fuel on site until storage capacity is full, and then transferring the waste to the facilities of Enresa, the national radioactive waste company. This public-sector company, founded in 1988, is responsible for implementing a plan to manage waste from creation to storage.

Spain acceded to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in London on 5 November 1987. It is also a signatory to the two IAEA (International Atomic Energy Agency) agreements on rapid notification and mutual assistance in the event of a nuclear accident.

Renewable energy

A national renewable energy plan (PER) drawn up by the Industry Ministry promotes the development of solar, wind and geothermal power etc. The contribution made by these energy sources to covering primary energy needs reached 0.8 % in 1988 and could, under the PER, rise to 2.8 % in 1992. The PER is, however, being revised in the light of the continuing decline in oil prices, as it is based on the assumption that prices, in real terms, would remain at their 1983 levels.

Energy conservation

Energy conservation has to date conformed to the strategy outlined in the 1983 NEP. The task of promoting it has fallen to the Institute for the Diversification and Conservation of Energy (IDAE), founded in 1984. This public body, directly controlled by the Energy Secretariat-General, was in fact originally set up to promote energy efficiency and the diversification of Spain's energy supply. Its role has gradually expanded, and now covers all aspects of improving energy use. IDAE's recent transformation into a State corporation which has to balance its books marks a new direction. Its State subsidy, which amounted to PTA 4.1 billion in 1987, will gradually be reduced, finally stopping in 1991. The Government envisages new financing mechanisms, based primarily on third-party financing.

Because of this, the Institute is concentrating increasingly on such profit-making activities as:

- (i) investing in projects,
- (ii) acquiring holdings in companies or bodies in the energy sector,
- (iii) surveys and technical and financial consultancy.

The aim is to improve industrial planning, management and plant maintenance and to promote more energy-efficient equipment.

Combined heat and power, an energy-saving technology which is not widely used at present in Spain, should reach 500 MW by 1995.

RENFE (the national railway company) and the IDAE have signed an agreement to promote energy management at national level as part of the restructuring of the network which will accompany adoption of the European railway gauge in the 1990s.

Energy pricing

Since 1974 the Government has been in general control of energy prices. The principle that prices should reflect production and distribution costs, including the marginal costs of long-term supply, underpins policy in this area. This approval conforms to the EEC recommendation of 27 October 1981 on electricity pricing.

Controls on the ex-refinery price of petroleum products will be lifted as the market is progressively liberalized. Prices are tending more and more to align on those on the Community market.

Gas charges are fixed by the Government under the Gas Act of 15 June 1987. The Government also decrees the price at which gas is purchased, transported and delivered to distribution companies. Gas prices are lower than those of competing oil fuels to encourage its use. Interruptible supply to industrial users is at a price 5 % lower than that of residual fuel oil.

Coal's market price varies according to its use. In the electricity sector the long-term contract for supplying coal to power stations is based on a pricing formula intended to guarantee the constant quality of the coal delivered. A percentage of this price is linked to volatility, another to sulphur content and a third to ash content. The average price of Community coal serves as the reference price.

The Commission is currently examining this contract's compatibility with the Treaty's competition rules, during its wider examination of vertical agreements in the Community.

At the beginning of 1989 Spanish steam coal cost between PTA 1.60 and PTA 1.90/therm compared with PTA 0.92/therm for imported coal.

Spanish coking coal prices are aligned on those of imported coking coal; the difference is subsidized by the State. This situation is again occurring in the other Member States since Community regulation of aids for coking coal ended.

Electricity pricing is regulated by the Royal Decree of 11 December 1987, introducing the 'statutory regulation' for the electricity sector. The new method for fixing national charges is based on the standard cost method, which was the average cost of supply from all the power stations together. The standard cost does not necessarily cover the costs of each individual power station. The Government aims to compel less competitive power stations to rationalize production.

The new system guarantees an adequate return on the investment needed for the generation and supply of electricity during the life of the plant, and reduces the risk of severe price rises in the years ahead.

Value-added tax was introduced on 1 January 1986 at an initial rate of 12 %. This rate has not changed. It is applied to all energy products.

Energy and the environment

Spain faces great difficulties in harmonizing its environmental legislation to Community rules. This is particularly true of the lead content of petrol and limit values on the emission of pollutants from large combustion plants. The reduction of petrol lead content from 0.40 g/l to 0.15 g/l will come into force in 1991.

Limiting pollution emissions from large combustion facilities as required by the Council Directive of 4 November 1988 would have required investment of the order of ECU 2 billion in conventional flue-gas cleaning equipment. Spain benefits however from the derogations provided for in Articles 5 and 6 of the Directive. Moreover, the rates at which SO₂ and NO_x emissions are to be reduced have been adjusted to take into account Spain's special circumstances and the poor quality of its domestic coal and lignite.

The Government is looking to other ways of achieving the limit values required by the Directive, such as the washing of coal with a high ash content, burning it in combination with imported low-sulphur coal and promoting fluidized-bed combustion.

National regulations adopted in 1988 require an environmental impact assessment to be presented for any new

industrial project. Criteria have been developed for assessing the impact of power stations and open-cast mining.

Research, development and demonstration

The Ministry for Industry and Energy drew up the first energy research plan (PIE) in September 1985. The 1983 NEP set energy research priorities: energy efficiency, new coal technologies, the environment, nuclear power and renewable energies.

The PIE also establishes guidelines for coordinating research activities with agencies and firms in the sector.

The PIE is integral to the national plan for scientific research and technological development, which coordinates sectoral research. An interministerial science and technology committee supervises the whole selection and decision-making processes.

Each energy sector has a research coordinating body: Ocide (electricity), Ocicarbon (coal), Ocipetrol (oil and oil products) and Ocigas (gas). These bodies are financed by a percentage (between 0.1 and 0.3 %) of sales revenue.

These levies are taken into account by the State when it sets energy prices. The Energy Directorate-General and the Directorate-General for Mines are becoming increasingly involved in R&D and are directly financing projects concerning the efficient use of coal, mining and renewable energies.

A share of 45 % of the R&D budget is allocated to Ciemat (Centre for Energy, Environmental and Technological Research). This body, created by Law 13/86 of 14 April 1986, succeeded the former Nuclear Energy Junta (JEN), whose nuclear energy research programmes it continues, but it has a broader scope extending to new research areas such as the environment and technological development.

A total of PTA 55 billion has been committed from public and private sources for energy R&D between 1988 and 1991. A Government study suggests that annual R&D expenditure will increase over this period.

Conclusion

Spain's energy sector epitomizes the changes currently taking place in the national economy. Membership of the Community has spurred on the sector, accelerating the process of adjustment and modernization begun earlier.

However, much remains to be done, particularly in view of the new challenge posed by the completion of the internal energy market, which will bring an even greater liberalization than that required under the Treaty of Accession.

The Commission's analysis of Spain's energy policy, in the context of the Community energy objectives for 1995, lead to the following conclusions:

Efforts to increase the proportion of Spain's energy needs met by natural gas should be continued and, where necessary, strengthened.

Spain should pursue and accelerate its efforts to increase energy efficiency, in order to reduce the extent to which it lags behind the Community average.

Installed electricity generating capacity may begin to prove inadequate in 1995. Considering the time required to commission new power stations, decisions in this field, concerning the nuclear freeze in particular, should be taken soon.

The adjustment of the oil monopoly, in compliance with the Act of Accession and the EEC Treaty, must be completed during the period of transition.

Oil and gas technology projects

Support programme for technological development projects in the oil and gas sector (Regulation (EEC) No 3639/85) — Results of the 1989 invitation to submit proposals

The Commission received applications for support for 88 technological development projects in the oil and gas sector in response to the invitation to submit proposals published in Official Journal C 215 of 17 August 1988. These projects concern investments totalling ECU 204 million, a reduction of ECU 40 million compared with the preceding invitation.

The projects, all proposed by European operators, concentrate mainly on production (33 %), exploration (13.5 %), drilling (12 %) and submersible vehicles (11 %).

In keeping with the trend which began in 1986 on the adoption of Regulation No 3639/85, the number of projects put up by undertakings from several Member States working in association has increased sharply and now accounts for 35 % of all applications.

The Commission's evaluation of the applications for financial support has been completed. Following the opinion of the Advisory Committee as provided for by the regulation, the support for a total amount of ECU 35 821 657 has been allotted to 52 projects.

Table 3
Decision 1989
Allotment of the support in the different technological sectors

Sector	Number of projects	Investment (ECU)	%
1. Geophysics and exploration	8	4 627 048	12.92
2. Drilling	4	3 738 067	10.44
3. Production system	18	13 622 824	38.03
5. Secondary and enhanced recovery	1	2 003 486	5.59
6. Impact of the environment on offshore structures	3	587 881	1.64
7. Ancillary vessels and submersible vehicles	3	3 046 570	8.50
9. Pipelines	6	1 763 495	4.92
10. Transport	2	1 488 804	4.16
12. Natural gas technology	—	—	—
13. Energy sources	1	1 392 000	3.89
14. Storage	—	—	—
15. Miscellaneous	6	3 551 482	9.91

Supplying the Community with natural gas

Development and special characteristics of natural gas supplies

Combustible gases were known, and occasionally used, in antiquity but it was not until the beginning of the nineteenth century that gas became economically significant, when the first gasworks were built to produce gas for lighting in towns. Gas production — by coking suitable hard coal grades, which came to be known as gas coal — and use spread rapidly throughout Western Europe. At the beginning of the present century, practically all towns and densely populated regions in this part of Europe had their own system, consisting of a gasworks from which the gas produced was fed through a low-pressure pipeline network to the various small and medium-sized consumers.

The first supra-local supply systems came into being in the twentieth century on the basis of surplus gas, which was obtained as a by-product in coke manufacturing areas and transported to neighbouring towns through small-diameter pipelines. At the same time, coal began to be replaced as feedstock in the gasworks by oil products, in particular naphtha. Gas production and distribution retained its local or regional character until after the Second World War. The gasworks were supplied with the necessary raw materials through the normal energy supply channels.

Development of the Community natural gas industry began after the Second World War with the discovery of natural gas deposits in the Po Valley in northern Italy, Lacq in the south of France and above all the massive Groningen field in north-east Netherlands at the end of the 1950s. The reserves proved to be so large that markets outside the neighbouring areas had to be found. In the middle of the 1960s, gas from Groningen began to be transported through large-diameter, high-pressure pipelines to local and regional gas distributors in Belgium, Germany, Italy, France and Switzerland: Europe now had an international gas industry.

Today, 10 of the 12 Member States of the European Community have a natural gas supply system. Work on introducing natural gas to Greece has already begun, and there are plans for the construction of a natural network system for Portugal in the 1990s, so that it can be expected that all Member States will be connected to natural gas supplies by the turn of the century.

Natural gas very quickly succeeded in 'taking over' the existing networks running on coke-oven or petroleum gas. With few exceptions, the whole Community gas supply system today operates with natural gas.

The advantages of this 'new' energy source: clean, convenient, competitively priced, flexible, environment-friendly and secure, enabled it to penetrate new markets. The use of gas by traditional customers, i.e. households, administrations and small industrial consumers, was expanded and new applications were found as fuel for medium-sized and large boilers, in various processing plants and as a raw material for numerous chemical processes.

The steady, rapid growth of the natural gas market led to a corresponding expansion on the supply side. As production from onshore fields could not be increased *ad infinitum*, it became necessary to turn also to offshore deposits which led in particular to the development of the gas deposits in the UK, Norwegian and Dutch sectors of the North Sea and imports from non-Community countries. In the 1970s, the foundations were laid for obtaining gas supplies through pipelines from Norway, the USSR and Algeria and for procuring liquefied natural gas (initially from Libya and Algeria).

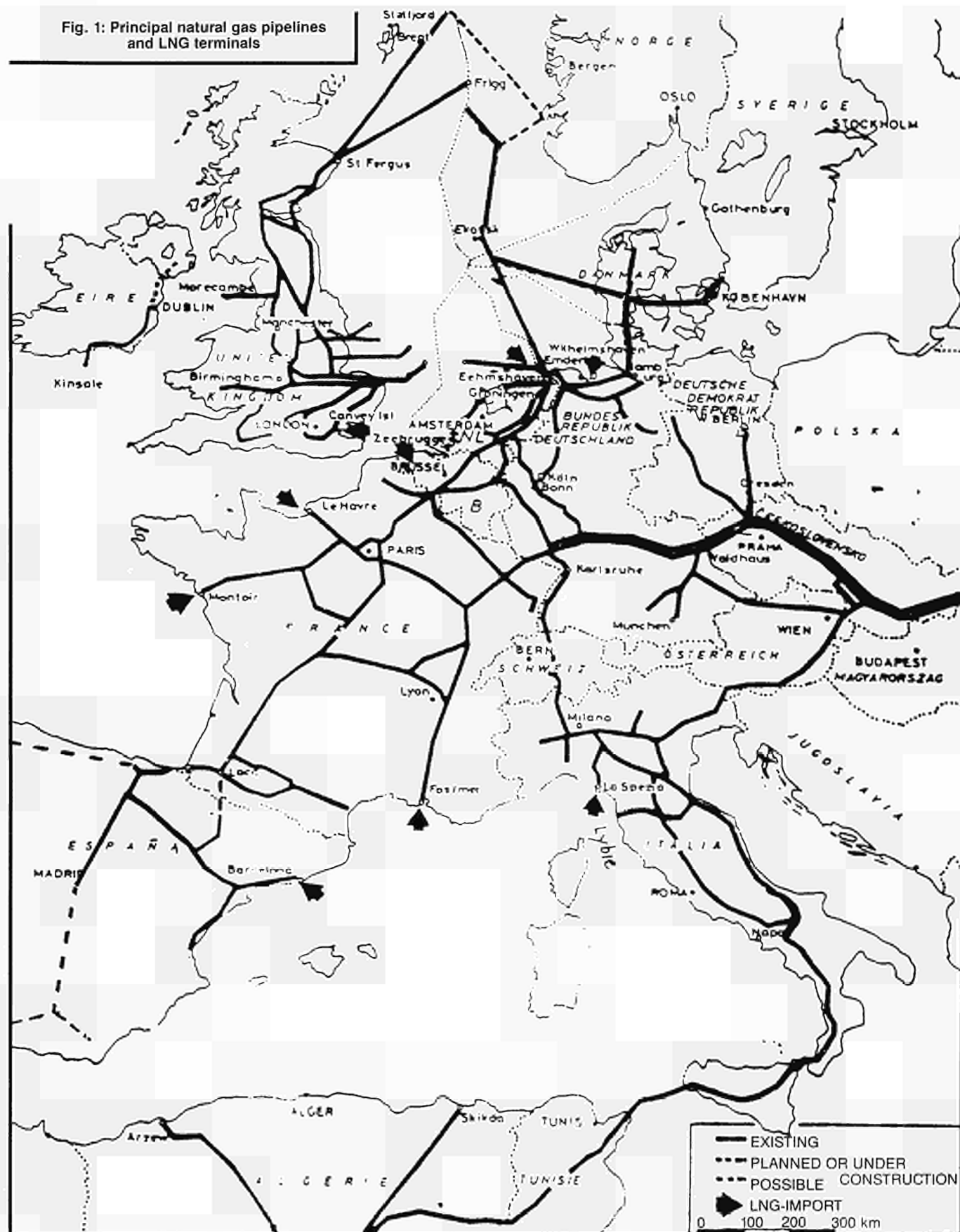
Parallel to this, an integrated international network of natural gas pipelines (Figure 1) developed, connecting the Benelux countries, Italy, Federal Republic of Germany and France with each other and with the non-Community supply sources. The young Danish gas industry was also integrated in this network in the 1980s. Spain is currently being connected up (through France). The transport and distribution networks of the United Kingdom and Ireland have not so far been connected to the integrated network.

Structure of supply

Natural gas consumption in the Community increased from 80 Mtoe in 1971 to approximately 200 Mtoe in 1987; this is equivalent to an increase of around 150 % in only 16 years.

As column 1 in Table 1 shows, consumption in 1988 declined to 191.3 Mtoe, owing to the mild weather. The United Kingdom and Germany are the largest consumers. Community production stood at 118.5 Mtoe, thus covering a remarkable 62 % of overall consumption. The main producing countries are the Netherlands, which not only produced almost 50 Mtoe (42 % of the Community total) in 1988, but also supplied 21 Mtoe of this production to other Community countries (see column 3 in Table 1), and the United Kingdom in particular from its offshore gasfield. Imports from non-Community countries stem fairly equally from the three main suppliers: Algeria (11 %); Norway (13 %); the USSR (15 %). The current supply situation can be regarded as balanced.

Fig. 1: Principal natural gas pipelines and LNG terminals



Future supplies

The general view is that the dramatic increase in natural gas consumption recorded in the 1970s and 1980s will not continue in the 1990s. Natural gas will follow the general energy trend, although certain factors such as increasing standards of comfort, the growing number of households (despite stagnating population trends) and above all its environmental compatibility will give it advantages over competing energy sources.

Cautious estimates in the Member States put natural gas consumption at 230 Mtoe at the turn of the century, while it may reach 250 Mtoe by the year 2010. This does not take account of possible special factors due to major, unforeseeable changes in the energy sector and energy policies of Member States and the Community.

With a comparatively low rate of increase, demand will continue to be covered mainly from Community production. Member States expect production in the year 2000 to stand at 142 Mtoe, which is equivalent to over 60 % of total projected consumption then.

The additional demand will continue to be covered primarily from the main producer countries Algeria, Norway and the USSR, although there is likely to be greater diversification of third-country supplies: the Nigerian liquefied gas project

now appears to have been finally decided and to be getting under way; the major part of production is destined for the Community market. There is basically scope for expanding supplies from Libya, and liquefied gas deliveries from more distant regions (e.g. the Gulf States) are not excluded.

Of the main suppliers, Algeria has large natural gas reserves (current estimate: 2.75 billion toe). The Algerian Government recently expressed a desire to expand deliveries to the Community. It is examining together with Morocco the possibilities for a second pipeline link to the integrated Community network through Spain.

Norway also has extensive reserves — currently estimated at 2.7 billion toe — for which the Community is the natural market and will remain so, as the possible outlets in Scandinavia itself will remain limited in the foreseeable future. Natural gas deliveries, now around 25 Mtoe, will assume a new dimension when development of the huge Sleipner-Troll project and of the corresponding infrastructure to supply the Community market is completed in the mid-1990s. By the year 2000, when deliveries reach the level contracted in the agreements signed with the Community gas industry in 1987, these fields alone will supply around 17 Mtoe annually to the Community.

Known natural gas reserves in the USSR are currently estimated at over 30 billion toe, or 38 % of world natural gas

Table 1
Community natural gas supplies 1988

(Mtoe)

Country	Total gas consumption (A)	Indigenous production	Intra-community trade (EXP-IMP+)	Contracted imports from third countries					Natural gas imports from third countries as:	
				Total	Algeria	Libya	Norway	USSR	% of natural gas consumption	% of total energy consumption
Belgium	7.2	—	3.1	4.1	2.4	—	1.7	—	56.9	9.1
Denmark	1.5	2.2	-0.4	—	—	—	—	—	—	—
Federal Republic of Germany	43.3	11.6	12.3	20.9	—	—	6.9	14.0	48.3	7.8
Greece	0.1	0.1	—	—	—	—	—	—	—	—
Spain	3.6	0.8	—	2.9	2.0	0.9	—	—	80.6	3.7
France	23.7	2.6	2.2	19.3	7.8	—	4.7	6.8	81.4	9.7
Ireland	1.6	1.6	—	—	—	—	—	—	—	—
Italy	34.1	13.5	3.4	16.6	8.4	—	—	8.2	48.7	12.0
Luxembourg	0.4	—	0.4	—	—	—	8.9	—	—	—
Netherlands	30.4	49.6	-21.0	1.9	—	—	1.9	—	6.3	3.1
Portugal	—	—	—	—	—	—	—	—	—	—
United Kingdom	45.4	36.5	—	8.9	—	—	—	—	19.6	4.3
EEC	191.3	118.5	0	74.6	20.6	0.9	24.1	29.0	39.0	7.1

(A) The difference between consumption on the one hand, and production and imports from third countries on the other hand, is due to storage and exports to third countries.

Source: Eurostat.

resources. The USSR is also the world's largest producer; in 1987 natural gas production stood at 653 Mtoe, which is over 39 % of world production. This is generally expected to increase further to over 1 billion toe at the beginning of the next century. Current exports to the Community amounting to 29 Mtoe account for less than 5 % of production. It is assumed that the Soviet Union will have reserve capacities in the 1990s which would permit additional exports to the Community of 20 Mtoe annually. The USSR's delivery potential and export flexibility are extraordinarily high owing to the scale of overall production.

As the high proportion of Community production will be maintained in the foreseeable future (the main gas exporting non-Community countries are able and willing to increase their exports to the Community) and new supply sources are a possibility, the situation of Community supplies can be described as secure, and indeed comfortable, for some time to come.

Security of supply

Despite its advantages as a clean, convenient, inexpensive and environment-friendly energy source and raw material, natural gas would not have attained its present important

position, with a share of over 18 % of Community energy consumption, if it had not been possible to ensure uninterrupted security of supply. Security of supply is a central concern of the gas industry, and it takes corresponding care in planning, construction and operation of its systems.

The fact that the public, State bodies and international organizations and — not least — the Commission and Council of the European Communities also take an interest in the issue of security of supply is due to the important position of natural gas in the energy market and the inevitably growing share of imported gas in supplies in the long term. In addition, when the Soviet Union initiated negotiations at the beginning of the 1980s with a view to increasing exports to the Community of natural gas from its newly developed western Siberian fields, reservations were expressed in various quarters about excessive dependence on Russian gas deliveries. Consequently, since 1982 the Commission has been carrying out detailed analyses of supply security at regular intervals and in close cooperation with the Member States. The most recent such analysis was made at the beginning of this year. It found that Community gas supplies could be maintained for at least nine months even if one of the third countries were to be lost completely as a source of supply, as a result of the balanced supply structure, the extensive integrated gas transport network and additional security measures (underground storages, increased indigenous production, interruptible supply contracts, etc.).

Combined heat and power in the European Communities

With the growing concern about the impact of energy production and use on the environment, more attention is being paid to greater efficiency in many sectors. One of the most promising areas appears to be the increased utilization of combined heat and power (CHP). This short article on CHP in the European Community by Dr Jürgen Greif is based on a presentation that he made at the CHP Conference and Exhibition held in the UK on 16 to 18 October 1989.

More than 10 years ago the Commission of the European Communities decided to submit a proposal to the Member States concerning the promotion of combined heat and power production and the recovery of waste heat.

The arguments which led to this initiative are as valid today as they were in 1977. They are:

- (i) the growth rate of energy consumption should be reduced, but without jeopardizing social objectives and economic growth;
- (ii) improvements in the rational use of energy are generally beneficial to the environment;
- (iii) more widespread use of cogeneration and recovery of waste heat are among the most promising areas of rational use of energy;
- (iv) the implementation of this technology requires the solution of complex problems of economic, technical, administrative and legislative nature. Even if these problems largely depend on regional or national factors, the search for solutions is facilitated by cooperation and exchange of information at national and Community level.

The Council agreed to this initiative and adopted the recommendation¹ that the Member States create advisory bodies or committees with the tasks of giving an opinion on all measures likely to lead to increased efficiency in the supply of heat for industry and the promotion of the use of district heat supply systems. These committees were invited to consider specific measures such as, for example:

- (i) the identification and abolition of legal, administrative and price obstacles to the development of combined heat and power production;
- (ii) encouragement of combined heat and power production and heat transport schemes within the limits set by the EEC competition rules (Article 92 of the EEC Treaty);

- (iii) the provision of better information to small and medium sized industrial enterprises.

Furthermore it was recommended that the Member States investigate and promote technical and economic studies and that they inform the Commission regularly of the measures taken in this field and of the results obtained or expected from these measures. Last — but not least — the advisory bodies should have regular exchanges of experience and should cooperate at Community level.

This Council recommendation led to quite a lot of activity in the following years and triggered the development of CHP and district heating schemes in a number of cases.

Other fora for exchange of experience developed in parallel, some of them comprising an even wider group of interested countries as for example the United Nation's Economic Commission for Europe (ECE) or the OECD's International Energy Agency (IEA).

A number of the especially encouraging examples of what has been achieved in some of the EC Member States concerning combined heat and power production are given below.

In the **United Kingdom** the Combined Heat and Power Association has considerably increased its efforts to promote CHP and has recently introduced new organizational arrangements. In helping the Energy Efficiency Office to launch its first 'good practice guide' focusing on small-scale CHP and by recently drafting a code of practice for large scale CHP and community heating systems, it has decisively contributed to paving the way for a wider use of CHP technology.

Another interesting development is the inclusion of a microcomputer into a medium-sized CHP installation, which by controlling permanently more than 30 parameters enables the manufacturer to provide preventive maintenance. This will render CHP acceptable to numerous potential users, who do not have technicians among their staff.

In the **Netherlands** a CHP stimulation programme was started in 1987. CHP installations dimensioned according to

¹ OJ L 295, 18.11.1977, p. 5.

the heat demand and tailored to the specific needs of the user can benefit from subsidies of 25 % (40 % in housing applications), from favourable gas prices and from electricity sales to the grid at prices based on avoided costs.

Present capacity of 1 860 MWe of large-scale CHP plus 225 MWe small-scale CHP is expected to rise by 50 % until 1995, which means that CHP will cover 20 % of future total electricity demand.

A project office for CHP was created, which offers information services on all aspects of CHP implementation and keeps contact with electric utilities in order to stimulate them to actively encourage CHP development.

Spain started a cogeneration programme in 1986 aimed at an additional 700 MW electric potential to be installed in suitable industrial plants by 1992. This will result in annual energy savings of half a million TEP. Whereas direct subsidies were offered in a first phase, the programme now comprises the following activities:

- (i) feasibility studies and co-financing of economic viability studies;
- (ii) technical aid and financial assistance for a project by third party financing and soft loans;
- (iii) information service (successful projects, most appropriate solutions to typical problems, etc.).

Denmark is the European leader in district heating systems at least in terms of the number of schemes and degree of penetration into the heat market. Waste heat from industry and burning of waste and straw provide a considerable part of the heat input and cogeneration alone supplies 40 %. The electric power industry offers almost symmetrical prices for electricity imported from or exported to the grid. Industry presently generates 5 % of its electricity and recent assessments show that the auto-production share could profitably be increased to more than 50 %. High taxation of non-industrial energy consumption renders gas powered cogeneration attractive for users like hospitals, hotels, etc.

Large-scale cogeneration provides 75 % of the heat supplied by district heating systems in the **Federal Republic of Germany**. Smaller scale cogeneration is widely applied in the form of standardized packaged cogeneration modules with typical sizes of 0.1 to 2 MWe. More than 500 such cogeneration plants based on gas or diesel fired engines are installed and produce about 250 MWe plus 400 MWth.

In recent years — and for some years to come — the Commission has fixed for itself as the highest priority the comple-

tion of the internal market. This is usually referred to simply as '1992'.

In spite of spectacular progress made up to now, the work which is still needed to be done before the internal market can be completed is substantial. This major task has made inevitable a reassessment of the relative priorities of the various fields of activity of the Commission as a whole and of its Directorate-General for Energy. In this DG, a redeployment of staff has been decided recently in order to cope better with the high priority objectives. Details of this reorganization are given elsewhere in this issue, but what concerns us here is the increased emphasis on technological development.

Innovative cogeneration projects have always been eligible for financial aid in the framework of the successive energy technology programmes known as 'demonstration programmes'. The new Thermie¹ programme, proposed by the Commission and currently being discussed by the European Parliament and the Council, will continue to provide assistance for innovation in the field of rational use of energy.

The arguments put forward by the Commission when inviting the Council to endorse a recommendation concerning the private generation of electricity clearly indicate the Commission's support for the promotion of combined heat and power production. It was stated *inter alia* that:

- (i) combined heat and power generation (CHP) and waste energy (combustion of waste and use of residual heat in industry), with their potential for oil substitution and savings of exhaustible primary energy sources, could make an important contribution to the achievement of the Community's 1995 energy policy objectives;
- (ii) the generation of electricity is a common field of application not only for renewable sources of energy but also for waste energy and for CHP and is therefore of crucial importance to the development of this energy supply potential.

As these power generation processes are mainly suited, because of inherent factors, to auto-production outside the public supply system the Commission also drafted guidelines to improve the situation of auto-production.²

The measures adopted by the Council³ in 1988 cover the introduction of standard contract criteria between auto-pro-

¹ See article on Thermie in this issue and in *Energy in Europe* No 13.

² See article in *Energy in Europe* No 12.

³ OJ L 335, 7.12.1988, p. 29.

ducers and public utilities — either by voluntary arrangements or, if necessary, by specific legal or administrative provisions. These provisions include an obligation for the public utilities to purchase auto-produced electricity as far as the smooth economic operation of existing public generation plants is not thereby jeopardized. Auto-production of electricity is to be authorized in principle as long as public interest is not infringed and must not be impeded by legal or administrative provisions nor by conditions imposed by the public utilities.

The recommendation concerning price structures for electricity sales to the public grid from auto-production using cogeneration, renewable energy sources or waste heat recovery is especially important. It states that:

‘... reimbursement for electricity sales to the grid should:

- (i) be based primarily on the long-term average costs avoidable by the public utilities in their area of supply,
- (ii) correspond at least to the variable costs avoidable by the public utilities, i.e. mainly the savings made in fuel costs,
- (iii) guarantee the auto-producer additional reimbursement to the extent that he enables the public supply network to make savings in investment costs in the generation or purchase of electricity. The size of this reimbursement should depend on how regularly the auto-producer’s

electricity production capacity is available, especially at peak periods,’

and, as a general rule:

‘reimbursement for the purchase of electricity from the public supply network is determined in such a way that auto-producers are treated in the same way as comparable purchasers who have no means of auto-production.’

Recent experience shows that this Council recommendation can have an effect on discussions with public utilities about tariff structures.

There is however still some way to go before the Community’s public utilities come to the same conclusion as that recently seen in a report by a major Canadian utility (Ontario Hydro) which was that:

‘... evaluated against our long-term avoided costs, it will in many cases be more economic to help finance private cogeneration projects than to construct new generating plants.’

The Commission of the European Communities is ready to support a move in this direction by encouraging increased cooperation between the CHP associations in the various Member States and the greater development of CHP in the Community.

Utilization of waste heat from power stations

Introduction

Waste heat from power stations is a source of energy little used at the present time but one which has considerable potential. Individual cases have already demonstrated the validity of upgrading technologies and the scope for economic use of this resource. Before undertaking new projects in this sector, however, it is time to take stock of the experience gained, to verify the economic and energy parameters and to compare the problems encountered and the solutions found.

The aim of the seminar 'Utilization of waste heat from power stations' was to allow us to examine the state of the art of the technologies employed and their economic viability and thus help to formulate conclusions and recommendations to guide future activities in this sector, especially those connected with demonstration and commercial exploitation projects.

The seminar was held at Gembloux in Belgium on 13 to 15 March 1989. It was organized by the Commission of the European Communities (Directorate-General for Energy), the European Cooperative Networks on Rural Energy (CNRE) of the Food and Agriculture Organization of the United Nations, and 'La Recherche Agronomique de Belgique' with the participation of the Faculty of Agricultural Sciences at Gembloux.

Conclusions and recommendations

The following conclusions and recommendations were noted in the light of the papers presented at the seminar and the resulting discussions:

1. Waste heat from power stations has already been widely used in agriculture, e.g. for crops under glass and field crops. On the whole these applications, introduced in the period 1976-86 during which the cost of energy increased sharply, did not encounter technical problems.
2. Marine and freshwater fish-farming schemes launched during the same period tended to be in the nature of demonstration projects; they generally came up against more problems, as this is a new industry and significant progress in breeding techniques and pathology is still to come. Further research and demonstration projects are necessary to put this industry on a sound footing.
3. Algae and seaweed cultivation is still at the research and development stage. This promises to be a high-yield sector with high value-added derived products. It already appears that small plants concentrating on specific products can be viable. More research and development work is necessary before passing to a demonstration phase for larger-scale production.
4. While 'low-temperature' heating technologies for district heating have made considerable advances in recent years, the temperature of waste water from power stations is nevertheless much too low for this application. Coupling a district heating system to a power station extracts so much heat that electricity production is diminished and the heat itself can no longer be regarded as residual. The current development of combined heat and power stations based on optimizing the response to the two forms of demand is not part of the heat recovery scenario with which the seminar was concerned.
5. In general terms, techniques for recovering residual low-temperature heat need to be improved, mainly in order to reduce costs. Further development and demonstration work should be carried out.
6. Economics is the critical factor in the development of these forms of low-grade energy utilization. The capital cost of water-offtake and distribution facilities are too high. Contracting authorities are not prepared to invest in expensive heat generation plant when energy prices are low and oil prices tend to fluctuate sharply at short notice. The development of long-term investment schemes based on energy prices, similar to third-party financing systems, should be the aim.
7. With energy currently cheap, the potential applications of waste heat recovery appear limited. In agriculture, it is restricted to high value-added sectors such as flower growing and pot plants, or for applications requiring minimum investment such as crops under plastic. With regard to aquaculture, investment in facilities producing certain species of fish can be profitable provided that a good marketing and distribution network is available.
8. The requirement for a guaranteed supply of heat obliges the user, on current contract terms, to install a standby heat generator to cope with possible interruptions in supply. The extra cost is an adverse factor in plant economics. The development of standard contracts between electricity generators and waste heat users should be promoted.

Transport of radioactive materials within the European Community — Part II: Regulations, the basic principles and their applications

Energy in Europe No 13 contained an article describing the extent of radioactive material transport in the European Community, radiation protection and hazards associated with these shipments and the need for specific regulations. This article describes the basic principles of the regulations covering transport of radioactive materials, the types of packaging used and the application of these regulations. It concludes with a summary of the Commission's proposals for the future programme in this area.

Since 1961, the International Atomic Energy Agency (IAEA) has published recommendations concerning the safe transport of radioactive materials. Those standard recommendations are published in a document entitled 'Regulations for the safe transport of radioactive materials'. These Regulations contain the technical and administrative provisions necessary to guarantee a level of safety without complicating the performance of transport operations to an excessive degree.

Basic principles of the Regulations

Since it is difficult to control all the conditions in any given environment, such as that of a nuclear installation, safety during transport is based mainly on the packaging and not on the conditions under which it is used. Furthermore, the very great variety of radioactive materials to be transported, like the very wide range of types and levels of radioactivity that must be contained, requires that packagings be used that are appropriate to the material being transported. The term 'packaging' means the assembly of components required to enclose the radioactive contents completely.

Both of these considerations are reflected in the two following principles, which form the basis of the Regulations:

- (i) safety depends on the packaging;
- (ii) the level of safety provided by the packaging must be appropriate to the potential hazards associated with the material being transported.

It is explicit in the first principle that any mode of transport can be used and any route can be followed as long as the radioactive material has been placed in a suitable container.

The reasoning behind the second principle is obvious: a radioisotope for medical diagnostic uses is not going to be

shipped in a packaging possessing the same strength characteristics as one used for the transport of irradiated fuel.

The Regulations hence define a number of categories according to the activity of the material being transported. In particular, they lay down the value above which this material has to be fully protected irrespective of the transport conditions, that is to say, it must be transported in a container capable of withstanding the effects of any accident that may occur.

Below that value, it is accepted under the Regulations that the packaging may be damaged and even destroyed in the event of an accident. For each radionuclide, two activity limit values are hence determined which, in the Regulations, are designated A1 (when the material is in non-dispersible form) and A2 (for dispersible material). Where the activity of the material being transported is higher than these values, the material must be shipped in a container capable of withstanding the effects of a severe accident. Such packagings are called type B packagings. For activities below these limits type A packagings or reinforced industrial packagings may be used.

The types of packaging and the tests

(a) Type B packagings

These packagings are thus capable of withstanding the effects of a very severe accident.

In order to attain this objective, the regulations define a number of tests, the effects of which are comparable to those of serious accidents: they mainly comprise a mechanical strength test, which takes the form of a 9 metre drop onto an indeformable surface and a fire resistance test, involving

subjection to a fire for half an hour at a minimum temperature of 800°C.

In the drop test, it is the fact that the target is an indeformable surface which makes the test extremely severe. Experimental proof of this was provided by tests carried out in the United States and the United Kingdom on packages of irradiated fuel which retained their integrity and lost none of their radiation shielding capacity after being subjected to the full impact of a locomotive travelling at 160 km/h and the crash of a semi-trailer carrying the package against a solid concrete block, also at a speed of 160 km/h.

As regards the fire-resistance test, its severity derives from the combination of two factors: duration and temperature. In fires of long duration (fires in cellars, ships' holds, tunnels, etc.), the temperature is well below 800°C.

In addition, the regulations require type B packagings to undergo a test involving immersion under 15 metres of water. It should be pointed out that most type B packages are capable of withstanding the effects of much greater depths.

The main items transported in type B packagings are:

- (i) irradiated (spent) fuel;
- (ii) fresh fuel containing plutonium;
- (iii) plutonium;
- (iv) high-level radioactive waste;
- (v) radioactive sources for medical uses (radiotherapy);
- (vi) certain radioactive sources for industrial uses (non-destructive inspection, gammagraphy, radiation sterilization, etc.).

The corresponding packagings vary widely, ranging in weight from 15 kilograms (portable gammagraphic equipment) to 100 tonnes (transport casks for irradiated fuel).

(b) Type A packagings

In the case of activity limits below those for which it is necessary to use type B transport packagings, the regulations lay down less severe criteria, but still require reasonable strength levels.

When the activity of the material to be shipped lies between the limits corresponding to transport in type B packaging and one-thousandth of those limits, the regulations require that a type A packaging be used. This is the case with many shipments of radioisotopes for medical uses or research purposes.

The regulations make allowance for the fact that packagings in this category may be destroyed in the event of a severe accident, but require that they withstand the effects of run-of-the-mill incidents and minor accidents, such as a drop during handling operations. For this reason, a series of tests has been devised which must be undergone by the packagings with satisfactory results and which include, in particular, a 1.20 metre drop test and a penetration test.

The range of activities covered is thus a wide one and the packagings are many and varied. Type A packagings are used for the transport of:

- (i) most radioisotopes for medical and industrial uses;
- (ii) non-irradiated nuclear fuel which does not contain plutonium;
- (iii) certain waste.

(c) Packagings for fissile materials

Fissile materials may have a high level of radioactivity (plutonium) or a very low level (uranium-235). If this were the only criterion to be used, some of these materials could be transported in type A packagings or even in industrial packagings (see (d) below). However, the consequences of a criticality accident (accidental initiation of a chain reaction) would be serious. The regulations thus provide that the packagings must be subjected to the same tests as the type B packagings and also lay down severe limitations on packaging deformations after an accident.

(d) Industrial packagings

Some of the materials to be shipped are not fissile and are only slightly radioactive. If the level of their radioactivity is less than one-thousandth of the limit above which the shipment would have to be made in a type B packaging, dispersion of the material as the result of an accident would not be likely to give rise to serious consequences in terms of radioactivity. There would therefore be no point in laying down special requirements for the corresponding packagings. However, the regulations do require the use of what are called 'reinforced industrial packagings', which are commonly employed for the transport of a wide range of chemical products and must meet a number of criteria, particularly with regard to their capacity to withstand a drop of 1.20 metre onto a concrete surface. This type of packaging is widely used for the shipment of low-level and medium-level radioactive waste.

Low-hazard materials with activities below one-thousandth of the type B limits are transported in reinforced industrial

packagings. This category includes instruments or objects containing a radionuclide and certain radioisotopes for medical uses. Materials of low specific activity also fall into this category: this includes certain radioactive ores, intermediate products from the processing of natural uranium (some of which may even be transported in bulk) and certain waste.

Application of the Regulations

As already stated, the IAEA Regulations for the safe transport of radioactive materials (Safety series No 6) form the common basis of the regulations in force throughout the world, particularly in the Community Member States.

The purpose of those Regulations, which assign the main safety role to the packaging, is to ensure that it is of the requisite quality and is properly used.

They also define the limits of their application and likewise the inspections and checks to be carried out.

National and international regulations

The provisions of the IAEA Regulations are incorporated in the national regulations issued by each State and the rules governing the international movements of radioactive materials.

The compatibility of all these sets of regulations derives from the fact that they are based on IAEA recommendations. The only difficulties that can arise are caused when the various international bodies adopt revised editions of the IAEA Regulations on different dates.

Difficulties of another kind might be caused within the Community as a result of each Member State incorporating the contents of the IAEA Regulations into its national legislation in its own way and applying it accordingly. This issue is being examined (see Commission proposals).

Approval of packagings

Type B packagings, which are designed for the transport of radioactive materials which exceed certain limits, must be approved by the competent authorities of the packaging's country of origin.

The national competent authority authorized to issue packaging approvals is either the body responsible for trans-

port or that responsible for nuclear matters; it may also be the body responsible for radiation protection. The IAEA regularly publishes a list of the competent authorities in all countries.

Until 1973, the competent authority in each country through which a type B packaging was to be transported or where such a packaging was to be used had to issue its own approval, and this led to complications and delays.

For this reason, the IAEA established in 1973 a packaging category called the B(U) category for 'unilaterally' approved type B packagings in respect of which the approvals issued by the countries of origin are considered valid in any country.

At present, all the Community Member States accept the principle of the free movement of type B(U) packagings. The basis for such acceptance is, on the one hand, the information set out in the approval certificate, and, on the other hand, the quality-assurance programmes implemented during both the manufacture of the packaging and maintenance work on it.

There are still, however, certain cases in which difficulties continue to arise with regard to the acceptability of type B(U) packages owing to the incomplete standardization of the certificate models and also because the certificate is drawn up in only one language (see Commission proposals).

Measures to be taken in the event of an accident

General instructions concerning the measures to be taken in the event of an accident or incident occurring during transport are issued to the workers concerned with the shipment in question by those responsible for that shipment (shipper, carrier, consignee) and form part of the training that they must receive as laid down in the Council Directives on health protection.¹

The same measures are applied by all countries in the event of an accident. They can be summarized as follows:

- (i) emergency action by the carrier, the police, the fire service and the medical service;
- (ii) evaluation of the radiological hazard and of the steps to be taken in order to reduce, where necessary, the severi-

¹ Council Directive 80/836/Euratom of 15 July 1980 amending the Directives laying down the basic safety standards for the health protection of the general public and workers against the danger of ionizing radiation, OJ L 246, 17.9.1980.
Council Directive 84/467/Euratom of 3 September 1984 amending Directive 80/836/Euratom, OJ L 265, 5.10.1984.

ty of the consequences following the arrival of qualified experts;

- (iii) decontamination, where necessary, of the environment and removal of contaminated substances by qualified teams.

In the case of shipments of irradiated fuel or large radiation sources, the measures to be taken in the event of an accident may be listed in the packaging-type approval certificates and the shipment approval certificates, which are not issued in the case of type B packages. However, in view of the very considerable strength of type B packagings, it is extremely improbable that environmental contamination would occur as the result of an accident involving such a packaging.

On the other hand, contamination of the environment might occur in an accident involving type A packagings or reinforced industrial packagings, the accidental destruction of which is accepted under the Regulations. It would, however, remain limited owing to the small quantities shipped or the low radioactivity of the materials being transported. The principal measure to be taken is the setting up of an isolation perimeter in order to allow the decontamination teams to work efficiently and thoroughly.

The IAEA has published a manual on emergency measures to be implemented in the event of a transport accident.¹ A study was carried out on behalf of the Commission which covers all the measures provided for in the Member States.² Each country possesses an emergency action system for coping with accidents involving radioactive materials, and countermeasures to be taken after transport accidents are covered by such systems.

In the case of transfrontier shipments, the emergency action procedure can be coordinated on what is generally a bilateral basis. It must, however, be remembered, as pointed out above, that contamination of the environment as a result of a transport accident can only be very slight.

Conclusions

The transport of radioactive materials is an every day activity which has been practised for several decades and is governed by regulations which are based on an analysis of the hazards

and on thorough and comprehensive studies of packaging models.

They do not, as in other areas, evolve as a result of serious accidents, but are adapted in the light of the results of studies and of practical experience built up over a period of time.

The very strict application of these Regulations is reflected in the fact that not a single serious accident has occurred, although millions of radioactive packages are shipped within the Community every year. There have been only a few minor incidents involving slight contamination of the environment which was easily dealt with and did not have any radiological consequences.

However, particularly in order to keep pace with the changes in the types of material to be transported, work is continuously dedicated to evaluating the hazards associated with the transport of radioactive materials and to taking appropriate precautions: a feature which should reassure public opinion.

The Commission's proposals

The programme

The programme for the next few years should be a continuation of projects already under way, concerning namely:

- (i) technology for the securing of packages in the case of accident during transportation by sea;
- (ii) specifications governing the design and manufacture of high-volume containers for the transportation of parts resulting from the decommissioning of nuclear installations;
- (iii) tests on shock absorber materials and on transport packaging structures.

In addition, with a view to the reinforcement of the internal market dimension and the greater reliability of the system in operation in the Community, the Commission proposes to:

- (i) look further into the question of type B(U) packages which, once unilaterally approved by a Member State should be able to be transported in other Member States without requiring fresh authorization by the latter;³

¹ 'Emergency response planning and preparedness for transport accidents involving radioactive materials'. IAEA SS No 87, 1988.

² 'Mutual emergency assistance in the event of an accident during transport of radioactive materials'. EUR 9133. EN, mf, 1984.

³ COM(88) 339 final.

- (ii) verify that the legislation, and implementation thereof, of the Member States adopted in application of the IAEA Regulations is compatible with the functioning of the internal market;
- (iii) compile an inventory of the difficulties which could result for transporters from variations of practice between Member States;
- (iv) complete the preparatory work aimed at the creation of a data bank on transport incidents and accidents and rescue services.

In collaboration with the Working Party, the Commission will keep the Council and Parliament informed of developments in the area of radioactive material transport in the Community and of the results of the programme and will submit appropriate proposals to them.

These activities are being pursued in coordination with others relating to transport security in general, the subject of two proposals currently before the Council concerned with the vocational training of road transporters and drivers of vehicles.

Community news

Energy Council — 11 May 1989

Under the chairmanship of Minister **Claudio Aranzadi** and with, for the first time, the participation of Commissioner **Cardoso e Cunha**, the Energy Council adopted a Decision on a Community action programme for improving the efficiency of electricity use (COM(88) 576). This programme will help to realize the Community's energy objective of achieving at least a further 20 % improvement in energy efficiency by 1995 through influencing consumer behaviour and improving the efficiency of electric equipment.

The Council endorsed common recommendations on the communication of the Commission concerning the oil market and the refining industry in the Community (COM(88) 491). These recommendations contain important messages to third countries and to the oil industry about the Community's policies in regard to the future of its refining industry, to external trade in petroleum products, and to investment by oil producing countries in Member States.

Discussions took place on the Commission's communication concerning transparency of consumer energy prices (COM(89) 123). Whilst all Ministers supported the general objective of improved price transparency in the frame of the realization of the internal energy market some more detailed questions remained open. The Commission confirmed its intention to propose a Directive by July to guarantee improved price transparency, especially for big industrial consumers of gas and electricity (see article in this issue).

Ministers had an orientation debate on the subject of the internal market in integrated electric energy systems and gave their reactions to a Presidency reflection document. Member States views differed on the policy line to be followed and the Commission announced its intention to submit proposals to the Council by July (see article).

An exchange of views also took place on the use of natural gas in power stations and the Commission explained in detail its decision to leave until next year its review of the Directive restricting the use of gas in power stations (75/404/EEC).

Approval was given to the intention of continuing after 1989 with a new Council Regulation concerning the promotion of energy technology in Europe (Thermie COM(89) 121). Whilst awaiting the opinion of the European Parliament and the Economic and Social Committee, detailed discussions will continue. Positive Council conclusions have been adopted on this issue.

Finally the Council expressed its interest in giving comments to the Internal Market Council (on the subject of public

works contracts in the energy sectors), before final decisions are taken.

Energy Council — 30 October 1989

Under the chairmanship of France's Minister for Industry, **Mr Roger Fauroux**, the Energy Council met on 30 October in Luxembourg. Commissioner **Cardoso e Cunha** represented the Commission. The following are the main highlights of the discussions.

● The Council examined the main aspects of the programme for the promotion of energy technology for Europe (Thermie programme).

The main aspects examined concerned:

- (i) the total amount of appropriations considered necessary for carrying out the programme;
- (ii) the maximum rate of support which could be granted for dissemination projects;
- (iii) the procedures to be laid down for implementing decisions under the programme ('comitology' aspects).

At the closing discussions, it was noted that views had converged on two of the points, but that the question of the total amount considered necessary required further clarification. The Council will resume its examination of this proposal once it has received the European Parliament's opinion.

● There was an initial examination of the proposal for a Directive submitted by the Commission on transparency of gas and electricity prices and concerning, in particular, the communication of data relating to:

- (i) the prices and the terms of sale of gas and electricity to industrial end-users;
- (ii) the price systems in use.

This convergence of views also covered the recognition of the need to guarantee the confidentiality of the data which would be communicated.

In addition, the principle of providing for the possibility of specific clauses for fledgling industries encountered a favourable reaction. The Council will resume examination of

this proposal when it has received the Opinions of the European Parliament and the Economic and Social Committee.

- There was an initial examination of the proposal for a Directive on the transit of electricity through transmission grids. This examination primarily concerned the general purpose of the Directive, namely an increase of intra-Community exchanges by means of the development of transfrontier transit through transmission grids. It was pointed out that this was without prejudice to the separate problem of transport for the account of third parties ('common carrier').

It was noted that the views converged to a large extent as to the Directive applying solely to transfrontier transit between Member States and that other aspects, such as the detailed implementing arrangements, should be examined in greater depth. The topic will be discussed again once the Opinions of the European Parliament and the Economic and Social Committee have been received.

- There was a general discussion on the proposal for a Directive submitted by the Commission on transit of natural gas through major systems. Following this exchange of views, the Council agreed to proceed on the subject once it had obtained the Opinions of the European Parliament and the Economic and Social Committee.

- The Council carried out an initial examination of the Commission proposal designed to amend the 1972 Regulation on notifying the Commission of investment projects of interest to the Community in the petroleum, natural gas and electricity sectors. A further examination of this matter will be carried out once the Opinions of the European Parliament and the Economic and Social Committee had been obtained.

ECSC Consultative Committee

At its 276th session of 14 March 1989, held in Toulouse, the Consultative Committee discussed several items concerning solid fuels. First came consultation by the Commission, under Articles 19 and 46 of the ECSC Treaty, on the market for solid fuels in 1988 and the prospects for 1989. Among the trends reported were an increase in deliveries of coke for steelmaking, but a diminution in those to power-stations and a reduction to an estimated 209 million tonnes for 1989 in domestic production. There had been a slight increase in prices and a reduction in solid fuels' share in Community energy consumption, which was a matter of concern to members of the Committee although the Commission representative, Mr C.L. Jones, took a more favourable view of long-term demand for coal in electricity generation. He also referred to the Commission's decision to undertake a

study of the energy outlook to the year 2010, preliminary work on which had already begun, and to the Energy Council in May.

The Committee then discussed the Commission's report on the implementation of the Community system of State aids to the coal industry in 1987. The report laid emphasis on the need for aids to be concentrated on the most profitable production, provided the accompanying social and regional consequences were acceptable. It was agreed that it was difficult to make comparisons between, and estimates of, the efficacy of the different types of aids administered in the various producer countries.

The Committee was consulted under Article 55, paragraph 2(c) of the ECSC Treaty on the financing of 81 coal research projects to the amount of ECU 27 million. These projects concerned mining technology and product upgrading. After some technical explanations given by the Commission, the Committee felt able to approve this expenditure. The Committee was also consulted on the guidelines for coal research for the period 1990-95, including the reduction of costs of production and the protection of the environment.

Gordon Langridge retires

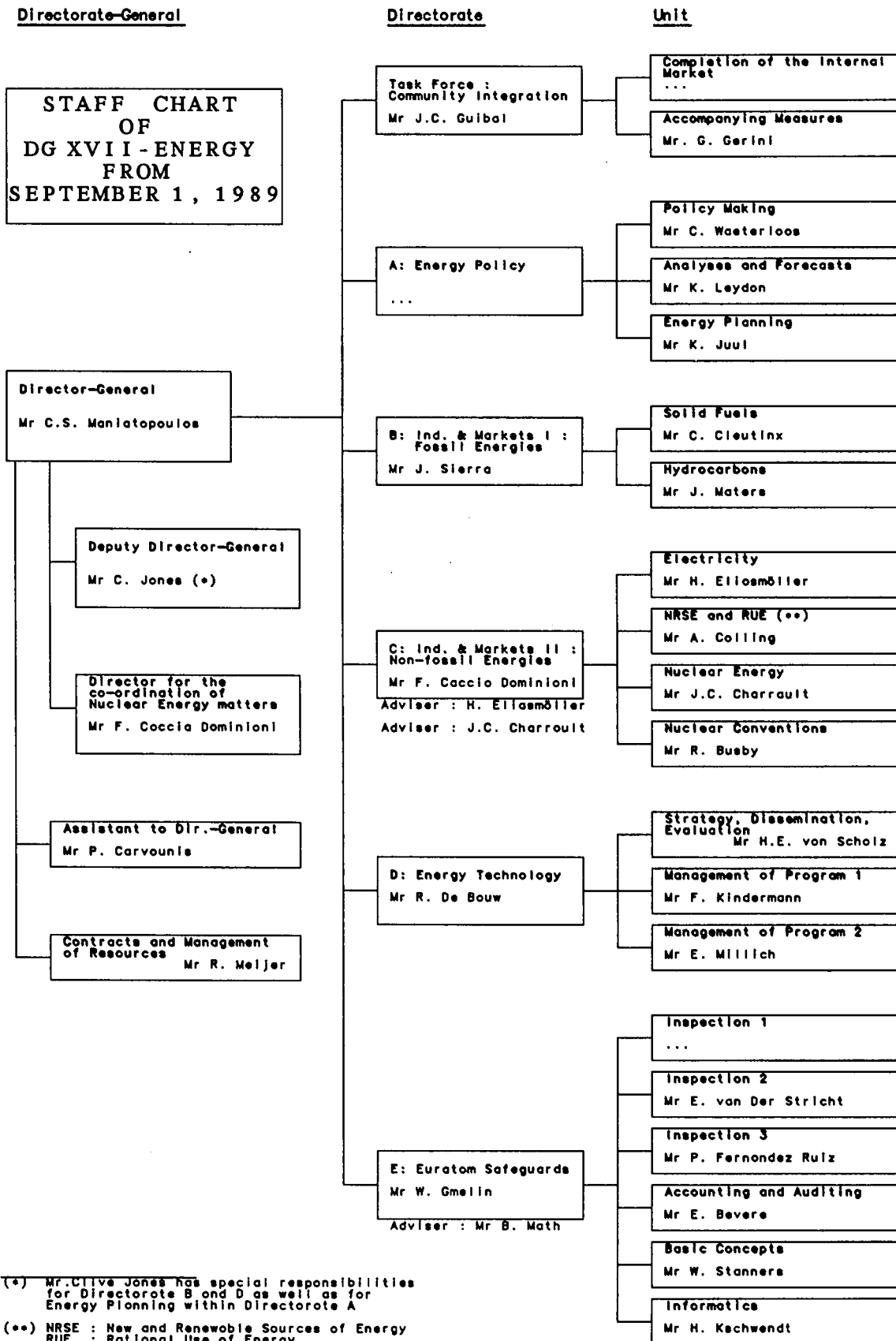
Gordon Langridge left the Directorate-General for Energy (DG XVII) and the Commission's service in September 1989, after reaching retirement age.

Known affectionately throughout DG XVII as the 'senior British statesman', Gordon and his wife are returning to England to live in the family home, south of London. He will be badly missed in Brussels.

Gordon joined the Commission in 1974, following UK entry to the Community and brought with him a wealth of experience in the oil industry, having worked for Shell in London and in various parts of the world, including South America and Japan. In 1987 he was appointed Head of the Commission's Oil Market Division. His wise advice and distinguished contribution to work on the oil market, oil policy issues and the development of the refining industry were of the highest quality and were delivered with the charm and modesty synonymous with his name. A noted gourmet who appreciates the fine restaurants of Belgium, Gordon also had a 'penchant' for testing the efficiency of the Commission's security service on late Saturday evenings in the office.

DG XVII wishes him a happy retirement.

New organization chart of DG XVII



(*) Mr. Clive Jones has special responsibilities for Directorate B and D as well as for Energy Planning within Directorate A

(**) NRSE : New and Renewable Sources of Energy
RUE : Rational Use of Energy

1 ECSC research, solid fuels, RUE
2 Hydrocarbons, NRSE

Reorganization of the Directorate-General for Energy DG XVII

Developments in the energy market over recent years have shown that DG XVII's present structure, dating back some 20 years, is no longer appropriate for today's needs. The emergence of the European internal market and its accompanying policies have aggravated this problem because the existing sectoral Directorates were not well placed to meet the challenge of 1992.

It was therefore necessary to restructure the Directorate-General so that it could pursue more effectively the policy priorities defined by the Commission.

The reorganization of the Directorate-General consists of the following changes:

- (i) the creation of a 'task force' to bring together all Community integration activities;
- (ii) the energy policy Directorate will concentrate on medium and long-term work in order to ensure the coherence of Community energy policy;
- (iii) the surveillance of energy industries and markets will be brought together in two Directorates: the first dealing with fossil fuels and the second with non-fossil energy sources;
- (iv) finally, the creation of an energy technology Directorate covering the technical management of Commission-supported projects as well as dissemination and strategy in the European energy technology field.

The new DG XVII organization chart in force since 1 September, is shown.

The use of natural gas in power stations

In February 1975, shortly after the first oil crisis, the Council adopted Directive 75/404/EEC on the restriction of the use of natural gas in power stations (Annex 1). Member States have conflicting views on the continuing usefulness of this Directive in current circumstances. In 1987, in the course of discussion of a Commission paper on natural gas supply,¹

¹ COM (86) 518 final.

the Commission agreed to consider whether it was timely to review this Directive.

As reported elsewhere in this issue, the Energy Ministers, meeting in Council on 11 May, noted that further consideration of the future of the existing Council Directive 75/404/EEC on the limitation of the use of natural gas in power stations would be deferred until the Commission had completed its review of the outlook in the energy sector up to the end of the century. This review should be completed by the end of 1989. The services of the Commission provided the ministers with a working document which reviewed the question of natural gas use in power stations, the conclusions of which are given below.

A. There are a number of reasons which suggest that an increase in natural gas consumption in power stations would not be desirable:

- (a) The Community's energy policy objectives adopted by the Council in 1986 recommended a further reduction in the use of gas and oil in power stations.
- (b) The level of European natural gas reserves, although significant, is much lower than the level of reserves outside the Community.
- (c) Natural gas can be used with greater efficiency at the level of the final consumer in premium applications, rather than in power stations.
- (d) Any increase in the use of natural gas in the Community would lead to a rise in our dependence on outside sources of supply.
- (e) Combustion of natural gas produces emissions of CO₂, CO and CH₄ which contribute to the greenhouse effect.
- (f) Any increase in the use of natural gas in power stations would hinder the progress of nuclear power, renewable energies and coal. The production of electricity is the use for which these three sources are particularly well adapted. The principal loser would be coal.

B. On the other hand a number of reasons of similar weight could be advanced in favour of the use of natural gas in power stations:

- (a) The 1995 energy objectives may have been adopted without sufficient account being taken of the impact of the internal energy market on energy independence, security of supply and increased trade. These objectives will be reviewed in this context in the near future and

should not therefore be regarded at this stage as an insurmountable obstacle.

- (b) The average price of natural gas is close to the price of heavy fuel oil in energy equivalent terms.
- (c) Gas-fired power stations are less expensive, less complex and, with the use of new technologies, can produce electricity at competitive costs.
- (d) Many polyvalent power stations could readily be converted to the use of natural gas.
- (e) The combustion of natural gas is less objectionable in environmental terms than residual fuel oil or coal. The emissions of SO₂, NO_x and CO₂ are smaller, sometimes very much smaller. Emission control facilities are efficient and cheap.

C. Directive 75/404/EEC seeks to limit the use of natural gas in power stations but is sufficiently 'friendly' to permit such usage where there are economic and environmental considerations, complying with the derogations allowed for in the text of the Directive. In view of this situation, and the balanced advantages and disadvantages discussed above, it would not seem advisable to take a decision on the revocation or retention of this directive at the present time. This issue should, however, be re-examined later in the course of reviewing the Community's long-term energy objectives, against the background of the unification of the Community's internal energy market.

Nuclear news

Nuclear safety: the European Community following the Chernobyl accident

Immediately after the Chernobyl accident in April 1986, the European Commission set in motion all available systems for information exchange. It also submitted a report to the European Parliament and the Council of Ministers describing the accident and its consequences in the Community. In June 1986, the Commission adopted a work programme to make use of the lessons to be drawn from the accident in the areas of health, safety of installations and nuclear research.

In August/September 1989 the Commission published an issue in its *European file* series which provides a summary of the activities initiated. The principal areas covered are:

- (i) health protection against contaminated food;
- (ii) improving information systems for emergencies;
- (iii) setting up networks for protection and mutual assistance in the event of a nuclear accident or radiation emergency;
- (iv) informing the people about nuclear dangers and protection from them.

The Chernobyl accident also brought about reorientation or strengthening of a range of ongoing activities in the nuclear safety field. These included:

- (i) the protection of health against ionizing radiation;
- (ii) the study of the impact of radioactivity on the environment;
- (iii) the technological safety of nuclear installations;
- (iv) scientific research.

Both the special measures and ongoing activities are covered in the European file No 12/89 — 'Nuclear safety: The European Community following the Chernobyl accident' which is available free of charge from the Directorate-General for Information, Communication and Culture, 200 rue de la Loi, B-1049 Brussels, Belgium or through European Community Information Offices.

Nuclear industries in the Community — the nuclear power station design and construction industry and completion of the European market

On 26 July 1989 the Commission passed its update of the 'Nuclear industries in the Community: Illustrative nuclear programme under Article 40 of the Euratom Treaty', called 'the PINC'. (Document: COM(89) 347 of 7 August 1989, 27pp.)

In the last PINC, published in 1984, the Commission had set out guidelines with regard to the nuclear-power production objectives in the Community. It had also examined the implications of attaining these objectives for all parties concerned with the nuclear sector. The main findings presented by the Commission in the report are, in the main, still valid today. However, it became necessary to examine the impact which the advent of the internal market will have on the nuclear industry.

As part of its drive towards an internal energy market, the Commission proposes to create a genuine common market for equipment and components and to ensure its transparency. This would reduce investment costs and improve the competitiveness of the industries in the sector.

In this new document the nuclear market is reviewed and appraised. The current indications are that there will be very few annual orders for nuclear power stations, at least until the resumption of activity which could result from the need to replace the existing installations in 15 to 20 years' time. The equipment and component markets will be very modest in numerical terms.

Moreover, the nuclear market is characterized by certain specific features: the importance of national safety authorities, the need for long-term continuity and hence to safeguard technical skills, the volume of service and maintenance activities and the small number of undertakings competent in the sector.

The report concludes that standardization is necessary in order to decompartmentalize the market. However, standardization must be compatible with safety requirements and the link between these two aspects should be considered by the Commission in a very special way.

In addition, the reports describes the Commission's plans to set up a group of experts which will be responsible for helping it to assess the technical aspects of the nuclear power market from the standpoint of the internal market.

The report then goes on to discuss the fast breeder reactor and its future role in power generation. It describes the development efforts which, in the Community, are now focused on the EFR (European fast reactor) project, with the various design, research and development activities conducted by industry, electricity producers and research organizations as a contribution to the project are being closely coordinated. This rationalization which will result in substantial savings of resources, the setting-up of an integrated industrial structure and other hand, in the definition of a single set of standards which will facilitate the operation of the internal market.

The report is now with the Economic and Social Committee for their opinion after which a 'final' version will be published by the Commission. An article will be published in *Energy in Europe* at that time. (For further details contact the Editor).

'Radiation and you'

The Directorate-General for Information, Communication and Culture (DG X) together with the Directorate-General for the Environment, Nuclear Safety and Civil Protection (DG XI) have recently published a booklet with the title 'Radiation and you'. Written by Dr Peter Saunders of the Environmental and Medical Science Division of the UK Atomic Energy Authority, the booklet describes the sources of radiation (both natural and man-made), the uses and effects of radiation and radiation protection in principle and practice, in particular within the European Community. This well-written and clearly illustrated booklet will be found very interesting and useful by a variety of professional people ranging from schoolteachers to specialists in the nuclear industry. It can be obtained through the Commission's Press and Information Offices (see inside back cover of this issue) or from the Office of Official Publications of the European Communities, L-2985 Luxembourg (quote catalogue number CC-54-88-053-EN-C).

Plutonium fuel — an assessment

Only minute quantities of plutonium occur naturally, but it is an inevitable by-product of using uranium in thermal reactors. Like many other materials, plutonium is toxic when inhaled, ingested or when it enters the bloodstream through a wound. Although it is a hazardous material it poses no greater threat than many other materials used industrially.

Quantities of plutonium, both in spent thermal reactor fuel and as separated material recovered by fuel reprocessing, have been increasing for the past 30 years and will continue to increase in the future.

The OECD Nuclear Energy Agency has just published a report on the facts and current views about plutonium and the options concerning its civil use or storage. The Commission of the European Communities contributed to the completion of the study by providing background documentation based on its own research projects and through membership of the international working group which, under the chairmanship of Professor Peter Jones, was responsible for the preparation of the report.

The report 'Plutonium fuel — an assessment' describes the occurrence and properties of plutonium and its compounds and the economics and logistics of the options for its use as a reactor fuel or its non-use (storage or disposal). A significant part of the report deals with the recycle of plutonium in what are known as 'mixed oxide' or 'MOX' fuels (a mixture of plutonium and uranium oxides) for light water reactors (LWRs). This technology has been demonstrated in three of

the Community's Member States (Belgium, France and Germany) and in Switzerland and Japan. The report concludes that where the plutonium is 'free' (i.e. derived from past, present or contracted reprocessing, the costs of which have been paid or committed) its use in LWR MOX fuel offers utilities an economic saving of some 30 % compared with equivalent uranium fuel.

Copies of the 160 page report (available in English or French for FF 150) can be obtained through government sales offices or by writing to the OECD, Publications Service, 2 rue André-Pascal, 75775 Paris CEDEX 16, France.

Seminar on oil crisis measures

In March the Commission's Oil and Gas Directorate held a seminar to familiarize officials from the Member States with Community measures to deal with oil supply problems.

This seminar provided an opportunity to recall the political and legal background to the adoption of the Community emergency response system and to review its main regulatory components regarding consumption, stocks, trade in petroleum products and consultations between Member States.

Attention was also focused on the parallelism between the Community crisis management system and that of the International Energy Agency.

Regional Energy Conference, Newcastle-upon-Tyne, 24 to 27 April 1989

A Regional Energy Conference took place from 24 to 27 April 1989 in Newcastle-upon-Tyne. This event was organized by the Commission (DG XVII) with the assistance of the Northern Regional Councils Association, and the Science Policy Research Unit, University of Sussex. A total of 18 papers were presented at the conference to over 100 European professionals, experts and policy makers in the energy planning field. **Mr Clive Jones**, Deputy Director-General for Energy and **Mr J-C. Guibal**, Director for Energy Policy were amongst the speakers at the opening of the conference.

The papers presented at the conference summarized the results of regional studies completed since the last conference

(which took place in Marseille in 1988); discussed implementation of the results of earlier regional studies and ways of disseminating information about such studies. Wide ranging discussions which ensued provided valuable insights for future regional energy policy work in the Community.

Symposium to promote industrial investment in renewable energies (Morocco)

A symposium to promote industrial investment in the renewable energy sector, organized by the Community's Directorate-General for Energy and Morocco's Ministry of Industry and Mines, was held from 20 to 24 April 1989 in Marrakesh. **Mr Constantinos Maniatopoulos**, the Director-General for Energy, led the Commission's delegation.

The event had a dual purpose: to demonstrate the potential for industrial cooperation between Moroccan and Community operators in their mutual interest, and to demonstrate ways of improving promotion of investment by industry in Morocco's renewable energy sector.

This was one of the first operations to bring together energy operators from the Community and a non-member country, and was consistent with DG XVII's recent emphasis on improving the dissemination of energy technology.

Over 250 people took part in the symposium; the level of participation from the renewable energy sector should also be underlined: more than 120, including 80 from Europe. The results were promising. Over 10 actual joint operations between Moroccan and European industrialists were mooted, mainly in the solar energy field. In other areas, such as hydropower, biomass and wind power, contacts were established between national and local government bodies in the main, with a view to launching projects and facilitating the setting-up of a domestic industry.

The symposium's discussions also spurred the development of Morocco's legislative, tax and customs apparatus to speed the country's exploitation of renewable energy.

Fourth international seminar on the results of EC geothermal energy research, 27 to 30 April 1989

The Commission (DG XII and DG XVII) organized this international seminar in conjunction with the *Ente Nazionale per l'Energia Elettrica* (ENEL). It followed three earlier seminars in the same field held in Brussels (1977), Strasbourg (1980) and Munich (1983).

The seminar's main themes, centred on the presentation of results from DG XII's high and low enthalpy geothermy research programme and DG XVII's demonstration programme, were discussed over three days. A field trip to the Larderello geothermal field with a visit to the geothermal sites rounded off the seminar.

The considerable attendance at this seminar, over 400, was due to the participation of the majority of DG XII's and DG XVII's contractors and to the presence of interested scientists and industry representatives.

The seminar was divided into five sessions: the first three devoted to research (Scaling, corrosion and modelling; hot dry rock and related studies; physico-chemical and resources studies) and the last two to the demonstration programme (Overview of geothermal resource development and demonstration; technology, obstacles and actions to promote the development of geothermal energy).

The seminar provided a round-up of the last four years' research and results. DG XII's and DG XVII's programmes proved to be complementary permitting the Commission's action in this area to continue satisfactorily.

In the high enthalpy sector, thanks to the stable KW price of electricity, the development outlook is good and should be enhanced as a standard production unit emerges. Recent low enthalpy research and operations have mainly concentrated on resolving difficulties in exploitation or improving technical processes.

In a climate of harsh competition those involved in the geothermal sector have demonstrated sensible aspirations and shown the opportunities for substantial development, making it conceivable that by 2010 in the Community geothermal could replace conventional energy by as much as 3.3 to 4 Mtoe pa compared with the current 1 Mtoe. These figures could rise if, in the intervening period, using HDRs permits a move to commercial exploitation.

Mission to Algiers

A Commission delegation led by Mr De Bauw, Head of the Oil and Gas Directorate, visited Algiers from 27 to 29 May. The purpose of the mission was to continue the regular exchange of views with Algeria's Minister for Energy begun in 1985. One of the main topics was the development of the energy market in the Community, with particular regard to gas.

In this context, the Algerian delegation was able to provide useful information on the planned western gas pipeline (Algeria-Morocco-Spain).

Mr Boussena, the Minister for Energy, issued an invitation for Mr Cardoso e Cunha to visit Algiers this year.

Director-General visits USA

DG XVII's Director-General, **Constantinos Maniatopoulos**, paid an official visit to the United States in July followed by a further visit in September. The visits took in meetings with government at various levels (Federal, Congress and State); a wide range of industry and associations, and research and consultancy groups.

The object of the visits was to assess the US energy situation and gain a first-hand view of how US energy policy was developing. On the way, a range of useful contacts was established and it was agreed that the US Administration and the Commission Services should meet annually at a senior level to discuss energy policy developments.

Recurring topics included US energy security, in particular growing oil import dependence, the environment, including the issue of global climate warming, the Bush clean air proposals and recent oil spills; and the relative outlook for the various energy sources. The high degree of interest in and knowledge of the EC and its internal market programme was noteworthy. Another point of interest was the reappraisal of energy policy which is happening at the present time on both sides of the Atlantic, together with associated long-term energy studies (for the EC, see 'Major themes in energy', special issue of *Energy in Europe*, September 1989).

In September, as well as meeting representatives from several industries, Mr Maniatopoulos visited oil platforms in the Gulf of Mexico and the Big Hill site of the US Strategic Petroleum Reserve (SPR) in Texas.

Latin America: High-level meeting between the Commission and Olade, Latin American Energy Organization

A high-level meeting between the Commission and Olade, the Latin American Energy Organization took place at Quito, Ecuador on 31 July 1989. The Commission Delegation was led by the Deputy Director-General for Energy, **Mr Clive Jones**. This was the first such meeting between the Commission and Olade.

The objectives of the meeting were to strengthen Commission links with Olade, which represents some 26 South American, Central American and Caribbean countries, and to discuss future areas of cooperation in the energy area between Olade and the Community.

The meeting with the Olade team led by Mr Gabriel Sanchez, Executive Secretary, was wide ranging and covered topics such as the energy situation in the Community and in Latin America and the energy activities of both organizations.

The resulting discussions led to improved mutual understanding and agreement in principle to cooperate in:

- (i) energy planning and forecasting;
- (ii) energy conservation and renewable energy technologies;
- (iii) electricity generation efficiency.

Both parties recognized the importance of this meeting which permitted constructive dialogue on energy policy issues in the Community and in Latin America. It was agreed that such meetings should be held on a regular basis in the future.

In the course of this visit to Latin America, Mr Jones and his colleagues also had discussions with the energy authorities in Brazil and Venezuela. A number of energy co-operation activities with the European Community are in progress in both these countries.

Mr Cardoso e Cunha at the World Energy Conference (Montreal)

Mr Cardoso e Cunha, Commissioner for Energy, chaired the plenary session of the 14th World Energy Conference in Montreal on 19 September. The general theme for the session was 'Sustainable energy growth — attainable or impossible?'. The Energy Ministers of the United Kingdom, Mr John Wakeham, of South Korea, Mr Bong Suh Lee, and the American Deputy Secretary of State, Mr Henson Moore also took part in the debate.

'Energy is politics in the noblest sense of that word', said Mr Cardoso e Cunha, 'Political incapacity to administer energy has lost our society part of its growth potential, led to unemployment, to difficulties in the balance of payments and to financial problems on a world level'.

According to the Commissioner, 'the debt problem of the developing countries finds its origin, to a large extent, in the attempt to cushion the weakest economies from the full rigour of the recessions connected with the energy crises'.

The World Energy Conference, which meets every three years, is the most important international meeting in the field of energy. The next meeting will take place in Madrid in 1992. The growth strategy, the supply-demand interaction of energy products, the impact on the environment and the safeguarding of primary energy resources were at the centre of the debates in Montreal.

Mr Cardoso e Cunha put the accent on the need to support the technological efforts of current research with actions of a political nature directed towards the habits and behaviour of society with regard to energy.

He stressed the political difficulties which face governments when trying to impose models of consumption not easily compatible with democracy and freedom, in particular in the fields of transport and electricity.

The Commissioner made a detailed analysis of economic and energy consumption growth scenarios in three areas of the world: the European Community, Eastern European countries and developing countries, based on detailed studies undertaken by the Commission.

Major themes in energy

On the occasion of the World Energy Conference (Montreal, September 1989) the Directorate-General for Energy of the Commission of the European Communities published a special issue of *Energy in Europe* on the subject 'Major themes in energy'. This special issue is centred around a study being undertaken within the Commission's services called 'Energy 2010'.

On 29 September Mr Cardoso e Cunha, Commissioner for Energy, presented the results of the study to the press.

The main objective of this study is to identify the 'major themes' in energy which could determine the direction of policy in the early to mid-1990s.

It is meant as a Commission contribution to the debate 'sustainable energy growth — attainable or impossible?' It addresses the question — can we have reasonably priced and secure energy supplies without destroying our environment? The report aims at contributing to the global discussion now taking place and to the fundamental options involved.

According to Mr Cardoso e Cunha, 'energy consumption will have to grow as we are committed to social and economic cohesion and to democratic options of development, within the framework of the single European market; our efforts should therefore be concentrated in increasing energy efficiency and environment protection'.

The study investigates three scenarios. The first of these is a conventional or 'business as usual' scenario. In this we see a Community population increasing only slowly in numbers but with more money to spend, more free time in which to spend it and growing increasingly concerned about the environment. Economic growth is sustained at reasonable energy prices but only at the cost of increased emissions of carbon dioxide.

The second scenario shows how things could go wrong with the conventional view. Failure to improve the efficiency with which we produce and use energy, coupled with higher than expected economic activity in the early 1990s, could put increasing pressure on the world oil price and our security of supply and lead to very substantial increases in CO₂ emissions.

The third scenario holds out hope for the future in showing us that high economic growth can be sustained in a clean environment. At the same time we could even reduce the Community's energy dependency. This would involve greater penetration of the market by more energy efficient

technologies, a new transport 'infrastructure' with more passengers and freight being carried by rail and the greater use of electricity generated by nuclear power and gas.

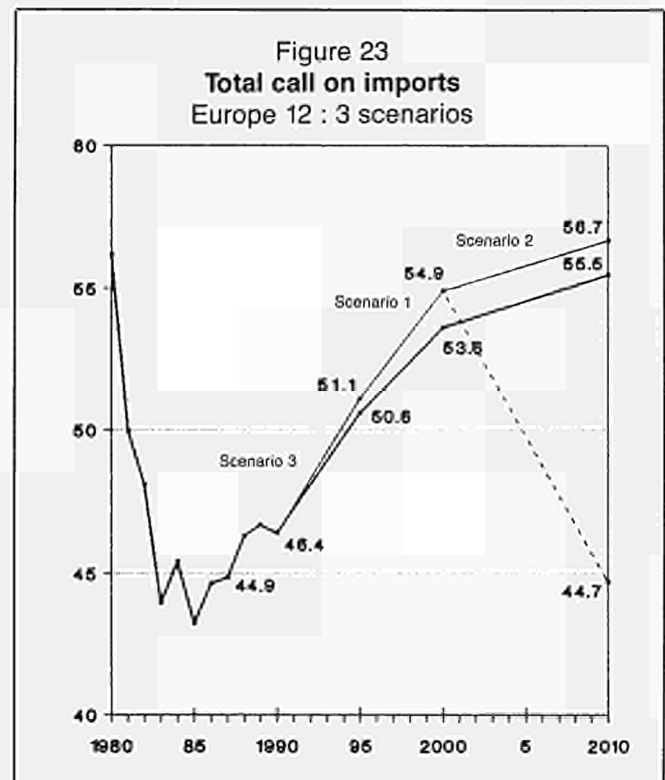
The scenarios chosen are not 'forecasts' of what will happen; rather they seek to explore the issues involved and to offer a basis for wide ranging discussion on what could constitute the 'Energy agenda' for the 1990s.

Major themes identified and discussed cover: energy and the environment; technological improvements and energy saving; energy security; and, in the run up to 1992, energy and the internal market. Annexes include projections about the world oil market to 2010, detailed energy balances by fuel and by sector and emission balances for each of the scenarios.

Comments, criticisms and suggestions on the report are most welcome and should be sent to Mr K. Leydon, Analysis and Forecasts Division, Directorate-General for Energy, Commission of the European Communities, 200 rue de la Loi, B-1049 Brussels.

●..... corrigendum

A number of errors were detected in the data as they appeared in the Special Issue. Figures 10 and 11 (page 26), Figure 23 (page 46) and Scenario 1 — annual NO_x emission balances (page 59) should be replaced by the following:



Scenario 1
Annual NO_x emissions balance
(1000 tonnes)

1986	Solids	Oil	Gas	Total
<i>Energy sector of which:</i>				
Power generation	1894	337	165	2396
Other conversions	5	314	32	351
<i>Final demand of which:</i>				
Industry	218	314	241	773
Transport	0	5621	0	5621
Other sectors	69	345	197	611
Total	2186	6931	635	9752

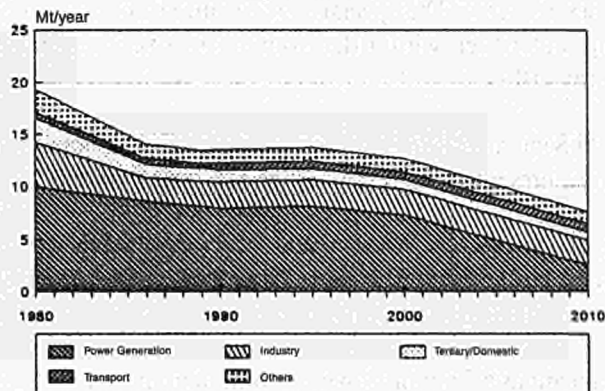
1995	Solids	Oil	Gas	Total
<i>Energy sector of which:</i>				
Power generation	1838	470	172	2480
Other conversions	3	347	9	359
<i>Final demand of which:</i>				
Industry	206	323	285	814
Transport	0	5699	0	5699
Other sectors	54	330	239	623
Total	2101	7169	705	9975

2000	Solids	Oil	Gas	Total
<i>Energy sector of which:</i>				
Power generation	1853	455	159	2467
Other conversions	3	343	10	356
<i>Final demand of which:</i>				
Industry	213	301	299	813
Transport	0	4571	0	4571
Other sectors	43	302	253	598
Total	2112	5972	721	8805

2010	Solids	Oil	Gas	Total
<i>Energy sector of which:</i>				
Power generation	1640	172	217	2029
Other conversions	2	320	10	332
<i>Final demand of which:</i>				
Industry	240	282	334	856
Transport	0	4807	0	4807
Other sectors	33	254	271	558
Total	1915	5835	832	8582

Figure 10
SO₂ emissions for Europe 12

By sector



By fuel

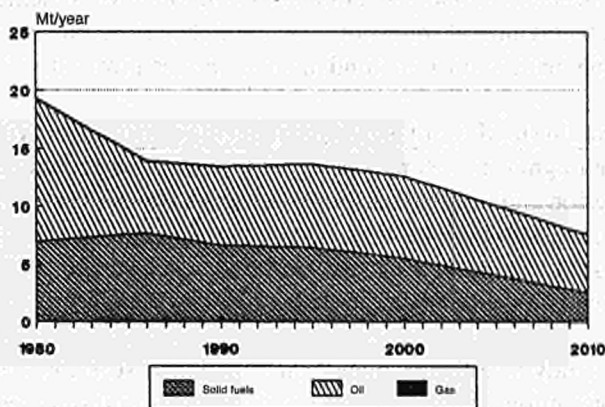


Figure 11
NO_x emissions for Europe 12

By sector

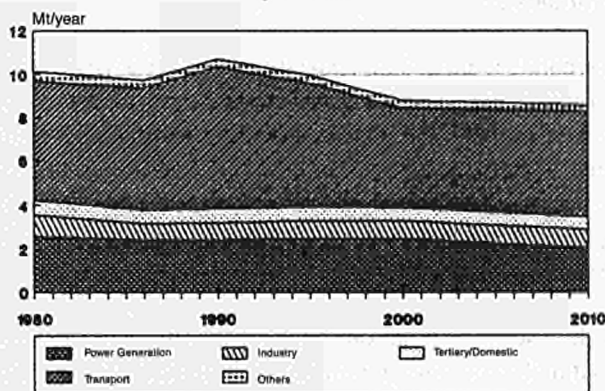
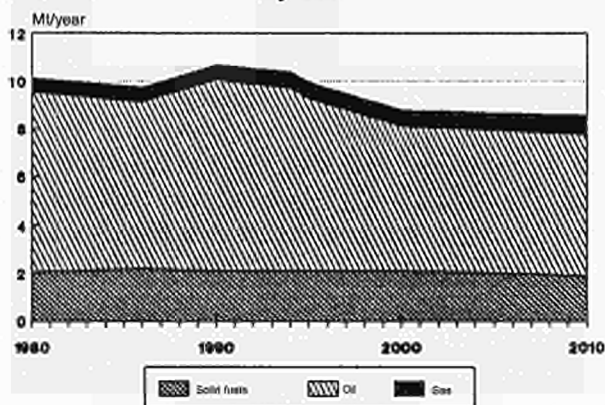


Figure 11

By fuel



India/EC Energy Management Centre

In September 1989 the Government of India and the Commission (DG XVII) signed an agreement to establish an India-EC Energy Management Centre. The main objective of the Centre is to strengthen cooperation, both within India and between India and the EC, in the field of energy management in order to ensure sufficient energy supplies for economic and social development.

The Centre's headquarters is in Nagpur with a first branch office in New Delhi where the EC's advisor to the Centre will be located. The Centre's activities for 1989/90 will include courses on the role of technology in electricity conservation in industry, electricity tariffication and the training of energy managers.

Energy cooperation with Algeria and Mexico

Algeria and Mexico, both large oil exporting countries, are now moving towards energy demand management. This development is brought about by the drop in the price of oil, the need to conserve oil resources for export and the need to provide a competitive environment for industry. Both coun-

tries have recently set up specific organizations with responsibility for the promotion of energy conservation policies, Copae (Comision para Ahorro Energético) in Mexico and Aprue (Agence pour la promotion et la rationalisation de l'utilisation de l'énergie) in Algeria.

It is therefore natural for these countries to want to take advantage of the diverse experience of the EC in defining and implementing policies for the control of energy use. The EC in turn wishes to support these endeavours and has defined a number of integrated cooperation projects in each country.

Algeria, which has associations with the Community under a Cooperation Agreement, will be the subject of a cooperation programme costing some ECU 4 million over a four-year period. Community support will consist of providing technical assistance, setting up training programmes, financing demonstration programmes and organizing meetings between European and Algerian industrialists.

Mexico, which has already had links with the Community through a three-year programme of cooperation in energy conservation, has now entered into a further three-year programme. This agreement was signed in July 1989, in Brussels. The first year of the new programme has just started, and consists of helping Copae to get its activities underway in its role of promoter of energy demand management. In the industrial and transport sectors it includes the promotion of exchange of technology between the Commission and Mexico by means of contacts between operators and industrialists.

Forthcoming event:

European conference on energy efficiency in buildings, Lille 28 to 30 November 1989

Almost 40 % of the European Community's energy is consumed in domestic, commercial and public buildings and this proportion has risen steadily over the last decade, so that the buildings sector is now the single largest sector of consumption and uses more energy than industry and agriculture combined.

In recent years technological developments have brought about substantial improvements in many areas, such as the insulation of buildings, boiler efficiency and energy manage-

ment systems. Despite this, ever since fuel prices began to fall in 1984, energy consumption in Community buildings has risen by an average of 3 % per year, an increase greater than for any other sector. The potential for energy efficiency improvements in buildings is clearly enormous; however, vigorous action needs to be taken to realize this potential.

Furthermore, with the progress being made towards the achievement of the single European market in 1992, it is vital that new energy efficiency technology is disseminated widely throughout the Community, particularly across national frontiers, so that the benefits of the single market can be realized in this area and social cohesion within the Community maximized.

The conference aims to assess the progress which has been made to date in:

- (i) energy efficiency in buildings, including improvements arising from Community and national demonstration projects;
- (ii) to consider where there is greatest scope for energy efficiency improvements in the coming years and to assess future prospects;
- (iii) to stimulate the dissemination and implementation of energy technology in buildings.

In fact during the last decade the Community has granted about ECU 20 million to support some 110 demonstration projects for energy efficiency in buildings; similar action has been taken in many Member States bringing the total of demonstration projects co-financed by public institutions in the Community up to about 400.

Commission services will take a keen interest in this conference, in the context of planning future Commission activity in this sphere. It is anticipated that this major Conference will give important pointers for several years to come. The Commission is very pleased to be associated with the organization of this conference in Lille, and trusts that all participants will take full advantage of this opportunity to further development and end-use of improved technology.

Forthcoming event: The Commission's natural gas seminar

On 17 and 18 January 1990 the second natural gas seminar of the European Commission will take place in Bonn. Following the success of the first seminar which was held in Bruges in May 1987 and which centred on an exchange of views between 'new' and 'mature' gas Member States and their industries, this time the general theme will be an exchange of views between the industries and the Commission regarding subjects related to the achievement of the internal market. Again speakers and participants will come from gas transmission companies, distribution companies and their respective associations and the Commission. The seminar will be organized by the Commission and the German association of gas industries, the BGW (Bundesverband der deutschen Gas- und Wasserwirtschaft eV), which has kindly offered to host the event.

.... and finally — 1992

A report published in September jointly by the Royal Institute of International Affairs and the Science Policy Research Unit at Sussex University casts doubt on the idea that great changes can be expected in Europe's energy industries as a result of the completion of the single market in 1992. The report says that the test of the Commission's determination to effect a single European market in energy may depend on whether it is prepared to countenance European-wide regulation in order to enable competition and third party access to gas and electricity grids to take place and doubts that the political will exists to create such regulatory structures with effective powers of enforcement.

The report *A single European market in energy* is available from the Energy and Environmental Programme, Royal Institute of International Affairs, 10 St James's Square, London SW1Y 4LE. Telephone: 01 930 2233. Needless to say, the report is being studied within the Commission's services and we hope to review it in a future edition of *Energy in Europe*.

Document update

Main Commission energy documents, proposals, directives

COM/89/0121 final	Communication from the Commission European technologies for energy management Thermie programme Proposal for a Council Regulation concerning the promotion of energy technology in Europe
COM/89/0123 final	Communication from the Commission Transparency of consumer energy prices
COM/89/0164 final	Communication from the Commission Evaluation of technological programmes in the field of energy
COM/89/0203 final	Report from the Commission Report on activities undertaken by the Com- munity following the Chernobyl accident
COM/89/0226 final	Proposal for a Council decision adopting a specific research and technical development programme for the European Atomic Energy Community in the field of management and storage of radioactive waste
SEC/89/0280 final	Report from the Commission The market for solid fuels in the Community in 1988 and the outlook for 1989
COM/89/0332 final	Draft Council Directive concerning a Com- munity procedure to improve the transparency of gas and electricity prices charged to in- dustrial end-users Catalogue number: CB-CO-89-410-EN-C ISBN 92-77-52948-2 (Office for Official Publications of the European Communities)
COM/89/0334 final	Communication from the Commission Towards completion of the internal market for natural gas Proposal for a Council directive on the transit of natural gas through the major systems Catalogue number: CB-CO-89-398-EN-C ISBN 92-77-52840-0 (Office for Official Publications of the European Communities)
COM/89/0335 final	Draft Council Regulation (EEC) amending Regulation (EEC) No 1056/72 on notifying the Commission of investment projects of interest to the Community in the petroleum, natural gas and electricity sectors Catalogue number: CB-CO-89-406-EN-C ISBN 92-77-52912-1 (Office for Official Publications of the European Communities)
COM/89/0336 final	Communication from the Commission Increased intra-Community electricity ex- changes: a fundamental step towards com- pleting the internal energy market Proposal for a Council directive on the transit of electricity through transmission grids Catalogue number: CB-CO-89-433-EN-C ISBN 92-77-53255-6 (Office for Official Publications of the European Communities)
COM/89/0347	Nuclear industries in the Community The nuclear power station design and con- struction industry and completion of the Euro- pean single market Update of the illustrative nuclear programme for the Community — PINC
COM/89/0380 final	Amended proposal for a Council Directive on the procurement procedures of entities operating in the water, energy, transport and telecommunications sectors Catalogue number: CB-CO-89-378-EN-C ISBN 92-77-52658-0 (Office for Official Publications of the European Communities)

SEC/89/0801 final	Communication from the Commission to the Council and the European Parliament on the transport of radioactive materials in the Euro- pean Community Second report on the transport of radioactive materials in the European Community
SEC/89/1344 final	Le marché des combustibles solides de la Com- munauté en 1988 et ses perspectives pour 1989
C/89/1386 final	Commission decision of 1 August 1989 on the granting of financial support to technological development projects in the hydrocarbons sector

New energy publications

Statistics

Energy. Monthly statistics.
Commission of EC. Statistical Office of the EC
Office for Official Publications of the European Com-
munities. 1989. 54 pp.
CA-BX-89-001-9A-D

Energy. Monthly statistics No 1 — 1989
Energie et industrie. Conjoncture
Luxembourg — Office for Official Publications of the EC.
1989. 42 pp.
CA-BX-89-001-3A-C

Electric energy statistics 1988.
Energy and industry, Rapid Reports No 2. 1989
Statistical Office of the EC — Luxembourg — 1989. 4 pp.
CA-NL-89-002-FR-C

Hard coal — Hard coke — Intra- and extra-Community im-
ports — 1988
Energy and industry, Rapid Reports No 3. 1989
Statistical Office of the EC — Luxembourg — 1989. 4 pp.
CA-NL-89-003-FR-C

Petroleum products — Inland deliveries
Energy and industry, Rapid Reports No 4. 1989
Statistical Office of the EC — Luxembourg — 1989. 4 pp.
CA-NL-89-004-FR-C

Aspects statistiques de l'économie du gaz naturel en 1988
Energy and industry, Rapid Reports No 5. 1989
Statistical Office of the EC — Luxembourg — 1989. 4 pp.
CA-NL-89-005-FR-C

Aspects statistiques de l'économie énergétique en 1988
Energy and industry, Rapid Reports No 6. 1989
Statistical Office of the EC — Luxembourg — 1989. 8 pp.
CA-NL-89-006-FR-C

L'industrie charbonnière dans la Communauté par bassin en 1988.

Energy and industry. Rapid Reports No 7. 1989
Statistical Office of the EC — Luxembourg — 1989. 4 pp.
CA-NL-89-007-FR-C

Houille 1987-1988

Energy and industry. Rapid Reports No 8. 1989
Statistical Office of the EC — Luxembourg — 1989. 16 pp.
CA-NL-89-008-FR-C

Structure et activité de l'industrie — Enquête annuelle — Principaux résultats — 1984-1985.

Statistical Office of the EC — Luxembourg — 1989. 292pp.
CA-53-88-601-3A-C; ISBN 92-825-9244-8

Energy balance sheets 1986-1987

Commission of EC. Statistical Office of the EC
Office for Official Publications of the EC. 1989. 229 pp.
CA-53-88-512-6F-C; ISBN 92-825-9274-X

Industry — Statistical yearbook.

Energy and industry.
Office for Official Publications of the EC. 1989. 147 pp.
CA-53-88-091-5E-C; ISBN 92-825-9038-0

Industrial production. Quarterly statistics No 1 — 1989

Energy and industry
Office for Official Publications of the EC. 1989. 201 pp.
CA-BL-89-001-3A-C

Industrial production. Quarterly statistics No 2 — 1989

Energy and industry
Office for Official Publications of the EC. 1989. 201 pp.
CA-BL-89-002-3A-C

Exploitation des centrales nucléaires 1987

Energy and industry — Reports, studies and statistics
Office for Official Publications of the EC. 1989. 143 pp.
CA-53-88-504-3A-C; ISBN 92-825-9330-4

European Community demonstration projects for energy saving and alternative energy sources

Evaluation of the energy demonstration programme

Energy efficiency and renewable energy projects.
Brussels — EC Commission. 1988 — 55 pp.

BM/034/85-NL — EN/NL, No 94 — Philips Bedrijven BV

— Combustion of industrial waste for heat production in a grate boiler furnace

GE/291/83-IT — EN/IT, No 95 — Coop. Va Sirio Scrl
— Geothermal urban heating at Acqui Terme (Italy)

GE/456/83-F — EN/FR, No 96 — SNGM
— Installation and testing of a turbopump at Meaux, France

GE/69/81-UK

GE/607/83-UK — EN/FR, No 97 — Southampton Geothermal Heating Co.

— Geothermal energy for district heating in Southampton

BM/333/84-F — EN/FR, No 98 — Le Bois Torrefie du Lot
— Wood roasting unit

EE/404/85-F — EN/FR, No 99 — ELF France

— Heat pipe exchanger

SE/596/83-UK — EN/FR, No 100 — Built Environment Research Group

— Solar heating with CHP

EE/476/86-F — EN/FR, No 101 — Waterford Cooperative Society Ltd

— Ice-bank/hydro-cooler system and air compressor pre-cooler system

EE/410/84-IR — EN/FR, No 102 — Kantoher Coop.

— Concentration of acid casein whey by mechanical vapour recompression

SE/163/81-UK — EN/DE, No 103 — Keable Bosley Partnership

— Combined passive and active solar systems

EE/145/83-IT — EN/IT, No 104 — Vitrofil

— Recovery of heat from the exhaust fumes from glass production furnaces

EE/621/84-HE — EN, No 105 — Corinth Refineries SA

— High octane lead-free gasoline production using molecular sieves

EE/070/81-IT — EN/IT, No 106 — ILVA Spa

— Optimization of the Cowper process with microprocessors and control loop

WE/291/85-DE — EN/DE, No 107 — Südwind GbR

— 15 kW grid connected machine with flap-hinge rotor

WE/127/83-UK — EN/FR, No 108 — VAWT Ltd

— VAWT 260 on St Marys, Isles of Scilly

BM/029/85-BE — EN/FR, No 109 — Pan-Terre SA
— Manufacture of an insulating panel from recycled raw materials

EE/426/86-IT — EN/IT, No 110 — SRS Srl
— Turbodrymex plant for the production of detergent powders

WE/023/84-BE — EN/FR, No 111 — Turbowinds NV
— Windmill for polderdrainage

WE/402/85-NL — EN/NL, No 112 — WRK Water wind station Princess Juliana
— Two 250 kW wind turbines and two 600 kW combined heat/power plants at Enkhuizen

WE/162/86-DE — EN/DE, No 113 — Husumer Schiffswerft Inh. Gebrüder Kröger GmbH & Co. KG
— HSW-250 — The Husum wind power installation

EE/323/86-ES — EN/ES, No 114 — Inseriales
— Optimization of energy consumption in an electric furnace
— Energy saving in agriculture and the agro-food industry

Biomass and energy from waste

The energy bus — a means to improve energy efficiency

Research and development

Energy conservation. R&D programme 1985-88
P. Zegers. 1988 — 60 pp.
Brussels, Commission of the EC.

Research and technological development in the field of energy — Non-nuclear energy and rational use of energy.

'Joule'. Joint opportunities for unconventional or long-term energy supply. 1989-92

Brussels — Commission of the EC — DG Science, Research and Development. 1989 — 29 pp.

Miscellaneous

Public opinion in the European Community on energy in 1987

Catharine Ghestem

Brussels — EC Commission — 1988 — 175 pp.

Collection of legislation and acts relating to energy. (Deadline 1992)

Commission of the EC. DG Energy

Office for Official Publications of the EC. — 1989 — 44 pp.
CB-55-89-584-EN-C; ISBN 92-825-9549-8

Proceedings of the third EC Symposium for the exploration and exploitation of oil and gas resources

Evaluation of the Community programme of support for technological development in hydrocarbons

Biogas end-use in the EC

Survey published in cooperation with SPPS-Belgium

Wind-diesel and wind autonomous energy systems

Proceedings of a contractor's meeting on wind demonstration projects

Annual report 1988 (Deadline 1992)

Euratom Supply Agency — Commission of the EC

Office for Official Publications of the EC — Luxembourg — 1989 — 28 pp.

CB-56-89-247-FR-C; ISBN 92-826-0024-6

ORDER FORM

- Subscriptions start from 1.1.1989 and until cancellation on your part (only possible at the end of a calendar year). They include all the issues for the calendar year in question
- Prices are valid until 31.12.1989 (excluding VAT)

ORDER FORM

ENERGY IN EUROPE

ISSN 0256-6141

Price annual
subscription — VCX (3 issues per year):

ECU 35

Number
of copies:

.....

Name and address:

Date: Signature:

ORDER FORM

ENERGY — Monthly statistics
English/French

ISSN 0258-3569

Price annual subscription — VVD
ECU 53,50

Number
of copies:

.....

ENERGY — Statistical yearbook — 1985
287 pp CA-47-86-583-9A-C
ECU 18.50

.....

Name and address:

Date: Signature:

ORDER FORM

ENERGY STATISTICS — Combined subscription
including: monthly statistics, rapid statistics,
structural statistics and statistical yearbook

Number
of copies:

Price annual subscription — VVT
ECU 81

.....

Name and address:

Date: Signature:

Please send your order to the
SALES OFFICE in your country

Learn more about
the

**EUROPEAN
COMMUNITY**

from our
publications:

consult the

**ANNUAL
CATALOGUE**

of

**PUBLICATIONS
OF THE
EUROPEAN
COMMUNITIES**

Please send your order to the
SALES OFFICE in your country

Please send your order to the
SALES OFFICE in your country

**Venta y suscripciones • Salg og abonnement • Verkauf und Abonnement • Πωλήσεις και συνδρομές
Sales and subscriptions • Vente et abonnements • Vendita e abbonamenti
Verkoop en abonnementen • Venda e assinaturas**

BELGIQUE / BELGIË

Moniteur belge / Belgisch Staatsblad

Rue de Louvain 42 / Louwensweg 42
1000 Bruxelles / 1000 Brussel
Tél. (02) 512 00 26
Téléfax 511 01 84
CCP / Postrekening 000-2005502-27

Sous-dépôts / Agentschappen:

**Librairie européenne /
Europese Boekhandel**

Avenue Albert Jonnart 50 /
Albert Jonnartlaan 50
1200 Bruxelles / 1200 Brussel
Tél. (02) 734 02 81
Téléfax 735 08 60

Jean De Lannoy

Avenue du Roi 202 / Koningslaan 202
1060 Bruxelles / 1060 Brussel
Tél. (02) 538 51 69
Télex 63220 UNBOOK B

CREDOC

Rue de la Montagne 34 / Bergstraat 34
Bte 11 / Bus 11
1000 Bruxelles / 1000 Brussel

DANMARK

J. H. Schultz Information A/S

EF-Publikationer
Ottliavej 18
2500 Valby
Tif. 36 44 22 66
Telefax 36 44 01 41
Girokonto 6 00 08 86

BR DEUTSCHLAND

Bundesanzeiger Verlag

Breite Straße
Postfach 10 80 06
5000 Köln 1
Tel. (0221) 20 29-0
Fernschreiber:
ANZEIGER BONN 8 882 595
Telefax 20 29 278

GREECE

G.C. Eleftheroudakis SA

International Bookstore
Nikis Street 4
10563 Athens
Tel. (01) 322 63 23
Telex 219410 ELEF
Telefax 323 98 21

Sub-agent for Northern Greece:

Molho's Bookstore

The Business Bookshop
Tsimiski Street 10
Thessaloniki
Tel. (031) 27 52 71
Telex 412885 LIMO

ESPAÑA

Boletín Oficial del Estado

Trafalgar, 27
28010 Madrid
Tel. (91) 446 60 00

Mundi-Prensa Libros, S.A.

Castelló, 37
28001 Madrid
Tel. (91) 431 33 99 (Libros)
431 32 22 (Suscripciones)
435 36 37 (Dirección)
Télex 49370-MPLI-E
Telefax (91) 275 39 98

Sucursal:

Librería Internacional AEDOS

Consejo de Ciento, 391
08009-Barcelona
Tel. (93) 301 86 15
Telefax (93) 317 01 41

FRANCE

**Journal officiel
Service des publications
des Communautés européennes**

26, rue Desaix
75727 Paris Cedex 15
Tél. (1) 40 58 75 00
Téléfax (1) 40 58 75 74

IRELAND

Government Publications Sales Office

Sun Alliance House
Molesworth Street
Dublin 2
Tel. 71 03 09

or by post

Government Stationery Office

EEC Section

6th floor
Bishop Street
Dublin 8
Tel. 78 16 66
Fax 78 06 45

ITALIA

Licosa Spa

Via Benedetto Fortini, 120/10
Casella postale 552
50125 Firenze
Tel. (055) 64 54 15
Telefax 64 12 57
Telex 570466 LICOSA I
CCP 343 509

Subagenti:

Libreria scientifica Lucio de Biasio - AEIOU

Via Meravigli, 16
20123 Milano
Tel. (02) 80 76 79

Herder Editrice e Libreria

Piazza Montecitorio, 117-120
00186 Roma
Tel. (06) 679 46 28/679 53 04

Libreria giuridica

Via 12 Ottobre, 172/R
16121 Genova
Tel. (010) 59 56 93

GRAND-DUCHÉ DE LUXEMBOURG

Abonnements seulement
Subscriptions only
Nur für Abonnements

Messageries Paul Kraus

11, rue Christophe Plantin
2339 Luxembourg
Tél. 48 21 31
Télex 25 15
CCP 49242-63

NEDERLAND

SDU uitgeverij

Christoffel Plantijnstraat 2
Postbus 20014
2500 EA 's-Gravenhage
Tel. (070) 78 98 80 (bestellingen)
Telefax (070) 47 63 51

PORTUGAL

Imprensa Nacional

Casa da Moeda, EP
Rua D. Francisco Manuel de Melo, 5
1092 Lisboa Codex
Tel. (01) 69 34 14

Distribuidora de Livros Bertrand, Ld.ª

Grupo Bertrand, SARL

Rua das Terras dos Vales, 4-A
Apartado 37
2700 Amadora Codex
Tel. (01) 493 90 50 - 494 87 88
Telex 15798 BERDIS
Telefax 491 02 55

UNITED KINGDOM

HMSO Books (PC 16)

HMSO Publications Centre
51 Nine Elms Lane
London SW8 5DR
Tel. (01) 873 90 90
Fax GP3 873 84 63

Sub-agent:

Alan Armstrong Ltd

2 Arkwright Road
Reading, Berks RG2 0SQ
Tel. (0734) 75 18 55
Telex 849937 AAALTD G
Fax (0734) 75 51 64

SUISSE

OSEC

Stampfenbachstraße 85
8035 Zürich
Tél. (01) 365 51 51
Fax (01) 365 52 21

ÖSTERREICH

**Manz'sche Verlags-
und Universitätsbuchhandlung**

Kohlmarkt 16
1014 Wien
Tel. (0222) 531 61-0
Telex 11 25 00 BOX A
Telefax (0222) 531 61-81

TÜRKIYE

Dünya süper veb ofset A.Ş.

Narlıbahçe Sokak No. 15
Cağaloğlu
İstanbul
Tel. 512 01 90
Telex 23822 DSVO-TR

UNITED STATES OF AMERICA

UNIPUB

4661-F Assembly Drive
Lanham, MD 20706-4391
Tel. Toll Free (800) 274 48 88
Fax (301) 459 00 56
Telex 7108260418

CANADA

Renouf Publishing Co., Ltd

61 Sparks Street
Ottawa
Ontario K1P 5R1
Tel. Toll Free 1 (800) 267 41 64
Ottawa Region (613) 238 89 85-6
Telex 053-4936

JAPAN

Kinokuniya Company Ltd

17-7 Shinjuku 3-Chome
Shinjuku-ku
Tokyo 160-91
Tel. (03) 354 01 31

Journal Department

PO Box 55 Chitose
Tokyo 156
Tel. (03) 439 01 24

AUTRES PAYS

**OTHER COUNTRIES
ANDERE LÄNDER**

**Office des publications officielles
des Communautés européennes**

2, rue Mercier
L-2985 Luxembourg
Tél. 49 92 81
Télex PUBOF LU 1324 b
Téléfax 48 85 73
CC bancaire BIL 8-109/6003/700

Price (excluding VAT) in Luxembourg: Single copy ECU 12.70/Subscription ECU 35



OFICINA DE PUBLICACIONES OFICIALES DE LAS COMUNIDADES EUROPEAS
KONTORET FOR DE EUROPÆISKE FÆLLESSKABERS OFFICIELLE PUBLIKATIONER
AMT FÜR AMTLICHE VERÖFFENTLICHUNGEN DER EUROPÄISCHEN GEMEINSCHAFTEN
ΥΠΗΡΕΣΙΑ ΕΠΙΣΗΜΩΝ ΕΚΔΟΣΕΩΝ ΤΩΝ ΕΥΡΩΠΑΪΚΩΝ ΚΟΙΝΟΤΗΤΩΝ
OFFICE FOR OFFICIAL PUBLICATIONS OF THE EUROPEAN COMMUNITIES
OFFICE DES PUBLICATIONS OFFICIELLES DES COMMUNAUTÉS EUROPÉENNES
UFFICIO DELLE PUBBLICAZIONI UFFICIALI DELLE COMUNITÀ EUROPEE
BUREAU VOOR OFFICIËLE PUBLIKATIES DER EUROPESE GEMEENSCHAPPEN
SERVIÇO DAS PUBLICAÇÕES OFICIAIS DAS COMUNIDADES EUROPEIAS



CB-BI-89-002-EN-C