

# ENERGY IN EUROPE

Energy policies and trends in the European Community



Number 16 December 1990



Commission of the European Communities

Directorate-General for Energy

# **ENERGY**

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# Preface by the Director-General for Energy

## C.S. Maniatopoulos

*The major events of 1990 in world politics, especially the Gulf crisis and the democratization of the countries of Eastern Europe, have made energy the focus of the international community's concern.*

*The Gulf crisis in particular has once again underlined how consumer countries need to have secure supplies of oil at a reasonable price. This is at the root of the proposals made last October by the European Commission, as a logical consequence of the increasing political and economic integration of the Community. The proposals aim to reinforce substantially the Community legal instruments intended to alleviate the oil supply problem, as regards both energy demand (cuts in consumption) and supply (partial use of emergency oil stocks).*

*The Commission's proposals in this field - as set out in this issue of 'Energy in Europe' - are not enough, in spite of their scale, to guarantee the security of the Community's energy supply in the long term. This can only be ensured by the creation of a Community-wide integrated energy market. Considerable progress was made in this direction in 1990, as can be seen in this issue, with the adoption by the Council of Ministers of Directives aimed at increasing price transparency and at allowing freedom of transit within the Community for electricity and natural gas.*

*The opportunity also arose in 1990 to emphasise the international character of the energy market, in particular its pan-European dimension. The foundations have been laid for cooperation on energy matters with most Eastern European countries through the growth of democracy there. Such cooperation, outlined in this issue, is set to expand towards other nations, the Soviet Union included, since the Community is currently looking at the establishment of a 'Pan-European Energy Charter', based on the initiative of the Dutch Prime Minister, Mr Lubbers.*

*In the world arena, 1990 was characterised by rapidly growing awareness of the threat of global warming due to increasing concentrations of greenhouse gases in the atmosphere. The key decision taken by the Community in this field, namely stabilizing CO<sub>2</sub> emissions at the 1990 level by the year 2000, is analysed in this issue especially in terms of examining possible measures for achieving this Community objective.*

*Looking ahead to 1991, the Commission, aware of the increasing role of energy as a factor of Community integration, will be working out a set of new energy policy guidelines for the medium and long term in the coming months. This should enable proposals to be put forward for the gradual implementation of the internal energy market and - in particular - a common energy policy. The work recently begun by the Intergovernmental Conference on Political Union could prove crucial here. If energy is covered, the new treaty to be drawn up could define clearly and with authority the rules of the new common energy policy and its associated objectives.*

December 1990

# Energy Council and joint Energy and Environment Council, 29 October 1990

*The Energy Council made significant progress towards an integrated energy market by adopting two directives in the electricity and gas sectors. The Commission also presented a set of proposals aimed at strengthening the Community machinery for coping with an oil supply crisis. The Energy and Environment Council adopted a CO<sub>2</sub> stabilization target for the Community.*

The Energy Council of 29 October 1990 was chaired by Italy's Energy minister Mr Battaglia; EC Energy Commissioner, Mr Cardoso e Cunha represented the Commission of the European Communities.

EC Energy Ministers firstly held a broad-ranging discussion on the oil situation in the Community in the light of the Gulf Crisis. The Ministers endorsed a set of general conclusions, but also asked the Committee of Permanent Representatives of the 12 Member States (COREPER) to carry out a technical assessment of the 'crisis proposals' drawn up on 24 October.

The Council also approved two Directives on the transit of electricity and gas taking a further step towards the internal energy market. At the same time it revoked a 1975 Directive curbing the use of natural gas in power stations. The aim now is to promote the increased use of this source of energy, supplies of which have improved considerably since the first oil crisis. Natural gas is also considered environment-friendly.

The Council also took positive note of the SAVE Programme on the rational use of energy.

On the afternoon of 29 October, following up a suggestion of the Italian Presidency, a meeting of the **joint Council of Ministers for Energy and the Environment** took place. The aim of this joint meeting was to work out a common Community position on the climate in preparation for the Second World Climate Conference, held in Geneva from 29 October to 7 November 1990.

## Oil market situation

Commissioner Cardoso e Cunha introduced the Commission's analysis of the present situation on the oil market and its short-term prospects. The Commission is proposing changes to the Community's present role in the event of oil supply difficulties (including emergency oil

stocks), as well as seeking a mandate to negotiate the Community's accession to the International Energy Agency (IEA). Details of these proposals are set out in a separate article in this issue.

The Council then adopted the following conclusions:

'The Council, having examined the Commission report on the meetings of the Oil Supply Group and discussed the oil supply situation in the Member States in the light of the Gulf crisis:

- appreciates the preparatory work carried out by the Commission and calls on the Permanent Representatives Committee (COREPER) to examine the proposals submitted;
- shares the conclusions of the IEA Steering Committee reached at its meeting in Paris on 28 September;
- observes that, although world market supplies continue to be adequate and there has been no fall-off in supplies, prices remain high, basically for emotive or speculative reasons;
- observes that Member States' reserves of crude and petroleum products remain high and that total stocks for daily commercial, industrial and government consumption purposes exceed 90 days.

In the event of a genuine oil supply crisis due to a worsening of the present situation, the Council has confirmed the positions already adopted by the IEA.

The Council has noted that all Member States are ready to take swift action to enact the necessary measures at the level of both supply and demand.

The Council will coordinate its response in the context of the IEA to a possible worsening of the oil supply situation.'



## Transit of electricity through transmission grids

The Council endorsed a Directive on the transit of electricity through transmission grids, following the completion of the cooperation procedure with the European Parliament.

To summarize, the Directive aims to contribute to the greater integration of the European electric energy market by removing obstacles to increased electricity exchanges between transmission grids.

The enacting terms provide that the Member States should take steps to facilitate transit of electricity through high-voltage grids through their territory.

'Transit' is defined as any transaction for the transport of electricity under the following conditions:

- transmission takes place through a high-voltage electricity grid (not a distribution grid) in a Member State's territory and contributes to the efficient operation of European high-voltage interconnections;
- the grid of origin or of final destination is situated in the Community;
- the transport involves the crossing of one intra-Community frontier at the very least.

The Directive lists the transmission grids in question and the entities responsible for them in each Member State; this list will be updated, whenever necessary, by the Commission after consultation with the Member State in question.

Contracts involving transit of electricity through transmission grids will be negotiated between the bodies responsible for the grids concerned and for the quality of the service provided and, where appropriate, with the entities responsible in the Member States for importing and exporting electricity.

The conditions of transit must, in line with the rules of the Treaty, be non-discriminatory and equitable for all the parties concerned; must not include unfair clauses or unjustified restrictions and must not endanger security of supply and quality of service, in particular taking full account of the use of reserve production capacity and the most efficient operation of existing systems.

At the operational level, Member States must immediately ensure that the entities mentioned above:

- notify the Commission and the relevant national authorities of any request for transit arising from electricity sales contracts having a period of validity of at least a year;
- open negotiations on the conditions of the electricity transit requested;
- inform the Commission and the relevant national authorities of the conclusion of a transit contract;
- inform the Commission and the relevant national authorities of the reason for the failure of the negotiations to result in contracts within twelve months following communication of the request.

Each of the entities concerned may request that the conditions of transit be subject to conciliation by a body set up and chaired by the Commission, and on which the entities responsible for transmission grids in the Community are represented.

If the reasons for the absence of agreement appear unjustified or insufficient, the Commission, acting on a complaint from the requesting body or on its own initiative, will take legal action.

The Member States must comply with this Directive by 1 July 1991 at the latest.

## Transit of natural gas through the major systems

A discussion on a proposed Directive on transit of natural gas through the major systems gave way to a qualified majority within the Council in favour of approving the proposal as it stood, following the proceedings of the Permanent Representatives Committee and the discussions held during the course of the day (29 October 1990).

The Council then asked COREPER to finalize the texts, to enable a formal Council decision to be taken at a forthcoming meeting<sup>1</sup>.

<sup>1</sup> The Council formally adopted a common position on the proposed Directive on 20 December 1990.

The definitions and arrangements governing the transit of natural gas will be fundamentally parallel, *mutatis mutandis*, to those adopted for the transit of electricity.

Mr Cardoso e Cunha made it clear that acceptance of the transit of gas and the transit of electricity through the major systems must not be confused with the 'common carrier' concept, i.e., the right of any industrial consumer to use any system. Two consultative committees on gas and two other committees on electricity are currently examining the economic and technical feasibility of such direct access.

## Use of natural gas in power stations

Pending the European Parliament's opinion, the Council agreed to the proposal for a Directive revoking the 1975 Directive on the restriction of the use of natural gas in power stations in the light of the altered situation in this area since 1975.

## Save programme

Commissioner Cardoso e Cunha presented the Commission's SAVE programme proposal, the main aim of which is to improve energy use with a view to a 20% reduction per unit of gross national product five years from now.

The programme found favour with most Ministers, and while it had been prepared before the Gulf crisis was

thought to hold fresh significance in the present situation. The Council asked the Permanent Representatives Committee to conduct a detailed examination of this programme proposal.

A short article featuring the programme in summarized form appears in this issue. The next issue of *'Energy in Europe'* will examine the SAVE programme in depth and will give details of progress of the Council's scrutiny of the programme.

## Joint meeting of the Energy and Environment Council

The 24 ministers (12 Energy Ministers and 12 Environment Ministers) reached common conclusions on a range of climate questions, and these formed the basis of the Community's position at the Second World Climate Conference.

The main thrust of these conclusions was to fix a global Community target to stabilize aggregate CO<sub>2</sub> emissions between now and the year 2000 at 1990 levels, as a means of combating the greenhouse effect. In effect, however, this means that Member States having relatively low CO<sub>2</sub> emission levels will enjoy a certain degree of flexibility, whereas an additional effort will be required of those Member States producing high CO<sub>2</sub> emissions, if the target of stabilizing aggregate emissions at the Community level is to be met.

The findings of the Second World Climate Conference are set out in the article entitled 'The greenhouse effect'.

# The Gulf crisis: The Commission's response

DGXVII: Hydrocarbons unit (B2)

*The Gulf crisis has shown that the EC Commission's Energy Directorate is fully capable of handling emergencies. Early August, when the crisis broke out, it co-operated actively with other services of the Commission to monitor oil market developments, enforce the embargo against Iraq and Kuwait agreed by the Council of Ministers on 8 August, prepare background material, and draw up concrete proposals for action which would give the Commission more power in case of oil supply difficulties. These proposals were presented to the Energy Council on 29 October 1990.*

## DG XVII's organisational response

An oil-crisis task force was set up and immediately opened an information hot-line with other Commission services and Member State governments. One of the biggest priorities was to speed up the flow of information on oil, particularly the supply and demand situation, the level of stocks and price trends.

Daily, weekly and monthly oil market reports are now being distributed within the Commission. A first meeting of the 'Oil supply' group, which represents EC governments took place on 9 August, and regular meetings have been held since. Close co-operation with the International Energy Agency (IEA) in Paris is also being maintained.

Close consultations paved the way for a joint Commission/Member State assessment of the latest market developments at the 29 October EC Energy ministers meeting. This ensured a unified Community approach to the situation and pre-empted potentially contradictory national responses.

## Current market situation and short-term outlook

Some 4.2 million barrels/day or 8 pc of world supplies and 15 pc of international oil trade was withdrawn from the market indefinitely as a direct result of the UN oil and EC embargoes on oil imports from Iraq and Kuwait. But there is no evidence of a world supply shortfall, according to IEA and Commission studies, as well as direct information from industry.

The combination of increased oil production in a number of OPEC countries since August, and the high level of stocks held by consumer countries - roughly 100 days supply - means demand, already on the downturn because of price increases, can easily be met.

The hike in prices has been severe and is a reflection of the uncertainty of operators about the duration or outcome of the Gulf crisis, as well as the reliability of Soviet supplies. The disappearance from the world market of the Kuwaiti oil products and light petroleum products from Saudi Arabia allied to technical difficulties in refining heavier crude oils with a higher sulphur content, have also pushed prices up.

But the scale of the increase in prices suggests speculation is to blame. Fluctuations have been marked in recent weeks, reflecting the sensitivity and volatility of the market to media reports on the crisis.

These price increases have had very varying effects on consumer prices in the Member States, highlighting existing price differences.

These differences are due in large measure to pricing policies of the Member States. In countries where prices (before tax) are allowed to find their own level, increases on the international markets are felt immediately, and sometimes even anticipated. In those Member States where prices are regulated, on the other hand, the increases are usually deferred, given that the numerous formulae applied are based on information relating to an earlier situation.

The Commission is now examining the different price mechanisms currently applied as these may, in times of crisis, threaten the free movement of products within the Community.

Diverging consumer price trends may also be explained by the different consumption, distribution and competition structures on the markets of the Member States.

Finally, where consumer prices are concerned, the differences are closely linked to the wide variety of taxation systems. Clearly, therefore, the convergence of taxes on petroleum products is essential for completion of the internal market in 1993.

The Commission, like its partners in the IEA, is trying to calm the market and discourage operators from panic buying which simply swells stocks and keeps prices artificially high.

If the present situation persists, the Commission believes speculative pressure should gradually ease and prices drop accordingly. This trend is liable to be particularly marked at the end of the winter, when consumption begins its seasonal downturn and stocks are always relatively high.

For this reason, apart from ensuring closer surveillance of the market, the Commission is not likely to take any specific market measures yet.

It would however, if necessary consider a limited withdrawal from oil stocks to help stabilize the market. Given that nobody knows how long the crisis will last, or its outcome, any withdrawal should not exceed ten days supply, as stocks need to be preserved in case of a critical shortfall.

The Commission is also considering talks with major gas exporting countries to seek the abolition of the practice of pegging gas prices to the price of oil.

Finally, the Commission, in a bid to heighten public awareness of the need to save energy, has already stepped up the SAVE programme (Special action programme for vigorous energy efficiency).

## **What could be done today?**

An outbreak of hostilities in the Gulf could cause prices to rocket if the conflict were to spill over into Saudi Arabia, in particular its oil installations in the North East. In the ensuing state of war, EC Energy ministers would decide on urgent steps to cut consumption and begin drawing on stocks. They would also decide the Community's strategy for an emergency meeting of the IEA which would also be called.

As the legislation stands, a Council Decision based on Article 103 of the Treaty would allow Community-wide measures on stock withdrawals and prices. The Commission meanwhile could move to cut consumption by 10% for an initial 2 month period under Article 1 of Council Decision 77/106 EEC.

If a consumption cut in excess of 10% or for longer than two months proved necessary this could be done by a further Council Decision.

Fundamental changes to the present system were needed to strengthen the Commission's power in case of supply difficulties and proposals to this effect were presented to the Council on 29 October 1990.

In parallel to this, the system for maintaining oil stocks, an essential instrument of action and of security of supply policy, should be overhauled. The Commission might be given responsibility for using a large proportion of the stocks, equivalent to 30 days' supply. To this end, each Member State would have to set up an agency which would hold stocks equivalent to at least 60 days' supply.

Two draft Council Directives designed with these aims in mind were submitted to Council on 29 October 1990 and are now being discussed in the energy experts groups.

Externally, the Community will have to assume a role on the international stage in line with its position on the international market as the largest importer of petroleum.

Participation by the Community as such in the IEA should be reviewed, as provided for, moreover, by Article 3 of the 1974 OECD Council decision setting up the IEA.

To this end, the Council was requested to issue a mandate allowing the Commission to enter into negotiation with the IEA.

## **What is the significance of these proposals for the Member States and the Community?**

The role of the individual Member States is and will continue to be essential in the new organizational structure. Their relations with and commitments to the IEA are established and form the basis on which the Community should assert its identity.

But the Community has a specific dimension to offer with regard to:

- analysis of the market and identifying the need for measures;
- the type of measures which might be adopted.

In analysing the market, it is natural to take account of the IEA's assessment of an oil crisis situation. An analysis of this kind must be done at the broadest level, covering all the industrialized countries.

As far as deciding what steps should be taken is concerned, the Community's first priority must be to guarantee supplies given the scale of its dependence on outside oil suppliers. But it also has to ensure the principle of freedom of movement between its 12 nations, plus the parallel economic, political and social development of those countries essential for bringing about the 1992 single market.

Therefore any steps taken to tackle supply problems would have to be applied in a similar way across the Community. A Sunday driving ban in one of the 12 Member States and not the others, for example would be unacceptable to European public opinion.

## How can we cope with supply problems?

The current oil price rise will automatically result in an increase in supply and a reduction or replacement of demand, provided surplus capacity is available and the price increase is passed on to the final customer of course. But supply and demand also have to be managed.

## Supply

Measures here include:

- drawing on stocks of oil;
- making the rules on the quality of petroleum products more flexible;
- making use of other sources of energy.

Apart from the possibility of allowing operators to make partial use of stocks in the present circumstances, action by the IEA, in addition to Community action, is essential for a decisive impact on the market and to dampen prices.

As for environmental considerations, the two main Community directives on petroleum products (Council Directives 85/210 and 87/219) already offer Member States the possibility of relaxing Community rules on the content of petroleum products for up to a period of four months, to increase the volume of products available and introduce greater flexibility into the refining process.

Finally, the Member States should mobilize all the energy resources at their disposal to make them more readily available to other Member States. A protracted crisis cannot be ruled out which would justify, for example, stepping up the use of gas in electricity generation, as long as it made economic sense.

## Demand

Final energy consumption of oil in the Community, which is in the region of 360 mtoe, breaks down as follows: 14% is used by industry, 28% in the domestic sector and 58% for transport.

The natural effect of market forces, i.e. a downturn in demand in response to the rise in consumer prices, should be allowed to come into play, and should be accompanied by measures to dampen demand.

In this respect the Community must seek to transpose measures taken on board within the IEA into a Community context.

The list below, sets out in increasing order of stringency, what Member States could agree to do:

- recommendations relating to:
  - advertising and public awareness campaigns to promote energy saving;
  - efficient driving;
  - adjustment of engines and heating boilers;
  - speed restrictions (increased surveillance);
  - increased use of public transport;

- increased use of combined transport.
- obligations relating to:
  - heating of public buildings (temperature, hours of heating);
  - fuel substitution, e.g. in power stations (fuel oil/coal/gas);
  - speed restrictions (lowering of speed limits);
  - public lighting and lighting for advertisements.
- prohibitions and rationing:
  - ban on use of private cars on certain days/weekends or on the basis of number plates (even or odd numbers);
  - obligation for distributors to allocate smaller quantities to households, reduced by a certain percentage compared with the previous year, with the exception of certain priority sectors (industry, hospitals, essential public services, etc.);
  - rationing of fuel by means of petrol coupons.

Should supply difficulties threaten to arise, the Community's role would be clear. The Commission would intervene initially to assess the situation, taking into account the IEA's evaluation. Should further action prove necessary the Commission, assisted by an advisory committee of representatives of the Member States, would pinpoint the objectives to be achieved and the means to be deployed. These would be reflected in a series of coherent and complementary measures, valid for three months, to be implemented by the Member States, which would take account where necessary of specific national and/or regional situations. If difficulties persisted, the Council would have to adopt necessary measures by qualified majority voting.

## What should be done after the crisis ?

As the President of the Commission stressed at the special sitting of the European Parliament on the Gulf crisis held on 12 September 1990, the Commission has already begun discussions on the lessons to be learnt from the crisis.

On the policy front, it is becoming increasingly clear that the dialogue between producers and consumers needs to

be stepped up and industrial co-operation, for instance with the USSR, encouraged. Calls for dialogue have been made by the producers but also by consumers. Improved predictability of oil prices is essential to the development of the economies of both the producer and consumer countries. The pragmatic approach displayed today by the vast majority of OPEC countries is a pointer for the future. It should encourage cross-investment, which acts as an added factor in ensuring the security of supplies.

The European Energy Charter proposed by President Delors at the CSCE Summit in Paris envisages binding together the countries of Western, Central and Eastern Europe, together with the Soviet Union, in a joint system to ensure security of supply and demand for Europe as a whole.

The complementary assets existing in terms of energy resources, supply and consumption characteristics, financial and technological capacity between these countries and regions could be brought together for the benefit of the entire continent. And at a time when European security of supply is at the forefront of people's concerns, such a Charter would offer very real reassurances to the people of Europe. In the Community context, the completion of a Single Energy Market will provide the impetus for the wider co-operation envisaged by the Charter.

On the economic side, the Commission is examining a possible Community consumer oil price system. Current petroleum price gaps between Member States cannot be allowed to continue.

Taxes are also being looked at as a way to keep up consumer oil prices, especially petroleum products like motor fuels which have no substitutes. These products already account for more than half of the Community's entire oil consumption. The benefits of this option are clear, for our economies in general, for the environment, and for the worldwide oil supply and demand balance, vital for developing economies. Consumption tax revenue could be used partly to achieve the other goals of energy policy.

Finally, success in achieving an EC internal market for energy will also improve the chances of genuine security of supply in the Community. The free movement of energy products in the Community, will enable resources to be used more efficiently helping to reduce dependence on outside suppliers. Incorporation of the 12 individual markets in the Community into a single EC energy market will give all Member States more reliable access to the resources available throughout the Community.

**List of statements by the Twelve in the framework of the  
European political co-operation on the Gulf crisis**

1	Statement on the Iraqi invasion of Kuwait <i>Brussels, 2 August 1990</i>
2	Statement on the Iraqi invasion of Kuwait <i>Brussels, 4 August 1990</i>
3	Declaration on the situation in the Gulf. Extraordinary EPC Ministerial meeting <i>Brussels, 10 August 1990</i>
4	Declaration on the situation of foreigners in Iraq and Kuwait Extraordinary EPC Ministerial meeting <i>Paris, 21 August 1990</i>
5	Declaration on the crisis in the Gulf Extraordinary EPC Ministerial meeting <i>Rome, 7 September 1990</i>
6	Declaration on EC-Arab relations Extraordinary EPC Ministerial meeting <i>Rome, 7 September 1990</i>
7	Declaration at the same meeting on foreign citizens in Iraq and Kuwait <i>Rome, 7 September 1990</i>
8	Statement on the Embassies in Kuwait <i>Brussels, 14 September 1990</i>
9	Declaration on the Gulf crisis <i>Brussels, 17 September 1990</i>
10	EC-USSR Joint Statement <i>New York, 26 September 1990</i>
11	Joint Communiqué of the European Community, its Member States and the Co-operation Council for the Arab States of the Gulf (GCC) and its member states <i>New York, 27 September 1990</i>
12	Declaration on the Gulf crisis <i>Brussels, 28 October 1990</i>
13	Declaration on the Gulf crisis <i>Rome European Council, 14-15 December 1990</i>
14	Declaration on the Middle East <i>Rome European Council, 14-15 December 1990</i>

**List of the Resolutions adopted by the Security Council of the  
United Nations concerning the situation in the Gulf**

Resolution	Date adopted
660 (1990)	2 August 1990
661 (1990)	6 August 1990
662 (1990)	9 August 1990
664 (1990)	18 August 1990
665 (1990)	25 August 1990
666 (1990)	13 September 1990
667 (1990)	16 September 1990
669 (1990)	24 September 1990
670 (1990)	25 September 1990
674 (1990)	29 October 1990
677 (1990)	28 November 1990
678 (1990)	29 November 1990



# The impact of the Gulf crisis on the world oil market <sup>1</sup>

by N.Deimezis, DG XVII: Analyses and forecasts unit (A2).

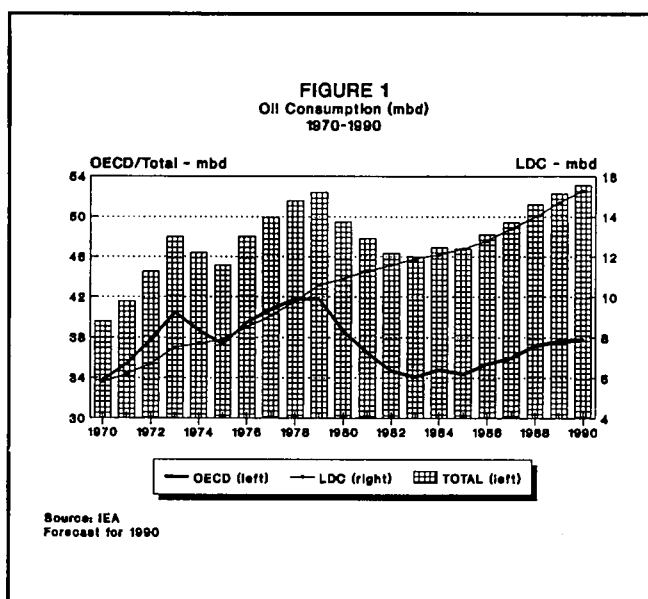
*Iraq invaded Kuwait on 2 August 1990. Some days later, the UN Security Council imposed an embargo on exports from both countries. The 'Gulf crisis' had started. 4.2 mbd of oil were gradually taken out of the world oil market, while oil prices started to climb, reaching more than USD 40/bbl by mid-October.*

*This article gives a brief analysis of the impact of the Gulf crisis on the world oil market and the situation that ensued after the embargo.*

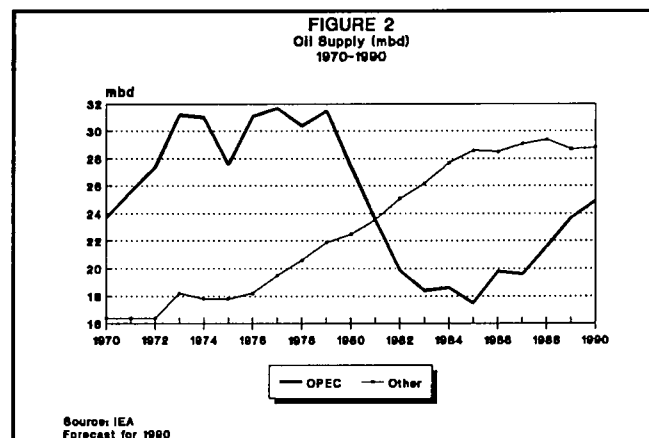
## The world oil market before the Gulf crisis

Table 1 summarises the world oil market in the 1980s.

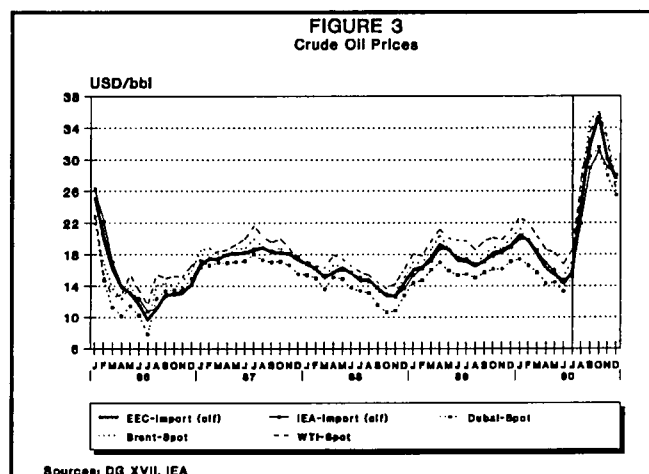
World oil demand (excluding the former 'Centrally Planned Economies' - CPE) which had peaked in 1979 and was decreasing up to 1983, started to rise firmly after the 1986 oil price collapse. By 1989, after four years of an average annual growth rate of 2.8%, oil consumption was back at its 1979 level (figure 1).



At the same time, OPEC production which had fallen from a maximum of 31.5 mbd in 1979 to 17.5 mbd in 1985, increased to 23.7 mbd by 1989 (figure 2).



Crude oil prices collapsed in 1986 and remained low until end-July 1990 although with considerable and erratic fluctuations (figure 3).



<sup>1</sup> Based on information available 17 December 1990.

Table 1: World oil balance 1979-1990

in mbd	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 <sup>1</sup>
<b>DEMAND</b>												
OECD	41.8	38.6	36.5	34.7	34.1	34.8	34.4	35.4	36.0	37.2	37.6	37.8
Non-OECD	10.6	10.9	11.3	11.6	11.9	12.1	12.4	12.8	13.4	14.0	14.7	15.3
<b>TOTAL</b>	<b>52.4</b>	<b>49.5</b>	<b>47.8</b>	<b>46.3</b>	<b>46.0</b>	<b>46.9</b>	<b>46.8</b>	<b>48.2</b>	<b>49.4</b>	<b>51.2</b>	<b>52.3</b>	<b>53.1</b>
<b>SUPPLY</b>												
OECD	14.7	14.8	15.0	15.5	16.0	16.6	17.0	16.8	16.8	16.6	15.9	15.8
DC	5.2	5.8	6.5	7.2	7.6	8.2	8.6	8.6	9.0	9.3	9.6	9.9
'CPE' Net Exports	1.2	1.1	1.3	1.5	1.7	1.9	1.9	2.0	2.1	2.2	1.9	1.8
Refining gains	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.2	1.3	1.3	1.3
<b>TOTAL NON OPEC</b>	<b>21.9</b>	<b>22.5</b>	<b>23.6</b>	<b>25.1</b>	<b>26.2</b>	<b>27.7</b>	<b>28.6</b>	<b>28.5</b>	<b>29.1</b>	<b>29.4</b>	<b>28.7</b>	<b>28.8</b>
OPEC Crude	30.6	26.4	22.5	18.8	17.3	17.3	16.0	18.0	17.7	19.7	21.8	23.0
OPEC NGL	0.9	1.0	1.1	1.1	1.1	1.3	1.5	1.8	1.9	1.9	1.9	1.9
<b>TOTAL OPEC</b>	<b>31.5</b>	<b>27.4</b>	<b>23.6</b>	<b>19.9</b>	<b>18.4</b>	<b>18.6</b>	<b>17.5</b>	<b>19.8</b>	<b>19.6</b>	<b>21.6</b>	<b>23.7</b>	<b>24.9</b>
<b>TOTAL</b>	<b>53.4</b>	<b>49.9</b>	<b>47.2</b>	<b>45.0</b>	<b>44.6</b>	<b>46.3</b>	<b>46.1</b>	<b>48.3</b>	<b>48.7</b>	<b>51.0</b>	<b>52.4</b>	<b>53.7</b>
<b>STOCK CHANGE</b>	<b>1.0</b>	<b>0.4</b>	<b>-0.6</b>	<b>-1.3</b>	<b>-1.4</b>	<b>-0.6</b>	<b>-0.7</b>	<b>0.1</b>	<b>-0.7</b>	<b>-0.2</b>	<b>0.1</b>	<b>0.6</b>

<sup>1</sup> DG XVII forecast

Source: IEA

Table 2: OPEC production and capacity

in mbd	OPEC quota	Production			Capacity end-90	Diff. from November production
		July	November	Difference		
1. Iraq	3.14	3.1	0.4	-2.7	3.5	
2. Kuwait	1.50	1.6	0.1	-1.5	2.3	
Sub-Total I	4.64	4.7	0.5	-4.2	5.8	
3. Saudi Arabia	5.38	5.3	7.9	2.6	8.5	0.6
3b. Neutral Zone	0.00	0.3	0.3	0.0	0.3	0.0
4. Iran	3.14	3.0	3.3	0.3	3.3	0.0
5. UAE	1.50	2.0	2.3	0.3	2.4	0.1
6. Qatar	0.37	0.4	0.4	0.0	0.5	0.1
Five Other Gulf States	10.39	11.0	14.2	3.2	15.0	0.8
7. Nigeria	1.61	1.7	1.9	0.2	2.0	0.1
8. Libya	1.23	1.3	1.5	0.2	1.5	0.0
9. Algeria	0.83	0.8	0.8	0.0	0.8	0.0
10. Gabon	0.20	0.3	0.3	0.0	0.3	0.0
11. Venezuela	1.95	2.0	2.3	0.3	2.5	0.2
12. Ecuador	0.27	0.3	0.3	0.0	0.3	0.0
13. Indonesia	1.37	1.3	1.3	0.0	1.4	0.1
Non-Gulf OPEC	7.46	7.7	8.4	0.7	8.8	0.4
OPEC crude	22.49	23.2	22.9	-0.3	29.6	
excluding Iraq/Kuwait	17.85	18.5	22.4	3.9	23.8	1.4
NGL	1.96	1.9	1.9	0.0	2.0	0.1
<b>TOTAL</b>	<b>24.45</b>	<b>25.1</b>	<b>24.8</b>	<b>-0.3</b>	<b>31.6</b>	<b>1.5</b>

Totals may not add due to rounding

Sources: OPEC, IEA

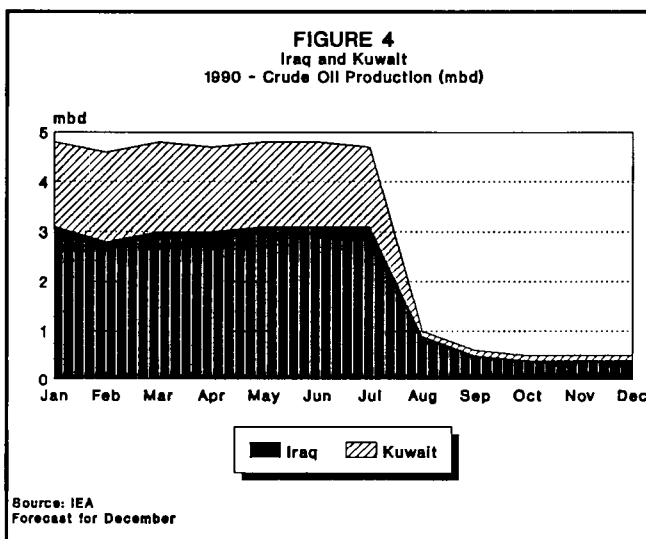
On 27 July 1990, OPEC fixed new production quotas (total ceiling for the second half of 1990: 22.491 mbd of crude) and a new reference price of USD 21/bbl. However, given that production in July was already about 1 mbd higher than allowed quotas, prices were not expected to reach those levels immediately. The feeling at the time was that oil prices could remain below USD 20/bbl for another year or two.

The 2 August Iraqi invasion of Kuwait modified profoundly the conditions of the world oil market.

## Impact of the embargo on the world oil market

### Supply

Following the embargo on Iraq and Kuwait oil exports, oil production by both countries started to fall. According to the latest IEA estimates, November oil production in Iraq was 0.4 mbd and in Kuwait 0.1 mbd compared to 3.1 mbd and 1.6 mbd respectively in July. In other words, by the fourth quarter of 1990 the embargo has resulted in a loss of 4.2 mbd of oil supply from those two countries (figure 4).



Accordingly, the world oil supply profile has been modified since August 1990. At a meeting in Vienna at the end of August 1990, OPEC decided to 'increase production, in accordance with need'. By November 1990, Saudi Arabia had increased its production to 7.9 mbd, while other OPEC countries were also producing at almost full capacity (Table 2). By November, 3.9 out of the 4.2 mbd lost had been replaced by other OPEC suppliers.

Although spare production capacities outside the OPEC countries were limited, oil production in the rest of the world has also reacted to the higher prices. Table 3 compares pre-crisis forecasts of supply with estimated figures for the third and fourth quarter of 1990.

Due to recovered Alaskan output, postponement of some shut-downs in the UK North Sea and higher production in Norway and in some minor OECD producers, OECD oil production in the fourth quarter is estimated at about 16.1 mbd against 15.3 in the third quarter. Production from developing countries and net exports from the ex-'CPE' countries (mainly Soviet Union) were also slightly higher than anticipated before the crisis.

In conclusion, by the end of 1990, almost all lost supplies from Iraq and Kuwait had been replaced by other sources. Global oil supply for the fourth quarter could be at the same level as our pre-crisis forecasts (53.8 mbd).

### Demand

Although full demand data for the third quarter of 1990 are not yet available, IEA estimates show an increase in OECD oil consumption of the order of 3.5% (over the third quarter 1989) coming mainly from Japan. However it seems that secondary and tertiary stocking was important in all OECD countries during July and August.

Available information shows that by September demand was beginning to be affected by higher oil prices. Our demand forecast for the fourth quarter shows a total OECD consumption of 38.5 mbd or a decrease of 2% compared to the same quarter of 1989.

### Stocks and supply-demand balance

Table 4 shows the complete 1989 and 1990 quarterly oil balance.

During the third quarter of 1990, total world stocks decreased by 0.8 mbd to balance demand and supply. However, according to IEA estimates, stocks in the OECD zone have increased by 0.3 mbd during the same quarter (Table 5), while outside the OECD stocks have decreased by 1.1 mbd.

These statistics, if accurate, indicate how the market reacted initially to supply cuts from Iraq and Kuwait. The perception of a risk of even higher prices in the event of war resulted in stockpiling in the OECD area. If stocks were released instead, the oil price could be much lower.

Table 3: Oil supply

in mbd	DG XVII pre-crisis forecast		Actual estimates		Difference	
	3q90	4q90	3q90	4q90	3q90	4q90
USA	8.8	8.8	8.8	8.9	0.0	0.1
Canada	2.0	2.0	1.9	2.0	-0.1	0.0
United Kingdom	1.8	1.9	1.7	2.0	-0.1	0.1
Norway	1.7	1.8	1.7	2.0	0.0	0.2
Other OECD	1.1	1.1	1.2	1.2	0.1	0.1
TOTAL OECD	15.4	15.6	15.3	16.1	-0.1	0.5
Mexico	2.9	2.9	2.9	3.0	0.0	0.1
Other developing countries	7.0	7.0	7.0	7.1	0.0	0.1
TOTAL DC	9.9	9.9	9.9	10.1	0.0	0.2
'CPE' net exports	1.7	1.6	2.0	1.7	0.3	0.1
Refining gains	1.3	1.3	1.3	1.3	0.0	0.0
TOTAL NON-OPEC	28.3	28.4	28.5	29.2	0.2	0.8
OPEC crude	23.1	23.5	21.9	22.7	-1.2	-0.8
OPEC NGL	1.9	1.9	1.9	1.9	0.0	0.0
TOTAL OPEC	25.0	25.4	23.8	24.6	-1.2	-0.8
TOTAL	53.3	53.8	52.3	53.8	-1.0	0.0

Sources: IEA and DG XVII forecasts

Table 4: World oil balance 1989-1990

in mbd	1Q89	2Q89	3Q89	4Q89	1989	1Q90	2Q90	3Q90	4Q90 <sup>1</sup>	1990 <sup>1</sup>
DEMAND										
OECD	38.6	36.1	36.5	39.3	37.6	38.4	36.6	37.8	38.5	37.8
Non-OECD	14.7	14.2	14.7	15.1	14.7	15.3	14.8	15.3	15.6	15.3
TOTAL	53.3	50.3	51.2	54.4	52.3	53.7	51.4	53.1	54.1	53.1
SUPPLY										
OECD	16.1	15.8	15.8	15.9	15.9	16.1	15.7	15.3	16.1	15.8
DC	9.5	9.4	9.6	9.8	9.6	9.8	9.8	9.9	10.1	9.9
'CPE' net exports	1.8	2.0	2.0	1.8	1.9	1.4	1.9	2.0	1.7	1.8
Refining gains	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
TOTAL NON OPEC	28.7	28.5	28.7	28.8	28.7	28.6	28.7	28.5	29.2	28.8
OPEC crude	20.1	21.1	22.2	23.7	21.8	23.7	23.6	21.9	22.7	23.0
OPEC NGL	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
TOTAL OPEC	22.0	23.1	24.1	25.6	23.7	25.6	25.5	23.8	24.6	24.9
TOTAL	50.7	51.6	52.8	54.4	52.4	54.2	54.2	52.3	53.8	53.7
STOCK CHANGE	-2.6	1.3	1.6	0.0	0.1	0.5	2.8	-0.8	-0.3	0.6

<sup>1</sup> DG XVII forecast

Source: IEA

Table 5: OECD, oil stocks 1989-1990

in MMT	4q88	1q89	2q89	3q89	4q89	1q90	2q90	3q90	4q90
<b>Stock levels</b>									
North America	216.1	211.4	217.8	222.9	212.6	222.5	225.1	228.1	226.0
Pacific	77.4	79.7	79.9	82.4	83.4	84.0	83.7	83.8	82.5
EUR-12	127.0	124.7	125.3	131.5	130.4	127.9	133.3	137.1	135.0
Other Europe	25.2	23.6	23.9	24.0	23.1	24.6	27.1	26.0	25.5
Total OECD	445.7	439.3	447.0	460.8	449.5	459.0	469.3	475.0	469.0
<b>Stock changes</b>									
North America		-4.7	6.5	5.0	-10.3	9.9	2.7	3.0	-2.1
Pacific		2.3	0.3	2.4	1.0	0.6	-0.3	0.0	-1.3
EUR-12		-2.3	0.6	6.2	-1.1	-2.5	5.4	3.8	-2.1
Other Europe		-1.7	0.3	0.1	-0.9	1.4	2.5	-1.1	-0.5
Total OECD		-6.5	7.7	13.8	-11.3	9.5	10.3	5.7	-6.0
<b>in mbd (IEA, MOR)</b>									
		-0.5	0.6	1.1	-0.9	0.8	0.8	0.5	-0.5
		-0.6	0.8	1.2	-1.1	0.8	0.8	0.3	-0.5

## Sources:

1. From 4q 1988 to 3q 1990: IEA: MOS, September 1990
2. IEA: End-November Oil Market Report
3. DG XVII forecast

Table 6: EUR-12, imports from Iraq and Kuwait  
Extra Community imports (EUR-12)  
Crude oil + feedstocks + products imports (1000 MT)

	EUR-12	B	DK	D	GR	E	F	IRL	I	NL	P	UK
	<b>Total oil imports</b>											
JAN-DEC 1989	486876	29251	8200	66604	18360	56198	79082	192	95366	74365	10316	48942
JAN-JUNE 1990	252123	15179	3450	35607	11139	27501	40245	91	49721	36058	5844	27288
	<b>Imports from Iraq</b>											
JAN-DEC 1989	30490	2287	0	401	2388	5334	6078	0	6286	4880	1157	1679
JAN-JUNE 1990	16412	1162	0	151	1748	2321	2736	0	2848	3977	658	811
JAN-DEC 1989	6.3%	7.8%	0.0%	0.6%	13.0%	9.5%	7.7%	0.0%	6.6%	6.6%	11.2%	3.4%
JAN-JUNE 1990	6.5%	7.7%	0.0%	0.4%	15.7%	8.4%	6.8%	0.0%	5.7%	11.0%	11.3%	3.0%
	<b>Imports from Kuwait</b>											
JAN-DEC 1989	21069	0	3277	1033	479	677	898	0	4784	9475	155	291
JAN-JUNE 1990	9868	19	1133	461	0	216	46	0	2201	4786	88	918
JAN-DEC 1989	4.3%	0.0%	40.0%	1.6%	2.6%	1.2%	1.1%	0.0%	5.0%	12.7%	1.5%	0.6%
JAN-JUNE 1990	3.9%	0.1%	32.8%	1.3%	0.0%	0.8%	0.1%	0.0%	4.4%	13.3%	1.5%	3.4%
	<b>Iraq and Kuwait</b>											
JAN-DEC 1989	10.6%	7.8%	40.0%	2.2%	15.6%	10.7%	8.8%	0.0%	11.6%	19.3%	12.7%	4.0%
JAN-JUNE 1990	10.4%	7.8%	32.8%	1.7%	15.7%	9.2%	6.9%	0.0%	10.2%	24.3%	12.8%	6.3%

Source: SOEC - monthly bulletin and SIRENE data-base (28.11.90)

On the other hand, with the exception of a 'test' of the Strategic Petroleum Reserve (SPR) mechanism decided by the US government in late September (a release of 5 mb of oil), no other OECD government decided to release government-held stocks.

The IEA estimated that by end September 1990, total stocks held by the OECD countries were equivalent to 98 days of forward consumption, 6 days more than by end September 1989.

According to our estimates, a decline in demand in the fourth quarter together with increased production, could lead to a limited stock draw in the fourth quarter of 1990.

### Prices

Crude oil prices started to rise in the immediate wake of Kuwait's invasion. Spot prices for Brent in Rotterdam reached a maximum of USD 41.7/bbl on 9 October, more than twice the pre-invasion price. Over the following days, spot prices decreased to a minimum of USD 27.6/bbl by 22 October (Brent). During the month of November they fluctuated between USD 30 and 35/bbl and by mid-December they were around USD 26/bbl (see figure 3).

Price fluctuations reflected the uncertainty surrounding both the duration and outcome of the crisis, anticipation of a military conflict, etc.

Some analysts argued that the disappearance from the world market of refined products from Kuwait and of some volumes of light products from Saudi Arabian refineries, together with the appearance on the market of some heavier crudes, contributed to the price increase. However, spot prices of oil products in Rotterdam have closely followed the fluctuations of crude quotations without showing any significant tendency to increase faster.

It has also been argued, at the highest political level, that price increases of such a scale were unjustified by the magnitude of the supply disturbance and were largely the result of speculation. It is certainly true that if stocking behaviour in the OECD countries had been different, prices could be lower.

### Europe-12

The impact of the Gulf crisis on the European Community will be examined in more detail in the next Short Term Energy Outlook, to be published early 1991.

From the limited point of view of lost imports from Iraq and Kuwait, it seems that there has been no special difficulty in any Member State even if the initial situation varied from one country to another. Table 6 shows the share of imports from Iraq and Kuwait for the first half of 1990.

According to available data, the last cargoes from both countries arrived in Europe in October 1990.

## Outlook for 1991

Making forecasts about the oil market has always been risky. Under present circumstances, any forecast is riddled with uncertainties and must be viewed with much caution. Nonetheless three scenarios can be envisaged:

- Rapid solution of the crisis without military conflict
- A prolonged crisis
- A military conflict

In our view, it is out of the question to quantify the last type of scenario although we know that in case of war, oil supplies from the Gulf could be seriously disrupted and prices could increase substantially. In this paper we present an outlook under the first scenario and we discuss briefly the implications of the second one.

### First scenario

In this scenario we assume that the embargo ends by the end of the first quarter of 1991. In this scenario the main uncertainty is the behaviour of OPEC producers after the end of the crisis. In this case we assume that a minimum restraint exists and prices are not allowed to fall for a long period below USD 20/bbl.

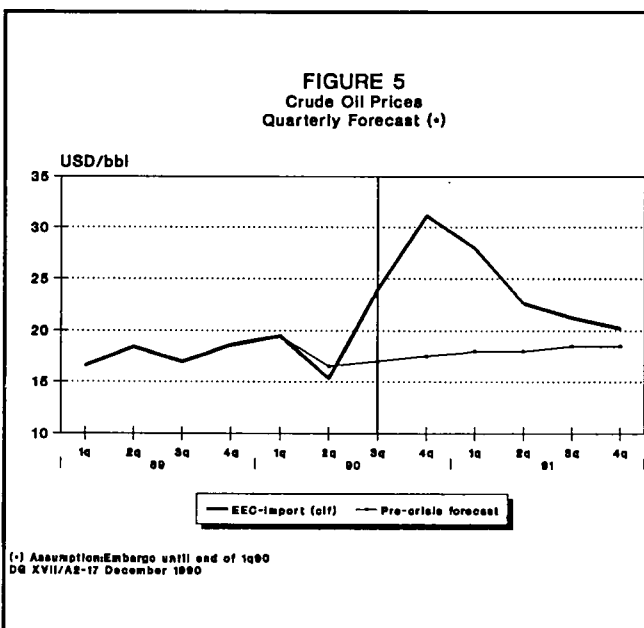
During the first quarter of 1991, total OPEC production is assumed to be close to the 22.5 mbd ceiling. By the end of the year Iraq's production is 1.8 mbd and Kuwait's production increases to 1.0 mbd. However, to avoid the price collapse, we assume a decrease in production by other OPEC members (mainly Saudi Arabia). Under this scenario, total OPEC crude oil production by the end of the year is still less than the 22.5 mbd ceiling. Table 7 shows the quarterly world oil balance.

Table 8 compares this scenario with some other recent forecasts of OECD demand.

Table 7: World oil balance 1990-1991

in mbd	1990					1991 <sup>1</sup>					Difference 1991-1990				
	1Q90	2Q90	3Q90	4Q90 <sup>1</sup>	1990 <sup>1</sup>	1Q91 <sup>1</sup>	2Q91 <sup>1</sup>	3Q91 <sup>1</sup>	4Q91 <sup>1</sup>	1991 <sup>1</sup>	1Q91	2Q91	3Q91	4Q91	1991
<b>DEMAND</b>	<b>in %</b>														
OECD	38.4	36.6	37.8	38.5	37.8	38.1	35.8	36.8	38.4	37.3	-0.8	-2.2	-2.6	-0.3	-1.5
Non-OECD	15.3	14.8	15.3	15.6	15.3	15.7	15.5	15.7	15.9	15.7	2.6	4.7	2.6	1.9	3.0
TOTAL	53.7	51.4	53.1	54.1	53.1	53.8	51.3	52.5	54.3	53.0	0.2	-0.2	-1.1	0.4	-0.2
<b>SUPPLY</b>	<b>in mbd</b>														
USA	9.1	8.8	8.7	8.9	8.9	8.9	8.8	8.9	8.8	8.9	-0.2	0.0	0.2	-0.1	-0.0
Canada	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.1	0.1	0.0	0.0
United Kingdom	2.1	2.1	1.8	2.0	2.0	2.0	2.1	2.2	2.2	2.1	-0.1	0.0	0.4	0.2	0.1
Norway	1.7	1.7	1.7	2.0	1.8	2.0	1.9	1.9	1.9	1.9	0.3	0.2	0.2	-0.1	0.1
Other OECD	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.0	-0.0	0.0	0.0	0.0
OECD	16.1	15.7	15.3	16.1	15.8	16.1	16.0	16.2	16.1	16.1	0.0	0.3	0.9	0.0	0.3
Mexico	2.9	2.9	2.9	3.0	2.9	3.0	3.0	3.0	3.0	3.0	0.1	0.1	0.1	0.0	0.1
Other DC	6.9	6.9	7.0	7.1	7.0	7.1	7.1	7.2	7.3	7.2	0.2	0.2	0.2	0.2	0.2
DC	9.8	9.8	9.9	10.1	9.9	10.1	10.1	10.2	10.3	10.2	0.3	0.3	0.3	0.2	0.3
'CPE' net exports	1.4	1.9	2.0	1.7	1.8	1.5	1.7	1.7	1.7	1.7	0.1	-0.2	-0.3	0.0	-0.1
Refining gains	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	0.0	0.0	0.0	0.0	0.0
TOTAL NON-OPEC	28.6	28.7	28.5	29.2	28.8	29.0	29.1	29.4	29.4	29.2	0.4	0.4	0.9	0.2	0.4
Iraq	3.0	3.1	1.5	0.4	2.0	0.4	1.5	1.7	1.8	1.4	-2.6	-1.6	0.2	1.4	-0.7
Kuwait	1.8	1.7	0.6	0.1	1.1	0.1	0.8	0.9	1.0	0.7	-1.7	-0.9	0.3	0.9	-0.3
Saudi Arabia	5.5	5.4	6.1	7.8	6.2	7.6	6.2	6.1	6.0	6.5	2.1	0.8	0.0	-1.8	0.3
Other Gulf	5.7	5.8	5.9	6.1	5.9	6.1	5.7	5.7	5.8	5.8	0.4	-0.1	-0.2	-0.3	-0.1
Other OPEC	7.7	7.6	7.8	8.3	7.8	8.3	7.7	7.5	7.5	7.7	0.6	0.1	-0.3	-0.8	-0.1
OPEC Crude	23.7	23.6	21.9	22.7	23.0	22.5	21.9	21.9	22.1	22.1	-1.2	-1.7	0.0	-0.6	-0.9
OPEC NGL	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	0.0	0.0	0.0	0.0	0.0
TOTAL OPEC	25.6	25.5	23.8	24.6	24.9	24.4	23.8	23.8	24.0	24.0	-1.2	-1.7	0.0	-0.6	-0.9
TOTAL	54.2	54.2	52.3	53.8	53.7	53.4	52.9	53.2	53.4	53.2	-0.8	-1.3	0.9	-0.4	-0.5
<b>STOCK CHANGE</b>	0.5	2.8	-0.8	-0.3	0.6	-0.4	1.6	0.7	-0.9	0.2	-0.9	-1.2	1.5	-0.6	-0.4

<sup>1</sup> DG XVII forecast



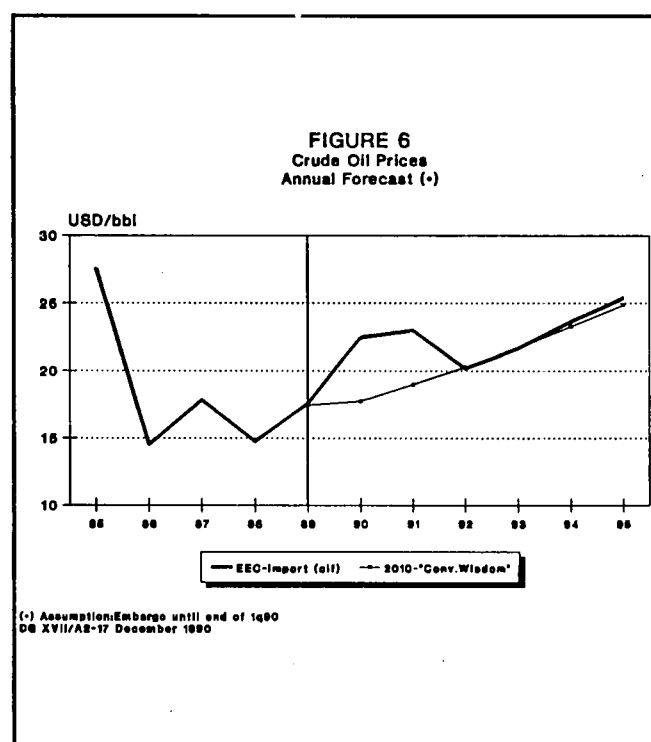
Under this scenario, oil prices (average import price for the European Community) could be about USD 31/bbl in the fourth quarter of 1990 and then decline to about USD 20/bbl by the end of 1991 (figure 5). Table 9 presents our successive forecasts for oil prices.

However, if Iraqi production increases faster and/or other OPEC producers do not limit their output, the price could collapse to even lower levels after the end of the embargo.

In the medium term, the oil price could start increasing again by 1993, following the path described in our earlier scenarios (figure 6, see also 'Energy for a New Century, The European Perspective', *Energy in Europe*, Special issue, July 1990 and Working Document No. 12: 'The World Oil Market - A Scenario Approach', January 1990).

Table 8: OECD Oil demand, various forecasts, 1990-1991

in mbd	1990					1991					in%				
	1Q90	2Q90	3Q90	4Q90	1990 <sup>1</sup>	1Q91	2Q91	3Q91	4Q91	1991 <sup>1</sup>	1Q91	2Q91	3Q91	4Q91	1991
DG XVII/A2															
2010-Conventional Wisdom-Jan90					37.9					38.4					1.3
Pre-crisis	38.5	36.6	37.6	39.6	38.1	39.5	37.2	38.4	39.7	38.7	2.6	1.6	2.1	0.3	1.6
August - SC1	38.5	36.6	37.3	38.9	37.8	38.6	36.6	37.9	39.2	38.1	0.3	-0.1	1.6	0.8	0.7
August - SC2	38.5	36.6	37.3	39.1	37.9	38.8	36.6	37.8	39.1	38.1	0.8	0.0	1.3	0.1	0.5
September - Ref SC	38.5	36.6	37.3	38.9	37.8	38.6	36.6	37.9	39.2	38.1	0.4	-0.0	1.7	0.9	0.7
September - SC2	38.5	36.6	37.3	38.9	37.8	38.6	36.3	37.4	38.6	37.8	0.4	-0.7	0.5	-0.7	-0.1
December	38.4	36.6	37.8	38.5	37.8	38.1	35.8	36.8	38.4	37.3	-0.8	-2.2	-2.6	-0.3	-1.5
IEA															
End July	38.5	36.6	37.3	39.6	38.0	39.6	37.0				2.9	1.1			
End August	38.5	36.6	37.8	38.9	38.0	38.5	36.1				0.0	-1.4			
End September	38.4	36.5	37.6	38.9	37.9	38.5	36.1				0.3	-1.1			
End October	38.4	36.6	37.8	38.5	37.8	37.9	35.4	36.2			-1.3	-3.3	-4.2		
End November	38.4	36.6	37.8	38.5	37.8	37.9	35.4	36.2			-1.3	-3.3	-4.2		
OPEC excludes processing gains															
August	37.2	35.1	35.9	38.7	36.7	38.3	35.7				2.7	1.9			
September	37.3	35.4	36.4	38.2	36.8	38.0	35.7				1.9	0.8			
October	37.3	35.6	36.4	37.8	36.8	37.4	35.3	36.1			0.3	-1.0	-0.8		
Oil companies (average values)															
October	38.4	36.5	37.6	39.1	37.9	38.9	36.7	37.5			1.3	0.5	-0.3		
November	38.4	36.5	37.8	38.8	37.9	38.6	36.7	37.3			0.5	0.5	-1.3		
Private forecast I (Europe)															
Summer	38.5	36.2	36.9	39.5	37.8	39.4				38.3	2.3				1.4
September	38.5	36.2	36.9	38.9	37.6										
October	38.5	36.2	36.9	38.8	37.6										
November	38.4	36.5	37.7	38.6	37.8	38.4	36.1	36.7	38.3	37.4	0.0	-1.1	-2.7	-0.8	-1.1
Private forecast II (USA)															
Pre-crisis	38.7	36.2	37.2	39.2	37.8	39.5	36.8	37.9	39.5	38.4	2.2	1.7	1.9	0.7	1.6
Post-crisis I	38.6	36.2	37.1	38.6	37.6	38.9	36.2	37.2	38.8	37.8	0.6	0.1	0.2	0.4	0.4
Post-crisis II	38.6	36.3	37.1	38.5	37.6	38.3	35.5	36.4	37.8	37.0	-0.9	-2.1	-1.9	-1.8	-1.7
Private forecast III (Japan)															
September	38.2	35.8	36.1	38.7	37.2										
November	38.4	36.0	37.0	38.1	37.4	38.0	35.0			36.6	-1.0	-2.8			-2.1



## Second scenario

If the crisis is not resolved during the first quarter of 1991 and we enter a long and uncertain phase of tension and continuing threats of military conflict, oil prices could remain high, reacting to the day-to-day psychology of the market. However, given the probable reaction of demand, the high level of stocks together with the high level of output of other OPEC producers, prices are likely to show a declining trend, remaining probably around USD 25/bbl. In this case, the probability of a total price collapse after the crisis is even higher.

## Macroeconomic impact

Higher oil prices have already had a negative macroeconomic impact on importing countries, both inside and outside the OECD. Developing and Eastern European economies are probably suffering most. The magnitude of the shock has been the subject of numerous recent studies



at both national and international level. It seems that under assumptions more or less similar to those presented in our first scenario, the magnitude of the shock for 1991 could be around 0.5% of GDP for OECD countries and probably higher for the rest of the oil importing world. Table 10 shows the evolution of GDP forecasts made by Commission services, before and after the crisis.

It must be clear of course that the slow-down of growth shown in this table results from other factors more or less independent of the oil price. However, it is clear that even if the oil shock cannot be compared with the two previous shocks, it has had an important negative impact on the world economy.

Table 9: Successive forecasts of oil price (USD/bbl)

	1q90	2q90	3q90	4q90	1q91	2q91	3q91	4q91	1H90	2H90	1H91	2H91	1990	1991
<b>A. PRE-CRISIS</b>														
2010-Conventional Wisdom <sup>1</sup>													17.75	19.00
Short Term Energy Outlook-7/90	19.47	16.50	17.00	17.50	18.00	18.00	18.50	18.50	17.99	17.25	18.00	18.50	17.62	18.25
Market price forecast <sup>2</sup>	18.22	17.69	18.13	18.47	18.83	18.89	19.23	19.48	17.96	18.30	18.86	19.36	18.13	19.11
DG II forecast-16 May 1990									17.62	18.00	18.50	19.00	17.81	18.75
<b>B. POST-CRISIS</b>														
10 August 1990 - Base scenario	18.2	17.7	25.0	28.0	30.0	26.0	20.0	22.0	18.0	26.5	28.0	21.0	22.2	24.5
17 Aug 90 - Sc 1-Market prices	18.2	17.7	26.1	29.5	25.8	18.4	18.7	19.0	18.0	27.8	22.1	18.9	22.9	20.5
17 Aug 90 - Sc 2-Market prices	18.2	17.7	24.1	25.5	24.8	20.4	20.7	20.0	18.0	24.8	22.6	20.4	21.4	21.5
13 Sept 90 -Reference-import price	19.5	15.5	25.0	28.5	24.0	17.5	18.0	18.0	17.5	26.8	20.8	18.0	22.1	19.4
13 Sept 90 -Sc 2-Import price	19.5	15.5	25.0	28.5	24.0	24.0	24.5	24.5	17.5	26.8	24.0	24.5	22.1	24.3
26 Nov 90 -Reference-Import price	19.5	15.3	24.0	30.1	29.0	23.1	21.2	20.2	17.4	27.1	26.1	20.7	22.2	23.4
14 Dec 90 -Reference-Import price	19.5	15.3	24.0	31.2	28.0	22.6	21.2	20.2	17.4	27.6	25.3	20.7	22.5	23.0
DG II forecast-21 November 1990									17.4	29.9	33.0	25.0	23.7	29.0
<b>C. CRISIS IMPACT</b>														
10 August 1990 - Base scenario	-0.0	0.0	6.9	9.5	11.2	7.1	0.8	2.5	-0.0	8.2	9.1	1.6	4.1	5.4
17 Aug 90 - Sc 1-Market prices	0.0	0.0	8.0	11.0	7.0	-0.5	-0.5	-0.5	0.0	9.5	3.3	-0.5	4.8	1.4
17 Aug 90 - Sc 2-Market prices	0.0	0.0	6.0	7.0	6.0	1.5	1.5	0.5	0.0	6.5	3.8	1.0	3.3	2.4
13 Sept 90 -Reference-Import price	0.0	-1.0	8.0	11.0	6.0	-0.5	-0.5	-0.5	-0.5	9.5	2.8	-0.5	4.5	1.1
13 Sept 90 -Sc 2-Import price	0.0	-1.0	8.0	11.0	6.0	6.0	6.0	6.0	-0.5	9.5	6.0	6.0	4.5	6.0
26 Nov 90 -Reference-Import price	0.0	-1.2	7.0	12.6	11.0	5.1	2.7	1.7	-0.6	9.8	8.1	2.2	4.6	5.1
14 Dec 90 -Reference-Import price	-0.0	-1.2	7.0	13.7	10.0	4.6	2.7	1.7	-0.6	10.4	7.3	2.2	4.9	4.8
DG II forecast-21 November 1990									-0.2	11.9	14.5	6.0	5.9	10.3
<b>Memorandum item:</b>														
World Bank - 12 Sept 1990														
Pre-crisis														
Sc1: Rapid return to normal									16.3	16.3	17.3	17.3	16.3	17.3
Sc2: Short-term uncertainty									16.4	26.7	22.1	19.0	21.6	20.6
Sc3: Prolonged uncertainty									16.4	32.9	30.5	27.4	24.7	29.0
Sc4: War									16.4	32.9	29.0	29.0	24.7	29.0
Crisis impact														
Sc1: Rapid return to normal									0.1	10.4	4.8	1.7	5.3	3.3
Sc2: Short-term uncertainty									0.1	16.6	13.2	10.1	8.4	11.7
Sc3: Prolonged uncertainty									0.1	16.6	11.7	11.7	8.4	11.7
Sc4: War									0.1	41.7	47.7	47.7	20.9	47.7

<sup>1</sup> Average Europe-12 import price (cif)

<sup>2</sup> Average Cost of International Traded Crude, Source: DRI, Spring 1990

## Concluding remarks

By mid-December 1990, five months after the invasion of Kuwait and the embargo that followed, it seems that the oil market had found a new, temporary equilibrium. Even if

the risks of supply shortages are now much greater, as production outside Iraq and Kuwait approaches maximum available capacity, and oil prices have almost doubled in dollar terms, the situation remains manageable. However, the political uncertainties are still huge and it is almost impossible to predict the final outcome of the crisis.

Table 10: World GDP forecast

Growth rate in %	May forecast			November forecast		Difference	
	1989	1990	1991	1990	1991	1990	1991
1. Belgium	4.5	3.0	2.5	3.5	2.2	0.5	-0.3
2. Denmark	1.1	2.0	2.1	0.9	0.9	-1.1	-1.2
3. Germany	3.4	3.7	3.7	4.3	3.1	0.6	-0.6
4. Greece	2.9	1.6	1.6	1.2	1.0	-0.4	-0.6
5. Spain	4.9	3.8	3.6	3.5	2.5	-0.3	-1.1
6. France	3.5	3.2	3.2	2.5	2.5	-0.7	-0.7
7. Ireland	5.7	4.6	3.4	4.5	2.3	-0.1	-1.1
8. Italy	3.2	3.1	2.8	2.6	2.3	-0.5	-0.5
9. Luxemburg	4.6	3.7	3.2	3.2	2.9	-0.5	-0.3
10. Netherlands	4.0	3.5	3.1	3.4	2.0	-0.1	-1.1
11. Portugal	5.4	4.0	3.8	4.2	3.2	0.2	-0.6
12. UK	2.3	1.6	2.4	1.5	0.7	-0.1	-1.7
<b>EUR-12</b>	<b>3.4</b>	<b>3.0</b>	<b>3.1</b>	<b>2.9</b>	<b>2.2</b>	<b>-0.1</b>	<b>-0.9</b>
EFTA	3.6	2.2	2.0	2.3	1.7	0.1	-0.3
USA	3.0	2.1	2.3	1.0	0.3	-1.1	-2.0
Canada	2.9	2.0	2.1	1.4	0.6	-0.6	-1.5
Japan	4.8	4.2	3.4	6.0	4.2	1.8	0.8
Other OECD	4.0	2.0	2.5	1.0	2.5	-1.0	0.0
<b>OECD</b>	<b>3.5</b>	<b>2.8</b>	<b>2.8</b>	<b>2.7</b>	<b>1.9</b>	<b>-0.1</b>	<b>-0.9</b>
USSR	2.5	0.5	1.9	-10.0	-10.0	-10.5	-11.9
Other Eastern Europe	0.4	-2.6	2.0	-6.7	-3.8	-4.1	-5.8
<b>EASTERN EUROPE</b>	<b>1.9</b>	<b>-0.4</b>	<b>1.9</b>	<b>-9.1</b>	<b>-8.2</b>	<b>-8.7</b>	<b>-10.1</b>
OPEC	4.5	4.0	4.0	4.1	2.4	0.1	-1.6
Asian NICs	6.9	6.6	6.8	6.1	5.6	-0.5	-1.2
Other Asia	4.0	4.0	4.2	4.0	4.7	0.0	0.5
Latin America	1.0	0.0	3.4	-0.7	3.3	-0.7	-0.1
Africa	2.6	2.4	2.0	1.7	2.7	-0.7	0.7
<b>Total Non-OECD</b>	<b>2.8</b>	<b>1.6</b>	<b>3.1</b>	<b>-2.8</b>	<b>-1.6</b>	<b>-4.4</b>	<b>-4.7</b>
<b>WORLD</b>	<b>3.3</b>	<b>2.4</b>	<b>2.9</b>	<b>1.1</b>	<b>0.8</b>	<b>-1.3</b>	<b>-2.1</b>

Source: DG II - Economic and Financial Affairs, May and November 1990

# The greenhouse effect

## Joint Energy and Environment Council adopts CO<sub>2</sub> target for the Community

by P. Faross, DGXVII: Policy making unit (A1)

*On 29 October EC Energy and Environment Ministers met jointly for the first time to draw up a Community position for the Second World Climate Conference in Geneva (6-7 November 1990). After lengthy, heated discussions, an EC wide CO<sub>2</sub> stabilisation target was agreed upon:*

'EC Member States and other industrialised countries should take urgent action to stabilise or reduce their CO<sub>2</sub> and other GHG emissions. Stabilisation of CO<sub>2</sub> emissions should be, in general, achieved by the year 2000 at 1990 level, although the Council notes that some Member countries, according to their programmes, are not in a position to commit themselves to this objective. In this context, countries with, as yet, relatively low energy requirements, which can be expected to grow in step with their development, may need targets and strategies which can accommodate that development, while improving the energy efficiency of their economic activities.

The European Community and Member States assume that other leading countries undertake commitments along the lines mentioned above and, acknowledging the targets identified by a number of Member States for stabilising or reducing emissions by different dates, are willing to take actions aiming at reaching stabilisation of the total CO<sub>2</sub> emissions by 2000 at 1990 level in the Community as a whole. Member States which start from relatively low levels of energy consumption and therefore low emissions measured on a per capita or other appropriate basis, are entitled to have CO<sub>2</sub> targets and/or strategies corresponding to their economic and social development, while improving the energy efficiency of their economic activities.'

At the Second World Climate Conference, the last major international conference before the official opening of negotiations on a convention to protect the world's climate, other participants, notably EFTA countries banded with the Community position. A declaration agreed by the 137 participating countries, stressed the need to stabilise greenhouse gas emissions not controlled by the Montreal Protocol, although the United States continued to refrain from any commitment on the limitation of emissions of greenhouse gases.

The outcome was spurred by scientific evidence of global warming drawn up by the Intergovernmental Panel on Climate Change (IPCC).

'The greenhouse effect is real: infra-red absorbing gases in the atmosphere make the surface of the earth warmer than it would otherwise be', concluded Working Group 1 of the IPCC, the biggest group of scientists ever to have worked on global warming.

The second major finding of Working Group 3 of the IPCC is that emissions of greenhouse gases are forecast to increase at a faster rate than previously thought. A reference scenario based on evidence from participating countries and the Community shows that CO<sub>2</sub> emissions (base 1985) will increase by about 2.5 times up to the year 2025 if no global action taken.

<b>CO<sub>2</sub> Emissions in the Reference Scenario</b>				
(billion tonnes carbon)				
	1985	2000	2010	2025
Global Totals	5.15	7.30	9.08	12.43
Developed World	3.83	4.95	5.70	6.95
North America	1.34	1.71	1.92	2.37
Western Europe	0.85	0.98	1.06	1.19
[EUR-12	0.70	0.82	0.86	n.a.]
OECD Pacific	0.31	0.48	0.55	0.62
Centrally Planned Europe	1.33	1.78	2.17	2.77
Developing Countries	1.33	2.35	3.38	5.48

Emissions of other greenhouse gases are also expected to substantially increase. However, data for Methane, Nitrous Oxide and CFCs still give rise to uncertainty. Research into present and future emission of these greenhouse gases needs to continue.

Current greenhouse gas emission increases are forecast to push up the global mean temperatures by 1.8°C by 2020, with a probable range of between 1.3 and 2.5°C. By the year 2070, the range of temperature increases will be 2.4 to 5.1°C with a best IPCC estimate of 3.5°C. This rapid climatic change could have devastating consequences such as raising sea levels, increasing the number of storms, precipitation and other extreme weather conditions.

Food production will be affected, major forest-type zones could shift significantly and natural terrestrial eco-systems may be twisted faster than they can respond. The impact will be most felt by human settlements in vulnerable coastal areas. The end result could be resettlement.

## Is there a way out?

The factor dominating climate change is the concentration of greenhouse gases in the atmosphere, found in a 36 kilometre deep layer. Because of the long lifespan of these gases, there is a substantial lag between changes in emissions of greenhouse gases and the resultant change in concentrations. Just to keep the current status quo will

require an enormous global effort. The IPCC has indicated the following necessary reductions in man-made emissions of greenhouse gases for stabilisation of atmospheric concentrations.

Carbon Dioxide	60 - 80 %
Methane	15 - 20%
Nitrous Oxide	70 - 80%
CFC 11	70 - 75%
CFC 12	75 - 85%

A scenario to give a rate of global warming slightly above 0.1°C/decade, was presented at a recent workshop on targets for greenhouse gas emissions in London, from 11 to 13 June 1990. In this scenario the atmospheric concentrations in terms of CO<sub>2</sub> equivalent would double by about 2090 and be stabilised at that level. CO<sub>2</sub> from fossil fuels would have to be limited according to the following time-table:

	OECD	non OECD
2000	0-5%	+ 25%
2025	-20/25%	+ 65%
2050	-20/25%	+ 100%
2075	-50%	+ 50%
2100	-70%	+ 15%
	1990 = 100	

Such a scenario would take into account the different situations and needs of developed and developing countries. However, a 50% cut of per capita CO<sub>2</sub> emissions in developed nations and a 50% increase in developing countries (base 1985) would still result in substantially higher per capita emissions in the developed world.

## The Community contribution

At present, the Community's share of global CO<sub>2</sub> emissions is about 13% and is expected to fall to 11% in 2000 and 9.5% in 2010. The respective current shares for the USA are 23%, USSR 19%, China 10%, Japan 5% etc... Other greenhouse gases such as Methane or Nitrous Oxide also contribute substantially to global warming but reliable statistics are still awaited.

It is obvious that the Community alone cannot solve the global problem. Even if all the OECD countries were to reduce CO<sub>2</sub> emissions, the gains could, in a matter of decades, be offset by burgeoning energy use in the developing world.

A global response at the broadest multinational level is therefore needed.

However, co-operation with national action should not be delayed and the developing world requires financial assistance and transfer of technology by the developed world.

## What can the Community do?

The Dublin European Council highlighted the importance and urgency of the issue and asked the Commission to play a leading role in international efforts to limit global warming. The Community took up this request when adopting the above-mentioned Community CO<sub>2</sub> stabilisation target on 29 October. This agreement should be considered as a first step to establish a long term strategy to cut greenhouse gas emissions to acceptable levels.

The stabilisation of greenhouse gas emissions is only a first step in a long-term reduction strategy. A mere stabilisation of emissions would be a waste of effort, time and financial resources.

The first Commission task is to draw up a coherent strategy to achieve CO<sub>2</sub> stabilisation by the year 2000. This strategy will have to take into account the different potentials and constraints as well as emission levels in individual Member States.

### Per Capita Emissions of CO<sub>2</sub> from Fossil Fuels

(tons of Carbon per Capita)

P	0.8
E	1.3
GR	1.6
I	1.8
F	1.8
IRL	2.3
EUR 12	2.6
UK	2.8
B	2.9
NL	3.0
DK	3.3
D	3.3
L	6.5

The main burden of achieving the CO<sub>2</sub> stabilisation target will fall on the Community's energy sector.

## Changes in energy policy

Practically all the Community's CO<sub>2</sub> emissions derive from the burning of fossil fuels. Hydrocarbons exploration and natural gas leakage are major sources of Methane emissions into the atmosphere. Our most recent Energy

2010 findings show that, under the conventional scenario, CO<sub>2</sub> emissions (in tons of carbon) would grow from 753 Mio t in 1990 to 856 Mio t by 2010 (= +13%) if no action is taken.

EUR - 12 Data	
The main sources of CO <sub>2</sub> emissions are:	
Power generation	31%
Transport	24%
Residential/Commercial	22%
Industry	19%
Others	4%
Emissions by fuel category	
Oil	49.5%
Solid Fuels	31.0%
Gas	19.5%

Ways and means of reducing CO<sub>2</sub> emissions are described in detail in the Commission's Communication on 'Energy and the Environment' (COM(89)369). The options seem to be:

- efficiency improvements and conservation in energy supply, conversion and end use;
- fuel substitution by energy sources which have lower or no greenhouse gas emissions;
- reduction of greenhouse gas emissions by removal, recirculation or fixation;
- management, behavioural and structural changes.

As a first step, it is agreed, measures should be beneficial for reasons other than climate change and justifiable in their own right. Under this category fall market oriented demonstration programmes for more efficient and cleaner energy technologies, such as Thermie and the new Community energy efficiency programme, SAVE.

As a second step, adaptation strategies need to be compared with emission reduction policies to identify the most appropriate and cost effective responses. To our present knowledge, adaptation alone (let society adjust to changes as they occur) will not be an acceptable option in the light of the drastic changes in climate and nature's balance.

A possible response strategy has been illustrated through scenario 4 of the 'Energy for a new Century' exercise showing possible coherent developments of the Community energy future up to the year 2010. Under this scenario, CO<sub>2</sub> emissions in the year 2010 would be 25% lower than today. However, this scenario means:

- slow economic growth;
- rapid penetration of more efficient end use and production techniques;
- higher end use prices to consumers at the beginning of the 1990s: Scenario 4 implies an increase on the price levels of 100% for coal, 44% for oil and 30% for gas;
- stricter environmental objectives.

Analysis shows that an efficient strategy needs to combine the effects of demand management, fuel substitution and higher prices. CO<sub>2</sub> emission reductions would remain more modest without fiscal intervention. However, any fiscal intervention must aim to support the Community's long-term energy security of supply. A general energy (BTU) tax may be an appropriate tool to limit CO<sub>2</sub> emissions and at the same time to maintain security of energy supply.

Other very important questions need to be answered, such as:

- would it be more effective to finance CO<sub>2</sub> reductions outside the Community, especially in central and eastern European countries?
- to what extent should we encourage financial and technology transfers to developing countries to cope with the large, projected increase in world population?

- how best can we shape a strategy which combines reductions of greenhouse gas emissions, afforestation and protection of forests and adaptation?

The Community has to take stewardship. There is no major political partner ready to act now.

At the conference 'Energy for a new Century' Commissioner Cardoso e Cunha gave a clear political message for the energy sector:

'We have to act, we have to act quickly, we have to act together'

# CO<sub>2</sub> targets and burden sharing

Kevin Leydon, José Carvalho Neto, Manfred Decker  
DGXVII: Analyses and forecasts unit (A2)

*The Council of Energy and Environment Ministers agreed at their meeting on 29 October to 'take actions aiming at reaching stabilisation of total CO<sub>2</sub> emissions by 2000 at 1990 levels'. This objective provides flexibility allowing Member States with as yet relatively low energy requirements, and which can be expected to grow in step with their developments, to adopt targets and strategies which can accommodate this development while improving the energy efficiency of their economic activities.*

*The Council noted the Commission's intention to propose by end 1990 appropriate options and measures based on equitable burden sharing, taking into account the potential and constraints for CO<sub>2</sub> reductions, as well as present situations of emissions facilitating a co-ordinated participation of Member States.*

*This article looks to the achievement of this policy objective, identifying the 'potential and constraints for CO<sub>2</sub> reductions'. It is complementary to other Commission analyses in:*

- Energy for a New Century - the European perspective (DGXVII, May 1990);
- The Economics of Policies to Stabilise or Reduce Greenhouse Gas Emissions: the case of CO<sub>2</sub> (DGII, October 1990);
- CO<sub>2</sub> Study - Crash Programme: Cost-effectiveness analysis of CO<sub>2</sub> reduction options (DGXII, October 1990).

*By focusing on recent experience in stabilising CO<sub>2</sub> emissions in the Community it identifies key driving influences which are likely to determine the outcome in the coming decade. It looks to how the effort in achieving Community stabilisation can be equitably allocated among Member States, the sectors (power generation and transport) which offer the largest potential and greatest challenges as well as the policy areas (fuel switching and efficiency) likely to provide the best potential. Finally and given the importance of a world approach to CO<sub>2</sub> reduction, the Community challenge in the power sector is placed in a global context.*

*The crucial task now is to develop a credible programme which harnesses the potential of each Member State (subsidiarity) co-ordinated with appropriate Community policies to achieve the intention of the Council to stabilise CO<sub>2</sub> emissions by 2000 at 1990 levels.*

## Executive summary

By asking in what would have been the situation had the Community established in 1980 a target of stabilization of CO<sub>2</sub> emissions by 1990 a number of key driving forces were identified which resulted in achieving such an objective

(CO<sub>2</sub> emissions in 1980 were 2.8 billion tonnes of CO<sub>2</sub>, by 1988 these were reduced to 2.6 billion tonnes); the driving forces were:

- **economic growth** with a recession in the early period and then recovering with an acceleration towards the end of the period;



- **high oil prices** in the first half of the decade;
- **fuel switching** with increased penetration of electricity, coal static or declining, oil declining, increase of gas and a substantial increase in nuclear;
- **energy efficiency** with strong gains in the early years of the decade and thereafter resuming the 1% per year long-term trend;
- **weather** was warmer in the beginning and end of the decade.
- In general, in the supply side of the electricity sector **gas would have to take the leading role in the 1990's**, replacing nuclear and displacing coal;
- on the demand side and as a complement to supply-side measures, achieving **stabilisation would mean an improvement in electricity intensity** of some -1.4% per annum instead of the +0.5% per annum foreseen in the 'conventional wisdom' scenario;
- in the **transport sector** there is little fuel switching potential in the next decade so **energy efficiency and changes in consumer behaviour are the means** to achieve any reduction in expected CO<sub>2</sub> emissions.

Based on this experience and looking to the coming decade one looks to the potential and constraints in achieving similar results by 2000:

- in the coming decade and in the absence of specific policy actions, CO<sub>2</sub> emissions are expected to increase between 10% (in a scenario 1 world<sup>1</sup>) but to over 20% if GDP were higher and energy efficiency lower than expected;
- while the average level of **emission reductions** do not in themselves seem to provide insurmountable difficulties in setting stabilisation targets (in scenario 1), closer analysis identifies two key areas which could determine the feasibility of such an objective: **production and use of electricity and the transport sector**;
- these sectors are growing and, particularly in the end use, are highly decentralised with '**demand**' levels **determined by individual decisions** of millions of persons. While 'engineering' improvements will help, changing '**consumer behaviour**' holds the key to the final outcome in diminishing CO<sub>2</sub> emissions;
- given the profile of investment in the power generation sector, the decade of the 1990's offers an important '**window of opportunity**' to influence the nature and volume of new capacity requirements.

Having identified electricity and transport as the critical sectors determining the outcome, fuel switching and efficiency improvements emerge as the crucial policy areas.

Given the importance of the world dimension, the article reports on likely trends and policy potentials for reducing global CO<sub>2</sub> emissions associated with fuel use in power generation, the transport sector, industry and all other economic and social activities. DG XVII's report (Energy for a New Century: the European perspective) reviews the global situation under the 'conventional wisdom' scenario for this and other sectors. In addition, a report to the Helsinki Conference on Electricity and Environment in May 1991, prepared under the auspices of the International Atomic Energy Agency, reviews electricity demand and production on a world-wide basis and the associated CO<sub>2</sub> emissions.

Finally, the article reviews how the effort of achieving a Community stabilisation target can equitably be allocated among Member States. A number of indicators which might be used have been assessed and key issues which must be resolved have been identified as a contribution to the political agreement required in the choice of the burden-sharing mechanism to be adopted.

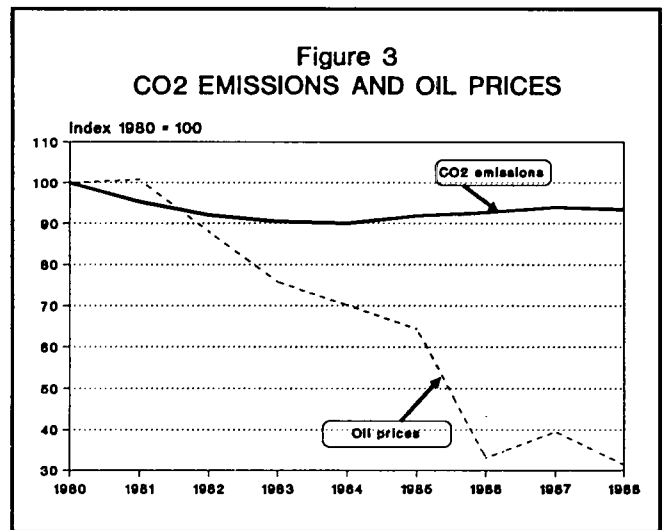
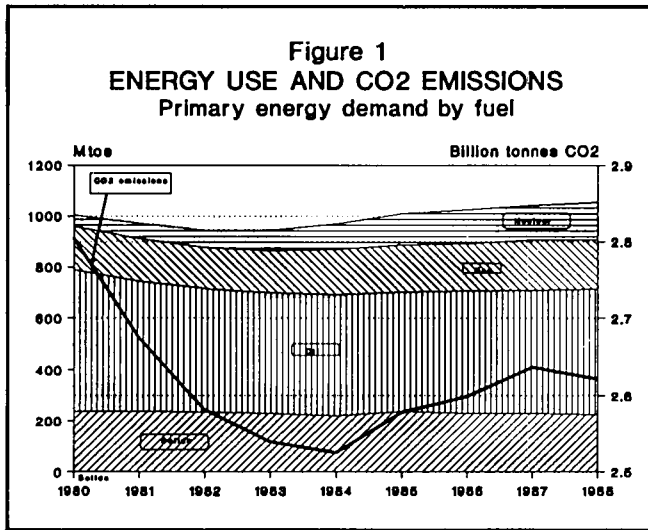
## The decade of the 1980's

### Question:

*Had the Community adopted a CO<sub>2</sub> stabilisation target for the decade of the 1980's (at 1980 levels), would it have been successful and what would have been the driving forces behind such an achievement?*

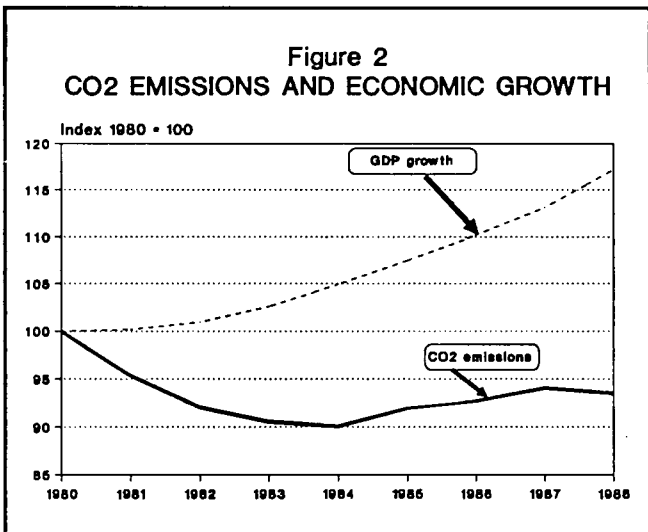
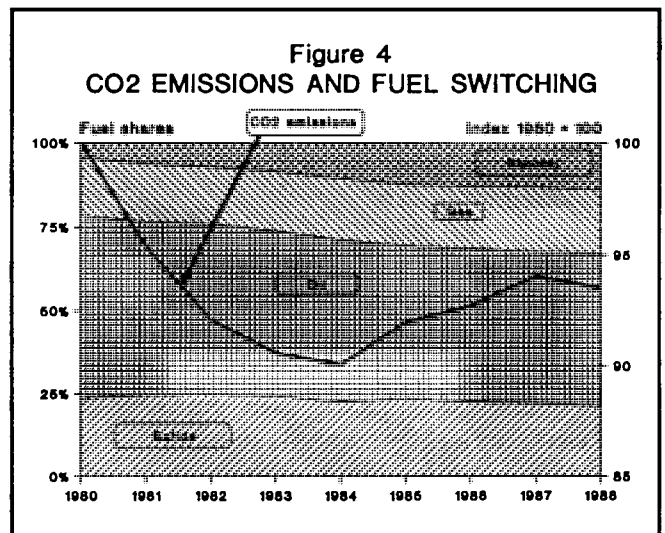
CO<sub>2</sub> emissions levels for the Community in 1980 were 2.8 billion tonnes. By 1988 (the last year for which full statistics are available) CO<sub>2</sub> had declined to 2.6 billion tonnes (see figure 1).

<sup>1</sup> Scenario 1 as in 'Energy for a New Century: The European perspective' - Energy in Europe, special issue, July 1990



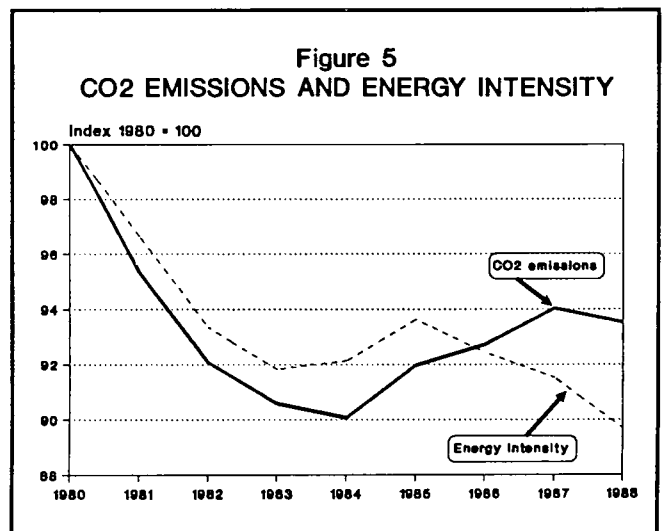
The principal driving forces for this evolution were:

- the level of economic growth, which had a recession in the early period, growing steadily in the mid 1980's and accelerating in the final years (see figure 2).

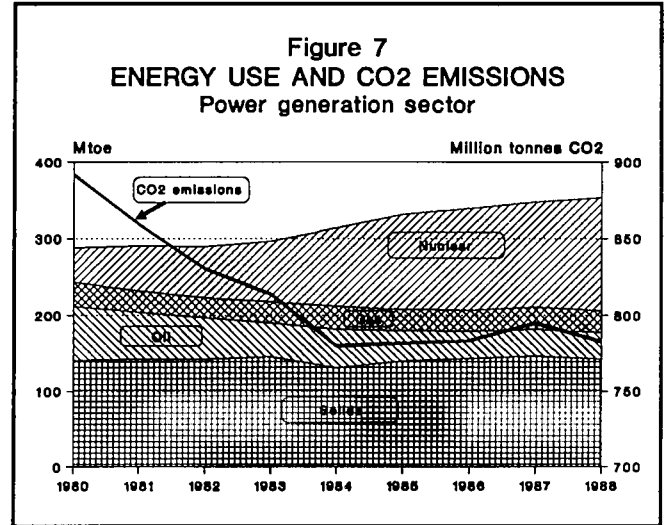
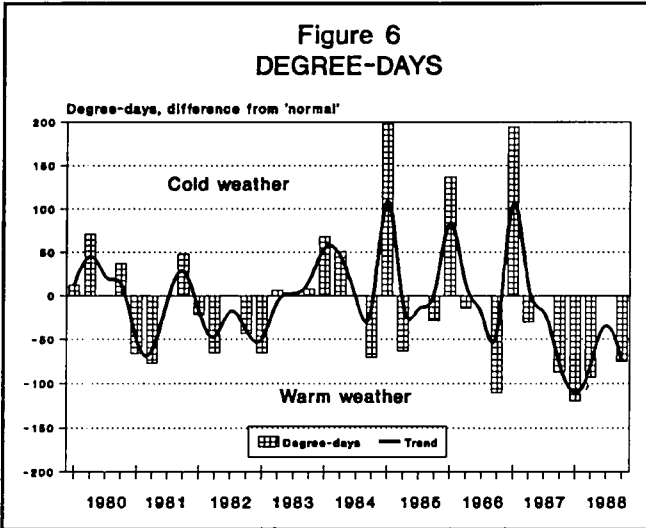


- the efficiency gains which were strongest in the early years of the decade, and then resumed the long-term trend of some 1% per year (see figure 5).

- the level of oil prices which were around 50 USD/bbl in 1990 prices in the early period, declined to 1986 when prices collapsed and increased then to around 18 USD/bbl (see figure 3).
- the degree of fuel switching with increased penetration of electricity; coal demand static or declining; oil consumption declining; increase of gas use and; substantial increase in nuclear-generated electricity (see figure 4).



- the weather conditions measured in degree days; the weather was warmer than average at both the beginning and end of the decade while in the period 1984 to 1987 temperatures were colder than average (see figure 6).



**Industry**

Figure 8 shows the evolution of energy consumption by fuel type in the industrial sector and the respective CO2 emissions dropped from 1980 to 1983 and stabilized thereafter. This evolution was mainly due to:

The following analysis focuses on the details of energy use and CO2 emissions in:

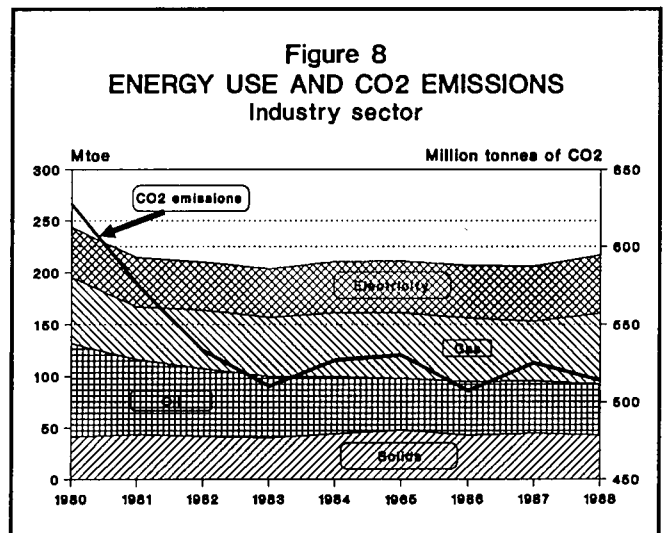
- power generation;
- industry;
- domestic/tertiary; and
- transport.

- a fall in energy demand up to 1983, with only moderate increases to 1988;
- up to 1983 there was some fuel switching away from oil to electricity and gas;
- electricity increased its share again in the later period;
- demand in solid fuels has only slightly increased.

**Power generation**

Figure 7 shows the evolution of the different fuel inputs for thermal electricity generation and the respective CO2 emissions. The two main conclusions are:

- overall CO2 emissions declined 12% between 1980 and 1988 due essentially to fuel switching, with fossil fuel inputs declining some 15%; oil use for electricity generation was substantially reduced;
- the change in fuel sources and the reduction in CO2 emissions was due to the significant increase in nuclear generation, increasing from 44 Mtoe to 147 Mtoe (from 36 GW to 101 GW).



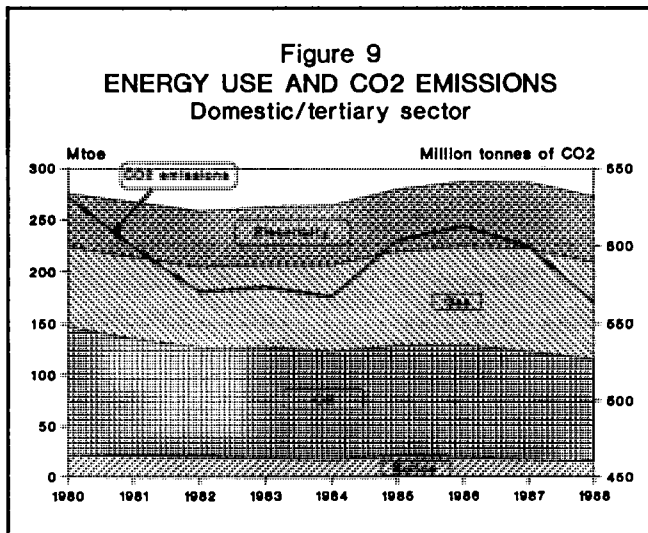
**Domestic and tertiary**

Figure 9 shows the evolution of energy consumption by fuel type in the domestic and tertiary sector and the respective CO<sub>2</sub> emissions.

Overall CO<sub>2</sub> emissions declined from 1980 to 1984, increased to 1986 and then fell again until 1988.

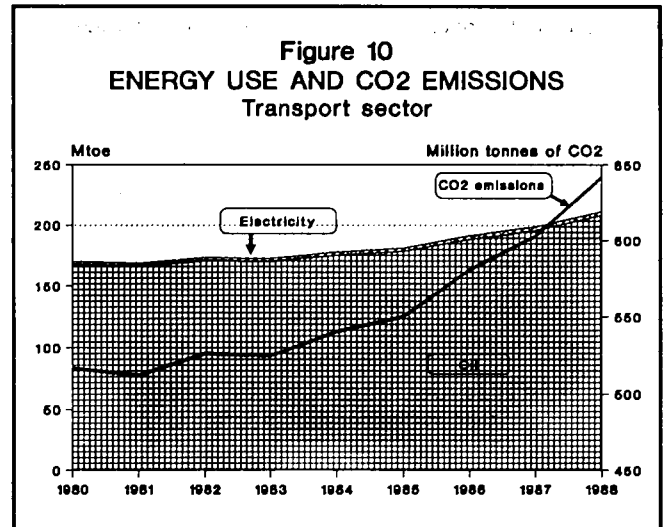
This evolution was mainly due to the fact that:

- while energy demand did not drop significantly up to 1984, there was considerable fuel switching away from solid fuels and oil to gas and electricity;
- between 1984 and 1986 there was an uptake of oil and gas;
- oil and gas use declined after 1986, in spite of lower oil and gas prices, because of mild climatic conditions maintaining fossil fuel consumption below normal levels.



**Transport**

Figure 10 shows the evolution of energy consumption in the transport sector and the respective CO<sub>2</sub> emissions. Overall CO<sub>2</sub> emissions steadily increased throughout the period (from 517 Mt to 640 Mt) due to continuing increase in demand. Post 1986 demand increased rapidly because of high incomes and relatively lower oil prices.



**The decade of the 1990's**

*Question:*

*Looking to the next ten to fifteen years ahead what are the prospects for achieving stabilisation in 1990 terms? How is each sector affected and what conditions must be met in these sectors if the objective is to be achieved?*

Depending on the rate of economic development, the success of the internal market and world trading conditions, CO<sub>2</sub> emissions could rise by between 21 and 33% from 1988 to 2010 (the corresponding estimates for the period 1990 to 2000 lie between 12 and 23%).

By energy sectors and in a 'conventional wisdom world', electricity and transport fuels are the principal driving sectors likely to increase their CO<sub>2</sub> emissions, between 1988 and 2000, by 56 to 58% and 15 to 40% respectively.

Figure 11 shows how energy demand and CO<sub>2</sub> emissions may develop for the electricity generation sector in a 'conventional wisdom' scenario vision on the future. According to this scenario, the main conclusions are:

- overall CO<sub>2</sub> emissions seem set to increase over the period 1988 to 2000 by some 38%, and this because demand for electricity in 1990 is higher than expected (thus the starting point is buoyant for electricity); the attractiveness of electricity is increasing (substituting for oil, coal and indeed some gas in final use reflecting the growth of technology-based industries); while between 1980 and 1988 65 GW of nuclear capacity came on stream, the outlook for the 1990's is for 11 GW

additional capacity (this is 3W lower than anticipated one or two years ago); and coal use is expected to increase (some 39 Mtoe in the 1990's);

- there are fewer options for fuel switching in the 1990's; gas has to take up the leading role, replacing nuclear and displacing coal; and oil will remain an unattractive option.

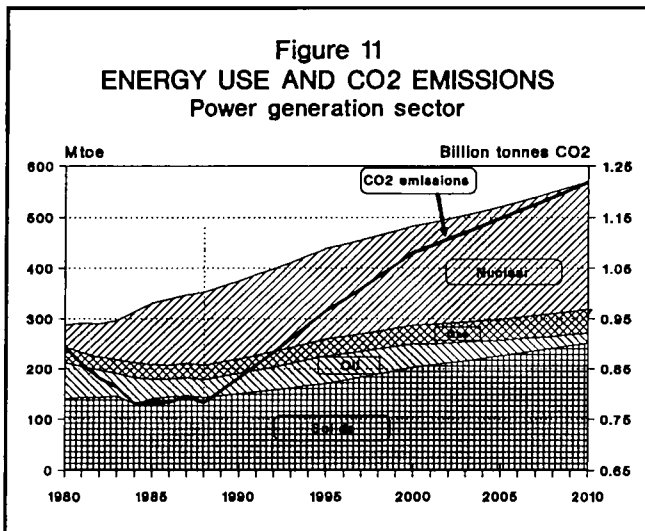
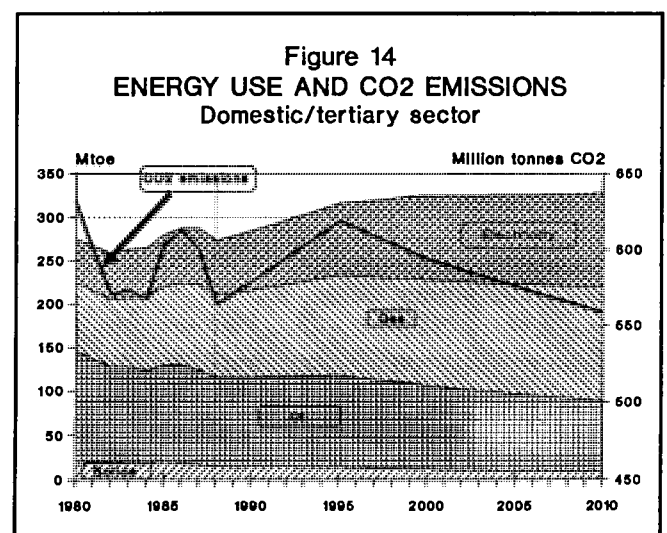
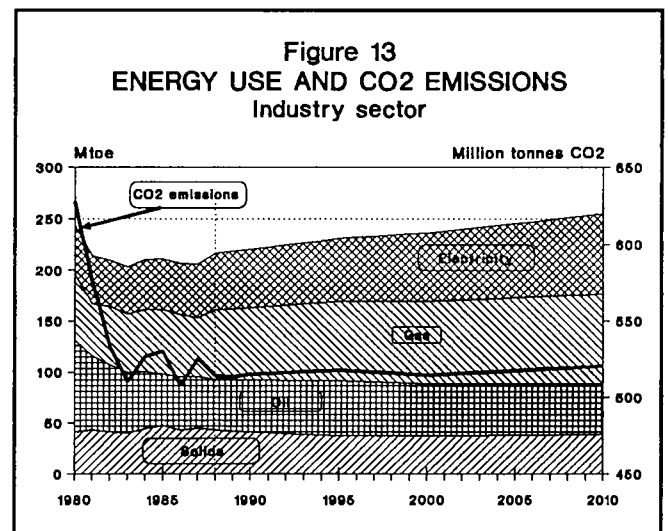
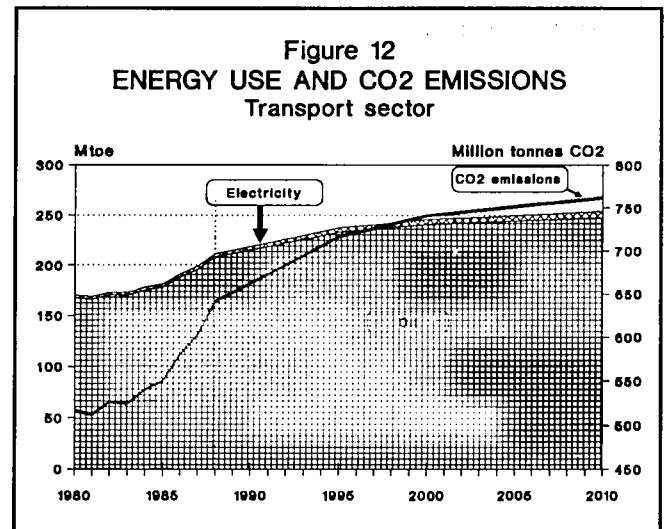


Figure 12 shows how energy demand and CO<sub>2</sub> emissions may develop for the transport sector in a 'conventional wisdom' scenario vision on the future. According to this scenario, the main conclusions are:

- following the trends noted from 1980 to 1988, CO<sub>2</sub> emissions seem set to continue rising (possibly by 15 to 40% over the period 1988 to 2000 - after 2000 some flattening in the rate on increase could be expected); this outlook already assumes some 9% improvement in fleet efficiency (some 14 to 17% improvement in new cars) but rising demand, in terms of number and size of cars, will more than compensate for any such improvements;
- the challenge posed in mastering these trends requires co-operation of motor manufacturers in designing and marketing vehicles with much lower specific energy requirements; upgrading of fuel qualities in addition to the search for alternative fuels with lower CO<sub>2</sub> content; city authorities implementing traffic management schemes and urbanisation policies; and development of transport pricing policies.

Prospects for stabilisation in the industrial and other sectors (domestic/tertiary) while important, pose lesser challenges (see figures 13 and 14).



The driving forces noted for the historical period will remain valid for the future, i.e. economic growth, oil prices, fuel switching, efficiency and weather. However, some of these cannot be forecasted e.g. weather or indeed oil prices; economic growth will be determined by forces outside of energy and environment. Therefore, the **two areas** for policy attention remain **fuel switching and efficiency**.

### Fuel switching

- the general trend is for increased penetration of electricity in end-use markets, with coal declining (except for power generation) and gas gaining ground in both end use and power markets. Transport will grow in importance for oil;
- within power generation the contribution of additional nuclear to meet incremental demand will, over the decade, be less important than in the previous period;
- coal will not be attractive because of CO<sub>2</sub> levels. Under earlier policies it was the natural replacement for fulfilling any short fall in nuclear;
- with oil continuing to be a 'volatile' fuel (in energy security terms) the burden of swing fuel falls to gas;
- the volumes of gas required to meet not only robust growth in electricity demand but also to act as a 'swing fuel' will be substantial; this aspect is explored further in section 3.

### Efficiency gains

In order to better master energy demand, by reducing the quantity of energy required for a given service, considerable attention is required in seeking means of improving both production and use of energy.

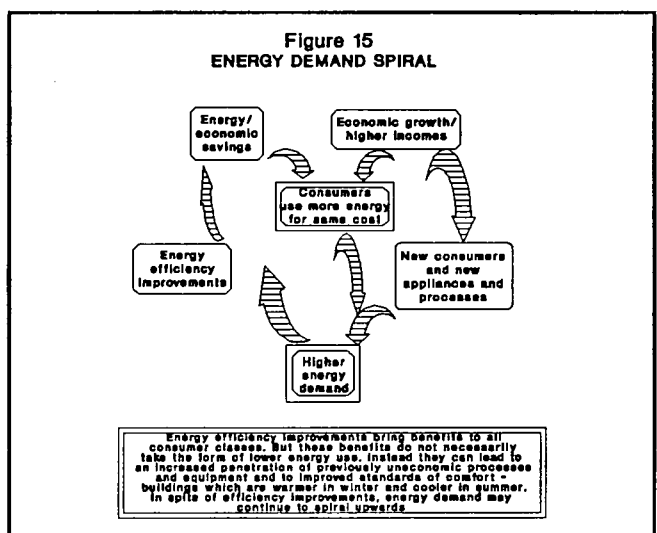
Existing scenario analysis assumes important gains in efficiency; the following sectoral analysis already foresees 1.3% per year improvement in energy intensity; closing the gap between these expectations and that required in achieving stabilisation implies an overall improvement per annum of some 2.4 to 5.8%.

Particular attention is required in power generation, electricity end use and transportation sectors.

### Conclusions

While the average level of **emission reductions** do not in themselves seem to provide insurmountable difficulties in setting stabilisation targets, closer analysis identifies two key areas which could determine the feasibility of such an objective: **production and use of electricity and the transport sector**.

These sectors are growing and, particularly in the end use, are highly decentralised with '**demand**' levels determined by **individual decisions** of millions of persons. While 'engineering' improvements will help, changing '**consumer behaviour**' holds the key to the final outcome in diminishing CO<sub>2</sub> emissions. This challenge of mastering the '**demand spiral**' is well illustrated in figure 15.



### Priority sectors

#### Question

*Electricity and transport have been identified as the critical sectors determining the outcome. Fuel switching and efficiency improvements emerge as the crucial policy areas. What 'port folio' of policy instruments are required to facilitate achieving these objectives?*

#### Power generation

Examples of the magnitude of the task of stabilising is illustrated below; three examples are offered: Stabilisation

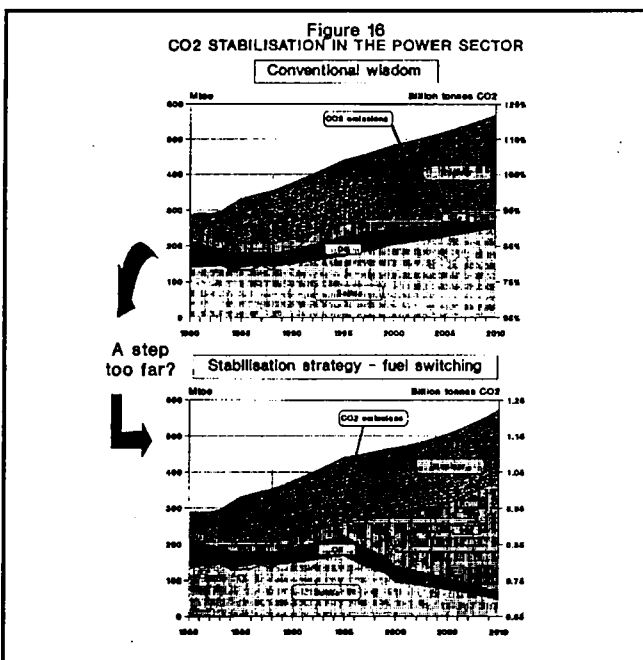
through fuel switching (figure 16), efficiency in end use (figure 17) and a combination of both (figure 18). These are not 'forecasts' but serve only to provide an estimate of the efforts called for.

**Fuel switching only**

Achieving CO2 emissions stability by 2000 simply through fuel switching requires the following:

- gas 88 GW of additional capacity (5 GW shown in scenario 1), or 104 Mtoe over and above 114 Mtoe of net imports (already foreseen);
- coal to forego 29 GW of new capacity plus closing 37 GW of existing capacity;
- nuclear 11 GW net additional capacity in the 1990's.

Structural changes of this magnitude over so short a time period are unlikely.



**Efficiency gains in end use**

Recent studies by the Commission's Services<sup>2</sup> suggest that, in terms of technical feasibility, there remains a substantial reservoir of 'engineering' possibilities. Within this there is much that can be done which could be economic at the Community and Member States level.

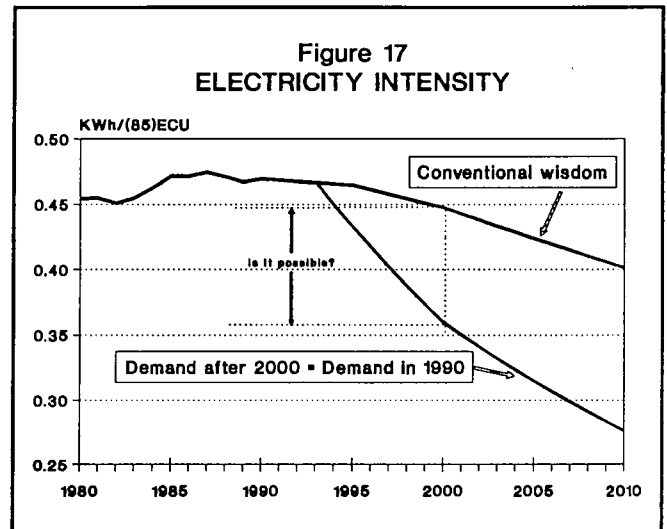
<sup>2</sup>

DGXVII; Cost effectiveness analysis of CO2 reduction options; October 1990. DGXVII; Scenarios 3 and 4 in the report 'Major Themes in Energy - Revisited'; May 1990

Penetrating the market, i.e. changing consumer behaviour holds the key in realising this potential.

Achieving CO2 emissions stability by 2000 simply through efficiency gains in end use requires the following:

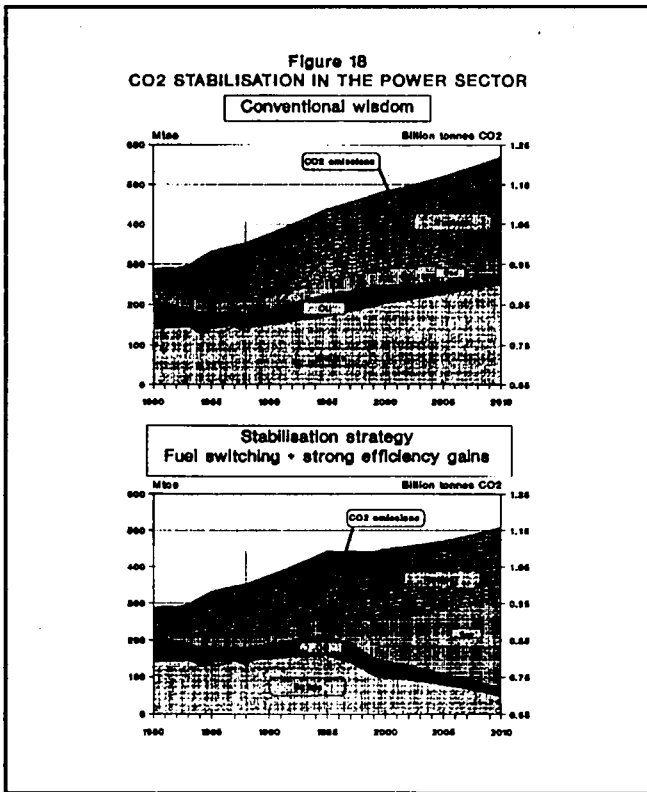
- electricity intensity to decline by 2.6% per annum as compared to a 0.5% increase in the 1980's.



**Fuel switching and energy efficiency in end use**

Achieving CO2 emissions stability by 2000 through a combination of fuel switching and efficiency gains in end use requires the following as an example:

- gas 77 GW of additional capacity (5 GW shown in scenario 1), or 78 Mtoe over and above 114 Mtoe of net imports (already foreseen);
- coal to forego 29 GW of capacity plus closing 37 GW of existing capacity;
- nuclear 11 GW net additional capacity in the 1990's.
- electricity intensity to decline by 1.4% per annum as compared to a 0.5% increase in the 1980's.



**Remarks**

Gas appears as the 'swing fuel', compensating for a reduced nuclear contribution and replacing coal as the principal alternative in meeting incremental demand. But volumes of gas required and which can reasonably be expected on the market during the 1990's are quite challenging.

Seeking these additional gas supplies should neither further expose the Community to greater vulnerability to energy insecurity, nor to substantially increase prices.

Meeting these challenges will require implementing the energy internal market for gas.

Coal will remain a major source of power generation over the foreseeable future; neither gas substitution nor greater end-use efficiencies will enable large volumes of coal to be displaced; a sustained R&D effort is required to improve both the efficiency with which coal is burned and the way it is used (liquefaction/gasification).

New and renewable energy sources will continue to provide a non-CO<sub>2</sub> input to power generation, but the additional volumes required from these sources to change radically the general argument outlined above are unlikely to be available by 2000.

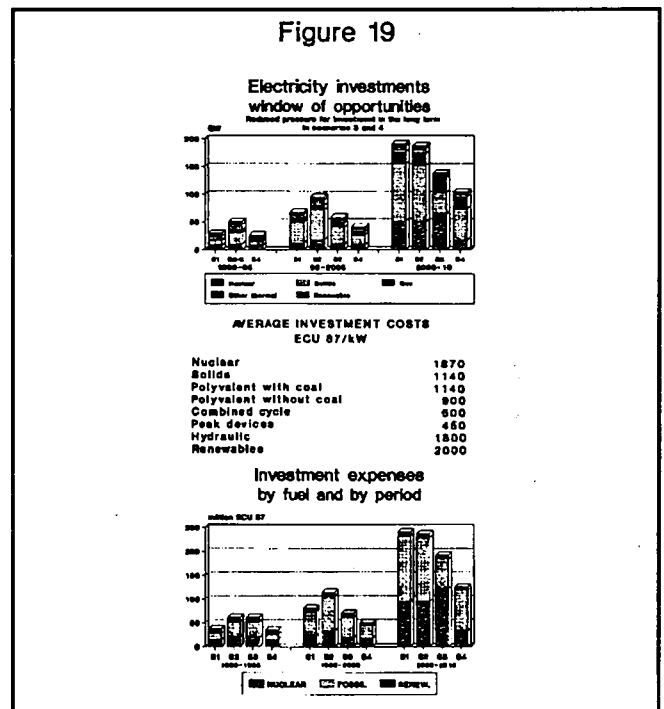
Thus while gas can provide some breathing space, the longer-term solutions require substantial R&D efforts in coal, new and renewable energy sources and nuclear - in the latter case to improve public acceptability of this form of generation.

Other ways of helping the solution to this problem are also available:

- increased electricity trade (internal market);
- better load management, at both the supply and consumption sides;
- increased use of combined heat and power;
- increased efficiency in supply technologies.

Electricity investments - capacities and capital:

- Figure 19 illustrates the possible levels of power generating investments required later in the 1990's and more importantly in the first decade of the new century; on a conventional approach, this could lead to some 190 GW costing in the order of ECU 240 billion being required between 2000 and 2010; there is the potential for major reductions in the volumes required and in the fuel mix in the production of electricity with subsequent impacts on CO<sub>2</sub> emissions;





- this important ‘window of opportunity’ for agreeing with Member States and power utilities on future policy options is now available before these decisions are made; this is a critical area for attention in developing options for achieving the stabilisation target.

## Transport

This is a sector where there are no significant fuel switching possibilities in the time period to 2000.

Efficiency gains are the only way to reduce demand and thus CO<sub>2</sub> emissions. However, these gains depend on:

- co-operation of motor manufacturers in designing and marketing vehicles with much lower specific energy requirements;
- upgrading of fuel qualities in addition to the search for alternative fuels with lower CO<sub>2</sub> content;
- city authorities implementing traffic management schemes and urbanisation policies;
- development of transport pricing policies.

stabilisation strategy incorporating aggressive fuel efficiency improvements and important behaviour changes.

Figure 20 gives the dimension of the problem of trying to stabilise or reduce CO<sub>2</sub> emissions from private car use.

## Final comment

This section has focussed on fuel switching and efficiency potential. Realising this potential may require additional policies initiatives, some of which are currently under study/discussion, i.e. SAVE, Economic Instruments.

## Community power generation and world trends

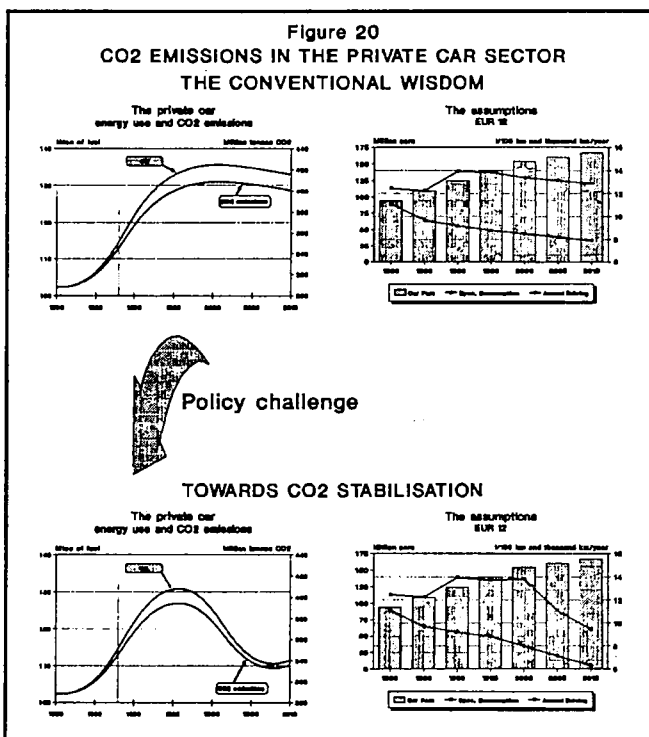
In their conclusions the Ministers stressed the world-wide nature of the global warming challenge and assumed that other leading countries would take similar commitments. Looking to world trends in electricity supply and demand, the situation would appear to be the following:

- **Reconciling development needs with impact reduction:**

The global demand for electricity services will continue to increase, subject only to constraints of economic growth; given this demand, the most stringent global impact reduction targets cannot be met by the electric power sector without curtailing (in the industrialised countries) and withholding (in the developing countries) electricity services significantly; somewhat less stringent global impact reduction targets can be met by the electric power sector without curtailing electricity services significantly, but only with forceful policy intervention; substantial progress with impact reduction will require sustained attention to capital investment and institutional development needs in the electric power sector.

- **The potentials and limits of alternative paths:**

Any evaluation of alternative paths for electricity system development is pervaded by uncertainty and diversity;



If the transport sector is to make its contribution to the overall target, then the outcome in CO<sub>2</sub> outputs foreseen under ‘conventional wisdom’ must be reversed by a

Efficiency improvement throughout electric power systems, from generation to end use, has a substantial potential to reduce impacts and should be pursued vigorously; efficiency improvements alone, however, will not realise the full potential for impact reduction;

Supply side alternatives to coal should also be emphasised wherever they can contribute to economic growth as well as to environmental management; coal will represent powerful competition with alternative energy sources in many countries;

Natural gas will play an important role in impact reduction, especially in Europe and North America, but the magnitude of its availability is uncertain;

Hydroelectricity is unlikely to play a substantially increased role globally, partly because of its own environmental impacts when it is utilised at a large scale;

Biomass energy is one of the best prospects for pleasant surprises; other renewable resources are expanding their uses impressively, but they are unlikely to be competitive economically in meeting a large share of global electricity demand;

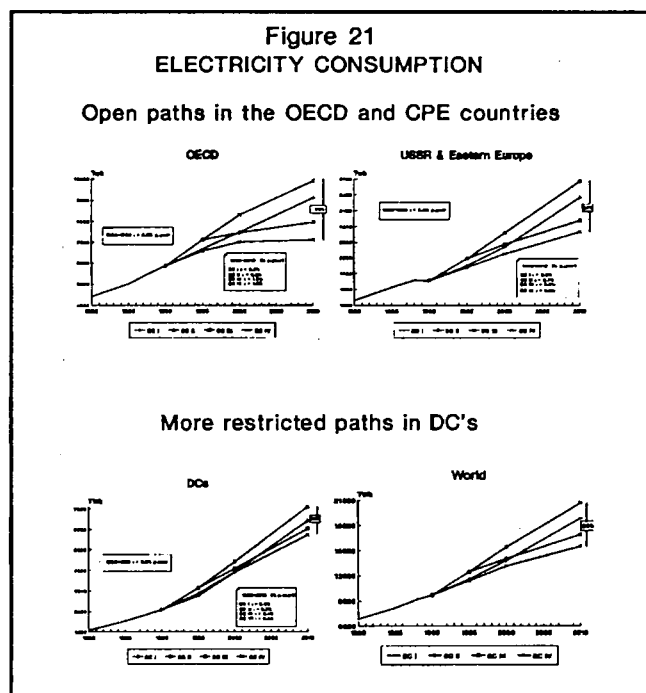
Nuclear energy has the potential to make a significant contribution to carbon emission reduction, but its social acceptability remains in question.

**Different regional roles and realities <sup>3</sup>:**

Appropriate and effective strategies for impact reduction will be region, country, and location specific; OECD should take the lead in pioneering alternative strategies; the Soviet Union and Eastern Europe face major uncertainties about paths for economic growth and institutional change, but they have a substantial potential to contribute to impact reduction through energy efficiency improvement if financial and other resources are available;

Developing countries are fundamentally different from higher-income countries in their needs and options; several key developing countries will have to increase carbon emissions and other environmental impacts in order to power their economic and social development; effective international collaboration will be needed to realise potentials for impact reduction.

Figure 21 illustrates these trends for several world regions; OECD, the Soviet Union and Eastern Europe and Developing countries (including China).



## Burden sharing

Having established Community stabilization targets the issue arises as to how to apportion the efforts required in achieving such an objective.

The task is complex, both in terms of principles upon which burden sharing would be agreed and on the criteria for an acceptable apportioning mechanism.

The principles involved could include deciding on:

- a bottom up or top down approach;
- social equity, comparable efforts;

<sup>3</sup> Advanced results of an expert group report to the Senior Expert Symposium on Electricity and the Environment to be held in Helsinki from 13 to 17 May 1991, jointly organized by CEC, CMEA, ECE, IEA, LAEA, IIASA, OECD/NEA, UNEP, World Bank, WHO and WMO.

- principle of subsidiarity;
- monitoring process.

The criteria could include a combination of the following:

- economic wealth (GDP);
- population;
- structure and level of energy consumption, (reflecting different industrial and economic structures);
- climate differences;
- land surface (natural sinks); and
- combinations of the above with reference to CO<sub>2</sub> emission levels.

The intention here is to open the debate on burden sharing. Much deeper reflection and analysis is required before the political debate advances. In all probability the final structure of how we share the burden will only emerge after considerable political debate. Before this the following comments identify some of the technical considerations which will underlie this debate.

### Social equity and comparable efforts

Given the differences between Member States should the stabilisation target mean that each Member State has to stabilise its own CO<sub>2</sub> emissions? Or should the objective of social and economic cohesion require greater efforts to be made by some Member States while others need to develop their economic base with resulting increases in emission levels? But within this concept of social equity resides the issue of 'comparable efforts' - what is required from those Member States who may have the possibility of increasing their emissions?

### Climate differences

It could be argued that the population in colder Member States must be allowed to have enough space heating in order to be on equal terms with people in warmer Member States. This would give rise to some kind of temperature adjustment of initial CO<sub>2</sub> figures.

### Trade

How should trade in energy be treated? For example electricity exported from one Member State to another avoids emissions in the 'importing' country. If CO<sub>2</sub> is emitted in the production should the importing country be debited with the levels involved in its production. If the export is CO<sub>2</sub> free (e.g. nuclear or hydro) should the exporting Member State be given a 'credit' to offset his overall CO<sub>2</sub> emission levels?

A further dimension of the 'trade' issue is the treatment of goods trade between Member States requiring high energy inputs (e.g. steel in the case of Luxembourg.)

### Methodology

Furthermore, it must be decided in which way the chosen criteria are to be employed. In principle, there are two different approaches. The criteria could be directly applied to the CO<sub>2</sub> emissions of the base year, i.e. the year at the level of which CO<sub>2</sub> stabilisation is to be achieved, or it could be applied to the level of emissions in the target year, i.e. the year by which stabilisation is to be achieved.

The latter approach involves a forecast, and the immediate question arises: which forecast and can anybody be committed to a forecast?

	(a) CO <sub>2</sub> GDP	(b) CO <sub>2</sub> CAP	(c) CO <sub>2</sub> TPER	(d) CO <sub>2</sub> TFC	(e) CO <sub>2</sub> km <sup>2</sup>	(f) CO <sub>2</sub> GDP/CAP
positioning						
1	MUX	LUX	LUX	GR	LUX	UK
2	GR	DK	GR	IRE	NL	D
3	IRE	B	DK	DK	B	IT
4	UK	D	IRE	UK	D	ES
5	P	UK	UK	LUX	UK	F
6	NL	NL	IT	D	DK	F
7	B	IRE	P	P	IT	NL
8	DK	IT	D	ES	F	P
9	D	F	ES	IT	GR	B
10	ES	GR	B	B	IRE	IRE
11	IT	ES	NL	NL	P	DK
12	F	P	F	F	ES	LUX

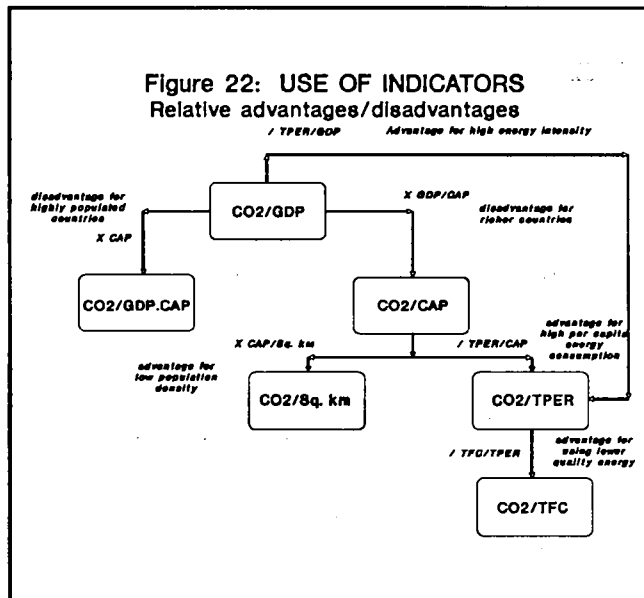
In whatever way a final burden sharing mechanism is established, all approaches would in one way or the other start from the actual positioning of Member states according to various criteria; possibilities are illustrated below. These six variables are: a) CO<sub>2</sub> per unit of gross domestic product (GDP); b) CO<sub>2</sub> per capita (CAP); c) CO<sub>2</sub> per unit of total primary energy requirements; d) CO<sub>2</sub> per unit of total final energy consumption; e) CO<sub>2</sub> per square kilometre surface (km<sup>2</sup>) and f) CO<sub>2</sub> related to income per capita (GDP/CAP).

### Examples of different indicators

Thus the message varies according to the indicators used. Though the choice of these indicators could be justified by considerations related to the CO<sub>2</sub> problem, e.g. countries with a larger surface could provide more sinks and could be credited for it, the interrelation of these parameters means that using one indicator instead of the other results in advantages/disadvantages for certain groups of Member States.

Using energy consumption as a denominator to calculate the CO<sub>2</sub> indicator instead of GDP or population, offers a certain advantage for less energy efficient countries.

As another example, there is a relative advantage for low population density Member States if CO<sub>2</sub> is related to surface instead of population. Figure 22 shows the advantages/disadvantages of using different indicators.



### Final remark

Finding the 'right indicator' for CO<sub>2</sub> emissions measured in the 'right way' and deciding on the procedures to be recommended requires further reflection, including some more general issues, such as the achievement of the 'internal market' and the pursuit of 'cohesion policies' within the Community.

# The use of natural gas in power stations

DGXVII: Electricity unit (C1)

*On 29 October 1990, the Energy Council agreed, unanimously, to the proposal<sup>1</sup> by the Commission to revoke the existing Council Directive 75/404/EEC<sup>2</sup>, which concerns the limitation of the use of natural gas in power stations and which dates from February 1975. Although this Council was unable to formally adopt the proposal, as the opinion of the European Parliament on the proposal was awaited, it is probable that by the time this edition of Energy in Europe appears in print, Council Directive 75/404/EEC will no longer be part of Community law.*

The existing Directive was adopted shortly after the first oil crisis. At that time, it was considered that, whilst natural gas was a valuable source of primary energy, supplies were limited and the use of natural gas should be reserved for special applications. We now know that natural gas reserves are much greater than was thought in 1975. Thus the underlying reason for the adoption of the Directive is no longer valid.

The Directive requires that the construction of power stations using natural gas and contracts for the supply of natural gas to power stations are subject to authorization by the Member State governments. However, it specifically allows the use of natural gas for reasons of environmental protection and for economic reasons. Given the current importance of the protection of the environment (and SO<sub>2</sub>, NO<sub>x</sub> and CO<sub>2</sub>) emissions may be lower when using natural gas than with other fossil fuels) and, due to changing technology, the favourable economics of con-

structing gas - burning power stations, it is easy to see why the Directive has been less restrictive in its application than was envisaged in 1975.

It is also understandable that, with these advantages, electricity producers will seek to make increasing use of natural gas for electricity production. It is likely that natural gas will play an increasing role in electricity production in the future and the Directive is seen by many as inappropriate in present circumstances and at variance with current policy developments. Nevertheless, the security of primary energy supplies, including that of natural gas, will remain a key element of energy strategy.

The Commission has clearly indicated that, should a need to monitor or control the use of natural gas in power stations arise in the future, it will not hesitate to propose appropriate Community measures.

<sup>1</sup> Published in Official Journal C 203 of 14.8.1990, page 19.

<sup>2</sup> Published in Official Journal L 178 of 9.7.1975, page 24.

# SAVE programme: more efficient use of energy in the Community

*The Commission has just adopted the SAVE programme (specific actions for vigorous energy efficiency).*

*Proposed by Mr António Cardoso e Cunha, Commissioner responsible for energy, the SAVE programme will have an initial duration of 5 years and consists of a medium- and long-term response to the need for revival of the Community action in the field of energy saving, a current priority due to developments in the energy sector and the need for increased environmental protection.*

On 16 September 1986, the Council of Ministers defined a series of energy policy goals which the Community should attain between then and 1995. The objective relating to energy efficiency was the improvement of energy intensity - i.e. of the final energy demand per unit of gross domestic product - of at least 20%. As a study concerning the policies of the Member States reveals, this objective is unlikely to be reached unless effective measures in favour of improvement of energy efficiency are undertaken as soon as possible.

The SAVE programme, the preparation of which dates back to well before the events in the Persian Gulf, is concerned with the promotion of energy efficiency by organisational means. It is complementary to the technological and financial promotion steps also carried out by the Community and the Member States. The programme will only develop medium- and long-term steps for structural purposes. The short-term actions for cyclical purposes, such as the measures to be taken in the event of difficulties of energy supply, will be the subject of a separate approach.

The programme is divided into three complementary categories:

- **actions of a technical nature**, taking into account the definition at Community level of standards or of technical specifications in the building sectors, of domestic electrical appliances or of transport, intended to achieve the aims of energy efficiency;

- **actions of a financial nature**: the development of financial instruments intended to promote investments as regards energy efficiency, in particular the promotion of third party financing;
- **actions on user behaviour**, at the level of training and of information, to create an awareness on the part of economic operators and to contribute to changing consumers' habits.

The SAVE programme will consist of a series of legal steps and norms which the Commission will draw up with a view to proposing them to the Council and to Parliament. A series of support actions partially financed by the Community and aiming to complete the structures and the actions of the Member States in the area of energy efficiency will also form part of the programme. Finally, a system adapted to exchanges of information at Community and international level will be developed.

At the same time as the SAVE programme, the Commission adopted a first norm. This involves a proposal for a Council Directive concerning the harmonization of legislation relating to production standards for new boilers for space heating.

# The internal energy market<sup>1</sup>

N. Commeau-Yannoussis DG XVII: Task Force on Community integration - Completion of the internal market unit (TF1)

*The Commission's working paper on the internal energy market, adopted on 2 May 1988, was featured in a Special Issue of this Review. Since then, the Commission has produced a first progress report (COM/90/124), accompanied by a working paper drawn up by the competent Commission department.*

*We felt that it would be useful to include an article on the internal market in this Review.*

The need to work towards the attainment of what is now commonly known as the internal energy market is the result of established economic facts and political necessity.

Community shortcomings in the energy sphere, characterized by a growing external dependence and a structural imbalance in consumption patterns in favour of oil, were masked during the 'glorious Thirties' by economic expansion based on cheap energy. Under the market conditions prevailing at the time, this external dependence was partly a deliberate choice, designed to avoid budget burdens through production support measures (geared essentially to coal). In 1973, external dependence accounted for nearly 2/3 of all energy consumed (65%), with oil playing a proportionately equivalent role (63%). North Sea oil and gas were not yet being produced on a very intensive scale.

It took two oil crises (1973 and 1979) before energy entered the Community sphere of competence, whereupon the following measures were implemented: fixing of Community objectives covering a period of 10 years, financial support to the various energy sectors (energy technologies and demonstration projects) and common rules on essential economic matters (supply crisis, oil refining strategy, transparency of oil prices and emergency stocks). The combined efforts of the Member States and of the Community have produced some spectacular results. Between 1973 and 1986, energy intensity improved by nearly 20%, external energy dependence fell to less than 45%<sup>2</sup> and oil's share in total energy consumption fell by 15 points (from 63 to 48%).

The current energy situation - relatively abundant in quantitative terms and drawn from diversified sources including oil (despite the Gulf crisis), gas, coal and uranium - is characterized by major national disparities between Member States of a kind liable to jeopardize the resumption of growth. In some cases, these disparities have been accentuated in part as a result of earlier energy-policy options<sup>3</sup>. Consequently, external energy dependence still imposes a heavy burden on certain Member States (Greece, Portugal), whereas others have succeeded in attaining a relative degree of energy independence (UK, Netherlands). Germany and France enjoy a reduced level of dependence. Some Member States are in a position to export energy (France - electricity, Netherlands - natural gas, UK - oil), whereas others import all their sources of energy.

Lastly, consumer prices vary significantly from one country to another. For instance, the price of electricity per kilowatt-hour paid by a large industrial consumer in France is ECU 0.05, as compared with ECU 0.08 in Germany<sup>4</sup>. These variations are indicative of a wide range of disparities (fiscal, production costs, etc.).

An economic study conducted by the Commission on the 'cost of non-Europe' in the field of energy has demonstrated the benefits that could accrue to a Community from a better integrated market. The report entitled 'Europe 1992 - the global challenge', published in March 1988, estimates the cost of 'non-Europe' in the Community at between ECU 20 000 and 30 000 million a year.

<sup>1</sup> This article reproduces in part and updates an article published in *Revue du Marché Commun* (Common Market Review) of February 1990, No 334, entitled 'The Single Market and Energy Policy' by Mr J.-C. Guibal and Mrs N. Commeau-Yannoussis.

<sup>2</sup> Whereas Community energy production has risen by more than 70% (oil and gas prospecting, and the fact that certain Member States have opted for a civil nuclear policy).

<sup>3</sup> Examples: nuclear policy (France, Belgium); support for the coal industry (Federal Republic of Germany, UK, Spain); exploitation of natural gas (Netherlands)

<sup>4</sup> Prices as at 1 January 1989, published by the Statistical Office of the European Communities.

Energy policy has long been a prime example of an area of responsibility retained exclusively by the Member States in spite of the importance of the energy economy to Community GNP. Only coal (in the interests of post-war reconciliation) and, to a considerably lesser degree, civil nuclear energy have benefited from a Community policy, based on the Treaty of Paris (ECSC) and the Euratom Treaty respectively.

When the European revival process was under way, it was essential that the energy crucial to all forms of economic activity in the contemporary world (industries, services, domestic sector) should keep pace with the economic changes of the last few years and consolidate the attainment of the internal market embarked on in the Commission's White Paper<sup>5</sup>. The Commission has adopted a global and gradual approach, as approved by the Council in November 1988<sup>6</sup>.

The adoption of a **global approach** was all the more necessary taking account of the economic context in which energy is evolving and of having analysed all the energy sectors in which circumstances may vary significantly<sup>7</sup>.

Successful integration of national markets in a vast Community market enabling economic operators to adapt adequately to new market prospects is a prerequisite for the **gradual approach**.

The internal energy market is geared to the objectives of the '1993 internal market' which seeks to bring about the integration of the national markets in a vast Community market which, in particular, will promote an increase in transfrontier exchanges<sup>8</sup>.

However, due to the special nature of the energy sector, this general definition has to be modified slightly: the internal energy market must be capable of promoting greater solidarity among the Member States and of ensuring the optimum allocation of available resources.

Consequently, the action taken by the Commission has been along two complementary lines: towards a more Community-oriented integration of the energy market and towards greater solidarity among Member States in the energy sector.

<sup>5</sup> COM(85)310, June 1985.

<sup>6</sup> COM(88) 238

<sup>7</sup> Having regard to external dependence, free movement within the Community, production costs, etc.

<sup>8</sup> See Article 8a of the Treaty of Rome.

## Towards a decompartamentalized energy market

Under the Treaty of Rome (amended by the Single Act), the decompartamentalization of national markets must be achieved through the abolition of national frontiers. To this end, the priority instrument is the **free movement** of goods (Article 8a of the EEC Treaty) or, to put it another way, the removal of barriers to trade and, to a lesser extent, the promotion of **sensible competition** (between products and between companies)<sup>9</sup>. The Directive on the transparency of gas and electricity prices<sup>10</sup> reflects the second approach, whereas the proposals on the transit of gas and electricity are more in keeping with the first<sup>11</sup>.

## Free movement of energy products in the Community

In this sector, the Commission has accorded priority treatment to gas and electricity which, in view of their transmission mode via the grid, have enjoyed a degree of protection which may not be justified purely on the grounds of protection of 'general economic interests'.

### ● Transit of gas and electricity

The communication on increased electricity and gas exchanges, approved by the Commission on 12 July 1989, sets out a programme for the gradual liberalization of transfrontier trade in electricity and natural gas.

The Directive on the transit of electricity through transmission grids was adopted by the Council of Energy Ministers on 29 October 1990 and will enter into force on 1 July 1991. The Directive on the transit of natural gas through the high-pressure systems is still in the process of being adopted. The delay is due essentially to opposition

<sup>9</sup> Such a distinction between instruments for the attainment of the internal market may appear somewhat academic, inasmuch as their effect is all-embracing and they cannot easily be implemented separately.

<sup>10</sup> COM(89)332, 14 July 1989.

<sup>11</sup> COM(89)334 and COM(89)336, 14 July 1989.



from Germany, the Netherlands and Denmark and to requests for detailed information from the European Parliament during the first-reading stages. The adoption, by a qualified majority, of the Council's common position (Council of Energy Ministers, 29 October 1990) would clear the way for the definitive adoption of the Directive, due to take place in the course of the first quarter of 1991.

Both of these broadly similar instruments stipulate that Member States must guarantee the right of transit through the grids operating on their territory.

The transit operation involves a link-up between at least three gas or electricity system grids, including one or more intermediate networks mandatorily required to provide transit facilities.

Networks receiving transit applications<sup>12</sup> relating to contracts of at least a year in the case of electricity and of unlimited duration in the case of gas are obliged to negotiate the terms of transit among themselves.

Transit does not necessarily mean an obligation involving the actual transmission of electricity or gas from one specific point to another but rather an obligation to transmit a specific quantity of electricity or gas.

In order to ensure the smooth running of the transit operation, the Commission has made provision for the setting-up of a body (accountable to the Commission) representing the relevant network entities. The task of this body will be twofold: on the one hand, it will advise the Commission on the implementation of the right of transit and, on the other, it will help, where necessary, to secure agreement between the networks, e.g., in devising a scale of transit tariffs.

### ● Third-party access to the networks

The stage envisaged subsequent to the recognition of the right of transit involves a study on the possible extension to all Member States of a type of transmission facility for the benefit of third parties that has already been introduced in different ways in the legislation of two Member States (Netherlands and UK) under the designation 'common carrier'.

The implementation of this principle is more delicate than that of transport and requires a detailed economic and technical feasibility analysis (on which the Commission has been engaged since June 1990).

These studies are being carried out by advisory committees in collaboration with the representatives of the Member States and, above all, with the economic operators concerned (producers and consumers). The latter's task is to analyse the impact of the possible introduction of third-party access to the networks at various stages ranging from production to consumption, as compared with the current position regarding both the gas and electricity producers and the consumers, and to consider possible means of implementation.

### ● Other developments

In another connection, a long-haul standardization project has been launched with a view to promoting the efficient movement of energy products. Up to now, such movements have been concerned mainly with oil products, many varieties of which are available on the market, but they will be extended in the near future to include the other energy sources. The update of the Illustrative Nuclear Programme for the Community<sup>13</sup> represents a commitment to pursue measures designed to standardize nuclear equipment and components.

## Competition

Under the EEC Treaty, competition assumes a dual role: on the one hand, it is the primary rule with which Community policies must comply and, on the other, the provisions governing it are intended to enshrine the free interplay of market forces in order to limit their harmful effects.

From the point of view of the internal energy market, in contrast, active steps must be taken to promote competition in as much as it is virtually non-existent - in the sense of competition within either the gas or the electricity sectors. The Commission proposals have been drawn up for this aim.

<sup>12</sup> Networks involved in commercial operations and networks mandatorily required to provide transit facilities.

<sup>13</sup> P INC COM(89)347, 7 August 1989.

## ● Rates and charges

In simple terms, competition can operate at two different levels: between interchangeable but distinct products having a certain mutual flexibility, or between manufacturers of the same product. The extent of customer's freedom of choice will be an indicator of the effectiveness of competition in action. At present, there is no effective interchangeability, so to speak, between the various energy sources that have cornered each of the distinct markets, nor is there any appreciable differentiation (in terms of technology, quality or service) between the various sources of electricity or gas. For this reason, the Commission is at pains to introduce competition in these two sectors, primarily through the instrument of rates and charges.

### Transparency of prices

The Council Directive on the transparency of gas and electricity prices<sup>14</sup> charged to Community industry is the culmination of the Commission's efforts since it issued its first common-energy-policy guidelines in 1986. The Directive on the transparency of prices is based on three established facts:

- competition is only possible if consumers are provided with the adequate minimum of information;
- the transparency of energy prices varies greatly from one Member State to another;
- the cost of the energy consumed by industry is one of the factors determining the competitiveness of the Community industry.

Consequently, transparency must be assured at Community level, if the industrial consumer is to have freedom of choice in energy procurement. The effects of any downward pressure on prices should be swiftly translated to the market place.

Under the Directive, the previously voluntary system of notification of statistics on gas and electricity prices charged to industrial consumers becomes mandatory.

Commercial confidentiality will be preserved by the definition of standard industrial consumers (at least three) and by price-fixing. This will provide a frame of reference for the three major consumers such that no amount of cross-checking will enable a particular company to be identified.

These recorded price statistics will be published by the Commission in May and November each year. They will be accompanied by any pricing-system information used in their compilation.

### Transparency of costs

Transparency of prices on its own, however, is not enough to ensure what is known as 'workable competition'. In keeping with the Council's recommendations on electricity and natural-gas prices (see 81/924/EEC and 83/230/EEC), the Commission is committed to the establishment of transparency of costs throughout the various price-fixing stages. This also reflects the wishes of the European Parliament and the desires expressed by several Member States.

In addition to promoting competition, the aim is to:

- combat state aids, concealed and/or incompatible with the Treaty;
- stamp out subsidies masquerading under the guise of price-fixing policies;
- eliminate external costs such as hidden taxes levied by the local authorities.

Transparency of costs is not an aim in itself but a means of attaining an internal energy market that is as uniform and dynamic as possible.

These measures are not intended to upset the balance of responsibilities distributed between the Commission and the Member States with regard to the formulation of major energy policy options. In practice, the fixing of the general level of rates and charges comes under the jurisdiction of the national authorities.

## ● Other measures

A Directive on procedures for the award of public procurement contracts in the allegedly exempted sectors (of which energy forms a part) was adopted on 17 September 1990 stipulating that, over and above a certain expenditure threshold (ECU 5 million for works

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<sup>14</sup> Directive 90/377/EEC of 29 June 1990 is due to enter into force on 1 July 1991. Petrol products are already the subject of an equivalent Directive (Directive 76/491/EEC). Under the terms of Article 60(2a) of the Treaty establishing the European Coal and Steel Community, publication of the price lists applicable to coal is mandatory.

and ECU 400 000 for supply contracts) consultations must be held between undertakings and public authorities in order to foster competition among all Community undertakings.

Detailed studies are currently being carried out with a view, on the one hand, to encouraging the development of independent and combined generation and, on the other, to ensuring harmonization of indirect taxation, notably in the energy field.

## Towards greater Member State solidarity in the energy sector

The reduction of economic and social disparities between the different regions of the Community is a constant concern governing the choice of guidelines for attainment of the internal market. It is an underlying factor in all the Commission proposals and is not in itself peculiar to the energy sector.

However, specific mention can be made of the **Rechar programme** which is based on the principle of aid to regions affected by the decline in coal-mining and which was adopted on 2 August 1989, and also of the **Valoren programme** adopted by the Council on 27 October 1986 to promote the development of certain disadvantaged regions of the Community through optimum use of their endogenous energy potential.

Nevertheless, there is more to solidarity in the energy sector than mere economic and social cohesion (Article 130a of the EEC Treaty). Steps must also be taken to reduce, as far as possible, the risks of breakdowns in supply and to improve the allocation of available resources (both quantitatively and in terms of prices). This is the dual objective of solidarity, both at the internal and external level.

## Internal solidarity

In general, the energy policy coordination pursued by the forming of medium-term Community energy objectives is an important element of internal solidarity.

At intra-Community level, there are a number of measures that seek to ensure solidarity among Member States. Their aim is to guarantee the transmission of energy through the existence of adequate infrastructures, to optimize the use of energy and to minimize the effects of a temporary difficulty, even an energy-supply crisis.

### ● Investment

The existence of adequate infrastructures in support of the liberalization of intra-Community trade is the key to the optimization of the allocation of available resources in the Member States, while at the same time helping to narrow the gap between EC regions.

The energy infrastructures of the European network reveal a number of gaps and deficiencies affecting several Member States and regions of the Community to the extent that development of the latter and the attainment of the internal energy market are severely hampered. This point was recently raised in the preamble to the Directive on the transit of electricity and at the Energy Council meeting held on 29 October regarding the Directive on the transit of gas.

For instance, Ireland and Greece are still not connected either to the European gas pipeline network or to the Community electricity system. Similarly, the United Kingdom, Spain and Portugal are not included in the European system for long distance natural gas transit. In the peripheral regions, the absence or inadequacy of major transit, transmission and interconnection infrastructures limits economic development and prevents the integration of these regions in the Community<sup>15</sup>.

Under an initiative known as **Regen**, adopted by the Commission on 2 May 1990, it is proposed to make good the energy infrastructure deficit of the underdeveloped regions and to strengthen measures by the Community support services through participation in the financing of investment designed to promote economic development and the availability of energy supplies<sup>16</sup>.

By way of illustration, a number of studies in the electricity sector tend to prove that a more rational infrastructure network on a Community scale would lead to additional investment savings of between 12 and 15 GW by the year 2010. Under these circumstances, an increase in capacity of less than 1% a year from now until the year 2000 would make it possible to meet a growing demand of more than 2% a year.

<sup>15</sup> The Commission communication 'Towards transeuropean networks' (COM(89)634) adopted by the Commission on 6 December 1989 was the subject of a Council resolution on 22 December 1989.

<sup>16</sup> In the past, the European Regional Development Fund (ERDF) has financed various measures in the field of energy infrastructures. Thus, between 1982 and 1987, it was actively involved in financing projects for the transmission and distribution of electricity and natural gas to the tune of ECU 1 200 million in the various Member States.

Under a draft Commission Regulation amending Regulation No 1056 of 1972, on notifying the Commission of investment projects of interest to the Community in the petroleum, natural gas and electricity sectors<sup>17</sup>, it had been proposed to hold consultations and carry out a joint study (involving the Commission, the Member States and the undertakings concerned) of alternative solutions in respect of any projected investment of interest to the Community. The Commission was at pains to promote the emergence of an intermeshing system of effective infrastructures in relation to the comparative advantages and availability of supplies.

However, at its meeting held on 21 May 1990 the Council decided that it would be preferable, as a matter of priority, to seek ways of ensuring the more effective application of the provisions of the 1972 Regulation and, when the time was right, to re-examine the Commission proposal in the light of the experience acquired.

### ● Optimum use of energy

A prerequisite for the optimum use of energy is the implementation of policies for coping with energy demand, improving energy efficiency and reducing the impact of energy on the environment. This is the ultimate aim of the 1995 objectives and of the Thermie programme (dissemination of advanced technologies).

The Thermie programme on technological innovation, adopted by the Council on 2 May 1990, seeks to narrow the gap between the development of a new energy technology, its dissemination and its ultimate commercial application. It covers four essential fields, including energy efficiency and alternative energy sources.

Similarly, in the case of the nuclear sector, the updating of the Illustrative Nuclear Programme is prompted by the same concerns.

As a complement to the Thermie programme, the Commission has just adopted the SAVE programme on ways of improving energy efficiency. This is in addition to the energy-saving measures which assumed priority status as a result of the need to protect the environment and in the light of the economic situation in the energy sector.

Lastly, the energy-harnessing policies conducted in all the Member States are being supported by the Commission through such programmes as **improved efficiency in the use of electricity**, which is designed to encourage the use of energy-saving apparatus and equipment.

### ● Supply-crisis measures

Crisis measures adopted by the Commission on 24 October 1990 (two draft Directives on action to be taken in the event of supply difficulties and on reserve stocks of oil) seek to bolster Community solidarity.

In case of aggravated supply difficulties, the Commission, assisted by an advisory committee made up of representatives of the Member States, will determine the objectives and measures to be taken over a three-month period. In addition, provision has been made for the introduction of a 'communautaire' dimension with regard to emergency stocks and their use, whereby Member States will be required to set up a national stockpiling agency responsible for 2/3 of the stocks (90 days' consumption), the remainder being held by the oil companies.

## External solidarity

The main aim of external solidarity is to boost available supplies by providing a cohesive adjunct to the accomplishments of the internal energy market and by creating stable relations with the energy supplier countries.

### ● External aspects of the internal market

It is clear that, if the Directives on the transit of gas and electricity are to be fully effective, steps will need to be taken, on the one hand, to supplement them with agreements with the third countries directly involved in intra-Community transit and, on the other, to strengthen (or create) transport infrastructures, notably to cope with the foreseeable increases in transmission flows.

#### Agreements with third countries

The texts of the Directives stipulate that the Member States should take the measures necessary to promote transit between the Community networks. While the field of application is limited to the territory of the Community, it is nevertheless the case that the third countries indirectly involved are essential intermediaries. For instance two-thirds of French electricity exported to Italy travels via

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<sup>17</sup> COM(89)335, 14 July 1989. Under the ECSC and Euratom Treaties, the coal and nuclear sectors are covered by special provisions.

Switzerland. It is therefore imperative that agreements be concluded with the countries concerned.

Thus, in the context of the agreements concluded under the EEC/EFTA negotiations on the European economic area, the texts on transit form an integral part of the pertinent Community patrimony which the EFTA countries must introduce in their national legislation.

### Investment in infrastructure

To ensure availability of supplies and integrate peripheral European countries (Portugal, Greece and Ireland), it is planned to set up international interconnections:

- between the African and European continents as an extension of what already exists or is currently being studied, i.e., between Algeria and Italy via Tunisia and soon with Spain (Algeria, Morocco, Spain) and interconnection of the electricity networks between Morocco and Spain, Tunisia and Italy;
- between the two Europes by reinforcing electricity and gas connections (e.g., doubling the capacity of the Megal pipeline).
- **Establishment of stable relations with the Community's neighbours**

The Community still depends on third countries for almost half its energy requirements (45% in total). The degree of dependence is 70% in the case of oil, and 35% in the case of natural gas and solid fuels. In the light of consumption projections and existing knowledge of available resources, it is estimated that Community dependence is bound to increase still further. Security of supply is therefore a matter of fundamental importance for the future. As part of the 'evolutionary proximity' policy announced by the President of the Commission, Mr Jacques Delors, on 17 January 1989, the Commission has set about creating closer and more lasting links with the adjacent countries, i.e. EFTA, East European and Mediterranean countries. Recent diplomatic developments affecting these three groups of countries have considerable implications for the Community's future energy supplies, notably with regard to natural gas and oil.

Negotiations are currently under way on the free-trade agreement on a dynamic European economic area referred to earlier. More specifically, countries such as Norway, Switzerland and Austria are integrated in the European natural-gas and electricity networks. The agreement falls within a more general framework aimed at increasing the economic integration of these two groups of countries - a factor not without implications for the energy sector.

East European countries reached a new turning-point in their relations with the EEC following the signature of the Joint Declaration of 25 June 1988 opening the way for negotiations aimed at the conclusion of bilateral agreements with these countries. All of the agreements signed<sup>18</sup>, or currently under negotiation, include an energy portfolio. There is no need to stress the importance for Europe of Soviet hydrocarbon reserves. In this regard, a Netherlands-inspired proposal (the Lubbers plan) suggests setting up a European energy community extending from the Atlantic to the Urals.

Lastly, in June 1988, the Community signed a major cooperation agreement with the countries of the Gulf<sup>19</sup>. The preamble to this agreement affirms the determination of the two sides to pursue a policy of cooperation aimed at improving the international economic and energy situation. The agreement is in the process of being supplemented by a trade agreement seeking to strengthen European-Arab relations on a basis of mutual advantage.

These agreements are the culmination of 15 years of Community efforts to establish stable relationships with its partners, based on mutual trust.

External solidarity should be supplemented by a common commercial policy. Such a policy, in so far as it exists, is still very incomplete in the energy sector, except in the case of fissile materials. It is specifically excluded under the ECSC Treaty (Article 71), and is non-existent in the case of energy products covered by the EEC Treaty. Thus, in such vital areas as the supply of hydrocarbons, contracts are concluded separately by national importers and not within a Community framework.

<sup>18</sup> EEC-Hungary, EEC-Czechoslovakia, EEC-Poland, EEC-USSR.

<sup>19</sup> United Arab Emirates, State of Bahrain, Kingdom of Saudi Arabia, Sultanate of Oman, State of Qatar and State of Kuwait.

## Conclusions

The obstacles to a genuine internal energy market are too numerous, and often too complex, to be overcome in one fell swoop. A **gradual but at the same time determined, approach** is essential, and a logical start must be made if all the intricacies are to be unravelled. Needless to say, the stakes are so high that economic players are already reacting. Consultation mechanisms are currently being set up by industrial circles with the object of anticipating Community requirements associated, for instance, with the finalization of the internal energy market: Eurelectric, Eurogaz and Europia are involved.

Through the achievements embodied in the completion of the internal market, it has been possible to embark on innovations on various fronts and to introduce a number of advantageous procedures:

- the new Article 100a, introduced under the Single Act, was chosen by the Commission to serve for the first time as the legal basis in the energy sector for the two proposed Directives on the transit of natural gas and electricity;
- the Commission has made a point of ensuring the involvement of all bodies affected by the new guidelines. Thus, the preparation of the draft Directive on the transparency of prices and, more particularly, on the technical aspects of the system for determining and notifying prices is the result of wide-ranging consultations conducted by the Commission with the various groups affected, namely distributors and consumers (large companies and small and medium-sized undertakings).

By the same token, the implementation of the right of transit will also involve professional bodies capable of advising the Commission on technical matters.

Talks on direct access to the network are being conducted by advisory committees composed of representatives from the Member States, professionals from the energy sector and consumers.

All these factors provide an advance insight into the 'common' energy policy currently in the process of formulation. As for the future, it remains to be seen how the internal energy market will fare in the face of such challenges as German unification, the new realities of East-West relations in Europe, environmental preoccupations and, in the short term, the Gulf crisis.

# Security of supply

DGXVII: Policy making unit (A1)

*'Security of energy supply, the internal energy market and energy policy' is the title of a working paper endorsed by the European Commission on 4 July 1990.*

*Tabled initially by the Commissioner for Energy, Mr Cardoso e Cunha, the document gave EC energy ministers a focus and some pointers for what was considered a very timely preliminary debate at their informal meeting in Rome on 16 July.*

The two main dangers in relation to security of supply are a high level of dependence on external sources and/or the preponderance of a single source in the overall energy balance.

In 1989 the external energy supply dependence of the Community amounted to about 49% (57% in 1979 and 45% in 1985). Oil remains the main source of supply covering 46% of the Community's energy needs and two-thirds of the Community's oil imports come from OPEC countries. OPEC's actual oil production in 1989 was approximately 85% of its capacity. This high capacity utilization rate was close to the situation during the second oil crisis in 1979. Total oil imports represent about 36% of demand. Understandably recent events in the Gulf have accentuated concerns about supply.

The gas industry is likely to be developed in the future particularly in view of the fact that the USSR owns 38% of the world's natural gas reserves. Plans for a pipeline linking Morocco and Algeria to the EC network via Spain will also play an important role in this respect.

The Commission's discussion paper starts out by defining security of supply as the ability to ensure that essential energy needs can be met, both by means of adequate domestic resources worked under economically acceptable conditions or maintained as strategic reserves, and by calling on accessible and stable external sources supplemented, where appropriate, by strategic stocks.

On the one hand, the achievement of the internal energy market must contribute positively to the Community security of supply. As the working document on the internal energy market stated, 'a more integrated energy market is a significant additional factor as regards the security of supply for all Member States. Greater interconnection of equipment would make it possible to increase both the solidarity between Member States and the flexibility of the

industry. It would therefore increase the emergency resources available in the event of a crisis and create the possibility of additional trading'.

On the other hand, all the Member States have implemented national aid measures or fiscal and administrative measures with equivalent effect to quantitative restrictions in order to safeguard their energy supplies. These include State aids, long-term supply agreements, import quotas, the fixing of market shares, accounting rules and price formation.

National measures should be kept under a common framework to avoid conflict with the general Community interest. Further measures may be needed to guarantee a strategic level of security for the Community but these should be adopted and co-ordinated at EC level. What we need, in fact, is a Community approach which strikes a balance between the benefits drawn from security of supply and the negative effects of measures taken, on competition and inter-Community trade.

The working paper seeks to organize, in the spirit of the internal energy market, a transition from national control to security on a Community scale.

The policy will have to be developed in successive stages in close liaison with the progress of the internal energy market.

The first stage involves making use of existing Community legal instruments to incorporate the various national systems under a common framework. To this end, the Commission will prepare an overall framework for national aid, and will examine any additional measures taken to safeguard supplies for their compatibility with Community law. The Commission will be preparing over the coming

months, a survey requiring the co-operation of the Member States, to complete information on the national security of supply measures.

If we take the example of electricity, the Commission intends to ensure, during this phase, that the share of the electricity market reserved for national supply as a result of aid or long-term agreements, does not rise above present levels. Later it will define a maximum level for protection of the electricity sector throughout the Community up to the year 2000. This share should be gradually reduced.

The aim of the second stage would be to organize security of supply at Community level, making optimum use of the interdependent and complementary relationships that exist within the borders of the Community.

To conclude, it has to be stressed that the Commission's working document, is designed to mark an important step in the building up of a Common Energy Policy. For this reason, DG XVII hopes to receive feedback on the ideas contained in the document, both from the member governments and the energy industry.



# Regen: A regional policy initiative for energy networks

DGXVII: Task Force on Community Integration: Accompanying measures unit (TF2)

*The Commission agreed on 2 May 1990 to launch an initiative for energy transmission networks in the Community's less developed regions. This initiative known as Regen (Regional Energy), is earmarked to receive ECU 300 million between 1990 and 1993.*

*Creation of efficient networks for transport of energy, particularly gas and electricity, and strengthening of existing networks will contribute significantly to the economic potential of Objective 1 regions and to achievement of the internal energy market. Moreover, the Regen initiative responds to the Strasbourg European Council's call for priority to be given to trans-European infrastructures to underpin economic and social cohesion between the twelve EC Member States.*

## The role of the Community initiatives

Among actions under the Community's structural funds, the European Commission can launch 'Community initiatives'<sup>1</sup> designed:

- (i) to help resolve serious problems directly associated with the implementation of other Community policies (for example, energy);
- (ii) to promote the application of Community policies at regional level; or
- (iii) to help resolve problems common to certain categories of regions.

Community support frameworks (CSF) already agreed are based on national development plans, whereas Community initiatives are transnational programmes at the Commission's own initiative.

Between 1989 and 1993, a total of ECU 60.3 billion (1989 prices) is available for the Structural Funds<sup>2</sup>. Out of this total, ECU 5.5 billion have been earmarked for Community initiatives. In addition, loans (from EIB and ECSC) can be made available. Partly because of this relatively small amount of money, Community initiatives have focussed on projects with a maximum effect on development of the EC's disadvantaged regions, including the lagging regions of Objective 1<sup>3</sup>.

## The impact of Regen

A particular drawback of lagging and/or peripheral regions is their lack of integration into Community-wide transmission networks for natural gas and electricity. Regen addresses this problem, through accelerating the integration process and strengthening interconnection between Community-wide networks.

Energy network projects have been given a very high priority by the Member States but they are also of major Community interest. These investments are vital for the future competitiveness of industry in some of the Community's disadvantaged regions. As such, they will make a major contribution to the achievement of economic and social cohesion.

<sup>1</sup> The legal basis for Community initiatives is to be found in Article 11 of Regulation (EEC) No 4253/88. For the European Regional Development Fund (ERDF) in Article 3.2 of Regulation (EEC) No 4254/88.

<sup>2</sup> European Regional Development Fund, European Social Fund and European Agricultural Guidance and Guarantee Fund.

<sup>3</sup> Greece, Portugal, Republic of Ireland and part of Italy, Spain, France (Overseas Territories and Corsica) and the UK (Northern Ireland).

Furthermore, they will enable clean energy sources to be substituted for hydrocarbon and solid fuels, and will therefore make an important contribution to the improvement of environmental conditions. Finally, these investments will also contribute to the completion of the internal energy market and, in the medium-term, will improve energy security of supply and the operation of the Community energy network as a whole.

## The contents of Regen

The proposed initiative differs from other Community initiatives in that the main elements of the projects are already known. In fact, investments in the energy transmission system are planned long-term. Therefore, Community assistance under the current ERDF, can only apply to projects which have reached sufficient maturity to be undertaken before the end of 1993, the deadline for agreed budgetary commitments.

Another feature of the Regen initiative is that a small number of large projects are concentrated on Objective 1 regions given the limited funds available to the Commission, (ECU 300 million).

Eligible projects mainly concern natural gas grids and to a lesser extent, electricity grids in lagging regions where a number of shortcomings and inadequacies have been identified.

Community assistance will be granted to the following projects according to their degree of advancement and the estimated expenditure earmarked before 1993:

- (i) the setting up of reception facilities and transmission networks for the introduction of natural gas in several regions of Portugal and Greece;
- (ii) gas transmission interconnector linking the networks of the Republic of Ireland and the United Kingdom;
- (iii) the inclusion of Corsica in a possible future interconnection between gas transmission networks of the Italian mainland and a transmission network to be built on the island of Sardinia;

- (iv) the establishment of links between gas transmission systems in Spain and those planned in Portugal;
- (v) the interconnection between electricity distribution networks in Italy and those in Greece.

For these projects, the Community's contribution will take account of the work likely to be carried out in the period 1990 to 1993, and of an assessment of the financial plans so as to ensure an appropriate balance between grant and loan finance. Cost-benefit analyses of proposed projects should give economic and technical data, the expected internal rate of return of the investment and other benefits such as the effect on regional energy pricing, the improvement of security of energy supplies and the environmental impact of the projects.

## Implementation of Regen

The Commission made a final decision on Regen on 12 December 1990 after receiving a favourable opinion from the European Parliament, the Economic and Social Committee and the associated regional Committee.

Member States are invited by the Commission to establish, as soon as possible, operational programmes following guidelines referred to in the Regen initiative and published in the Official Journal (OJ EC N° C326 of 28.12.1990).

## Conclusion

In conclusion, it should be pointed out that the Regen initiative goes far beyond the initial impression of mere co-financing of a series of natural gas and electricity transmission projects in the European Community's disadvantaged regions. It will strongly contribute to reinforce social and economic cohesion, the basic aim of the programme.

The Regen initiative should also be considered as part of a Community-wide integrated approach towards trans-European networks in the energy sector. General consideration is being given here based on partnership and subsidiarity, on how to improve the role of energy infrastructures in the EC's internal market.

# Energy in central and eastern Europe

DG XVII: Policy making unit (A1)

*Since October 1990, the energy problems of central and eastern Europe have become a new focus for aid to the region from the Group of 24 western countries, (G-24).*

## Energy: a new priority for the Group of 24

While the problems vary from country to country, most suffer from the following constraints:

- a high level of dependency on a single energy source. This is a characteristic of all the countries in the region, but Poland's and Czechoslovakia's reliance on coal is particularly acute. Most of them also depend on the USSR as their sole supplier of oil, natural gas or electricity;
- imports of oil from countries other than the USSR are having to be increased given the difficulty in maintaining Soviet supplies;
- energy is used inefficiently owing to poor management in outdated and centrally planned industries, many of which are energy intensive;
- environmental and safety risks linked to energy production and consumption are high, particularly in the nuclear industry;
- the pricing system is centrally planned so bears no relation to market realities;
- from 1991 all energy imports from the USSR have to be bought with hard currency;
- access to new technology is extremely limited.

The Gulf crisis and the breakdown of the COMECON trade system have exacerbated these problems, and the current economic recession has led to fears that political and economic reforms underway in these countries could be jeopardised.

As a result of the G-24s decision to make energy a priority sector for aid, the EC Commission, which coordinates G-24 aid, drew up a list of priority requirements in cooperation with other international bodies.

During its first meeting on 21 December 1990, the G-24 Working Group on Energy, which was set up for this purpose, dealt, under the chairmanship of the EC Commission's Director General for Energy, with:

- emergency assistance for central and eastern Europe during the winter months;
- cooperation in the energy sector over the medium and long-term;
- coordination of G-24 assistance in the energy sector.

## The EC Commission's aid programme for energy planning

ECU 1.4 million is involved to help improve energy planning in central and eastern Europe.

The programme has already funded a study of the potential for third party financing in Hungary, whilst surveys on energy use in the Hungarian food industry and on energy management in the city of Miskolc have been launched.

In Poland, the EC will finance a series of studies on the restructuring of the oil sector, and projects aimed at improving energy management in a number of cities are getting underway.

In Czechoslovakia, aid to improve energy efficiency in the construction industry is being made available, and other projects, including an energy conservation programme and a training course, are planned.

Meanwhile in Yugoslavia, the programme has helped to organize a seminar on energy management.

## Phare

The Community's economic aid programme for central and eastern Europe, (Phare), originally targeted on Poland and Hungary, has recently been extended to Bulgaria, Romania, Czechoslovakia, Yugoslavia and the former East German territory, (Council Regulation 2698/90, OJ L 257 of 21.09.1990).

The former Eastern Germany is also now fully eligible for the usual EC funding instruments (structural funds, EIB loans etc) from the date of German reunification, 3 October 1990.

Energy problems are given considerable attention in 1990 Phare environment projects already approved for Poland, Hungary and former East Germany, as well as those being planned for Czechoslovakia. Roughly a quarter of the 100 MECU earmarked for environment projects under Phare deal specifically with energy. Projects for 1991 are already on the drawing board.

A coherent energy strategy is considered an essential part of any future aid programmes for central and eastern Europe. In achieving this, co-ordination of aid is vital, particularly where a variety of donors is involved (the EIB, the World Bank, the IMF, the EBRD and the IEA for example) and the EC Commission is fully aware of the importance of its role in ensuring this co-ordination is brought about.

# The Phare programme and the European Community

by Serge Christiane, Directorate General for External Relations (DG I): Phare Operational service

*The democratization of East European countries and collapse of the Soviet Union's hegemony over its former partners are an important historic event for the European continent.*

*After almost 40 years of Communist government, Poland - the precursor -, Hungary, Czechoslovakia, the German Democratic Republic, Bulgaria, Romania and Yugoslavia suddenly found themselves facing immense problems in reorganizing their economies.*

*The European Community was least of all in a position to remain indifferent to the manifold difficulties that began to arise, particularly in Poland, in June 1989. At the July 1989 Paris Summit of the world's seven most industrialized countries, participants entrusted the Commission of the European Communities with the task of co-ordinating aid from all the industrialized countries (EEC and OECD) to those East European countries on the path to adopting democratic systems.*

## G-24 and the Phare programme

Until June 1990, aid from G-24 (Group of 24 industrialised countries) was restricted to Poland and Hungary. The Commission of the European Communities (CEC) therefore set up its own Task Force, called Phare (Poland and Hungary - Aid for Economic Restructuring), to be responsible for co-ordinating G-24 aid.

In addition, an appropriation of ECU 300 million was made available to the CEC to enable development and privatization projects in four priority sectors, namely; agriculture, the environment, training and industry/joint ventures.

To administer this substantial aid, which will act as a catalyst for the G-24 aid, the Commission set up a Phare operational service within its Directorate-General for External Relations.

Operation Phare has a difficult task before it. In spite of the emergency food aid granted to Poland by G-24, the country is in a very difficult economic situation which could jeopardize its transition to democracy.

## Guarantees for balanced growth

An attempt is consequently being made, with available financial resources, to attend to the most urgent things first by creating optimum conditions to establish the foundations for balanced economic growth in Poland and Hungary, despite the difficult state of public finances in both countries.

However, Poland's USD 40 billion and Hungary's USD 20 billion foreign debt are spiralling. Foreign financial aid and measures to encourage investments hence appear to be an urgent priority, although the effects of such measures would not be immediate and would only be felt in the medium-term.

The impact of the Phare programme will largely depend on the will of each country to recover, and on their economic operators' determination to succeed.

## What has the Phare programme achieved?

For the first six months of the Phare programme, a series of projects for each country was drawn up. Almost all the ECU 300 million funds available for the initial phase have been committed. The projects are listed below:

## Poland and Hungary

- co-operation in the field of economics (ACE) (ECU 1.5 million);
- implementation of a trans-European mobility programme for higher education (TEMPUS) (ECU 20 million).

### Poland

- sectoral import programme (SIP) for crop protection products (ECU 50 million);
- environmental protection programme (ECU 22 million);
- basic technical assistance programme for the Privatization Agency (ECU 9 million);
- sectoral import programme for animal feeds and animal-feed additives (ECU 20 million);
- sectoral import (SIP) and technical assistance programme for small and medium-sized enterprises (ECU 25 million);
- establishment of lines of credit for imports of agricultural equipment and equipment for the food industry (ECU 30 million).

### Hungary

- environmental protection programme (ECU 25 million);
- Community participation in the Regional Environment Centre in Budapest (ECU 2 million);
- programme for the development of private farming (ECU 20 million);
- technical assistance programme for modernization of the financial system (ECU 5 million);
- basic technical assistance programme for the Privatization Agency (ECU 5 million);
- assistance programme for small and medium-sized enterprises (SMEP) (ECU 21 million);
- sectoral modernization programme for research infrastructures (ECU 3 million).

All projects involve funds for technical assistance and for the import or purchase of various types of equipment.

The bulk of projects are executed by the beneficiary countries themselves which, under the supervision of the Commission or newly established delegations in those two countries, will issue invitations to tender and conclude contracts. It was for this purpose that the Commission, in the case of the 'environment' programmes, set up a 'project management unit' in each of the two countries, staffed by European Community experts who assist their Polish and Hungarian counterparts in programme implementation.

Projects still pending a decision include; reform of foreign trade, training, industrial restructuring and various minor activities in the social sector.

## And other countries?

Following a decision of 4 July 1990 at the G-24 Ministerial meeting, the Phare programme was extended to other countries in Central and Eastern Europe (Bulgaria, the German Democratic Republic<sup>1</sup>, Czechoslovakia and Yugoslavia), but not Romania, on which a decision was postponed pending establishment of a more solid democratic system.

Additional appropriations amounting to ECU 200 million will be released by the Community so that rapid action can be taken for those countries. A selection has already been made from the lists of priorities they put forward. It is hoped that the entire budget earmarked will be committed by the end of the year to projects concerning the environment, training and reform of services and financial systems.

What will happen over the next few years? The Commission is currently planning to make available a budget of ECU 850 million for 1991 and ECU 1 000 million for 1992. The priorities for the near future still remain to be defined, but they are expected to be similar to those already defined 1990 and will probably include the energy and transport fields too.

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<sup>1</sup> Until 3 October 1990, the date of German unification.

## Other measures

The Phare programme aside, the Community and other international donors have responded to the economic and social problems of the Central and East European countries in a variety of ways:

- I Trade concessions have been offered which considerably open up the community market to exports.
- II Technical assistance focused on training will be provided.
- III Considerable financing facilities have been granted, the effects of which will be felt in the medium term.

### I Trade concessions

A series of measures has been adopted to improve the access of products from Central and Eastern Europe to the Community market. Their purpose is to increase those countries' export capacities and to facilitate the acquisition of strong currencies to offset balance-of-payment problems.

The principal trade measures are:

- (i) the abolition of specific quantitative restrictions still in force;
- (ii) the suspension of all other quantitative restrictions applied by the Member States for a period of one year;
- (iii) the extension to the countries concerned of benefits of the Generalized System of Preferences (GSP);
- (iv) an undertaking to study ways and means of increasing imports into the Community of textile and clothing products;
- (v) a decision in principle to negotiate with the countries concerned, agreements within the ambit of the European Coal and Steel Treaty (ECSC) in order to eliminate the few national quantitative restrictions still in force.

These measures, which took effect in 1990, will enable the beneficiary countries, in accordance with their wishes, to develop trade with the West.

In addition to these agreements, Association agreements between those countries and the European Community are on the drawing board. Such agreements would go beyond the current simple co-operation arrangements to establish longer-term closer links for participation in the European economy and way of life.

### II Vocational training

The Strasbourg Summit in December 1989 decided on:

- (i) the setting-up of a European Training Foundation for vocational training to be open to all East European countries, which could serve as a centre for information exchange and technical documentation and as a basis for co-ordinating various training activities;
- (ii) programmes for educational purposes similar to those already being implemented in the Community, such as Erasmus, Comett, Lingua, etc.

There has been a delay in placing the European Training Foundation on an operational footing, since a decision is awaited on its siting. It is expected, however, this will be shortly resolved for the benefit of Central and East European countries.

### III Financing facilities

The European Council in Strasbourg, 1989, decided to set up the European Bank for Reconstruction and Development (EBRD).

The bank's role is to facilitate the transformation of centralized economies into market economies, to enable the financing of investment projects and to speed up structural adjustment. Participation in the capital and management of the bank is open to the East European countries. The Bank's seat is to be in London and it will start operations in March 1991.

Furthermore, the Community has granted Hungary medium-term financial aid to assist it in overcoming its balance-of-payment problems. The Community borrowed for this ECU 1 billion on international markets.

As for Poland, the Group of 24 Western countries has set up a \$1 billion fund to stabilize the zloty. This fund, of grants and loans, is intended to provide currency reserves to assist the fight against inflation and to facilitate the convertibility of the currency.

Finally, both Poland and Hungary have been offered access to European Investment Bank (EIB) loans. Loans up to a sum of ECU 1 billion over a period of three years will be granted under the Bank's normal conditions. Their main purpose will be to finance investment projects that require a currency contribution, as in the setting-up of joint ventures. Other high-priority sectors that could receive financing from the EIB are energy, telecommunications and transport.

## Energy and Phare

Although energy has not yet figured among any of the specific projects under the Phare programme, except in relation to projects on environmental improvement, it appears that countries receiving Phare aid are becoming increasingly aware of the benefits that could accrue to them from an effective and economy-conscious energy policy.

First of all, their nuclear and conventional power stations, often antiquated in design, have obsolete technological procedures and function haphazardly as a result.

There is considerable pollution from electricity production. For example, Polish and Czechoslovak sulphur emissions are equivalent to the combined sulphur emissions of West Germany, France and the Benelux, while the level of industrialization of those five countries is appreciably higher than that of Poland and Czechoslovakia.

In addition, the fact that the Central and East European countries will now be obliged to pay for their oil in hard currencies and no longer in roubles (with which they paid the USSR), considerably increases their balance-of-payment and currency problems.

Under the artificial trading system within the CMEA (Comecon), the former socialist countries paid USD 7 per barrel of Soviet crude. Under the new system, oil at USD 20 per barrel would account for 80% of Bulgaria's currency reserves, while a price of USD 30 would account for 100%.

These figures are 60 and 90%, respectively, in the case of Czechoslovakia, 14 and 21% for Hungary and 22 and 33% for Poland.

Furthermore, the current Iraq-Kuwait conflict and the uncertainty of its outcome have placed some of those countries in a difficult position. Compensation transaction contracts with Iraq under which oil was exchanged for certain goods are now in jeopardy. The international embargo on trade with Iraq means that oil supplies have been interrupted. While most of the goods contracted for under these trade agreements have already been delivered, in Poland's case, this loss of revenue amounts to approximately USD 150 million for 1990.

Finally, each inhabitant of the Central and East European countries, including the USSR, consumes 4.8 tonnes of oil equivalent per year as opposed to 3.4 toe in the Western countries.

The situation has reached alarming proportions, and ignoring it could have disastrous consequences for our environment and for the democratic reforms currently underway. According to the experts, failure to take counter-measures would vastly accelerate the decline in the standard of living in those countries - from 10 or 15% to 20 or 30% - over the next three years. To rectify the situation as rapidly as possible, they might well be prompted to continue operating their nuclear power stations in a dangerous manner or to continue burning brown coal and head straight for ecological and human disaster.

If the countries benefiting from the Phare programme request that financial aid be extended for various environment projects in 1991, the new economic and political circumstances will probably trigger the definition of new priorities and new projects in the field of energy. These will also have to be covered by the Community's Phare programme in association with the EIB and the EBRD from 1991 onward. The Commission has already been considering this matter internally and it will probably be discussed with the various beneficiary countries in the latter part of 1990 (see box below).

It should be pointed out, however, that all environmental projects already being financed, largely concern the establishment and execution of energy-saving programmes.

On 30 October 1990 the Group of 24 Western countries decided to make energy a priority sector for aid; subsequently a G-24 Working Group on Energy was created and held its first meeting on 21 December 1990. *Note from the Editor.*



# XXXIVth IAEA<sup>1</sup> General Conference

## (Vienna, 19 September 1990)

The EC Commission statement by Mr F. Caccia Dominioni, Director, DGXVII

*The IAEA (International Atomic Energy Agency) was set up in 1956 as a specialized organisation within the United Nations, and has been carrying out its activities since 1957. 113 states were members in 1990; the Member States of the Community are all members of the Agency.*

*The Agency plays a very important role in the international nuclear field.*

*The General Conference, an annual event, is composed of representatives of all the member states and takes the most important decisions such as the admission of new members, the adoption of the budget recommended by the Board of Governors and the election of all its members.*

*Each year, since 1982, the Community has been represented at the General Conference as an observer with the right to participate in debates.*

Mr Chairman,

1. On behalf of the Commission of the European Communities, which I am pleased to be representing at this Conference, may I congratulate you on your election and wish you every success in the performance of your duties.
2. Italy, which currently holds the Presidency of the Council of Ministers of the Community, has already spoken on behalf of the Community and its Member States. I would now like to provide you with evidence, within the time available to me, that, through its initiatives, the Commission of the European Communities stands out as a key actor and a dynamic organisation in these times in a world which is changing very rapidly.
3. The single European market will not be completed on 31 December 1992 unless energy markets are opened up. Energy often accounts for a substantial proportion of production costs and undue separation of these markets may adversely affect the competitive position of a significant number of Community industries.
4. The Community has therefore just adopted a Directive laying down a Community procedure on the transparency of the prices of gas and electricity to the final industrial consumer. This is a first major step towards transparency in the markets concerned.
5. Another directive aimed at facilitating the transmission of electricity through the major grids is also expected within the next few weeks.
6. A conference on energy in the next century was, furthermore, held in Brussels in May at the initiative of the Commission of the European Communities. It formed part of the step-by-step approach which should lead to new energy policy guidelines. Allow me, very briefly, to mention some of the concerns which were expressed at the conference.
7. Overshadowing all other concerns in the field of energy is still that of security of supply. The recent events in the Middle East have clearly shown that security of supply is vital to our economies. It is inevitable that there will be a worldwide increase in demand as a result, in particular, of the population growth in the developing countries. The changes taking place in central and eastern Europe should also lead to substantial progress being made towards

<sup>1</sup> International Atomic Energy Agency.

a more efficient use of energy, but there will almost certainly be higher energy requirements.

8. Another major concern was fully confirmed, namely that of protection of the environment. This has become an absolute priority at world level and, more particularly, for all of the industrialized countries. Everyone recognizes the need for rapid, joint action in this area. What we must now do is to say how we plan to act and this, in itself, is already a difficult problem.
9. The industrialized countries with energy know-how must, furthermore, do everything they can to limit their consumption so as not to place excessive pressure on the world markets in order to avoid interfering with the economic development of the poor regions of the world, this development being the guarantee of social and political stability which will permit positive changes to take place in relations between the north and the south.
10. The task facing those responsible at the national and international levels is really to square the circle: to ensure security of supply, to protect the environment while faced with a worldwide increase in energy consumption and to limit this consumption of energy.
11. Nuclear energy certainly has a role to play in this context. In the medium-to-long term, provided we manage to persuade public opinion that safety is well assured and that waste can be acceptably managed, nuclear energy should consolidate its current position and become an increasingly significant energy vector.
12. Finally, it should be pointed out that the highest political authorities, including the Houston Summit in July, have recognized that nuclear energy helps to reduce the levels of pollution which are otherwise emitted when fossil fuels are used. This contains the clear political message that nuclear energy will have a role to play in the future, which will be dominated by the growing and legitimate concern about greater environmental conservation.
13. Mr Chairman, Ladies and Gentlemen, there is a heavy concentration of nuclear activities within the Community. This means that the Member States and the Community authorities must, within this sector of activities, pursue a policy of careful management

which is at the same time open to the broadest possible cooperation between parties concerned. In this respect, I most especially welcome the fact that cooperation between the Commission and the IAEA has been both strengthened and widened. I would refer, *inter alia*, to the examples of:

- the continuing implementation of the agreements signed in 1988 and 1989 to receive fellowship holders from Asia and Latin America at centres within the Community;
- the participation of the Commission in the preparatory work on the setting up of an international research centre at Chernobyl;
- the Commission's active participation in the post-accident evaluation project at Chernobyl.

14. I would also like to refer to the important role of Euratom safeguards.

For the first time this year, the Commission of the European Communities, in response in particular to a request from the European Parliament, published an exhaustive report on the operation of this safeguards system.

15. The report explains the safeguarding arrangements by means of which it is able to ensure, in particular, that, in the territories of the Member States, ores, source materials and special fissile materials are not diverted from their intended uses as declared by the users. The report also shows the very close co-operation arrangements that exist between Euratom safeguards and the IAEA Safeguards Department.
16. In this context, I would like to remind you of some of the conclusions adopted by the European Council in June. In its declaration on nuclear non-proliferation, the European Council reaffirmed the need for the peaceful application of nuclear energy to take place under credible, effective and efficient international safeguards. It recognized the indispensable role of IAEA safeguards in the development of the peaceful uses of nuclear energy and, in this respect, drew attention to the important contribution of Euratom safeguards. Similar conclusions were adopted at the Houston Summit in July.

17. The Commission also attended, as an observer, the fourth Non-Proliferation Treaty Review Conference which ended on 15 September in Geneva.

The Commission noted that the Conference was not able to reach agreement on a joint declaration, but that it carried out a substantial review of the implementation of the Treaty. The Commission shares the views expressed by the Italian Presidency in this respect.

18. As I have already said, the future development of nuclear energy will depend on public opinion accepting that it is safe and that waste can be satisfactorily managed.
19. With regard to nuclear safety, I would simply like to say that in March the Council of Ministers of the Community concluded that activities within the Community were aimed at achieving an optimum degree of protection with the highest possible safety levels. It recognized that, at Community level, cooperation is taking place between the authorities in the Member States responsible for safety aimed at achieving an equivalent degree of protection within all of the Member States.

The Council also recognized the importance of the fact that the logic of nuclear safety within the Community as a result of such cooperation helps to create a logic that is accepted internationally within the framework of the IAEA. To this end, the Commission will ensure consistency between all of its international cooperation activities as regards nuclear safety and the Community cooperation process.

20. At the meeting of the IAEA Board of Governors in June, the Commission also gave a detailed report on ongoing nuclear safety activities in the wider sense within the Community. At this meeting, the Commission confirmed its support for the Nuclear Safety Conference which will be held in 1991 under the aegis of the IAEA.
21. In the field of reactor safety, the Commission is continuing with its research programmes, with priority being given to the present and future generations of light-water reactors. At the same time, the Commission will be studying in greater detail the prevention, the phenomena and the management of serious accidents.

22. The Community is also extending its research in radiation protection, the scientific content of which covers all pertinent subjects in this field, namely:

- radiation sources, zones and exposure measurements;
- the prevention of human exposure to irradiation and the evaluation and treatment of its consequences;
- the hazards and management of exposure to radiation.

23. Mr Chairman, may I say once again that the problem of the management and storage of nuclear waste is crucial and calls for concrete action now to secure a solution.

24. On 15 December 1989 the Community adopted a new programme for 1990-94 in this field. The aim of the programme, which follows on to the earlier programmes, is to contribute to the demonstration and implementation of a complete, safe radioactive waste management system.

25. I would like to go on now to a subject which will be promising for the distant future, namely nuclear fusion. In this context, I wish to mention that the activities on the preliminary design of the international thermonuclear experimental reactor (ITER) begun in 1988 under the auspices of the IAEA by the four parties which have major programmes in this field (the European Community, Japan, the USA and the Soviet Union) will be nearing completion by the end of the year.

26. The work carried out by the parties during this phase of the project is an exemplary model of international cooperation in the field of science and technology. The supporting role played by the Agency in the ITER project has met with the full satisfaction of the parties involved.

27. It is to be hoped that the current exploratory stage will soon be followed by the opening of negotiations aimed at the signing of an agreement to enable the engineering activities required for the project to be jointly carried out.

28. Mr. Chairman, the last twelve months have been a remarkable period in the history of Europe and the world. The Commission of the European Communities is well aware of this and is acting accordingly. As part of its policy of opening up towards the East, and in particular the USSR, the Community is planning an agreement with the Soviet Union in the following three fields of cooperation: nuclear safety, matters relating to exchanges of nuclear materials and controlled
29. Furthermore, in the context of the renewal of relations between the Community and the countries of central and eastern Europe, the Commission in April announced an initiative to promote contacts and exchanges of knowledge between the producers of nuclear energy in the geographical areas concerned. The main aim is to capitalize on the experience acquired by all the parties concerned.
30. Some central and east European countries have already expressed concern about the safety of some of their nuclear power plants and have asked to be able to make use of the scope afforded by the Phare programme on the financing of projects to
31. evaluate the safety of such power stations and any improvement measures required.
31. In the very near future, we shall therefore be entering into specific commitments with regard to Czechoslovakia, but we are considering a strategic regional approach in which, initially, we can deal on a methodical basis with all of the practical questions raised by the safety of the power plants concerned.
32. I would also like to mention that the action taken complements that taken by the IAEA and by WANO (World Association of Nuclear Operators) and that a certain degree of synergy can therefore be achieved. The IAEA, in particular, will be kept regularly informed about our work and the results. Here again, cooperation began at the meeting last week of an *ad hoc* consultative working party.
33. Mr. Chairman, thank you for allowing me to speak before this General Conference in order to explain more clearly the place of nuclear energy within the European Community.

# The market for solid fuels in the Community Outlook for 1991

DG XVII: Solid fuels unit (B1)

*This summary analyses the forecasts for 1990 and 1991 prepared by the Member States and forwarded to the Commission in November 1990. Its purpose is to provide the ECSC Consultative Committee and the circles concerned with the most up-to-date information about developments in the Community's solid fuels market.*

*A more detailed market analysis is to be found in the Commission's annual report of 16 April 1990<sup>1</sup> on 'The market for solid fuels in the Community in 1989 and the outlook for 1990' and in the document revising that market report.*

*A new report on the market for solid fuels in the Community in 1990 and the outlook for 1991 will be drawn up during the first half of 1991.*

As far as economic growth in 1990 is concerned, estimates have been revised downwards slightly as the rate of growth in GDP is likely to be only 2.9% compared with the original estimate of 3%. For 1991 economic growth should be of the order of 2.2%.

Community hard coal production continues to be affected to varying degrees by the restructuring, rationalization and modernization plans. In France, activity in the Bassin du Nord is declining very rapidly and production there is likely to finish at the end of 1990, while the last mine still working in Belgium is due to close in 1992 at the latest. In the United Kingdom new pit closures were put into effect under the restructuring programme which has been under way since 1985. This means that coal production in the Community has fallen by 31 million tonnes, or around 15%, since 1987.

Although total hard coal deliveries in the Community appear to have more or less reached a plateau at around 310 m tonnes, the proportion of the Community's energy needs covered by hard coal has once again declined in relative terms. Imports of hard coal from third countries look likely to stabilize around the 112 m tonne mark.

There has been a marked slowdown in steelmaking activity since the beginning of 1990. Crude steel production in the Community fell 2.2% over the first ten months of 1990. Extrapolating this figure for the full year, the drop in production is likely to be around 2.5%. A surprising feature is that this decline is primarily attributable to the Federal Republic of Germany where production between

January and September 1990 was 7.3% down on the same period of the previous year.

However, it seems that Germany's domestic steel consumption was not responsible, but rather an increase in imports accompanied by a fall in exports and heavy de-stocking by consumers.

Deliveries of coking coal to coking plants have fallen steadily over the past five years (from 71.7 m tonnes in 1987 to an estimated 63.4 m tonnes in 1991), even during the steelmaking boom from the end of 1987 to mid-1989. Only the stocks of coke held by the 'Nationale Steinkohlenreserve' prevented potential bottlenecks resulting from Germany's generally ageing coking capacity, combined with the use of steam coal to fire blast furnaces, which resulted in a saving of some 3.5 m tonnes of coke, representing 4.7 m tonnes of coking coal, compared with 1987.

On the other hand, deliveries of coal to power stations operated by nationalized companies, mining companies and industry in 1990 will be 3.1 m tonnes (1.5 %) up on the previous year and, in fact, 3.1 m tonnes higher than last July's forecast. The situation looks set to remain roughly the same in 1991. This stabilization is chiefly due to the fact that France and Spain expect their deliveries of coal in 1991 to the electricity sector alone to be 4.5 m tonnes down on 1990 levels, since there has been a rebuilding of emergency

<sup>1</sup> Sec(90)545/2

stocks at French power stations in 1990 and hydroelectric power production is expected to return to normal levels in both countries next year.

Deliveries to other sectors (steel industry, other industries, domestic heating and miscellaneous) fell back overall in 1990 by 1.9 m tonnes (-4.2%) compared with the previous year. The increase in deliveries of coal to the steel industry, which are up 24.1% at 1.1 m tonnes, contrast with the decline in the other sub-sectors, especially in the 'other industries' category which had an offtake, excluding power generation requirements, of 21.8 m tonnes in 1990 as against 22.7 m tonnes in 1989, a drop of 0.9 m tonnes. The decline was particularly marked in the 'domestic' sector and the 'miscellaneous' sector (which is closely related to it) where deliveries were down by 2.2 m tonnes (-12%) compared with 1989.

For 1991 the forecast is for an increase in deliveries to the steel industry (+0.5 m tonnes) and to other industries (+0.3 m tonnes), a forecast which is likely to be borne out if petroleum coke (used primarily in cement works) were to experience the same price movements as other petroleum products. On the other hand, a further drop of 0.8 m tonnes (-5.1%) is forecast in the 'domestic heating' and 'miscellaneous' sectors.

The final figure for coke production in 1990 should turn out to be 50.7 m tonnes, 0.6 m tonnes lower than forecast last July, compared with 52.8 in 1989. Deliveries to steelworks will be 46.4 m tonnes (down 3.5%) compared with 48.1 m tonnes in 1989. Other deliveries of coke in the Community, at 5 m tonnes, are 21.9% down on the previous year, while exports fell 68% from 2.5 m tonnes in 1989 to 0.8 m tonnes in 1990. For 1991 a further decline is expected, both in production (-1.9 m tonnes, that is -3.7%) and in deliveries to steel industry (-1.3 m tonnes, or -2.8%), to other Community consumers (down 0.1 m tonnes or 2%) and for export (-0.2 m tonnes or -25%).

Lignite and peat resources in the Community in 1990 were slightly lower (-1.5 m tonnes or -0.8%) than the previous year. For 1991, however, they are expected to increase again by 5.6 m tonnes (+2.9%).

Total deliveries are expected to follow the opposite trend: +2.2 m tonnes (+1.2%) in 1990, turning into +5.2 m tonnes (+2.7%) in 1991. Greece is primarily responsible for the favourable trend in 1991. The figures shown above do not include either production in or deliveries from the new 'Länder' created by the unification of Germany in late 1990.

For 1990 the figures for the former German Democratic Republic are:

	m tonnes
Production	243.7
Deliveries	243.7 - of which:
power stations	95.5
briquetting plants	98.7
Other	49.6

Intra-Community trade in both hard coal and coke is shadowing the downward trend in production. This is because the prices the producers can obtain for their exports are aligned with the prices of supplies from third countries and therefore are not profitable. For hard coal, this has meant a drop from 8.8 m tonnes in 1989 to 8.5 m tonnes in 1990 and 7.5 m tonnes in 1991, and in the case of coke from 4.1 m tonnes in 1989 to 3.6 m tonnes in 1990, with the same level expected to be maintained in 1991.

Imports of hard coal from third countries will reach a new high in 1990, passing the 110 m tonne mark. In fact, they are expected to total 112.6 m tonnes this year. Most Member States increased their imports in 1990, more especially the Federal Republic of Germany (+3.1 m tonnes), the United Kingdom (+3 m tonnes), the Netherlands (+1.4 m tonnes) and Belgium (+1.3 m tonnes), to mention only those countries whose imports increased by more than 1 million tonnes on the year. Only Denmark (-1.2 m tonnes) and Spain (-0.7 m tonnes) followed the opposite trend.

For 1991 the situation is expected to remain the same for the Community as a whole, with imports of the order of 111.8 m tonnes (-0.7%), but there will be marked variations from one Member State to another, with the United Kingdom (+3 m tonnes), Denmark (+1.2 m tonnes) and Germany (+1.1 m tonnes) increasing their purchases abroad and France (-4.2 m tonnes) and Spain (-1.4 m tonnes) reducing theirs.

The United States is still the Community's leading supplier, followed by South Africa, Australia, Colombia and Poland. These five countries supplied 87.5% of the Community's total imports in 1990. For 1991 the United States, Australia and Colombia all seem likely to lose some of their market share to Poland, and to a lesser extent, to other countries such as Indonesia or Venezuela. Deliveries from China will continue to be well below the levels expected a few years ago, falling from 2.4 m tonnes in 1990 to 1.8 m tonnes in 1991.

	(million tonnes)			
	1988	1989	1990	1990/1989
	Actual	Provisional	Forecasts	%
	<i>revised 30.03.90</i>			
<b>Coal</b>				
<b>Resources</b>				
- production	214.7	208.0	200.0	- 3.8
- recoveries	4.5	4.1	3.8	- 7.3
- imports from third countries	<u>96.7</u>	<u>103.6</u>	<u>113.1</u>	<u>+ 9.2</u>
<b>TOTAL</b>	<b>314.9</b>	<b>315.7</b>	<b>316.9</b>	<b>+ 0.4</b>
<b>Deliveries</b>				
- to coking plants	71.5	68.3	68.9	+ 0.9
- to power stations	195.9	199.1	200.4	+ 0.7
- to others	48.3	45.2	45.5	+ 0.7
- exports to third countries	<u>1.6</u>	<u>1.4</u>	<u>1.3</u>	<u>- 7.1</u>
<b>TOTAL</b>	<b>317.3</b>	<b>314.0</b>	<b>316.1</b>	<b>+ 0.7</b>
<b>Lignite and peat</b>				
<b>Resources</b>				
- production and imports	181.5	194.4	191.4	- 1.5
<b>Deliveries</b>				
- to briquetting plants	14.5	16.4	17.2	+ 4.9
- to power stations	163.8	171.8	169.7	- 1.2
- to others (exports to third countries included)	<u>4.4</u>	<u>3.8</u>	<u>4.0</u>	<u>5.3</u>
<b>TOTAL</b>	<b>182.7</b>	<b>192.0</b>	<b>190.9</b>	<b>- 0.6</b>
<b>Coke</b>				
<b>Resources</b>				
- production	52.9	51.7	52.0	+ 0.6
- imports from third countries	<u>1.5</u>	<u>1.3</u>	<u>1.1</u>	<u>- 15.4</u>
<b>TOTAL</b>	<b>54.4</b>	<b>53.0</b>	<b>53.1</b>	<b>+ 0.2</b>
<b>Deliveries</b>				
- to the steel industry	47.1	48.5	47.1	- 2.9
- others within the Community	5.9	5.8	5.3	- 8.6
- exports to third countries	<u>1.8</u>	<u>2.2</u>	<u>0.7</u>	<u>- 68.2</u>
<b>TOTAL</b>	<b>54.8</b>	<b>56.5</b>	<b>53.1</b>	<b>- 6.0</b>

Prices of imported coal increased at the beginning of the year, but now seem to have stabilized. There have even been recent signs of a slight erosion of spot prices for deliveries of steam coal.

The guide price for coking coal in the third quarter of 1990 was USD 59.40 as against USD 57.10 for the same quarter of the previous year; and the weighted average price of steam coal (all contracts and all origins) imported into the Community in the second quarter of 1990 was USD 53.45 per tce compared with USD 49.91 tce for the same period in 1989. The depreciation of over 20% in the dollar during 1990 naturally makes the price of imported coal in national currencies much lower, notwithstanding the increase in USD prices.

Current forecasts indicate that the trends observed over recent years, namely a steady decline in production, an increase in imports to balance total resources and virtual stabilization in deliveries, will show little change. The Gulf crisis is unlikely, for the time being, to produce any noticeable alteration in these trends given the low potential for substitution of coal for petroleum products.

The full-length report can be obtained by writing to:  
 Directorate General for Energy (DG XVII B)  
 Rue de la Loi 200  
 B-1049 Brussels

# Energy planning in the European Community (at regional level) - Activities in 1990

DG XVII: Task Force on Community integration: Accompanying measures unit (TF2)

*Energy planning at regional or local level in the Community aims to promote energy efficiency and the economic use of new and renewable sources of energy, compatible with the protection of the environment. This is best brought about by improving information about energy demand and supply, such as setting up energy flows, plans, carrying out energy demand and supply analyses and assessments. These actions are in line with the Community's goal of bridging the economic gap between EC regions.*

*Under the current programme, the Commission's (DG XVII - Energy) March 1990 invitation to submit proposals (OJ 90/C77/04) met a great response from the relevant public. More than 100 were received by the deadline (31 May 1990). The areas covered, the conditions of eligibility and the results obtained are summarised below.*

## Areas covered

- (i) Regional energy planning studies, which could improve the energy supply situation through a more rational use of resources in both production and consumption, whilst at the same time taking environmental aspects into account. Priority is given to proposals from regions where energy planning has not yet been properly developed : regions in economic decline, the Community's outlying and isolated regions, and border regions in a number of Member States.
- (ii) Feasibility studies on projects aimed either at the more effective use of energy, the exploitation of local resources or the introduction of more environment-friendly energy production or utilisation methods. Priority is being given to transfrontier proposals as well as those from underdeveloped regions.
- (iii) Studies of policies to ensure sounder energy management in the urban environment. Priority is given to proposals from towns or cities particularly affected by problems arising from the use of energy in urban areas.

## Conditions for eligibility

The proposals:

- (i) must relate to one of the above-mentioned fields;
- (ii) should be for work to be carried out within the territory of the Community;
- (iii) must provide a detailed financial plan;
- (iv) must indicate what resources will be used to disseminate the information and results obtained;
- (v) must be submitted by, or on behalf of, regional bodies or organizations;
- (vi) under (iii) of areas covered, must be submitted by a town or a city, by an urban energy management body or by a public transport undertaking. Towns or cities covered must have a minimum of 100 000 inhabitants.



## Results obtained

Following a thorough evaluation of the proposals received, and on the basis of pre-established objective criteria, 26 projects were finally selected for a total EC support (co-financing of a maximum of 40% of the total cost, or ECU 150 000) of approximately ECU 2 million. Of these projects, six refer to regional energy planning, nine to feasibility studies, and 11 to energy planning at the urban level. Several more proposals are on a waiting list for support, pending the availability of Community funds before the end of this year.

An invitation to submit new proposals in 1991 is being prepared and is expected to be published in the Official Journal of the EC before the end of this year.

The CEC (DG XVII) is also organising a wide dissemination of the results of the most successful and representative studies, for example through the publication of summaries in the form of 'map brochures'.

DG XVII organised a symposium in Crete, Greece (11 to 13 November 1990) on the theme 'Energy problems in

EC-islands' with the backing of the regional authorities of Crete. There were more than 200 participants at this event, representing regional or local authorities of various EC islands as well as a number of experts. The conference proceedings will be published and disseminated in due course.

Co-operation with the USSR is being explored between the CEC and the Soviet authorities in the area of energy efficiency and environmental improvements by energy planning, particularly at the urban and regional level.

DG XVII is organizing a symposium on 7 and 8 February 1991 in Mannheim in the course of which 12 exemplary projects in the field of urban energy management, one from each EC-Member State, will be presented in various, including brochure, forms. In addition, a proposal will be made to create a European network of energy- and pollution-conscious cities for the exchange of information and experience in this field.

Participating in this event will be representatives of many European cities, national and regional politicians, representatives of energy management and energy-producing companies, professional and local authorities' associations as well as interested experts.

# Review of 1987 and 1988 activities under the EC-International Energy Co-operation Programme

by M. Delehanty, DGXVII: International energy co-operation programme unit (A3)

*The Commission's International Energy Co-operation Programme has its origin in the oil crises of the 1970s when it became obvious that special importance needed to be given to energy planning, in both developed and developing countries. The international programme was thus developed to improve the long-term world energy situation and hence Community energy security by helping major Third World energy consuming countries to draw up and implement effective energy policies.*

*The programme has evolved in step with the needs of our co-operation partners and world energy trends. For example, the relationship between energy and the environment has become an increasingly important factor in the development of co-operation programmes. In view of the Commission's commitment to help Eastern European countries achieve political and economic liberalisation, the Programme has now been extended to this area and specific projects are being developed in Poland, Hungary, Czechoslovakia and Yugoslavia. Between 1980 and 1988, over ECU 33 million were spent by the Directorate-General for Energy on this programme. This article outlines activities carried out in 1987 and 1988.*

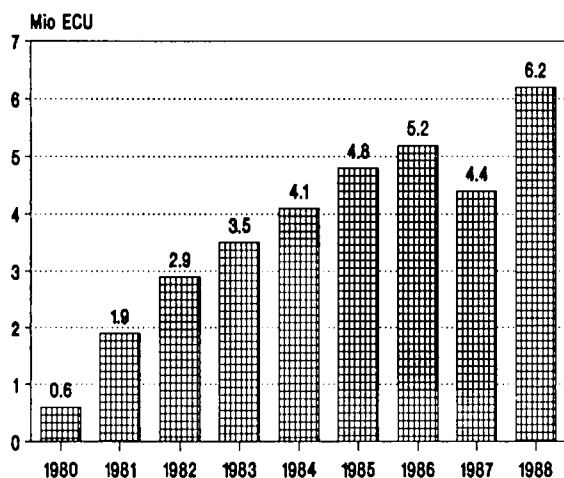
## Asia

Energy-associated activities in 1987 and 1988 focused on the People's Republic of China, with emphasis on training. A series of training courses in energy management were given to Chinese energy economists and energy conservation engineers. The Commission has been providing assistance to such courses since 1982. The courses are designed to familiarize participants with the principles of energy management, industrial energy conservation, electricity management, new technologies, project evaluation methods and energy economics.

Lectures were given at five training centres (located in Nanjing, Hangzhou, Tianjin, Shanghai and Chongqing) in two separate sessions which were attended by some nine hundred students. In addition, training courses on coal combustion were held at joint-centres in Harbin and Xian.

With two nuclear power plants now under construction in China, the Chinese Government set up the National Nuclear Safety Administration in 1986. The Commission supported the Administration in setting up a National Nuclear Information System and a Nuclear Emergency

EC-Commitments 1980-88  
for Energy Co-operation Projects  
in developing countries



- Chart 1 -

Response System. Training courses for nuclear inspectors were held in 1987 and 1988.

In the electricity sector, the Commission provided training and technical expertise for the Chinese Ministry for Energy in 1987 and 1988 for establishment of a National Electricity Dispatching Centre. Over the same period, a number of Chinese research institutes carried out energy planning studies with EC funding. Topics ranged from energy pricing to energy environment interaction.

India, whose Government has accorded a very high priority to the energy sector, also received assistance from the Commission in 1987 and 1988, in particular for training seminars and conferences. The Commission (DG XVII) sponsored two workshops on energy planning and energy policy for decision makers in South Asia. These workshops were arranged and carried out by the Tata Energy Research Institute (TERI), New Delhi, which has been a partner in DG XVII's international programme since 1981. The Commission also supported TERI in the holding in 1988 of a training course on energy planning for the power sector.

An international conference on energy conservation in the processing industry also took place in 1988. All these activities were successful in reaching key energy personnel in India. They are being co-ordinated through the EC-India energy sector centre, inaugurated in 1989, where an EC Special Adviser has now been appointed.

At the regional level, technical assistance was given to the Asian Institute of Technology (AIT), Bangkok, for the setting up of a data base for a regional energy development programme. Assistance was also given to preparatory work towards the setting up of an Asean-EC Energy Management Training and Research Centre (AEEMTRC) located in Bangkok. A more detailed article on the activities of the Asean-EC Centre is included in this issue of *Energy in Europe*.

The AIT is a member of the Co-operative Programme on Energy and Development (COPED), a network of energy research institutes located in Asia, Latin America, Africa and Europe, supported by the Directorate-General for Energy. In 1987 and 1988, AIT's activities were mainly devoted to research in energy planning methodology in developing countries. The specific aims of the project were to carry out an energy diagnosis and develop appropriate tools to study the energy requirements of Capiz Province in the Philippines. The approach used was based on the methodological guidelines developed by the COPED<sup>1</sup>.

1 Outlined in 'Energy Development', Lavoisier Publishing, Paris, 1984

*Countries and international organizations involved  
in the EC-International Energy  
Co-operation Programme - 1987/88*

Countries	International Organizations:	
Algeria	Jordan	AIT
Argentina	Mexico	Asean
Bolivia	Morocco	Olade
Brazil	Peru	Oapec
China	Senegal	
Columbia	Thailand	
Ecuador	Tunisia	
India	Venezuela	
Indonesia		

- Chart 2 -

Under the international programme, scholarships were awarded to students from Asian countries to follow a 20 month Master's Degree course in energy planning at AIT. The Commission also provided (and continues to provide) some lecturers for this course. Scholarships continue to be awarded to enable students to participate in this course.

Another important project which was carried out with the Commission's practical support was the development of an energy planning methodology for the Thai National Energy Administration, again based on the COPED methodology. This project enabled AIT to identify and assess the problems and constraints in transferring and adapting COPED's approach to the whole region. The results of the project were presented and discussed with Senior Thai energy planners in October, 1988.

Indonesia was the focus of an energy bus project initiated in 1987. The energy bus is a valuable aid in improving energy efficiency through 'on the spot' energy audits. Equipment (measuring instruments, computer software) and training of personnel was provided by the Commission. The Indonesian authorities financed the vehicle itself and provided the necessary personnel. The EC also provided funding in February 1990 for an expert to accompany the bus during its initial operative year.

## Latin America

Energy activities in Latin America concentrated on Mexico and Brazil. The second phase of support, begun in 1985, was given to Mexico's Ministry for Energy and Mines (Semip). Several projects were undertaken, including a survey of ninety rural areas in Mexico, a study of the transport sector in Mexico City and a study of selected industrial sectors. Phase III was begun at the end of 1987 and consisted of a consolidation of the earlier work of Phases I and II. The results of the programme were presented at a seminar in Mexico in November 1988, which confirmed that very real progress had been made in assisting the Mexican authorities in energy planning and conservation. A firm desire was expressed by the Mexican authorities to continue the programme. A second co-operation programme with Mexico has since been established and this is proceeding satisfactorily.

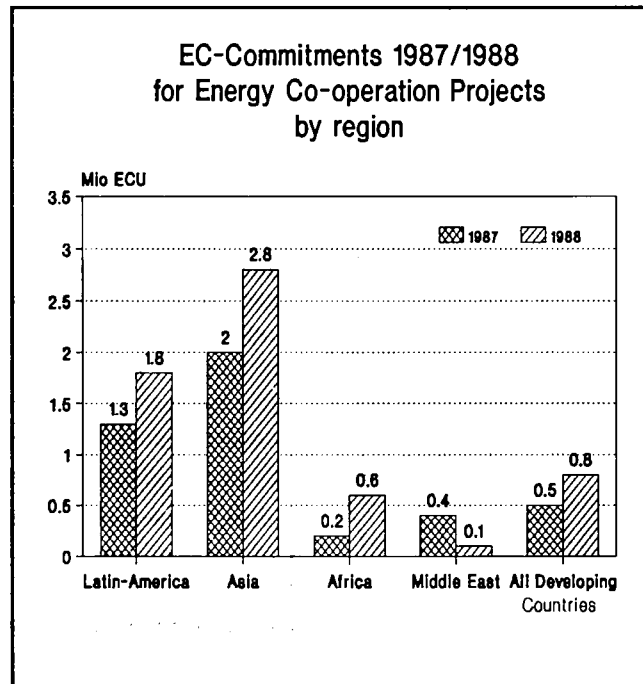
Activities in Brazil centred on seminars and training courses and study visits of Brazilian experts to the European Community. A seminar on prices and tariffs took place in November 1988 and this was followed by a 5-day course on modelling and forecasting tools. All these courses were well attended and were of considerable benefit to Brazil's energy planners.

Other South American countries also figured in the programme in 1987 and 1988. For example, Argentina received support for Phases III and IV of a major study on north-east Argentina. Over one hundred professional and technical staff from the governments of six different regions participated in the study, along with representatives of the Energy Ministry and the Instituto de Economia Energetica (IDEE) located in San Carlos de Bariloche, Argentina. COPED methodologies were again applied in this study. The objective of the study was to identify and tackle the energy problems of each region, enabling supply and demand

forecasts to be drawn up. The next step is to draw up plans which would serve to remedy those deficiencies identified.

In the training area, the Commission supported a Latin-American course on energy Economics and Planning in 1987 and 1988. This course, which is run by IDEE, has been supported by DG XVII's international programme since 1985 and has trained hundreds of people from the whole of Latin America who are now working in government planning organizations, energy agencies and universities. Support from the Commission took the form of student scholarships and funding of European professors.

Olade, the Latin-American Energy Organisation, ran courses in Energy Planning in Quito and Barbados in 1987 and 1988 respectively. These were attended by students from the whole of Latin America.



- Chart 3 -

divided into two parts - development of an information system and a programme to promote the rational use of energy.

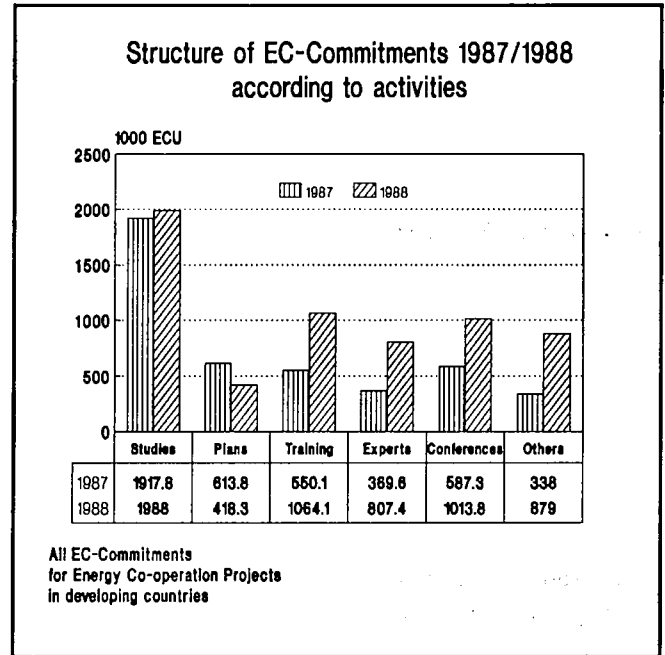
## Other Areas

On top of support to Latin America and Asia, support was also given to activities in Algeria, Morocco, Tunisia and Jordan. For example, a seminar on energy planning in Algeria took place in 1987 and Moroccan energy personnel

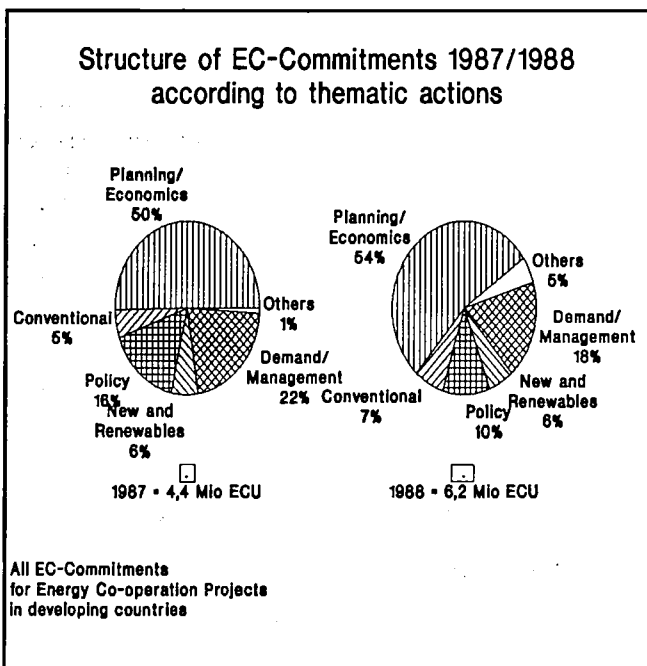
As for Peru, technical assistance for energy planning was given to the Ministry of Energy and Mines. Support was channelled to Cenergia, a body specifically set up to promote energy management. Finance was also given to help the Peruvian government develop an effective energy policy following the discovery of reserves of natural gas.

In Venezuela EC support consisted of assistance to the Venezuelan authorities for energy planning. The programme, begun in 1988, was co-financed by the French authorities. It was

were brought to Europe to study the energy bus system. Under a co-operation agreement with the Jordanian Energy Ministry, specialists were sent to Jordan to aid the development of the country's energy policy. Assistance was also given to Senegal for an energy planning course in Dakar. Support was also given to the COPED Research Institutes to carry out research in selected areas in their regions (see article in Energy in Europe 15). Continuity and exchange of ideas within this organisation were facilitated by annual meetings which took place in the UK and in India in 1987 and 1988 respectively.



- Chart 5 -



- Chart 4 -

## Conclusion

The above description of recent activities demonstrates the diversity of projects supported by DG XVII's International Energy Co-operation Programme. A breakdown of activities can be found in Chart 5. All activities fall into the area of; 'Studies', 'Plans', 'Training', 'Experts' and 'Conferences'. Most of the commitments during the period were on studies. Over the two years in question, ECU 10.6 million was spent on improving the planning abilities of over twenty developing countries representing co-operation with over one hundred institutions. There is clearly a need for this work to be carried out and the Commission (DG XVII) is continuing to meet this need through the International Energy Co-operation Programme.

# Asean-EC Energy Management Training and Research Centre (AEEMTRC)

by Professor Wahjudi Wisaksono, Director, AEEMTRC

*The origin of AEEMTRC goes back to a visit by former EC Commissioner for External Affairs, Claude Cheysson, to the Association of South-East Asian Nations (Asean) in 1985. During this visit, the suggestion was made that Asean and the EC might co-operate in a joint energy programme. The idea of a centre was proposed by the EC at the Asean-EC Ministerial meeting on economic matters in Bangkok, October 1985.*

*Intensive discussion within Asean of the merits of the network form of co-operation already practised in Asean followed. Eventually, it was agreed to establish a joint institution (an Asean institution in co-operation with EC) and the offer of Indonesia to host the Centre in Jakarta was accepted. Negotiations between Asean and the EC were lengthy, but the prolonged process helped create a better common vision of the role and function of the centre and helped some of the differing expectations and objectives of both parties to converge.*

*AEEMTRC was formally inaugurated on 8 November 1988 by Mr Ginanjar Kartasasmita, Indonesia's Minister for Mines and Energy, in the presence of the Ambassador of Spain (Spain was at that time President of the Council of Ministers of the European Communities), the Head of the EC representation in Jakarta, several European Ambassadors and Asean's Senior Officials on Energy Co-operation (SOEC).*

Meeting in Manila on 15 December 1987, Asean heads of government included in their final communiqué the intention that: 'Asean shall enhance co-operation in the field of energy, including energy planning, exchange of information, transfer of technology, research and development, manpower training, conservation and efficiency, and the exploration, production and supply of energy resources'. AEEMTRC now makes this aim possible.

Cash funding to carry out part of the programme of AEEMTRC is provided by the EC and is secured over a three year period. The EC also provides a resident adviser and some short-term consultants. The government of Indonesia has kindly provided a suite of offices in the premises of the Oil and Gas Technology Research and Development Centre (Lemigas) in Jakarta, as well as administrative and other in-kind financial support.

Asean member states support AEEMTRC in providing facilities and footing local costs for workshops, nominating staff and giving expert guidance and criticism in the carrying out of studies. To date, the Ministry of Energy in Malaysia has hosted workshops on energy and the environ-

ment in Kuala Lumpur in July 1989. The Office of Energy Affairs of the Philippines hosted a workshop on urban energy planning in May 1990, and the member states have responded to requests for nomination of speakers, provision of data and other necessary inputs.

AEEMTRC reports to a Project-Steering Committee composed of members appointed by the Asean Senior Officials referred to above and by the Commission of the European Communities.

The objectives of AEEMTRC as set out in an agreement between Asean and the EC are:

- to strengthen co-operation among the Asean countries and between Asean and the European Communities in the field of energy;
- to contribute to the Asean-EC dialogue on energy issues of mutual interest;
- to provide a focus for joint energy activities.

In addition, AEEMTRC has acquired the role of a permanent analytical and research body in the energy field for Asean Senior Officials on Energy Co-operation. If this role is confirmed in the long run, and if AEEMTRC fulfills it successfully, then it will represent a small, but significant change in the manner in which Asean conducts its affairs.

## Activities

There are regular training workshops. Topics chosen for workshops are related to the research programme either as a means of transferring results of research, of defining research topics in new areas or to initiate research programmes. The first three workshops were aimed at a relatively senior level. The first was held in Jakarta in July 1987 before AEEMTRC was officially inaugurated. It dealt with industrial energy management and was intended to transfer energy conservation technologies and methodologies of formulating and implementing energy conservation policy, but also to help define research fields for future work by AEEMTRC.

The second training workshop devoted to energy system analysis and decision-making, was held in Jakarta in November 1988, straight after the centre's inauguration. The objective of this workshop was to review methodologies and experience in energy system analysis, particularly limitations and difficulties, and to give practical experience of a variety of softwares available.

The third workshop, in Kuala Lumpur in July 1989, was the first to be held outside of Jakarta. It dealt with energy and the environment and was designed to examine the interactions of policies in these areas and to help establish priorities and difficulties of implementation.

A similar workshop on urban energy planning was held in Baguio City, Philippines in May 1990, and one on electricity demand analysis was held in September in Bangkok.

## Research

AEEMTRC is also active in the research field, acting in two ways. In-house research is carried out and it also serves as a focus and a channel for Asean guidance in joint research activities with third parties outside Asean institutions.

## In-house research

### Data and information

A reliable set of statistics is fundamental to any research in energy planning. The first priority of AEEMTRC has thus been to assemble data on all aspects of energy supply and use in Asean. At the request of Senior Officials (1988), AEEMTRC designed a reporting format and obtained the agreement of member countries to provide the information requested. Most of the data has now been transferred to AEEMTRC, which will prepare regular reviews of the energy situation in Asean based on this information.

### Asean 2010

A major project of AEEMTRC is to prepare a regularly up-dated long-term supply-demand study for Asean. This study, known as Asean 2010, is the first attempt to provide, at Asean level, an idea of future needs and possibilities. An important objective of the study is to provide an insight into the opportunities which exist for collaborative supply developments. Asean 2010 was initiated by an objectives-oriented project planning meeting in February 1990.

### Urban energy planning

The problems of overloaded infrastructure in the huge cities of Asia do not need to be stressed. AEEMTRC is conducting research into possible means of alleviating the problems, at least in energy and related sectors. The project was initiated at a workshop in May 1990 and arrangements have already been made with the city of Baguio in the Philippines for implementation of the first urban energy planning case study. Baguio was chosen because of its relatively small size, yet it has most of the problems of larger cities. It also has relatively good data. After completion of the Baguio study, AEEMTRC will work with Chiang Mai, Thailand, to look at the problems of a larger conglomeration and will finally focus on a large city in Indonesia.

### Electricity demand analysis

The third major project is on electricity demand analysis and in particular, the role of price. This subject is of great importance for Asean as the present rate of growth in demand for power, if continued, will lead to crippling capital requirements. An understanding of what determines demand for power is therefore vital. The initial institutional contacts for this project have been made. Data

has been obtained and the project was fully initiated in September 1990 at a workshop in Bangkok.

### **Programme (Plan) of Action for Co-operation in Energy**

At the Asean Senior Officials meeting and Ministerial meeting held in Kuala Lumpur in June 1989 AEEMTRC was asked to prepare an Action Programme for Energy Co-operation. This falls in line with the Manila Declaration by heads of government, on the strengthening of Asean. AEEMTRC has made a preliminary enquiry among the Asean countries of specific areas for co-operation, and following talks with senior officials, further defined and developed its initial ideas. This is an important development for Asean, but also for AEEMTRC, as it demonstrates the willingness of Asean to use the centre for its original purpose.

### **Work with third parties**

As mentioned earlier, AEEMTRC has an important role in working with non-Asean institutions on matters of importance to Asean. Guidance and comments are communicated to Asean officials, hence extending the scope of work which it is able to undertake and giving access to sources of expertise which would otherwise be difficult to mobilise.

AEEMTRC currently has two such projects. In one, it is working with the Asian Institute of Technology in a project for the dissemination of energy conservation technology. If this project is successful, it might open the door to demonstration projects in energy conservation, some new to the region.

### **Conclusion**

The second project of this kind is the feasibility study of a natural gas pipeline extending through all Asean countries including its diverse consequences for the countries and the region. Here, AEEMTRC is working with a consortium of European companies to fund and outline the feasibility study. Although many of the details of this have yet to be settled, it promises to be a most interesting development.

AEEMTRC's progress has not been as rapid as first envisaged. However, in initiating a joint venture between two regional associations delays and difficulties must be

expected. These have now been successfully overcome. AEEMTRC has an agreed legal basis within Asean and with the EC. It has adequate funding for its first phase and a work programme has been agreed by the Asean Senior Officials meeting and the project steering committee of AEEMTRC.

AEEMTRC has received excellent co-operation from Asean member countries in secondment of staff, provision of data, hosting of workshops and many other encouraging signs of support. Despite delays, the original research projects should be finished within the time foreseen for the programme. On top of the original content of the research programme, the Programme of Action for Co-operation in Energy for the Senior Officials and two new projects have been added. These are not just important projects, but reveal the different possibilities open to AEEMTRC.

The setting up of AEEMTRC represents a distinct change in the institutional character of Asean. It is the first time that a representative decision-making body of Asean (i.e. the Senior Officials and the Ministerial meeting) have at their disposal a permanent analytical and research body. Normally, the only support given to Asean meetings is secretarial and there is no permanent access to technical and analytical services at an Asean level.

The existence of AEEMTRC is an innovation and the Senior Officials have been quick to take advantage of it. Requests so far for a common data reporting format and for the development of an Asean Programme of Action for Co-operation in Energy, are clear indications of the role of AEEMTRC in strengthening Asean co-operation. From the Asean Programme of Action for Co-operation in Energy a systematic basis for the exchange of research results on energy policy management will develop, as well as planning techniques, energy statistics, forecasting, joint programmes in Asean and identification of sectors for co-operation programmes.

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**Fourth Asean-EC Energy Management Training and  
Research Centre Workshop on  
'Integrated Energy Planning in Urban Communities',  
Baguio City, Philippines, May 1990.**



From left to right:

*Mr de la Paz, Director of Office of Energy Affairs, Manila  
The Honourable J.R. Bugnosen, Mayor of Baguio City  
Professor W. Wisaksono, Director, AEEMTRC*

# PACE<sup>1</sup> - A Community action programme for the efficient use of electricity

by R. H. Greenwood, DG XVII: Electricity unit (C1)

*Electricity consumption continues to grow inexorably, yet there are limits to the provision of new generating capacity. Moreover, the Council agreed on 29 October to stabilise CO<sub>2</sub> emissions in the Community by the turn of the century. What can be done? PACE - a Community action programme to use electricity more efficiently - offers a major contribution to any solution.*

Electricity generation accounts for about one third of total primary energy consumption in the Community. The reason that the share is so substantial is partly because electricity is a derived energy form, so that for the most part, other fuels are consumed to produce heat and then generate electricity. Moreover, for thermodynamic reasons, it is difficult to convert more than a proportion of the energy consumed into electricity. On average only about 35% of primary energy input is converted to electricity in power stations, although the efficiency of conversion is constantly being improved. Moreover, certain energy sources, such as hydropower and nuclear energy, can in practice only be exploited via the electricity route.

Indeed it is sometimes said that electricity is at the crossroads of energy supply, since it can convert virtually any source of energy to a form which can be used in every kind of application. Such applications include, for example, the driving of motors, used in every part of industry as well as in the home in virtually all domestic appliances. Electricity is also essential for all modern communications and computing equipment as well as for hi-fi, television, and other electronic home entertainment goods. Electricity can be readily converted to heat in a controlled manner, which often makes it suitable for industrial heating applications and for both space and water heating in commercial and domestic premises. Electric lighting, of course, is found in virtually every building and public thoroughfare, and another unique use of electricity is in electrolysis, widely used in the chemical industry.

The great diversity of electricity use, particularly in a developed economy, means that it is the energy form with the fastest rate of growth in demand. Whereas energy use in general in the Community has tended to remain static or grow only slowly over the last decade, electricity consumption has continued to grow at about 3% or more a year, and is forecast to continue at an annual rate of around

2%. Furthermore, this growth rate applies to a very large existing use of electricity and thus to a very large generating capacity. At present, the total Community generation park stands at about 450 000 MW; if demand growth continues at about 2% per annum, in just eight years, new capacity (i.e. - ignoring replacement investment) totalling about 75 000 MW will be required - about the size of the total generating park in the UK.

Some Member States are already experiencing difficulties in constructing new power plants, often because of problems in obtaining planning approvals. But in any case it is difficult to imagine how this amount of new demand could be met, especially since virtually all the fuel options present one problem or another. Coal, one of the major fuels currently used for electricity generation, gives the greatest discharge of CO<sub>2</sub> per unit of electricity produced. Moreover, a significant increase in its use could have a major impact on the coal market and in particular on prices, as well as requiring substantial new transport infrastructure. As a matter of policy, nuclear energy is not used in several Member States, and whilst natural gas is currently abundant, a major and sustained increase in its use for electricity generation could eventually lead to excess demand and increased prices. In any event, all of the fossil fuels are finite, and all of them add CO<sub>2</sub> to the atmosphere, (although CO<sub>2</sub> emissions per kWh from natural gas are about half of those from coal). Yet the combined Energy/Environment Council of 29 October agreed to stabilise CO<sub>2</sub> emissions at 1990 levels by the year 2000 (or, for a number of Member States, by 2005).

<sup>1</sup> The French acronym.

The renewable energies give no gaseous emissions to the atmosphere and they are inexhaustible. But of the renewable energies, only hydropower can make a significant contribution to supplies, currently meeting about one eighth of total electricity demand. Furthermore, the potential hydro capacity which could be developed in the Community is relatively limited. As for the other renewable energies, even with further technological advances and a concerted programme of support throughout the Community (areas in which the Commission is itself very active) their potential contribution could only meet a fraction of new supplies required.

Because of the greenhouse effect and the need to limit CO<sub>2</sub> emissions to the atmosphere (and electricity generation currently accounts for about 30% of man-made CO<sub>2</sub> emissions in the Community), because of the cost and difficulty of meeting new capacity requirements, and because of the impact the consequent increased demand for primary fuels would have on the various energy markets, it is clear that action must be taken to stem the growth in electricity demand. Improving the efficiency of electricity generation has a role to play, and technological improvements, introduced in particular through new plant, are slowly but steadily increasing conversion efficiencies. But given that society will continue to seek the benefits which electricity-consuming appliances and equipment bring, the main action must be improving the efficiency of electricity end-use.

A wide range of studies and investigations have demonstrated that substantial potential for improving the efficiency of electricity end-use exists, and that the measures required to realise these improvements are often very economic. For the consumer this would mean, for example, that the extra cost of a more energy-efficient refrigerator is more than re-paid by the savings in electricity consumption over a couple of years. The same logic applies to the industrial consumer; for example new methods of induction heating in industrial processes can sometimes be much more economic than traditional heating methods, either electrical or with other fuels.

In fact decisions of this kind reflect the fact that there is considerable potential for measures to save a kWh, which are less costly than building new capacity and generating an extra kWh for consumption. Furthermore, the argument in favour of saving measures is even stronger when one remembers that electricity prices do not include the external costs, for example of atmospheric emissions associated with electricity generation. Yet the measures

taken to improve energy efficiency in general, and electricity end-use in particular, are far less than the economics justify. Part of the reason for this is that the relevant decision-making is dispersed; normally no single entity is responsible for comparing and implementing actions based on new energy supplies or on energy saving measures as alternatives. Instead, quite understandably, the three main actors tend to concentrate on their primary responsibilities: the electricity supplier ensuring that there is sufficient capacity to meet demand, the consumer, particularly the domestic consumer, buying equipment to satisfy a range of criteria (of which energy efficiency is just one) and the equipment manufacturer doing his best to meet the client's various desires, often in a very competitive market.

Returning to the example of the refrigerator, research has shown that the electricity efficiency of new models which currently exist on the market varies by a factor of two or more, with the more efficient appliances being perfectly satisfactory in all respects and little different in price. However, consumers are often unaware of the energy efficiency aspect, and the less efficient appliances continue to be sold, even though improving their efficiency is often technically quite straightforward. Thus, not only is there a pressing need for action to improve the efficiency of electricity end-use, but what is more the economic possibilities for improvement are far from being fully exploited. In short, the normal market incentives are failing to work.

In the light of these considerations, the Council, on 5 June 1989 adopted a Decision establishing a Community action programme to improve the efficiency of electricity end-use<sup>2</sup>. This Decision requires the appointment of a body within each Member State to coordinate the implementation of actions on electricity efficiency within that country, and gives the Commission the role of coordinating these actions at Community level, as well as pursuing its own actions where appropriate. The Decision establishes an Advisory Committee to the Commission, which it chairs, made up of representatives from the Member States. The Commission also has the role of monitoring and reporting on the programme to the Community institutions, and may make proposals to the Council for any further action required to achieve the programme's objectives.

<sup>2</sup> 89/364/EEC of 5 June 1989 (O.J. L157/32 of 9 June 1989)

After the Decision by the Council to establish the programme the initial task of the Commission was to formulate a strategy for its implementation. This was done after consultation with the Advisory Committee and with representatives of all the major actors involved, including the manufacturers of electrical equipment and appliances, the electricity supply industry, and consumer organisations. The guiding principles the Commission followed in this work were to concentrate on actions which are effective, particularly in relation to their cost; to select actions which are relatively quick; to build as much as possible on existing activities and experience; and lastly, to seek for consistency with actions in other areas. For example under the first head, incentives for electricity efficiency through fiscal instruments do not feature in the programme, since possible changes at Community level are being explored in a much broader context, a process which is likely to need some time.

The Commission must also build on the activities and experience existing within Member States, and for this reason, one of the Commission's first steps was to investigate national activities as well as Member States' views on possible areas of cooperation at Community level. This was achieved, in particular, through meetings of the Advisory Committee and by sending a questionnaire to each of its national representatives. The results of this research show a great range of activity in the Member States, and one of the Commission's primary tasks under the programme will be to promote the exchange and coordination of this kind of information and experience.

The fourth principle, of consistency with other activities, is clearly important. There has been close coordination with other relevant programmes for which the Directorate General for Energy is responsible, and in particular with the Energy Technology Demonstration Programme and its successor Thermie, and with the new SAVE proposal (see separate articles in this issue). Indeed, the SAVE proposal for a new general energy efficiency programme incorporates most of the initiatives currently being pursued under PACE, although the obligations placed on the Commission under the June 1989 PACE Decision must clearly be respected until superseded. Links have also been made with other Directorates General within the Commission wherever appropriate and in particular with those Directorates General responsible for standards (e.g. for domestic appliances), for the environment, and for research and development.

The implementation strategy developed by the Commission groups activities in six main areas, called

'Action Areas'. One is the Commission's central role in facilitating the exchange of information and experiences between the Member States. This Action Area also includes possible cooperation on future activities, such as on studies, data bases, seminars, conferences, and other information activities. A second Action Area concerns electricity in the home, and here it is envisaged to encourage the giving of advice to domestic consumers on electricity efficiency, for example through brochures, through flysheets with electricity bills, and through consumer associations' publications. Many of these ideas are already used in many Member States. Our role is to draw on the expertise and experience which exists in some Member States to the benefit of others who are not yet exploiting such techniques.

Another Action Area concerning the domestic sector, though separated because of its special characteristics, is action on efficiency labelling and standards for domestic appliances. Domestic electricity consumption accounts for about 30% of total demand in the Community and about two-thirds of this is thought to be accounted for by home appliances. Furthermore, as has been previously indicated, whilst efficiencies have been substantially improved by some manufacturers, appliances with much lower efficiencies are still widely available on the market. To help remedy this, the Commission is reconsidering the question of labelling and/or minimum efficiency standards for domestic appliances. In this respect the Commission recently organised a workshop with over 100 participants, including representatives of all the major actors, to fully debate the problems and opportunities for these two topics. There was a general recognition for further action in this area, although the manufacturers of appliances argued strongly that it should be on a voluntary, rather than a compulsory basis.

Because of the common need to target actions on key decision-takers and because of their rather more specialist nature, activities to encourage electricity end-use efficiency in the industrial and the commercial sectors (including public buildings) have been grouped together. Measures to increase awareness and convey information are central components of the strategy, through brochures, seminars, conferences and other such activities. The industrial use of electricity is extremely diverse, and it is important to give the right information to the right people. In the commercial sector, on the other hand, the techniques are more limited and include climatic control and heating of working areas, lighting, and office equipment. Another idea under this Action Area is to promote awareness of energy issues in

commerce and industry, by encouraging the use of energy accounts (including electricity) wherever appropriate.

One of the benefits from the programme should be to defer the need for new generation plant, an objective which also results from a more even use of electricity over time. Apart from a few pump storage installations, electricity cannot be stored in large quantities, so generation capacity must be sufficient to meet peak demands. For the rest of the time, however, this plant is not used, representing poor utilisation of economic resources. If demand can be shifted from these peak periods to other times, utilisation is clearly improved. Whilst some Member States have attained rather level demand curves, through tariff incentives and load management devices, other countries still need to make progress. Moreover, the general level of electricity prices will have some effect on demand (although the effect is thought to be less in the domestic sector). For these reasons the Commission is particularly keen to learn of the techniques and possibilities for 'load management', including through electricity tariffs, and for extending their use throughout the Community wherever appropriate.

The last Action Area is to explore the possibilities for drawing up, in consultation with the Commission, some sort of declaration or code of practice on electricity end-use efficiency by the electricity supply industry. Consultations

are currently underway with Eurelectric, (the organisation representing the electricity supply industry in the Community), and it is hoped that the declaration will be finalised and adopted shortly. In brief, it would represent an undertaking by the industry to promote the efficiency of electricity end-use, through the provision of information and advice to consumers, through research and development, and by other activities. The idea was inspired by the new UK electricity supply industry legislation, although it should be noted that its adoption by Eurelectric, in contrast, would be on a voluntary basis.

The foregoing paragraphs have attempted to give a description of the activities being carried out under the Community action programme to improve the efficiency of electricity end-use. And it is indeed a Community programme, with each Member State carrying out activities, including some not necessarily proposed at Community level, best suited to its particular circumstances. The Commission role is to stimulate; to encourage the exchange of information; to persuade; and, if necessary, to propose legislation. But ultimately the programme's success depends on the efforts and cooperation of all the actors in the Community electricity market. And since that includes electricity consumers, that means each and every one of us!

# Energy demonstration programme 1979 to 1989

## An initial evaluation of the projects financed by the EC Commission

DGXVII: Energy Technology Directorate - Strategy, dissemination and evaluation unit (D1)

*The energy demonstration programme and funding for technological development projects in the oil and gas sector wound up at the end of 1989. The projects financed under these programmes were analysed in a DG XVII study.*

*Its purpose was to set out a series of reference criteria for evaluating future proposals and to draw up guidelines for evaluation of the Thermie programme.*

*The study made an analysis of funds granted under the demonstration programme and an examination of energy production and consumption trends. It focused largely on the principal demonstration sectors, since results obtained in the oil and gas technology programme and in the coal sector could not be analysed in the same way as the bulk of activities under the demonstration programme.*

### Summary of proposals

Out of the four major sectors covered by the demonstration programme, only two: Energy Saving and Renewable Energy Sources, were suitable for analysis based on the eligible cost of the projects and on the quantity of energy saved or produced.

All 838 proposals accepted by the Commission between 1985 and 1989 in the two sectors concerned were thoroughly examined. A set of 26 tables was annexed to the study in question detailing results.

By analysing the recorded data on the projects and taking account of the features specific to each of the sectors, it was possible to recommend for the coming period of the Thermie programme (1990 to 1994) reference criteria to assess the perspective for new projects.

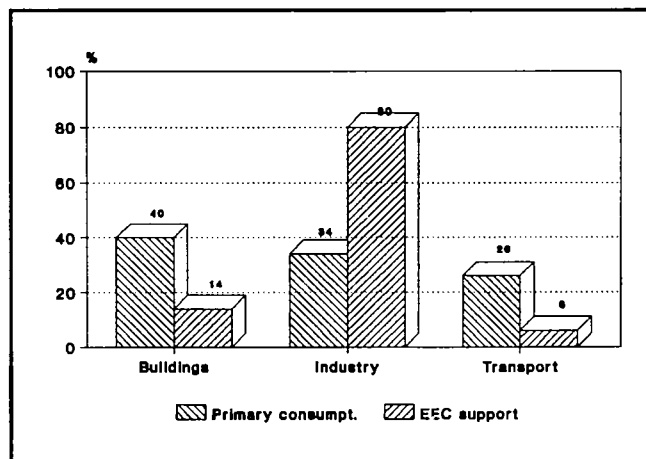
### Developments in energy saving

Over the period of the analysis, a considerable disparity surfaced in the breakdown of funds granted to industry, building and transport projects. Industry, accounting for 34% of primary energy consumption, received 80% of funding, while buildings (40% of consumption) obtained only 14% and transport (26% of consumption) only 6%. An overview of the support granted to industry, buildings and

transport is set out in Figure 1.

Figure 1

Distribution of EEC support (projects EE, EC and CS) between 1979 and 1989 by activity sector (industry, buildings and transport)



There are numerous reasons for the imbalance, the chief one probably being the predominant role played by the influence of pay-back time on the procedure for project selection.

The nature of the project proposer also has a bearing. In the industrial sector, the proposer (who is also the future

user of the technology) is normally 'master' of his own investments. In the transport or building sector, the main protagonists are many and varied so that setting up a partnership is rather difficult.

In industry, there has been a slight rise in specific project costs, which increased from ECU 300 to ECU 800 . year/toe (tonnes oil equivalent) between 1985 and 1990.

The study recommends a similar reference cost for the Thermie phase (1990 to 1994) to that defined for 1990, namely ECU 800 . year/toe.

As for buildings, there has been a rise in specific costs from ECU 500 to ECU 1 000 . year/toe over the same period.

For future years, the study proposes a reference cost of ECU 1 000 . year/toe.

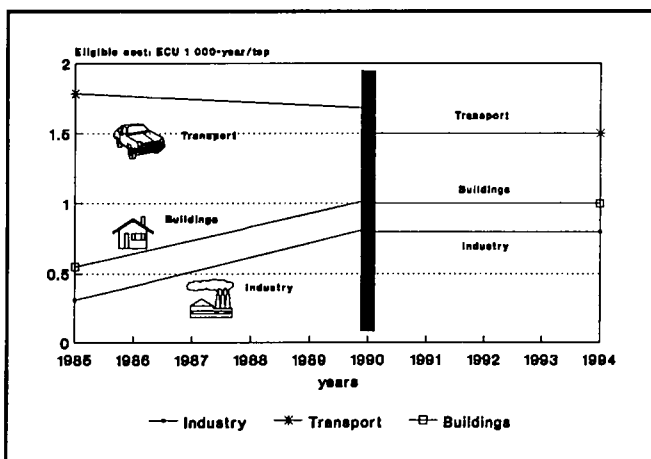
In the transport sector, a slight decrease has occurred since 1985. Projects directed towards transport management proved to be more cost-effective in terms of overall benefits than those focusing on mechanical or dynamic improvements to vehicles.

A reference cost of ECU 1 500 . year/toe for the coming years seems realistic. The figure is appreciably lower than in previous years, but could be attained through the establishment of projects targeted mainly on urban transport.

Figure 2 presents the results obtained.

**Figure 2**

Evolution of the eligible cost between 1985 and 1989 of industry, buildings and transport and the reference cost for the period Thermie



## Developments in alternative energies

There is a considerable variation in terms of economic forecasts between proposals relating to alternative energies. If, for example, reference is made to pay-back time, the average values range from 2 to 3 years for biomass, 5 to 6 years for wind energy, to an estimated 20 years for solar thermal energy or 180 years for photovoltaic techniques.

The great diversity of the results reflects technical and economic differences.

Many energy sources, such as biomass, already have interesting economic prospects in the short-term. The other sources such as mini hydroelectric, geothermal energy or wind energy are not as economically advantageous but their overall balance can be improved appreciably if account is taken of other benefits deriving from local exploitation of resources and the opportunity in some cases of integration within the local network.

That balance could be improved further still by taking account of investment, operating and maintenance costs spread over the entire lifetime of the installations. (Life Cycle Cost).

Under the Thermie programme, the reference values proposed in the study are ECU 1 600 . year/toe in the case of solar thermal energy, ECU 800 . year/toe for biomass, ECU 450 . year/toe for geothermal energy, ECU 0.45 . year/kWh for wind energy and ECU 0.14 . year/kWh for low-power hydroelectric plant.

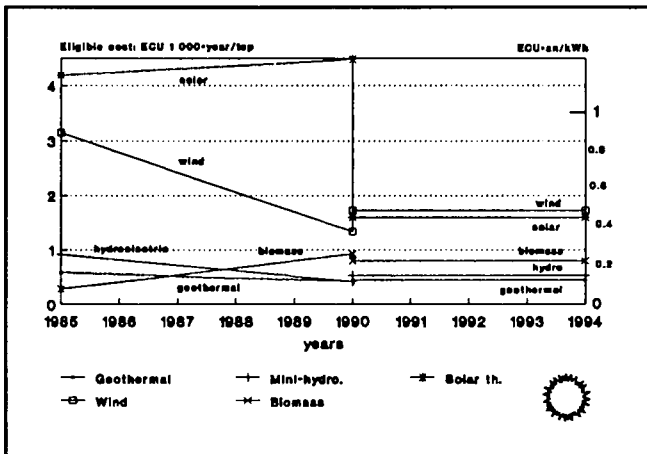
(see Figure 3)

## Recommendations for the Thermie programme

An analysis of proposals submitted for the demonstration programme, as well as the experience acquired in managing projects, enable some preliminary recommendations to be made for the selection of future projects and the best approach to be adopted under the Thermie programme.

Figure 3

Evolution of the eligible cost between 1985 and 1989 of renewable energies and the reference cost for the period Thermie



### Evaluation of future proposals

In energy saving, industry places special emphasis on financial criteria. These criteria provide a simple way of establishing the cost-effectiveness of an innovative technology in terms of energy saved, productivity gains or improvements in product quality.

It would however be highly desirable to link these financial indicators with broader evaluation criteria.

For example, replication of the project must be made a condition for granting support. Special attention must therefore be paid to this when proposals are being examined to ensure that a given technology will in the future attract potential investors.

The overall benefits generated by the project generally make the pay-back time more significant. For this reason, it is advisable to back up the evaluation of proposals by paying attention to the relative proportion of energy in the overall operating costs and by assessing the absolute value of the benefits.

The rate of equipment renewal also plays an important role in marketing energy technologies, particularly in industry,

where the lifetime of investments is shorter than in the building or transport sectors.

In certain areas, greater significance is attached to collective social or ecological considerations. In urban transport, for example, projects can be justified on the basis of factors other than energy such as pollution, congestion or an improvement in the quality of life.

In all sectors where investments are repaid over quite a long period (buildings, transport, most renewable energies) and, to an even greater extent, where maintenance costs are marginal in comparison with the amount invested, cost-effectiveness can be improved considerably by evaluating the entire lifetime of the investment. This factor may become very important when the decision-maker is accustomed to calculating in terms of lengthy periods.

### A strategy for the promotion of energy technologies

The Thermie programme is part of the Community's energy strategy. One of its purposes is to promote innovating technologies for energy production and consumption.

The EC Commission relies on two main courses of action in promoting such technologies: financial support for technological projects, and dissemination of the results, vital for paving the way onto commercial markets for these new technologies.

Past experience shows that the importance of dissemination support varies according to the technology. In all cases, it must however be limited to a certain market penetration threshold, beyond which the technological breakthrough will occur anyway by means of commercial information channels which do not require public aid.

Market studies aimed at promoting technologies must identify that threshold and assist in undertaking targeted actions to this purpose.

To sum up: proper evaluation of proposals, drawing on past experience; integration of technologies into the market economy; and appropriate dissemination of project results are the three main components governing future funding of projects under the Thermie programme.



# The Thermie programme - promotion of energy technologies in Europe

by Michael Gowen, DGXVII: Energy Technology Directorate -  
Strategy, dissemination and evaluation unit (D1)

*Thermie (a programme for the promotion of energy technologies in Europe): another acronym, another Community programme. Why do we need a programme for energy technology? What can it achieve, and how? This article sets out to answer these questions..*

*Ever since the oil price shocks of the 1970's the Community has been aware of the important role which technology has to play in facing the energy policy challenges of the future: the challenge to reduce energy consumption whilst sustaining economic growth; the challenge to reduce dependency on imported supplies of oil; the challenge to develop indigenous hydrocarbons and renewable energy resources; the challenge to reduce environmental pollution and to consume and produce energy in a more environmentally friendly manner. Recent events in the Gulf have emphasised the crucial importance of these challenges for the future economic prosperity of the Community.*

*Throughout the 1980's the Community contributed ECU 1.4 billion to demonstrate energy technologies and develop hydrocarbon technologies through two separate programmes<sup>1</sup>. As these programmes expired at the end of 1989, independent evaluations<sup>2</sup> were conducted. These indicated that the technologies which were being demonstrated and developed, were not automatically spreading across the Community and being more widely implemented, particularly when national boundaries had to be crossed. The need became obvious for a programme to positively promote new European energy technologies in the market place, and so the Thermie programme was born<sup>3</sup>. The programme is seen to have an important role as moves to complete the 1992 single market progress.*

## The scope of Thermie

Thermie is a 5-year programme, designed to run from 1990 to 1994, building on the foundations laid by the energy demonstration and hydrocarbons technology programmes, but differing from them in some important respects. 350 MECU has been allocated for the first three years of the programme, and funding will continue at the same level in years 4 and 5, depending on the Community's budget for those years.

Thermie has four principal fields of application which, between them, give a comprehensive coverage of non-nuclear energy uses:

- (i) **rational use of energy, in:**
  - buildings: domestic, commercial and administrative;
  - industry;
  - the energy industry;
  - transport and urban infrastructure.
  
- (ii) **renewable energy sources:**
  - solar energy: both thermal and photovoltaic applications;
  - energy from biomass and waste;
  - geothermal energy;
  - hydroelectric energy;
  - wind energy.

<sup>1</sup> See Regulations (EEC) Nos 3639/85 and 3640/85 (OJ L 350, 27.12.1985).

<sup>2</sup> Evaluation of energy demonstration programme:

- 'Energy efficiency and renewable energies projects' November 1988; Mr. Caprioglio and the March Consulting Group;
- 'Solid fuels', November 1988; Mr. Thurlow and Mr. Kallebach;
- Evaluation of the European Community's programme of support on technological development in the hydrocarbons sector, August 1988; Smith REA Energy Associates Ltd.

<sup>3</sup> Regulation (EEC) No 2008/90 (OJ L 185, 17.7.1990).

- (iii) **solid fuels**, meaning anthracite, coal, lignite (brown coal), peat or any other derived fuel, for:
- clean combustion methods;
  - conversion into gaseous or liquid energy products;
  - treatment of wastes;
  - gasification integrated with a combined gas/steam cycle.
- (iv) **hydrocarbons** (including tar sands or oil shales, but excluding solid fuels above), in relation to:
- exploration;
  - production;
  - transport;
  - storage.

75% of the Thermie budget will be divided equally between these four fields with the remainder to be allocated as the programme proceeds.

In order to achieve its objectives, Thermie is focusing on three main types of activity:

- financial support for energy technology projects;
- associated measures to encourage the application and market penetration of energy technologies;
- co-ordination between national and Community actions in this field.

Each of these activities will now be examined in detail.

## Financial support for projects

85 to 90% of the financial resources of Thermie will go towards energy technology projects. Financial support<sup>4</sup> may be granted for:

- (i) **innovatory projects**, where a technique, process or product is being applied on a commercial basis for the first time. It would normally be expected that the research and development phase be completed for these technologies. Up to 40% of the eligible costs can be made available for these projects.
- (ii) **dissemination projects**, for technologies which have already been tried but which have not yet penetrated the market, and which are now being applied under different economic or geographical conditions.

Here the aim is to stimulate a wider implementation of technologies and, in recognition of the somewhat lower level of risk involved, financial support is limited to a maximum of 35%.

In addition, the Commission may take the initiative itself to set up **targeted projects**, where it appears that a need is not being met or where significant technological advances could be achieved. These will be co-operation projects involving companies from at least two Member States.

In all cases, if financial support is obtained from other public bodies, the total level of public support, inclusive of the Commission's contribution, may not exceed 49% of the project costs.

In order to be eligible for support under Thermie, a project must meet the following conditions:

- it must have some **innovatory** aspects: Thermie is designed to promote new energy technologies and not merely to subsidise technology investments.
- the project must show good prospects of being both **technically and economically viable** - support for 'lame duck' projects is not a good use of Community funds.
- it must be compatible with **safety and environmental protection** requirements. Clearly most energy technologies will have significant positive environmental spin-offs arising from their implementation.
- it must be **difficult to finance** because of technical and economic risks - clearly, if there is no risk element, there is no need for Community financial participation.
- the proposer must be capable of implementing or applying the technologies and **assisting in their dissemination**, if the project reaches a successful conclusion. This is of great importance, since the overall aim of Thermie is to promote the wider utilisation of new technologies.
- projects costing more than 6 MECU must be submitted by at least two independent promoters from different Member States, unless there are exceptional circumstances.
- projects must be carried out **within the Community** in all but exceptional cases.

<sup>4</sup> For full details, see Articles 2, 4, 6, 7, 8, 9 of the Thermie Regulation (EEC) No 2008/90.

For projects of equal technical merit, a certain preference will be given to:

- **co-operative projects** between companies from at least two Member States, to stimulate trans-national technology co-operation;
- projects proposed by **small and medium-sized enterprises**, recognizing that these are often a source of innovation but may lack the resources to disseminate effectively on their own;
- dissemination projects in **regions whose development is lagging behind**<sup>5</sup>, recognizing the need to make a special effort to ensure that these regions are not disadvantaged as the Community moves towards completion of the single market in 1992.

Proposals for projects will generally be invited by means of an annual call for tender published in the Official Journal in the first half of the year. Proposals are invited to be submitted by a specific date in late summer or early autumn and decisions are expected to be taken on financial support at the beginning of the following year.

## Associated measures

Although only 10 to 15% of the Thermie budget is devoted to associated measures<sup>6</sup> for encouraging the application and market penetration of energy technologies, the fact that these measures are generally much less expensive to implement than technology projects (which often have an expensive hardware component) means that they form a vital part of the Thermie programme. Indeed, it is the associated measures which can take the results of successful technology projects (and not exclusively those financed by the Community) and encourage their widespread implementation, both within and outside the Community.

Examples of these associated measures are:

- **analysis of market potential** for the application of particular energy technologies;
- **monitoring and evaluation** of projects financed by the Community;

<sup>5</sup> Regions as defined in Article 8 of Regulation (EEC) No 2052/88 (OJ L 185, 15.7.1988).

<sup>6</sup> For full details see Article 5 and Annex V of the Thermie Regulation.

- **dissemination of energy technology information**, for example, by means of brochures, documentation, video material, databases, seminars, workshops, conferences.

Most of these associated measures will be carried out by the Commission through a network of **Organisations for the Promotion of Energy Technology (OPETs)**. This network of 33 OPETs throughout the Community has now been established and for the most part consists of organisations, both public and private, already active in the dissemination of energy technology. Some function on a national basis, others on a regional or local basis, and others for certain defined sectors function throughout the Community. All of them are engaged in carrying out a specific work programme agreed with the Commission and they are being linked together with the Energy Directorate-General of the Commission through a small central secretariat based in Brussels.

Associated measures may also be carried out in **third countries** through industrial co-operation. This will be achieved both by working with OPETs already active in particular third countries and through the establishment or designation of OPETs in those third countries themselves. Principal target areas initially are Central and Eastern Europe (the Soviet Union included) and the industrialised countries of the world.

## Co-ordination

The Commission's responsibilities for co-ordinating national and Community actions in the sphere of energy technology<sup>7</sup> are clearly important to ensure that efforts do not overlap. The importance of consulting Member States on the selection of projects for funding was recognised under the earlier energy demonstration and hydrocarbons technology programmes, and this consultative mechanism has continued in the Thermie programme, though in a somewhat different form<sup>8</sup>.

However, co-ordination must extend beyond this, and it is here that the network of OPETs will again play an important role. A number of these are entrusted by their governments with the task of energy technology dissemination in their own countries and, as the network becomes operative and links grow stronger, a more comprehensive overall picture

<sup>7</sup> Articles 11, 12(2), 17 of the Thermie Regulation.

<sup>8</sup> Articles 9, 10 of the Thermie Regulation.

of European activity will build up and a genuinely European strategy for energy technology promotion will emerge.

As we enter the 1990's, Thermie has an important role to play in securing and diversifying Community energy supplies and in reducing energy demand through the more widespread implementation of better technologies. During the 18 months of discussion on the Regulation, environmental issues were very much in the forefront as a primary justification for the programme. It was even heard said that there were adequate supplies of energy worldwide and that energy price levels would not be a critical factor

for the remainder of the century.

The events of 2 August in Kuwait and the subsequent developments have shown the weakness of a continuing heavy reliance on oil supplied from a region which has shown itself over many years to be inherently unstable, and the urgent need to consume less energy, to use it in a more efficient manner, to diversify supplies and to make more use of indigenous energy sources. Stable, uninterrupted supplies of energy at a reasonable price are vital for the future economic prosperity of the Community, and of the world, and the Thermie programme has an important role to play in reaching these goals.

For further information on the Thermie programme, contact:

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## COMPARISON BETWEEN THERMIE AND THE FORMER DEMONSTRATION AND HYDROCARBONS TECHNOLOGY PROJECTS

	THERMIE (Reg. 2008/90)	Demonstration programme (Reg. 3640/85)	Hydrocarbons technology programme (Reg. 3639/85)
Fields of application	<ul style="list-style-type: none"> <li>- rational use of energy</li> <li>- renewable energy sources</li> <li>- solid fuels</li> <li>- hydrocarbons</li> </ul>	<ul style="list-style-type: none"> <li>- energy saving</li> <li>- alternative energy sources</li> <li>- substitution of hydrocarbons</li> <li>- liquefaction and gasification of solid fuels</li> </ul>	<ul style="list-style-type: none"> <li>- hydrocarbons</li> </ul>
Types of project supported	<ul style="list-style-type: none"> <li>- innovatory projects</li> <li>- dissemination projects</li> </ul>	<ul style="list-style-type: none"> <li>- demonstration projects</li> <li>- solid fuels industrial pilot projects</li> </ul>	<ul style="list-style-type: none"> <li>- technological development projects</li> </ul>
Types of action envisaged	<ul style="list-style-type: none"> <li>- financial support for projects (including targeted projects)</li> <li>- associated measures for technology promotion</li> <li>- co-ordination</li> </ul>	<ul style="list-style-type: none"> <li>- financial support for projects</li> </ul>	<ul style="list-style-type: none"> <li>- financial support for projects</li> </ul>
Geographical area	<ul style="list-style-type: none"> <li>- for projects, within EC in all but exceptional cases</li> <li>- for associated measures inside and outside EC</li> </ul>	<ul style="list-style-type: none"> <li>- within EC in all but exceptional cases</li> </ul>	<ul style="list-style-type: none"> <li>- inside and outside EC</li> </ul>
Eligibility conditions	<ul style="list-style-type: none"> <li>- innovatory</li> <li>- prospects of technical and economic viability</li> <li>- compatible with safety and environmental protection</li> <li>- difficult to finance because of risk</li> <li>- proposer capable of assisting in dissemination</li> <li>- two proposers from different Member States (MS) for projects greater than 6 MECU</li> <li>- R&amp;D stage mostly completed</li> </ul>	<ul style="list-style-type: none"> <li>- innovatory</li> <li>- prospects of technical and economic viability</li> <li>- must 'envisage actions and means' for replication</li> <li>- difficult to finance because of risk</li> <li>- R&amp;D stage completed</li> </ul>	<ul style="list-style-type: none"> <li>- innovatory</li> <li>- prospects of industrial, economic and commercial viability</li> <li>- difficult to finance because of risk</li> </ul>
Preferential criteria	<ul style="list-style-type: none"> <li>- co-operative projects between proposers from at least 2 MS</li> <li>- Small and Medium-sized Enterprises (SMEs)</li> <li>- dissemination projects in less developed regions</li> </ul>	<ul style="list-style-type: none"> <li>- co-operative projects between proposers from at least 2 MS</li> <li>- appropriate solutions for environmental protection</li> </ul>	<ul style="list-style-type: none"> <li>- co-operative projects between proposers from at least 2 MS</li> <li>- SMEs</li> </ul>
Maximum financial support for projects	<ul style="list-style-type: none"> <li>- innovatory projects: 40%</li> <li>- dissemination projects: 35%</li> </ul> Total public support not to exceed 49%	40% Total public support not to exceed 49%	40% Financial aid from other sources to be 'taken into account'
Role of Committee (composed of MS representatives) in project selection	<ul style="list-style-type: none"> <li>- projects &gt; 500 000 ECU: can overturn Commission decision with qualified majority</li> <li>- projects 100 000 - 500 000 ECU: delivery opinion</li> <li>- projects &lt; 100 000 ECU: no role</li> </ul>	<ul style="list-style-type: none"> <li>- Commission to decide 'on the basis of the opinions' of the Committee</li> </ul>	<ul style="list-style-type: none"> <li>- Commission to decide 'on the basis of the opinions of the Committee'</li> </ul>
Division of budget	<ul style="list-style-type: none"> <li>- 85-90% projects, 10-15% associated measures</li> <li>- 75% to be divided equally between the 4 fields of application, the remaining 25% to be allocated by the Commission</li> </ul>	<ul style="list-style-type: none"> <li>- 100% projects</li> <li>- Approx. 30% for solid fuels</li> </ul>	<ul style="list-style-type: none"> <li>- 100% projects</li> <li>- no sectoral subdivision</li> </ul>

# Demonstration and industrial pilot projects in the field of energy pressurized coal gasification using the PRENFLO process

DGXVII: Energy Technology Directorate - Management of programmes unit (D2)

## Project No: LG 354/87 DE

With financial support from the Commission of the European Communities (Contracts No. LG 018/83, LG 270/85, LG 354/87) and the Ministry of Research and Technology of the Federal Republic of Germany, Krupp Koppers built a pressurized coal gasification plant in Saarland, FRG, based on the PRENFLO process, with a capacity of 48 t/d coal dust. Fuels from various regions were successfully gasified over more than 8000 operating hours, demonstrating that the PRENFLO process is environmentally compatible, efficient, operationally safe and economically attractive.

## I Introduction

The PRENFLO process for high-temperature pressurized gasification of dry coal dust with oxygen produces a raw gas of simple composition, consisting mainly of carbon monoxide and hydrogen. Using conventional gas treatment technologies, the raw gas is upgraded to synthesis gas, hydrogen, reduction gas or to the fuel gas required for electricity generation from coal in the combined-cycle (gas and steam turbine) power plant.

Krupp Koppers developed the PRENFLO process for gasification of coal under high pressure on the basis of the commercially established Koppers-Totzek process (low-pressure gasification).

The aim of the PRENFLO development programme, Fig. 1, is to introduce the process to the market on an industrial scale.

The project '48 t/d PRENFLO plant', Fig. 2, provided important bases for the planning of a demonstration power plant with integrated coal gasification. The power plant was planned together with Siemens AG/KWU group. A decision to build is anticipated in 1991, with a view to building commercial power plants with gasifier units for 300 MW<sub>el</sub> from the end of this century.

## II Objectives

The overall aim of the PRENFLO project is to guarantee the techno-economic appeal of the process for the commercial application of large gasifier units.

The main objectives of the '48 t/d PRENFLO plant' project were:

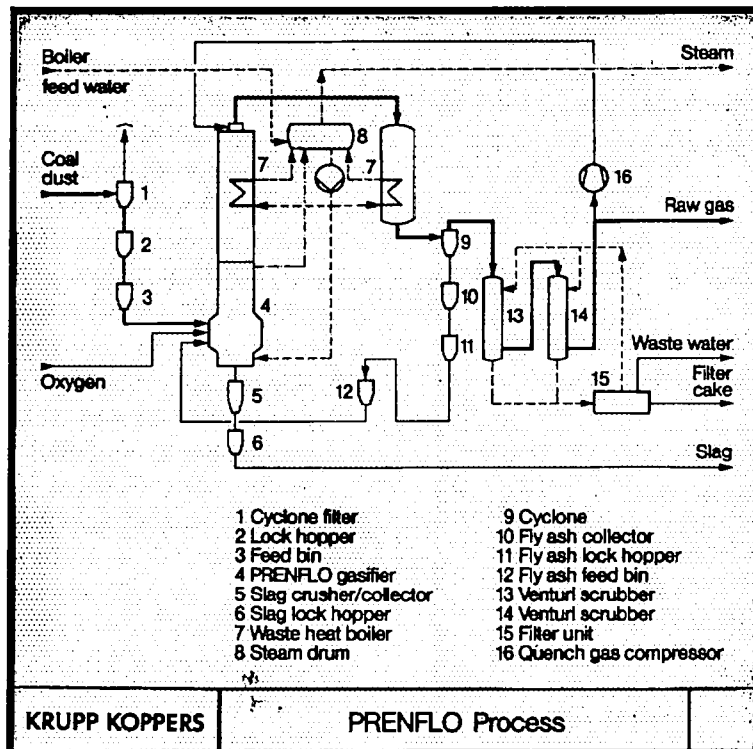
- to demonstrate the long-term availability of the PRENFLO system and its components;
- to optimize the efficiency of the PRENFLO process when using low-grade solid fuels (high content of ash, sulphur, chlorine);
- to minimise gaseous emissions, waste water and solid waste;
- to demonstrate the operational flexibility of the process to meet the requirements of power plant application.

## III The PRENFLO principle

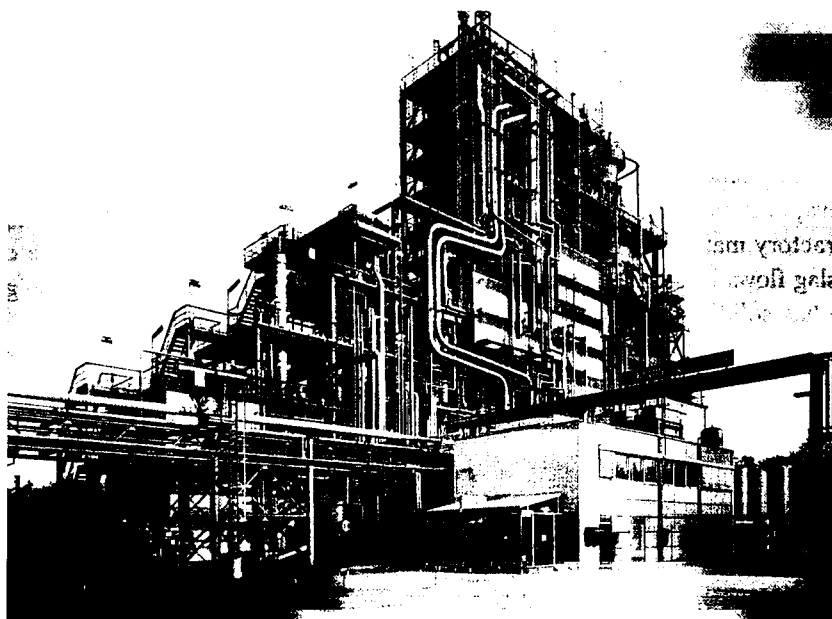
PRENFLO gasification works according to the entrained-flow principle. Using nitrogen as a transport medium, coal dust with a grain size less than 100 µm and low residual moisture content is passed into a reaction chamber with a cooled, refractory lining. The coal dust is gasified, i.e. the carbon is partially oxidized to carbon monoxide, in a flame reaction at temperatures greater than 2000°C and at a pressure of 24 to 30 bar. The coal substance is converted to carbon monoxide, hydrogen and small portions of carbon dioxide, the sulphur content to hydrogen sulphide and to a limited degree to carbon oxisulphide, and the chlorine to hydrogen chloride. Coal ash is melted at the high gasification temperatures.

The main functional unit of the PRENFLO module comprises coal dust metering, coal dust/oxygen ratio control, gasifier burners and gasification chamber.

**Fig. 1: The PRENFLO development programme**



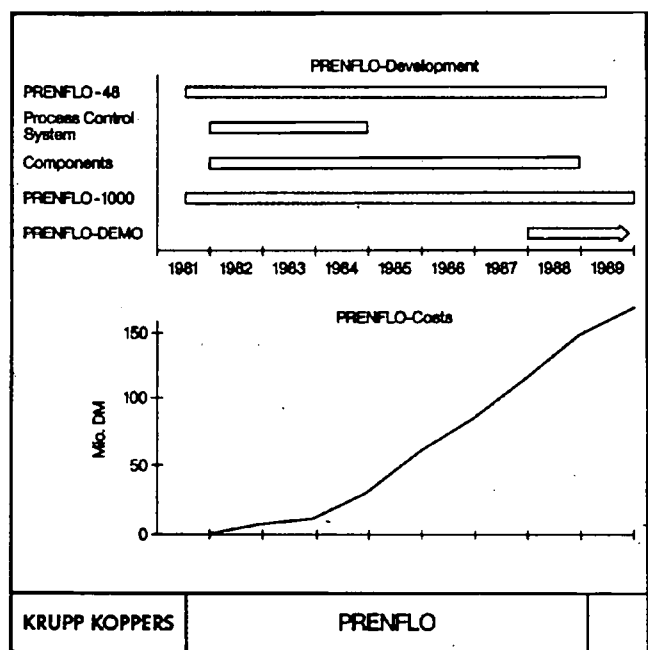
**Fig. 2: The '48 t/d PRENFLO plant' project**



## IV The PRENFLO process

The PRENFLO flowsheet, Fig. 3, indicates the development status which has been achieved.

Fig. 3: The PRENFLO flowsheet



Coal dust is transported pneumatically from a storage bunker to the gasifier lock hopper system, consisting of a receiving bin, lock hopper and feed bin. Nitrogen is used as a transport medium and to increase pressure. The coal dust is fed via a metering and distribution system to the 4 gasifier burners of the PRENFLO module, where the gasification agents oxygen and steam are also fed. The gasifier reactor is located in the pressure vessel; the pressure vessel has a low thermal load. The gasifier reaction chamber is surrounded by an evaporation cooling system which is protected by refractory material from direct slag attack. The liquid slag flows into a water bath via a layer of slag which has solidified on the refractory lining. A slag crusher ensures that any larger pieces of slag are broken before being discharged.

The raw gas flows from the gasifier into the radiant-type boiler on top of it. The radiant-type boiler is fitted with radial heat-exchange tube walls and mechanical cleaning devices. To limit the overall height of the system, the raw gas is cooled with recycled product gas to the specified inlet temperature

for the downstream convective boiler, before leaving the radiant type boiler.

The gas is then further cooled in the convective boiler. The steam systems of the waste heat boiler and the gasifier are coupled. The gas is cleaned in a cyclone filter with fly ash sluice and fly ash recycle, and undergoes further cleaning in Venturi scrubbers and a high-pressure separator. The wash water system is fitted with a pressure filter and a stripper for waste water cleaning. Some of the clean and cooled gas is recycled as quench gas. The product gas is treated in a dry desulfurization unit and used as fuel gas.

The radiant type boiler has an additional potential for optimization in that there is virtually no need for cooling gas. The required development work will be performed within the scope of Agreement LG 255-89 DE.

## V Results of the test operation

In over 8080 hours of test operation, 9 different fuels with ash contents of up to 40% were successfully used. The components and materials used meet the technical requirements of power plant operation.

- Efficiency

All fuels used are converted at more than 98%, fly ash recycling at more than 99.5%. The gasification is distinguished by high useful gas yield; CO<sub>2</sub> content is between 0.5% and 3%. High thermal efficiencies result. The cold gas efficiency for the 48 t/d PRENFLO plant attained 80%, in large plants 82% can be expected. A further 15% of the calorific value is converted into high-quality steam. If the cleaned gas is heated in a raw gas/clean gas heat exchanger, the gas is available at a burning chamber of a gas turbine with 85% of the energy content of the coal, and the steam production of the gasification system is reduced correspondingly.

- Environmental compatibility

Fuel ash leaves the gasifier as inert, granulated slag. The slag is practically non-leachable and can either be used as building material or dumped according to regulations on excavated earth. Up to 85% of the coal ash is converted to slag in one step. Dry fly ash separation and fly ash recycling ensure virtually



complete slagging. Residual fly ash of approx. 4 kg/t coal is discharged from the scrubbing system as filter cake and post-treated if necessary. The scrubbed clean gas contains less than 0.1 mg dust/m<sup>3</sup>n.

Sulphur compounds are removed almost completely from the gas by conventional physical or chemical scrubbing processes, if need be undergoing COS hydrolysis, and are converted to marketable elemental sulphur in a Claus plant.

Halogen compounds are removed entirely from the raw gas in the Venturi scrubbers. The recovery of alkaline salts by evaporating upgraded scrubbing water (circulation scrub) permits effluent-free operation. More than 80% of the salt recovered is available as a high purity saleable product.

The use of the cleaned coal gas in the combustion chambers of the gas turbine leads to extremely low NO<sub>x</sub> values in the power plant flue gas, due to the use of nitrogen from the air separation unit and a water saturation of the coal gas. The high coal gasification efficiency limits the CO<sub>2</sub> emission.

● **Flexibility**

The PRENFLO plant is distinguished by its operational safety and flexibility. It can be started up in a short time, with 90 minutes being required from ignition to full load from pressureless condition and hot steam system. Prompt increase or decrease in production is achieved by switching individual burners on or off, providing new stable operating conditions within a few seconds. Load changes in the load range 35 to 110% can be effected fully automatically with load change rates of 2 to 20% per minute. Gas quality hardly changes, even if the plant is operated at partial load. A change of fuel requires only limited changes to the operating parameters.

If fuels with high chlorine contents are used, contamination of heat exchange surfaces is kept at a low level by means of mechanical cleaning devices.

## VI Prospects

The industrial-scale integration of the PRENFLO process into a combined cycle (gas/steam turbine) power plant using high quality hard coal permits the generation of power from coal with a net efficiency of 45%, whereby an additional potential of approximately 2%-points (higher gas turbine inlet temperature, hot gas cleaning) is achievable in the medium-term.

The high level of environmental compatibility, the particularly low CO<sub>2</sub> emissions, operational safety and flexibility of the PRENFLO process indicate a potential for widespread application.

The construction and successful operation of a demonstration power plant of an appropriate size (200 to 300 MW<sub>e1</sub>) is necessary in order to introduce the new technology to the market. It is aimed to overcome in the near future the threshold marked by the high costs involved in such a demonstration power plant project.

Further information on this project may be obtained from:

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# France

N. Commeau-Yannoussis DG XVII: Task Force on Community integration - Completion of the internal market unit (TF1)

*Energy in Europe continues its presentation of European Community countries' energy reports with France.*

With a population of 56 million (17% of the Community's population) spread over 550 000 km<sup>2</sup>, France is one of the least densely populated Community countries per km<sup>2</sup>. Almost 80% of the population lives in urban regions. One could therefore speak of the 'French cities and desert'. The major conurbations are those of the Paris, Marseille and Lyon regions.

French GDP is equivalent to one fifth of the Community's. It has the most powerful economy in the Community after the Federal Republic of Germany. Together, these two account for almost half (45%) of Community production.

In 1988 France experienced record growth of 3.5% above the previous year. This trend was consolidated in 1989 and should continue in 1990<sup>1</sup>. As in the other Community countries, investment in industry is the most dynamic component of demand owing to the rise in demand throughout the world. This burgeoning industrial activity contrasts sharply with the French economy's recent past, providing a quarter of industrial growth in 1988.

The working population in 1988 exceeded 21.5 million. Following a surge in industrial activity and in the wake of job-creation policies, the unemployment rate was cut to 10.1% of the total active population (2 563 000 job seekers) although that population grew by a further 170 000. The number of young people and men out of work fell sharply compared to unemployed women.

In 1988 France consumed 201 million toe<sup>2</sup> or, in other words, 19% of Community consumption<sup>3</sup> and produced less than half of its own energy requirements (97.6 million toe). Domestic production of oil and natural gas (3.8 million toe and 2.6 million toe respectively) fell especially short. France depends on outside sources for more than 90% of its hydrocarbon supplies.

France consumes 3.6 toe per head as against a slightly lower Community average - most of these in private dwellings (20%). The country has moderate energy consumption

<sup>1</sup> GPD 1988 = 743 359 million ecu (1985 ecu)  
1989 = 769 377 million ecu (+ 3.5%)  
1990 = 793 997 million ecu (+ 3.2%)

<sup>2</sup> Primary energy consumption. Sources: EUROSTAT, SOEC.

<sup>3</sup> Ratio equivalent to that of the population.

occupying seventh position within the Community after the United Kingdom.

Although vulnerable as regards indigenous energy sources, France is in a satisfactory energy situation, thanks to an active, sustained energy policy displaying twin features: a balanced consumption structure and security of supplies.

## **An internal energy policy based on alternatives to oil**

The 1973 and 1979 oil crises prompted western countries to take on board stringent policies aimed at restricting, or even reducing, energy demand, particularly for oil.

Oil accounted for 70% of primary energy consumption in 1973: the expansion of domestically-produced energy and an energy-saving policy have since cut back this level to less than 43% today.

## **Expansion of domestic energy production**

The first oil crisis showed how precarious the energy situation was in France and set the course of future energy policy: changing the face of supply by boosting domestic energy sources via the promotion of renewable energy sources and stepping up the French nuclear electricity programme.

### **Promoting the use of electricity**

In the late 1950s France launched a plan to bolster the use of atomic energy by gradually feeding more and more nuclear electricity into the national economy.

In 1974 the French Government introduced a major nuclear electricity programme which has slowed down only in recent years. The installed nuclear capacity was 50GW in 1987, making France the second biggest nuclear electricity user in the world, after the United States.

Nuclear power's share in total energy production rose from 8% in 1973 to more than 70% in 1988.

Parallel to this, and in addition to the increase in productive capacity, the French electricity company EdF has pursued a policy of promoting the use of electricity, more specifically by providing incentives to install electric heating in households.

This electricity promotion policy is being backed up by further support for campaigns and improvements to product quality (fewer power cuts) and the service offered (matching supplies to customer demand).

The advances made by electricity are utterly spectacular. Electricity consumption grew by 437% between 1973 and 1988 whereas overall energy consumption only rose by 12.3%. Unfortunately, however, the 'all-electric buildings' of the 1970s and 1980s tend to push up peak demand. This is why French policy is looking to export base-load electricity to Germany, Spain and Portugal, and to import peak-level electricity from bordering countries such as Spain and Germany.

#### **Greater use of renewable energy sources**

In the wake of the second oil crisis, the Barre Government laid emphasis on renewable energy sources. The Solar Energy Commissariat (COMES) and the Ministerial agencies for geothermal energy and district heating networks were then set up.

At the moment there are 350 district heating schemes in more than 250 towns. They receive up to 20% of their heat from refuse incinerators, urban waste disposal being particularly important in promoting such schemes.

Between 1973 and 1988, the share of renewable energies in the energy balance did not rise appreciably, moving from 1% to 2%. Nevertheless, in absolute figures, their production doubled, from 2 to 4 million toe. In 1988 it represented 2% of primary energy consumption. Although this result may seem a little unsatisfactory, it conceals major research which has led to the development of technologies which in future are likely to be turned to account on a much larger scale should they prove to be economically viable.

It would nevertheless appear, according to the French Energy Management Agency (AFME), that these figures do not correspond exactly to reality given the difficulty of estimating consumption of firewood (estimated at 8 m toe by AFME) and the exclusion of major hydroelectric sources.

The expansion of national energy production has proved to be worthwhile since, between 1973 and 1988, France more

than doubled domestic output (+ 133.5%) basically in the form of nuclear electricity.

### **A return to energy saving and energy management**

#### **The resources deployed**

The French Government reacted to the first oil crisis by adopting a rational energy use policy (by setting up the Energy Saving Agency) which focussed on industry and, to a lesser degree, both transport and households. The French Energy Management Agency (AFME), which was set up in 1982, as the successor to the ESA, is continuing the latter's policy and has added to it the practical use of renewable energy sources, as already pursued by other bodies.

The sharp revival of demand in 1988 (+ 2.7% over 1987), the conclusions reached by the (1989) BRANA Report on energy management and the acknowledgement of the fundamental impact of energy on our environment, have reawakened an active policy in support of energy savings (increase in the AFME budget in 1990) and also a broader approach by that policy towards greater energy efficiency, energy saving and environmental matters (waste and air quality). The basic targets were transport, private homes and SMEs (since the big industries had already invested heavily in this area).

#### **Inconclusive outcome**

Since 1984 France has largely succeeded in breaking the link between economic growth and energy demand. Between 1974 and 1989 the market GNP grew three times faster than energy consumption. Energy intensity improved by 20% during that period. France now therefore has one of the lowest energy intensities in the EC.

Between 1980 and 1987 energy consumption in France remained relatively stable, with a slightly decreasing annual rate estimated at 0.5%, largely due to the drop in coal, and above all, oil consumption. It is estimated that 34 million toe of energy are saved each year.

In 1988 primary energy consumption rocketed, thus exceeding its 1979 level (185 million toe). The increase in consumption reflects a less frugal attitude towards energy and points to a significant upturn in industrial activity.

During the Parliamentary debates, in December 1989, the French Government recognized that considerable savings could still be made and it set about tackling the challenge. More funds were devoted to this in 1990 and a public awareness policy was given a fresh impetus. It was decided

to fuse the activities of AFME with the bodies for waste disposal and water quality (ANRED and AQA).

## A sustained external policy

France's external policy is driven by the desire to maintain security of supplies and enhance Community solidarity.

By 1987 import dependence had fallen to 47.3%. However, France depends almost exclusively on outside supplies (Community and third countries) for its oil supplies (96%) and gas supplies (89%) and for slightly more than half of its coal requirements (53%).

The trend was reversed slightly in 1988 and net energy imports grew by roughly 3% in 1989, those of gas increasing by 5% and coal by 14%.

### Support for Community integration

During its EC Presidency in 1989, France was actively involved in firming-up the internal energy market. It supported proposals for Directives on the shipping of gas and electricity, and on public procurement in the excluded sectors (part of which included energy)<sup>4</sup>. It saw in this an opportunity for greater solidarity and dovetailing energy sources throughout the Community. The Franco-German energy co-operation agreement concluded in late 1989 reflects that view<sup>5</sup>.

France has deliberately opted to strengthen its electricity and gas supply links and to provide incentives for electricity exports.

#### Boosting links with neighbouring countries

Rising gas imports and the wish to export more electricity require investment in adequate infrastructures.

Interconnected electricity and gas supply grids are either at the planning stage or being built i.e. the reinforcement of high-tension electricity grids linked with Germany, Italy, Spain and the United Kingdom and gas pipelines linked with Corsica and Italy, and even with Algeria through Spain.

#### Electricity exports

French electricity exports amounting to roughly 50 TWh in 1988 could easily reach 70 TWh, and there is even talk of 120 TWh.

At the moment, most exports go to Italy, Portugal and the United Kingdom. The main reason being the need to make

efficient use of surplus French capacity. At the moment they should enable the French electricity board to make useful profits. The EC Directive on electricity transit rates<sup>6</sup> adopted by the Council of Ministers on 29 October 1990 should make it easier for France to export electricity.

In 1989 and 1990 France signed an important tripartite agreement with Portugal and Spain, a 1000 MW contract with Spain (with perhaps another shortly), and a new contract with the United Kingdom.

To convince foreign importers of its reliability, the French Government intends to extend to international contracts the minimum service requirements (in the event of a strike or power cut). This is a significant and promising indication.

### Bolstering the security of supplies

Increasing the number of outside suppliers and forging stable relationships with producing countries are the two consistent aspects of France's foreign energy policy. Multiple sourcing provides a cushion against supply instability: this has proved to be effective during the Gulf crisis, while energy co-operation agreements promote stable relations with the supplier countries.

#### Multiple sourcing

France's heavy dependence on gas and oil has caused the various governments and importing companies to fine tune their sources of supply in geographical terms.

In 1988 each country supplying oil met at most 10-20% of France's needs. Supplies are drawn from the Middle East, Saudi Arabia, the North Sea, North<sup>7</sup> and West Africa and the USSR. Gas supplies, too, are drawn from Algeria<sup>7</sup>, the North Sea (in particular the Netherlands) and the USSR, and are covered by long-term contracts (in general 25 years). By and large coal is obtained from stable regions of the world (the United States, Australia, West Germany and South Africa). Supplies are therefore not especially risky.

<sup>4</sup> Even so, it has not succeeded in having energy procurement contracts, (gas, electricity) included in the Directive.

<sup>5</sup> Basically two agreements have been made, one on nuclear cooperation and the other on areas of common interest (national coal output and electricity sales between those two countries)

<sup>6</sup> See the article on the internal market in this issue.

<sup>7</sup> By way of an example: in January 1989 France concluded a new contract covering 9 000 million m<sup>3</sup> of gas, and in November 1989 two oil supply contracts, both with Algeria.

### Co-operation agreements

The emergence of new players on the hydrocarbon market (eastern bloc countries, the United States) and the foreseeable overall growth in world demand has induced France to forge broader links with exporting countries in the form of partnerships.

Since both Algeria and the USSR are sizeable oil and gas exporters, each has recently signed agreements of this type. In 1990 CFP-Total signed a co-operation agreement with Sonatrach (the Algerian national hydrocarbon company) mainly concerned with hydrocarbon prospecting and production. The French gas board has signed a letter of intent with the USSR with a view to setting up joint ventures on transport, distribution, engineering and equipment manufacture.

## Conclusion

French energy policy has produced encouraging results, but it is clear that difficulties remain:

- Economic and energy difficulties need to be ironed out

### Economic difficulties linked with energy bills and the relevant level of energy self-sufficiency

Energy is still one of the biggest items of expenditure for most of the energy importing states. Although constantly getting smaller up to 1988, France's energy bill did precisely the opposite in 1989 and should continue to do so in 1990 owing to the tensions on the oil market (Gulf crisis).

The ups and downs of energy spending, due to fluctuations in the dollar exchange rate and the price of crude, severely test the French economy during oil crises. The inflationary impact of the Gulf crisis has been assessed at 1.4 points for 1990 (in October 1990).

Although between 1973 and 1989 energy self-sufficiency fell from 70% to less than 50% of energy consumed, thanks essentially to the restriction of energy (oil) imports and to the increase in domestic production of primary energy (nuclear electricity), oil is still the largest energy source and thus inevitably the benchmark for French energy dependence.

### Energy difficulties linked with the predominance of nuclear energy

The policy of energy self-sufficiency conducted by France for 40 years that largely relies upon nuclear electricity displays certain technical features which are still causing problems. Although so far the reliability of French nuclear electricity technology cannot be called into question, 1989 was beset by electricity generating difficulties linked with faults in all of the 1300 megawatt reactors and in half of the 900 megawatt reactors.

In addition, despite the use of reliable high technology for reprocessing fuel or storing radioactive waste, nuclear waste is still prompting vigorous reactions from the public. The controversy surrounding the Saint Aubin discharge is one of the most recent examples.

A White Paper on the nuclear programme, plant safety and the disposal of waste, will certainly spark a broad national debate and give the opportunity for reinforcing the consensus in favour of nuclear power, which is still substantial.

- The results are encouraging since the oil substitution policy has been an unqualified success

The energy policy pursued has rebalanced the French energy equation, in some respects in a spectacular manner. Domestic primary energy production, which has been growing consistently since 1973 (41.8 million toe) rose to 97.6 million toe in 1988 (an increase of 133%), while in 1989 it flattened out noticeably, but not very significantly, since this was due to short-term economic difficulties during the year.

Electricity and gas made constant inroads during the 1970s and 1980s (the respective annual growth rates were 2.5% and 3.9% per annum). In 1988 electricity accounted for more than one third (34.7%), and gas 12.1% of primary energy consumption, as opposed to only 7% by each of these in 1973.

This situation is reflected in the level of employment in the energy sector. There has been a slight overall drop in the numbers employed, owing to heavy job losses in the coalmines, partly offset by more jobs in the electricity and gas industries. In 1988 these two energy sectors represented 65% of the jobs within energy overall, as compared with 56% in 1980.

France seems to have chosen its energy options judiciously in terms of the structure of internal energy consumption, energy dependence and world energy demand forecasts .

# Community news

## Inauguration of EC-Indonesia energy bus project

The EC-Indonesia energy bus project was officially inaugurated at a ceremony in Jakarta, Indonesia on 6 February 1990. The EC was represented by Mr Van der Meulen, head of the EC Commission Delegation in Jakarta. The Indonesian government was represented by Mr Wiryosumarto, Deputy Chairman of the Agency for Assessment and Application of Technology in Jakarta.

The bus is equipped with the most modern measurement and data processing equipment and will be of valuable assistance to the Indonesian authorities for energy conservation purposes. It will help small and medium sized industrial enterprises to identify significant energy saving opportunities, so that precise steps can be taken to cut energy consumption.

This project is a good example of EC-Indonesia co-operation as both sides have made equal contributions to the success of the project. The Indonesian side provides the vehicle, the bus crew and pays for the operating costs while the European Commission provides the bus equipment, expert advice and training.



*Above: Indonesian-EC energy bus team with Mr E. Sorribes, EC Representation to Jakarta (third from left).*

## Seminar on regional energy planning north-east Argentina, May 1990

The Directorate-General for Energy has backed a comprehensive study of regional energy planning in north-east Argentina since 1985. A concluding evaluation seminar took place from 7 to 9 May 1990 in Rosario, Argentina. Approximately 300 representatives from the Central State, the six provinces of north-east Argentina which participated in the study, energy organizations, banks and industries from the region took part in the seminar. The contribution of the Commission of the European Communities to the success of the project was widely acknowledged.

The method used in the study was that developed by the Instituto de Economia Energetica, Argentina (IDEE) within the Co-operative Programme on Energy and Development (COPED) a programme also assisted by the EC Commission.

The study's findings have met its original objectives, namely to assist regional energy planners to develop regional planning methods. The study will also assist national energy planners to develop nationwide planning methods based on regional planning. The work will also ensure greater consistency between the energy plans of the various regions in north-east Argentina.

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## Workshop on Energy Integrated Planning in Urban Communities, Baguio City, Philippines, 7 to 11 May 1990

The 4th workshop of the Asean-EC Energy Management Training and Research Centre (AEEMTRC) 'Energy integrated planning in urban communities' took place from 7 to 11 May 1990 in Baguio City, Philippines. Baguio City is the centre's demonstration city for their urban energy project. The workshop was organised by AEEMTRC in conjunction with the Office of Energy Affairs of the Philippines and the City Government of Baguio.

The workshop was officially opened by the Mayor of Baguio City, Mr J. Bugnosen, Mr de la Paz, Executive Director of the Office of Energy Affairs and Professor Dr Wisaksono,

Director of AEEMTRC. Twenty seven participants from five Asean states were present at the workshop.

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## First steps towards co-operation between the EC and the USSR

In Dublin on 25 and 26 June 1990 the Heads of State and Government of the 12 (the 'European Council') called on the Commission to consult the Soviet Government and draft proposals on the support to be lent to its structural reforms. At the same time they asked the Commission to examine the Dutch Government's proposal to set up a European energy network.

In response to this mandate, the Commission sent two missions to Moscow in September, the first led by the member of the Commission responsible for energy policy, Mr Cardoso e Cunha, the second by the Director-General for Energy, Mr Maniatopoulos.

These missions established the political contacts needed and discussed possible forms of bilateral co-operation between the EC and the Soviet Union and the conditions which must be created before they can be put into action.

These talks with the Soviet authorities, combined with contacts with industry within the Community, enabled the Commission to compile a preliminary list of measures taking into account the current situation on the energy market - particularly in the wake of the Gulf crisis - and the outlook for the future.

At the European Council meeting in Rome on 14 and 15 December the Heads of State and Government approved plans for the Community to provide the Soviet Union with technical assistance on nuclear safety, energy saving, oil, gas and electricity transmission and administrative and legal matters.

The European Council also designated energy as a sector requiring long-term co-operation spanning the whole of Europe. This will be institutionalized by pan-European Energy Charter to be drafted at an international conference on the subject in 1991.

The next issue of *'Energy in Europe'* will give further details of this co-operation between the EC and the USSR.

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## Conference on energy management - strategy and techniques, Belgrade, 6 to 8 June 1990

A conference, successful in raising awareness of the importance of energy management, took place in Belgrade from 6 to 8 June 1990.

Entitled 'Energy management - strategy and techniques' the conference was organized by the Economic Institute of Belgrade with the backing of the EC Commission. Over 150 leading Yugoslav experts in the energy field took part. The conference was opened by Mr S. Santo, the Yugoslav Federal Secretary for Energy and Industry. The EC was represented by Mr Clive Jones, Deputy Director-General for Energy. The following topics were covered during the conference:

- economic aspects of energy management;
- implementation of effective energy management policies;
- Cogeneration - a review of its potential.

The conference was well received by the Yugoslav authorities and at their request, the Commission is at present examining other ways to continue with EC-Yugoslav co-operation in the energy area.

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## European oil and gas conference in Palermo

The first European oil and gas conference was held in Palermo from 9 to 12 October 1990.

Organized by the European Commission, together with AGIP, and sponsored by several major hydrocarbons companies, the conference was considered timely in bringing together policy makers, and actors in the field, to dwell on future developments.

The last few years have witnessed an increased role for new technologies, while the more traditional technologies have been fine-tuned to promote greater efficiency and a better safety standards.

At technical sessions of the conference, some 300 representatives of the scientific and technical community discussed the state of the art technologies and likely future applications.

Participants agreed that a multi-disciplinary approach, favouring exchange of information, should accompany any technological specialization involving the use of new and sophisticated techniques.

Geoscience is one such field where the interplay of different disciplines is vital.

Progress depends on characterization of reservoirs and extensive use of interactive methods for basic modelling are required. Acquisition of information on a reservoir is largely gained using seismic techniques. Higher resolution is required but costs will increase correspondingly. Main effort will be required for accurate modelling using integration of all available data and applying expert systems and other software tools.

On safety and environmental issues, the conference dwelt on problems such as sea and ground water pollution, disturbance of sensitive land areas or removal of offshore structures.

The industry is making serious strides towards better safety standards by using new materials, developing technology to 'man' platforms or applying undersea production techniques.

Participants welcomed the efforts of the Community to foster the promotion of new technologies for oil and gas.

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## EC/Algeria relations

Prospects for co-operation between the EC and Algeria in energy were the focus of talks, on 26 October 1990, between EC Energy Commissioner Antonio Cardoso e Cunha and Algeria's energy minister, also current President of OPEC, Mr S. Boussena.

The two men also discussed the EC internal market and the inter-exchange of oil and gas between Algeria and the Community.

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## Cogeneration 90 - Madrid, 16 to 18 October 1990



Above: (from left to right) Mrs A. Larraña, Director of the Exhibition, Mr F. Serrano, Director General of IDAE, Mr C. Maniatopoulos, Director-General for Energy of the EC Commission, Mr R.P. Simarro, Technical General Secretary of the Ministry of Industry and Energy, Mr J. Badosa, President of Enagas, Mr P. Rivero, Executive Vice President of Unesa, Mr G. Molina, Principal Administrator, DG for Energy

The second international Cogeneration exhibition was held in Madrid at IFEMA (the Madrid World Fair Organization) from 16 to 18 October 1990.

Aimed at increasing awareness of Cogeneration and its prospects over the coming decade, the exhibition was timed to run in tandem with a series of technical meetings, sponsored jointly by the EC Commission, the Institute for Diversification and Savings of Energy (IDAE), as well as the Spanish electricity and gas boards Unesa and Enagas.

Upwards of 400 delegates took part, most of them from the EC Member States, but also many from the US, Canada, Brazil, Austria and Switzerland.

Efforts by both public and private bodies in Europe to develop Cogeneration was the theme of the keynote address at the opening session of the conference, given by Mr Perez Simarro, Secretary General for Energy and Mines.

Mr C.S. Maniatopoulos, Director-General for Energy at the European Commission meanwhile, dwelt on the role of the Commission in promoting Cogeneration as part of the EC's energy policy for the coming years. He stressed the



relevance of a pledge made by EC governments to improve co-operation between the various energy supply bodies and other potential electricity producers in the Community, as well as programmes such as Thermie (promotion of energy technologies for Europe), SAVE (special action for a vigorous energy efficiency) and the Commission's various energy planning activities.

Speeches were also made at the opening session by Mr F. Serrano, (Director General of IDAE), Mr J. Badosa, (President of Enagas), and Mr P. Rivero, (Executive Vice President of Unesa).

Messrs Molina, Greif and Fee of the Directorate-General for Energy of the EC Commission chaired conference sessions entitled 'Relationship between energy users and suppliers', and 'Technological and environmental aspects of Cogeneration'.

Five central themes were addressed in the following papers presented at the Madrid conference:

- 'Cogeneration and the Environment', given by Mr D. Contreras (Spain);
- 'Finance for Cogeneration, issues and opportunities', Mr I. Brown (UK);
- 'The energy suppliers view of Cogeneration', Mr B. Kassebohm (Germany);
- 'An overview of the market potential for Cogeneration', Mr D. Green (UK);
- 'Cogeneration: the users view', Mr G. Jandeaux (France).

Other speakers shared opinions and experiences with the audience on specific questions or case studies.

The various presentations paved the way for discussions on:

- the legislative and planning aspects of Cogeneration;
- the technological and financial options;
- the interests of different categories of users;
- the relationship between users and suppliers; and finally
- the market prospects.

EC Commission representatives stressed the need for a more viable commercial relationship between energy suppliers and cogenerators, adding that well proven techniques and important markets existed. They also emphasized the importance of the role of Cogeneration in regional energy planning. The Commission, they assured the participants, would be taking steps to tackle the various administrative and legislative obstacles to a wider penetration of combined heat and power into the market.

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## Euro-Med Solar Business Seminar 1990, Nicosia, 8 to 10 November

A seminar on solar energy (EURO-MED), attended by 111 representatives from industry and officials from 20 EC and Mediterranean countries, was held in Nicosia, Cyprus.

The aim of the seminar was to stimulate industrial co-operation in the field of solar energy.

Attendance was by invitation only, so as to ensure a restricted participation that would be more conducive to effective communication and the exchange of ideas.

The seminar was opened by the Minister for Trade and Industry, Mr Takis Nemsitas and the delegate of the Commission of the European Communities to Cyprus, Mr J.P. Derisbourg.

In his opening speech the Minister stated that solar energy has an important role to play in the Mediterranean countries. In the case of Cyprus, such energy permits savings of USD 7 million on oil imports: 90% of private houses, 15% of apartments and 50% of hotels are already equipped with hot water production installations, representing 4.6% of energy consumed.

Twenty-five papers were presented, including contributions by the Directorate-General for Energy on the Commission's energy policy (Mr Carvounis, assistant to the Director-General), programmes to promote energy (Mr Molina) and actions for technology transfer and the promotion of co-operation (Mr Nacfaire).

Two technical visits were also organized: one to a factory producing solar panels (METALCO) and one to an operational installation (Hotel Ledra).

Numerous contacts were established between manufacturers, and co-operation projects will be prepared in time for the next call for proposals on technology transfer, due to be launched by DG XVII in 1991.

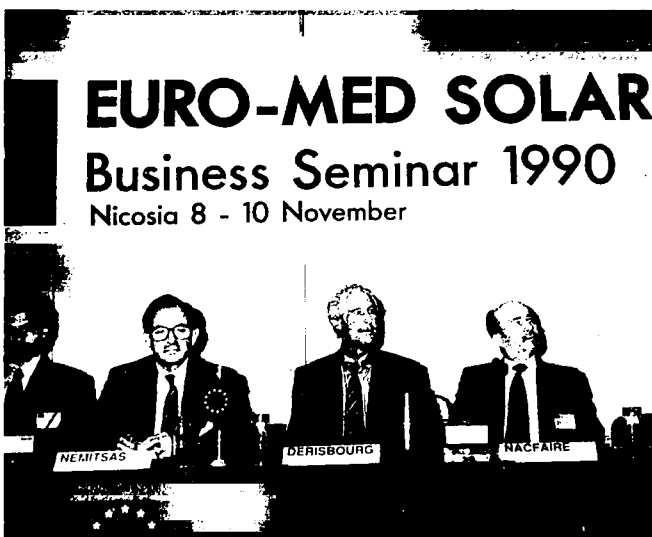
It was considered that due to progress in research, development, demonstration and promotion of solar thermal energy technologies there were now efficient and available technologies on the market.

These mature technologies will benefit from higher solar insolation and can be applied with an even greater economic gain.

Consequently, solar thermal energy can be a very appropriate field of co-operation between technical centres and small- and medium-sized industries in Mediterranean and EC countries.

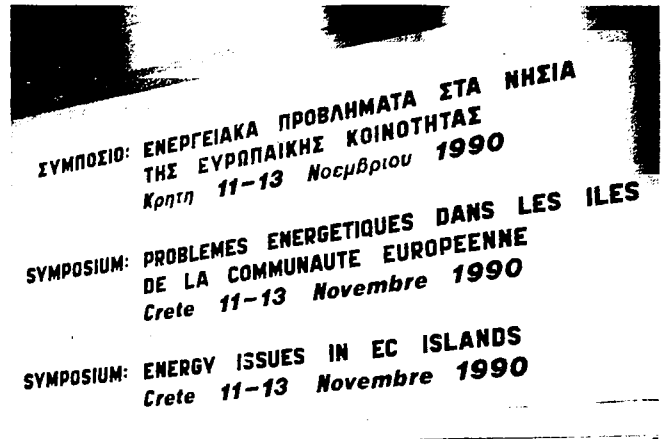
It was therefore recommended to create an appropriate network at the Mediterranean Basin level to define strategy, to disseminate information, to assist in the transfer of technology and to organize seminars, workshops and training sessions. The Commission will continue to fund further seminars in this field.

At the end of the seminar, participants expressed the wish that by the end of the century the contribution made by solar energy to the overall energy consumption in the countries bordering the Mediterranean would rise to 5%.



Above: Cyprus Minister of Commerce and Industry, Mr Nemitsas, with Commission representatives (from left to right) Mr Carvounis, Mr Derisbourg and Mr Nacfaire

## Symposium on the energy problems of the European Community's islands - Crete, 11 to 13 November 1990



Above: Mr C.S. Maniatopoulos, EC Commission Director-General for Energy, with Dr J. Twidell, Chairman of the Session and Prof. H. Baguenier, Rapporteur

Representatives of the local and regional bodies in the EC's islands, came together in Crete, between 11 and 13 November, with EC officials, private professional bodies, and several independent experts for in-depth discussion of energy problems peculiar to the EC's islands.

Madeira, the Azores, the Canaries, Guadeloupe, Corsica, Sardinia, Sicily, the Orkneys, the Shetlands, the Western Isles, Bornholm, Heligoland, the Aegean islands, Crete and the Ionian islands, were represented in the symposium of over 200 participants, jointly organized by the EC Commission, the Crete region and National Technical University of Athens.

The islands often have particular energy problems. For example, Crete depends almost entirely on imported petroleum to meet an ever-increasing energy demand.

Diversification of supply and more efficient use of energy sources to keep in pace with growing energy demand, were two themes stressed in an opening speech by EC Commission Director-General for Energy, Mr C.S. Maniatopoulos.

His general introductory remarks emphasized the importance of an EC-wide energy policy in the near future, which has become more important given supply threats in the wake of the Gulf crisis.

The policy will have to strike a balance between security of supply, economic growth, environmental protection, completion of the internal energy market and development of a new trans-European dimension, in view of the new geo-political situation between Eastern and Western Europe.

Representatives of the islanders highlighted the specific problems arising from the insular nature of their regions and suggested that the Commission could play a role in setting up a network linking the islands for example, to exchange information on energy planning.

DG XVII official, Mr Galanis, outlined some of the Commission's existing initiatives from which the islands could benefit.

These included:

- regional energy programme activities;
- technological development (Thermie programme);
- activities to improve energy efficiency (Save programme);
- activities to promote alternative energy sources;
- discussions underway on strengthening regional energy structures;

- research and development programmes;
- structural fund assistance to islands.

During his stay in Crete, Mr Maniatopoulos inaugurated a 150 kw wind generator in Anogia co-financed with DG XVII under the Community demonstration programme. The pump will be used to supply water to the 3,000 inhabitant municipality.

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## EC Energy Commissioner visits Brazil

Governments, international institutions and economic operators must co-operate to limit unjustified speculation in the oil market, given the present circumstances, EC Energy Commissioner Antonio Cardoso e Cunha warned on a recent visit to Brazil.

Speaking at the Latin American Energy Organization (Olade) Ministerial Meeting, held in Brazil on 12 November 1990, Mr Cardoso e Cunha outlined steps taken by the EC Commission to prevent speculation, and expressed satisfaction with the increase in oil production in a number of Latin American countries.

Twenty-eight Energy ministers from Latin America and the Caribbean took part in the meeting which dwelt on how to develop an energy strategy for each region in the coming decade.

Commissioner Cardoso e Cunha reviewed progress towards the internal energy market in the EC, and emphasized that the increasing interdependency of world economies demands further integration of energy markets.

The Commissioner also stressed the need for sound energy policies which take account of energy efficiency, market related energy performance, the environmental impact of the sector as well as the need for strengthened energy dialogue between the regions of the world.

Mr Cardoso e Cunha also had meetings with Mr O. Silva, Brazil's Energy Minister, Mr A. Escofet, State Secretary for Energy, Mexico, Mr C. Armas, Minister for Energy, Venezuela and Mr L. Prol, Minister for Energy, Argentina. The Commissioner also signed a protocol with the Brazilian authorities which provides for EC co-operation with Brazil in the energy area over the next three years.

## Visit to Greece by Commissioner and Director-General for Energy

One of the large-scale infrastructure projects included by the Commission in the Regen programme co-funded by the Community (see separate article in this issue) is the scheme to introduce natural gas in Greece.

Mr Cardoso e Cunha, the member of the Commission responsible for energy policy, and the Director-General for Energy, Mr Maniatopoulos, went to Athens in early December to examine the progress made on this major gas supply project and the legal procedures for exploiting the grid in future, a matter of particular interest to the Commission at a time of steady liberalization of the European energy market.

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## Conference on 'Energy in Crisis: The new challenges for Europe'

Four months after the start of the Gulf crisis, a worthwhile attempt was made to draw the first lessons and consequences for the energy markets at a conference in Brussels on 6 and 7 December.

Six topics were discussed:

(i) oil prices;

- (ii) supplies of refined products;
- (iii) further encouragement of non-fossil fuels;
- (iv) exploitation of the energy resources in Eastern Europe;
- (v) common energy policy;
- (vi) expansion of the gas market.

The conference was opened by Mr Cardoso e Cunha, the member of the Commission responsible for energy policy, who stressed the importance of the proposals tabled by the Commission on 24 October 1990 with a view to giving the Commission a stronger role in managing the Community's oil crisis mechanism and making the mechanism more effective and consistent with the spirit of the internal energy market.

On the second day of the conference, the Commission's Director-General for Energy, Mr Maniatopoulos, called for the establishment of a common energy policy to build on the foundation being laid by the Intergovernmental Conference on Political Union, which started in Rome in mid-December.

Three other senior officials of DG XVII participated in the debates: the Deputy Director General, Mr C.L. Jones (gas market) the Director of Non-fossil energies Directorate, Mr F. Caccia Dominioni (alternative energy sources) and the Head of the Policy making unit, Mr C. Waeterloos (co-operation with the Soviet Union).

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# Document update

## Main Commission energy documents, proposals, directives

- 390R1370 Council Regulation (EEC) No 1370/90 of 21 May 1990 amending Regulation (EEC) No 2592/79 laying down rules for carrying out the registration of crude oil imports in the Community provided for in Regulation (EEC) No 1893/79. Official Journal No 133, 24/05/90 p. 1
- 390R2008 Council Regulation (EEC) No 2008/90 of 29 June 1990 concerning the promotion of energy technology in Europe (THERMIE programme). Official Journal L 185, 17/07/90, p. 1
- 390L0377 Council Directive of 29 June 1990 concerning a Community procedure to improve the transparency of gas and electricity prices charged to industrial end-users. Official Journal L 185, 17/07/90 p. 16
- 390L0531 Council Directive of 17 September 1990 on the procurement of entities operating in the water, energy, transport and telecommunications sectors. Official Journal L 297, 29/10/90 p. 1
- 390L0547 Council Directive of 29 October 1990 on the transit of electricity through transmission grids. Official Journal L 313, 13/11/90
- COM/90/0164 Proposal for a Council Decision adopting a specific research and technological development programme in the field of non-nuclear energies (1990-1994). Official Journal C 174, 16/07/90 p. 77
- COM/90/0306 The use of natural gas in electricity power stations
- COM/90/0328 Proposal for a Council Directive amending Directive 80/836/Euratom laying down the basic safety standards for the health protection of the general public and workers against the dangers of ionising radiation as regards prior authorization of shipment of radioactive waste. Official Journal C 210, 23/08/90 p. 7
- COM/90/0365 Proposal for a Council Decision concerning the promotion of energy efficiency in the Community (SAVE programme)
- COM/90/0368 Proposal for a Council Directive concerning the efficiency requirements for new, hot water boilers fired with liquid or gaseous fuels
- COM/90/0514 Communication from the Commission to the Council on the oil supply situation, incorporating two proposals for Council Directives on the steps to be taken in the event of supply difficulties and on the maintenance of stocks of oil
- SEC/90/1248 Working paper of the Commission on security of supply. The internal market and energy policy
- SEC/90/1959 Working paper of the Commission. The internal energy market

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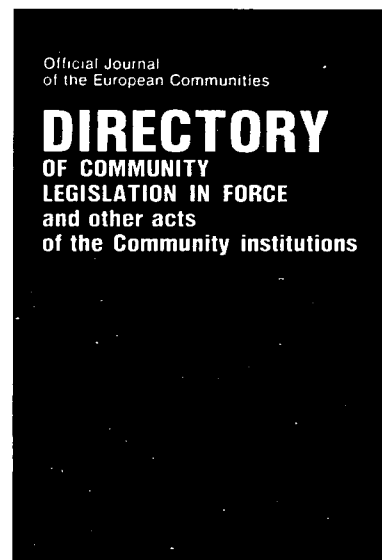
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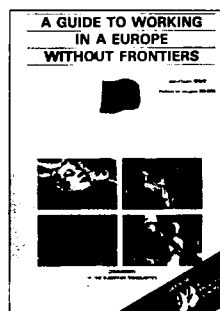
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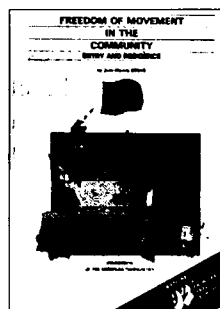
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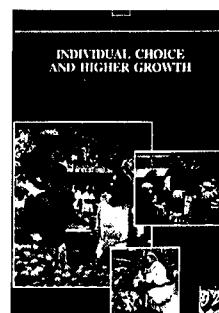
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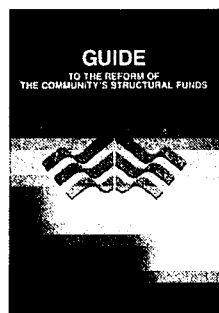


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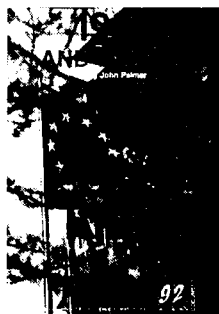
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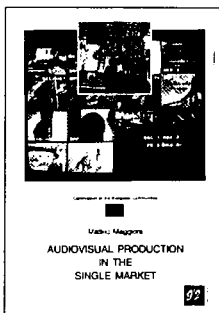
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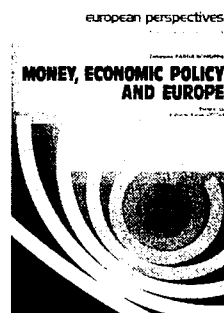
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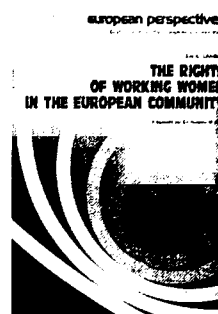
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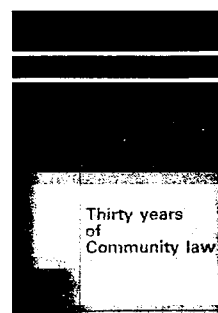
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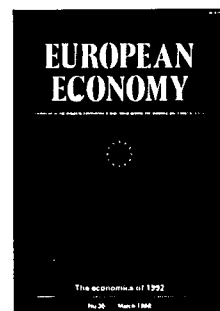
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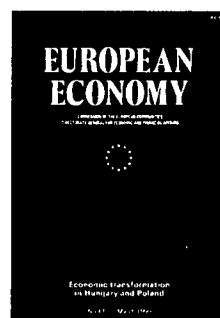


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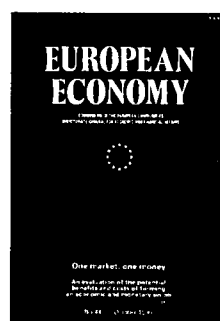


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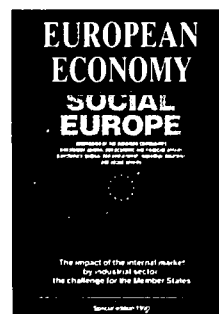
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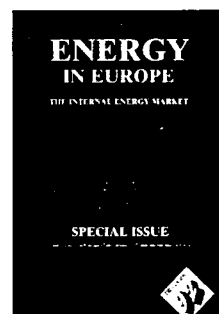
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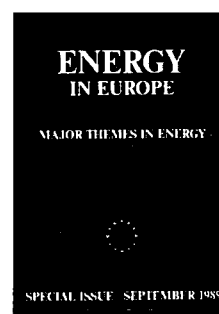
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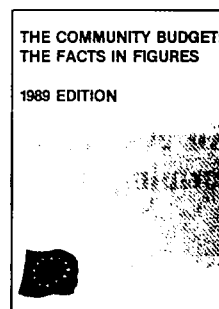
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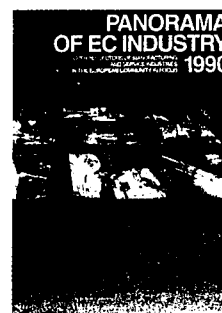
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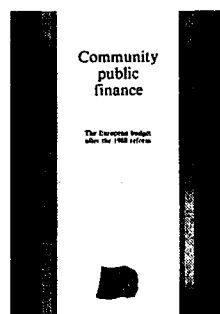
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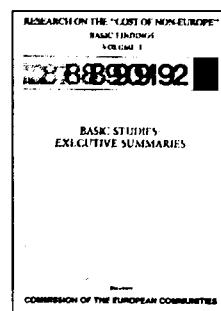


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-	nil		
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M	million (10 <sup>6</sup> )		
t	tonne (metric ton)		
t = t	tonne for tonne		
toe	tonne of oil equivalent (41 860 kjoules NCV/kg)		
fob	free on board		
cif	cost-insurance-freight		
MW	megawatt = 10 <sup>3</sup> kWh		
kWh	kilowatt hour		
GWh	gigawatt hour = 10 <sup>6</sup> kWh		
J	joule		
kJ	kilojoule		
TJ	terajoule = 10 <sup>9</sup> 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		
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Este retraso - del orden de 6 meses - en la publicación de las versiones francesa, alemana y española de la revista, se debe al largo período de tiempo que requieren la traducción y la paginación de las versiones lingüísticas no inglesas. Puede incluso ocurrir que reciba usted un número de una de estas tres versiones lingüísticas después de la publicación de la versión inglesa del número siguiente.

Así pues, algunos de los artículos están ya obsoletos cuando son publicados en francés, alemán o español, lo que hace que muchos de nuestros lectores soliciten la versión inglesa de "La energía en Europa".

A pesar de los esfuerzos realizados con vistas a mejorar la situación, los imperativos administrativos y materiales no han permitido reducir de forma significativa los retrasos ocasionados.

Por este motivo, y a título experimental, la revista se publicará a partir del número 17 en una versión plurilingüe que reagrupará artículos en inglés publicados por primera vez, junto con artículos en francés, alemán y español, ya publicados en inglés en el número 16 y que correspondan a la realidad del momento. Esto explica que el número 16 que acaba usted de recibir haya sido publicado íntegramente en inglés.

Le agradecemos su comprensión y tomaremos en consideración cualquier sugerencia que estime usted oportuna en este sentido, así como respecto al contenido de la revista en general.

Un cordial saludo,

El Comité de Redacción



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Sicher ist Ihnen bekannt, daß wir "Energie in Europa" in vier Sprachen herausgeben: Englisch, Deutsch, Französisch und Spanisch. Wie Sie jedoch zweifellos auch festgestellt haben, erscheinen nicht alle Sprachfassungen gleichzeitig. Das englische Original liegt zuerst vor, die drei anderen Fassungen folgen später.

Die etwa sechsmonatige Verzögerung bis zur Fertigstellung der französischen, deutschen und spanischen Ausgabe ist durch die langen Fristen für Übersetzung und Drucklegung der nichtenglischen Sprachfassungen bedingt, an die wir gebunden sind. Es kommt sogar vor, daß diese drei Fassungen erst erscheinen, wenn die nächste englische Nummer der Zeitschrift bereits auf dem Markt ist.

Das hat zur Folge, daß manche der veröffentlichten Artikel bereits überholt sind, wenn sie auf Deutsch, Französisch und Spanisch herauskommen. Deshalb entscheiden sich viele unserer Leser für die englische Ausgabe unserer Zeitschrift.

Aufgrund materieller und verwaltungstechnischer Zwänge war es uns trotz redlicher Bemühungen nicht möglich, die Verzögerungen wesentlich zu verkürzen.

Wir haben uns daher entschlossen, "Energie in Europa" ab Nummer 17 versuchsweise in einer mehrsprachigen Ausgabe zu veröffentlichen, die außer neuen englischen Artikeln gleichzeitig deutsche, französische, und spanische Übersetzungen von Artikeln aus Nummer 16 enthält, die ihre Aktualität bewahrt haben. Deshalb erscheint die Ihnen jetzt vorliegende Nummer 16 nur auf Englisch.

Wir danken Ihnen für Ihr Verständnis und werden Ihre eventuellen Anregungen sowohl in dieser Sache als auch generell zum Inhalt der Zeitschrift so weit wie möglich berücksichtigen.

Die Redaktion



Cher Lecteur,

Comme vous le savez sans doute, "Énergie en Europe" paraît dans quatre langues différentes : anglais, français, allemand et espagnol. Cependant comme vous avez dû vous en apercevoir, toutes les versions linguistiques de "Énergie en Europe" ne paraissent pas simultanément. La version anglaise qui est la version originale paraît en premier, suivie des trois autres.

Ce retard dans la parution des versions française, allemande et espagnole de la revue - de l'ordre de 6 mois - est dû aux longs délais nécessaires pour la traduction et la mise en page des versions linguistiques, autre qu'anglaise. Il arrive même que la parution d'un numéro dans ces trois versions linguistiques vous parvienne après la parution de la version anglaise du numéro suivant.

C'est ainsi que plusieurs parmi les articles publiés sont obsolètes, lorsqu'ils paraissent en français, allemand ou espagnol, ce qui incite nombre de nos lecteurs à demander la version anglaise de "Énergie en Europe".

Les contraintes administratives et matérielles n'ont pas permis, malgré les efforts entrepris en vue d'améliorer la situation, de réduire de façon significative les délais occasionnés .

C'est pourquoi, à titre expérimental, la revue paraîtra, à compter du numéro 17, selon une formule multilingue ; elle regroupera des articles en anglais paraissant pour la première fois avec des articles en français, allemand et espagnol ayant déjà paru en anglais dans le numéro 16 et qui gardent leur actualité. Ceci explique pourquoi le numéro 16 que vous venez de recevoir est publié uniquement en anglais.

Nous vous remercions de votre compréhension et tiendrons le plus grand compte des suggestions que vous auriez à faire dans ce domaine, ainsi que sur le contenu de la revue, en général.

Bien cordialement,

Le Comité de Rédaction.



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