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ENERGY IN EUROPE

Energy policies and trends in the European Community

Number 15 August 1990

Commission of the European Communities □ Directorate-General for Energy

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Contents

Abbreviations and symbols

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

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
l or —	discontinuity in series
of which	the words 'of which' indicate the presence of all the subdivisions of the total
among which	the words 'among which' indicate the presence of certain subdivisions only

Introduction

'Can we continue to develop the world's energy supplies, on a secure and economic basis, sufficient to maintain economic growth whilst at the same time ensuring that the global environment is protected and indeed improved?'

This was the question posed by Commissioner Cardoso e Cunha at the World Energy Conference in Montreal in September 1989. He posed the same question again at the conference 'Energy for a new century: The European perspective' in Brussels in May 1990.

This issue of Energy in Europe *does not try to answer this question. It is doubtful if any single issue could. What it does do is to highlight some aspects of the question. It also describes part of the Commission's response to the challenge implied in the question.*

But first - an apology. This issue of Energy in Europe *is much later than we had planned. The main reason for this is the May conference which placed a very heavy call on the resources of DG XVII. However, there will be benefits for our readers. We have just completed a special edition of* Energy in Europe *containing the background documentation prepared for the conference - including details of the results of our studies on energy scenarios to the year 2010 and an update of the analysis 'Major themes in energy' released at the World Energy Conference last year.*

One of the major events since the World Energy Conference regarding energy in the European Community was the adoption by the Commission of a Communication to the Council on energy and the environment. This describes the most pressing environmental problems in the energy sector and concludes that urgent measures are needed. The first article lists the main findings of the analysis.

The second article summarizes the opinion of the public on energy matters - and shows that the average European agrees with the Commission about the importance of protecting the environment. In fact the survey, carried out in 1989, shows that protecting the environment was seen by a large majority of Europeans as the most important objective of completing the internal energy market.

Environmental pollution does not respect frontiers. It is something on which we will need to work together with all other countries. The Community has had considerable experience of collaboration in the energy field. The Cooperative programme on energy and development (Coped) has been in existance for nearly ten years and an overview of this period is presented in this issue.

The environment is only one of the topics raised in Commissioner Cardoso e Cunha's question. Another is security of supply. The next article is concerned with 'Stockdraw'. This is an action which could take place in times of supply difficulties to either supplement limited supply or to reduce spot market tensions when a crisis is threatening.

The next article continues the oil theme with a description, by its Chairman, of the new statistical institution set up by the oil industry the 'Euroilstock Foundation'.

The proponents of nuclear power would tell you that it is an energy source that is contributing to keeping our environment clean and to increasing our security of supply. The public are not convinced. This issue contains an article entitled 'Nuclear questions' - addressing topics of particular concern to the public about nuclear power. The main public worry about nuclear power continues to be over the handling and disposal of radioactive wastes and this is the subject of the first article.

The Community is already working to solve several of the issues raised in the Commissioner's question. One very important way is through the support of energy demonstration projects. The Commission has announced that as a result of its 1989 call for tenders, it granted over ECU 80 million (MECU) of financial support to around 200 projects. Many of these projects involve new or renewable energies.

Of course, the Community is also continuing other forms of financial support to the energy sector. In 1988, the Community awarded the energy sector grants and loans totalling ECU 2.8 billion. The article on energy grants and loans gives a breakdown of this financing by source, by sector and by Member State.

Several of the topics covered by the Commission's energy technology dissemination activities have a strong environmental ring to them. The ones described in this issue include 'European technologies for cleaner diesel vehicles', 'Rational use of energy in the textiles industry' and 'Energy efficiency in buildings'. More detailed descriptions of two projects - 'Construction of an inflatable weir' and 'Wood roasting unit' are also covered in a separate article.

Possibly the only subject which, during the last few months, has had more attention in the world than the environment is Eastern Europe. Even in this context, the protection of the environment is a major concern - as are the demand for, and supply of energy. In July 1989, the Commission was asked to coordinate the action of 24 western countries (G-24) on economic assistance to Poland and Hungary (Phare). This short article gives a first introduction to the energy aspects of the Phare programme. This is an area of vital importance to Europe - and beyond.

In August 1989, the Commission decided to undertake a Community initiative concerning the economic conversion of coal mining areas (Rechar). The financial envelope of the initiative was fixed in November 1989. The short article here describes the objectives of Rechar and how it will be financed.

Finally, the Community news section describes many of the more important meetings, seminars and visits which have taken place in the last six months. These include the last EC/OAPEC high level meeting (December 1989), the White House Conference on global change (April 1990), a report on the EC/US high level energy talks and the most recent Energy Council (May 1990).

Energy and the environment

Following a proposal of Commissioner Cardoso e Cunha the Commission adopted, on 29 November 1989, a Communication to the Council (COM(89)369) on the most pressing environment problems in the energy sector. Both Member States' governments and energy industries are called upon to contribute to the necessary solutions. The Energy Council of Ministers in its session of 21 May 1990 adopted conclusions on this communication and gave orientations for further action (see separate article on the 'Energy Council').

The European Commission concludes that urgent measures to reinforce and expand efforts in energy efficiency improvements and in energy conservation combined with the use of more non fossil fuel energy sources are the priority areas for necessary environmental improvements, especially as far as the greenhouse effect and the reduction of carbon dioxide (CO_2) emissions are concerned. Such measures should be coupled with other environmentally friendly elements of energy policy, such as the support of renewable energies, the introduction of cleaner and more efficient energy technologies and the substitution of high polluting fuels by natural gas.

These conclusions are based on a detailed analysis of present and future sulphur dioxide (SO_2), nitrogen oxides (NO_x) and CO_2 emission trends up to the year 2010 from the combustion of fossil fuels in the Community. The main findings of this analysis are the following:

Traditional air pollutants

(i) With regard to the reduction of SO_2 and NO_x emissions, technological solutions are at the disposal of the Community and there is a political will to enforce the use of these technologies.

(ii) As a result of existing national and Community legislation (introduction of clean cars, reduction of emission from large combustion installations), SO_2 emissions from fossil fuel use will decline substantially in the period 1980 to 2010, by about 70%. NO_x emissions are expected to decline more modestly - about 20% - over the same time period.

(iii) In the light of these expected emission reductions, there seems to be no new environmental policy to be discussed in these fields except for some energy aspects, such as energy conservation.

CO_2 emissions and the greenhouse effect

(i) The greenhouse effect and possible climate change is a global problem that can only be solved through international concepts, multilateral approaches and broad cooperation with industrialized, developing and centrally planned countries.

(ii) As regards CO_2 emissions, which are at present thought to be responsible for slightly more than 50% of the greenhouse effect, there are no economic reduction technologies at our disposal. Therefore the amount of CO_2 emissions in the Community will be a direct function of fossil fuel use.

(iii) CO_2 emissions in the Community are expected to grow continuously up to the year 2010 (about 25% on the basis of 1980 emissions) in the absence of necessary political choices to reduce this problem.

A need to respond

In its Communication to the Council on the greenhouse effect and the Community (COM/88/656) the Commission decided to carry out a work programme concerning the evaluation of policy options to deal with the greenhouse effect. Within this overall work programme the Community's energy sector is of special importance and specific analysis of alternative policy options to reduce CO_2 emissions has been defined and the Council as well as energy industries are invited to collaborate closely with the Commission in the execution of this important work. Detailed strategy responses will be given after the finalization of this work. However, the Commission has already concluded in the past that apart from the uncertainties of some scientific aspects of the greenhouse issue 'urgent action to reinforce and expand efforts in the

field of energy savings, energy efficiency improvement, development of new energy sources and the use of safe nuclear technology' is already necessary today.

Where to act and what to do

To reduce CO_2 emissions and to improve the Community's environment energy policy measures could be undertaken in the following sectors for action:

Energy efficiency: the cornerstone of any action must be a Community commitment to energy efficiency and conservation. In terms of energy and environmental benefit, there is no doubt that energy efficiency is the best strategy. Energy efficiency improvements bear the most significant CO_2 reduction potential showing immediate results.

However, low energy prices acting as a disincentive to energy efficiency improvements have slowed down the impressive efficiency improvements of the past (more than 20% improvement between 1973 and 1982) to a meagre 3% improvement between 1982 and 1987. To counterbalance these adverse developments the Commission announced the preparation of a Special action programme for vigorous energy efficiency (SAVE) in the first half of 1990. Furthermore, in the long term, the use of increased or modulated energy taxation will be analysed to reduce energy consumption via higher efficiency. The Commission will set up a respective Committee of national experts. However, to achieve ambitious CO_2 reduction objectives, it is necessary to undertake efforts on the supply side as well.

Nuclear energy: none of the greenhouse gases, particularly CO_2 is emitted from nuclear energy, which faces different environmental problems, like the creation and storage of nuclear waste and the risk of accidental radioactive releases. Already now, nuclear energy is limiting the amount of CO_2 emissions and if the 140 or so nuclear reactors in the Community were closed down and the electricity they generate had to be obtained from coal, this would result in CO_2 emissions of around 550 million tonnes (242 million tonnes in the case of natural gas). However, only two Member States are building nuclear power stations at present. The impact of nuclear energy on reducing emissions will only be seen over time.

Renewable energies: the Commission underline the need to continue the support of renewable energies which at present only make a marginal contribution to the Community's energy balance. However, the future potential of these energies is enormous and the Community will continue efforts to tap this potential by its non nuclear research programme, the running energy demonstration and the proposed Thermie programme. Biomass energy may have an important role to play in future.

Natural gas: the switch from high emitting to low emitting fuels is an efficient energy measure to reduce emissions into the air. As natural gas is the cleanest fossil fuel an increased use of gas would have a positive impact on the environment, especially CO_2 emissions. However, before such a substitution process is launched on a large scale, the economic and security of supply implications need to be analysed very carefully. At present the Commission is undertaking this analysis, which includes the review of Directive 74/40/4/ EEC limiting the use of gas in power stations.

Furthermore, the Commission points to the development of clean and more efficient energy technologies and the use of regional energy planning as tools in the fight against environmental degradation. In the technology sector the proposed Thermie programme will have a key role to play in meeting the environmental challenge.

To integrate the environmental dimension into energy policy, as requested by the Single European Act in its Article 130R, some general guidelines are given to Member States which reflect:

(i) the priorities of Community regional support frameworks;

(ii) the establishment of adequate cost/benefit analysis;

(iii) the integration of environmental costs into energy prices;

(iv) the need for improved institutional links and coordination; and

(v) the need to have stable framework conditions to guarantee the smooth realization of future energy investments.

The Commission calls urgently on the Community's energy industries to develop together with the Commission codes of conduct for energy and environmental responsible behaviour. Such voluntary commitments would make industry an integral part of the solution to the Community's energy and environmental problems instead of being considered as an uninvolved contributor to them.

Public opinion on energy in the European Community in 1989

Since 1973 the Commission of the European Communities has organized public opinion surveys in the Member States to help us to improve our knowledge of the views and feelings of Europeans on a wide range of issues. These surveys - called Eurobarometers - are carried out twice a year. However, we usually only include questions on energy in the survey every other year or so. The time series for questions on nuclear energy is 1978, 1982, 1984, 1986, 1987 and the most recent Eurobarometer in June/July 1989. The following article is a summary of the report on the last survey.

During the most recent Eurobarometer survey close to 12 000 people were questioned - approximately 1 000 in each Member State. The people were interviewed in their own homes by professional pollsters working for one of a dozen specialized institutes. The work was coordinated by the French company 'Faits et Opinions' who also produced a report on the survey. This was published by the Commission in February 1990.

The questions relating to energy were divided into three topics. The first dealt with people's impression of the different sources of energy, the second with how they saw environmental problems related to energy and, thirdly, what they expected as a result of the opening up of the internal energy market.

Before describing the replies to questions on specific energy sources it is useful to summarize the replies to some general questions which help to put the public's views on energy matters in perspective.

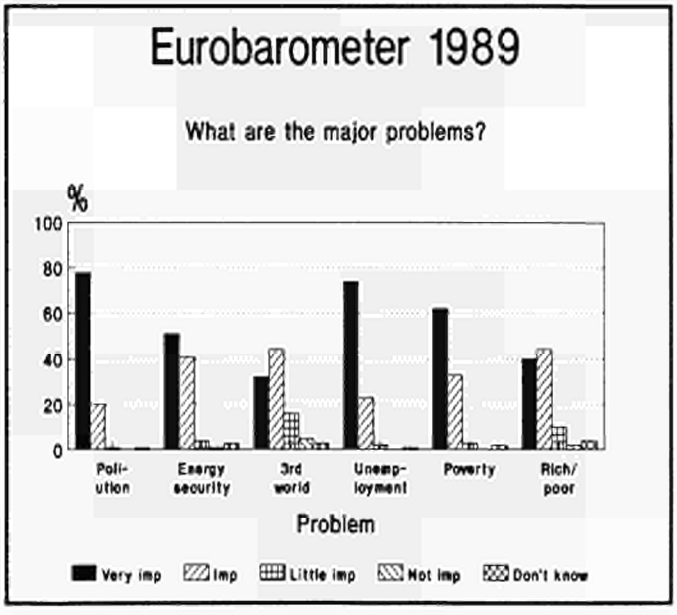
How important are 'energy problems'?

In recent surveys, one of the public's main concerns about energy has been assurance of supply. So a question on this was included in a list of other 'problems' facing society today. The people interviewed were asked which topics they found 'very important', which they found 'important' and those which were either 'not very important' or 'not at all important'. The same question - with the same topics - had been asked in 1987 so a comparison could be done between the two surveys. Nearly everyone thought all the topics to be 'very important' or 'important'. The replies are summarized in the table.

There were significant differences in opinion from one country to the next. Denmark was the most concerned about the environment with 89% of the population classing this as 'very important'. In France, on the other hand, only 68% thought it to be a very important problem and the fight against unemployment was given higher priority. Incidentally, over three-quarters of those questioned wanted action at Community level to fight against pollution.

	Very important	Important
	1989 (1987) %	1989 (1987) %
Protect nature against pollution	78 (61)	20 (32)
Security of energy supplies	51 (41)	41 (46)
Helping poor Third World countries	32 (28)	44 (47)
Fight against unemployment	74 (76)	23 (19)
Fight against poverty	62 (*)	33 (*)
Reducing differences between the richer and poorer parts of the EC	40 (29)	44 (50)

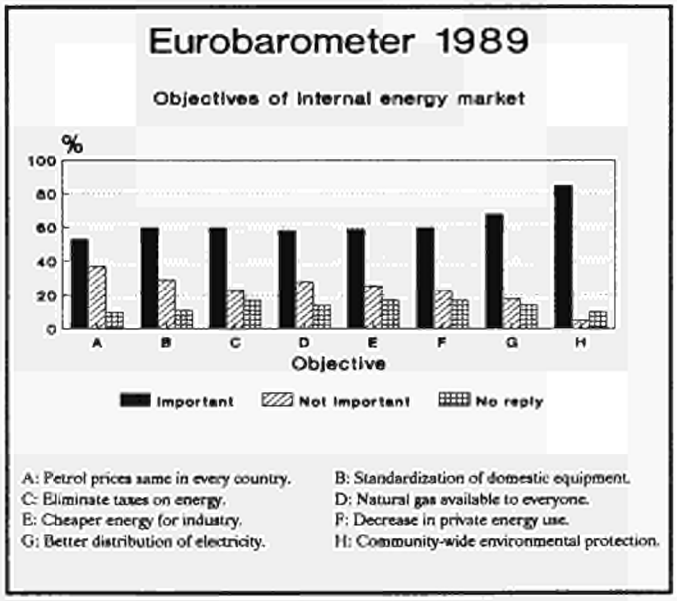
* Not asked in 1987



Energy and the internal market

The second set of 'general' questions concerned the opening up of the internal market. Here the people were given eight different topics to choose from. They had to say if each one was an important objective (or not) and whether or not it would be achieved with the completion of the internal energy market.

The adoption of Community regulations for the protection of the environment was seen to be - by far - the most important objective. Seventeen out of twenty Europeans (85%) thought this. As an objective it is seen as much more important than reducing energy taxes and costs. Seven out of ten (71%) also expected the introduction of the regulations to protect the environment. Only two other objectives - improved electricity distribution across the Community and standards for domestic appliances - were identified both as important and likely to be achieved.

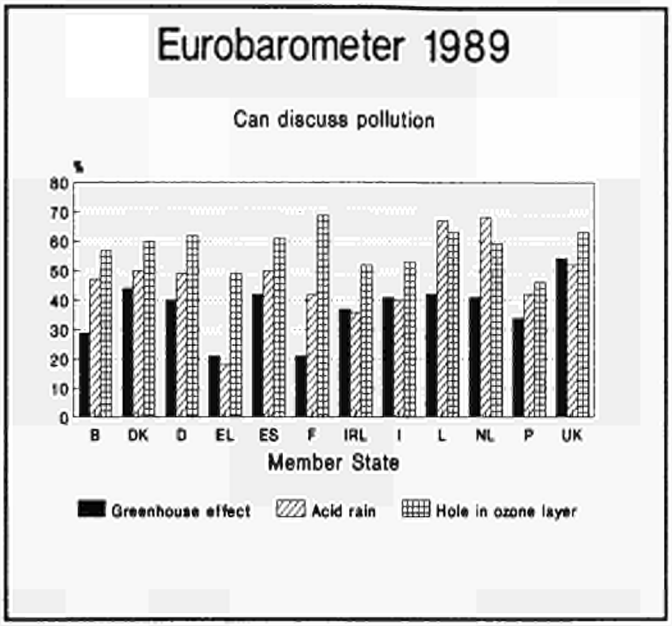


To summarize so far, there is a rapidly growing concern about the environment and people want something done about it. What is more, they expect it to be done.

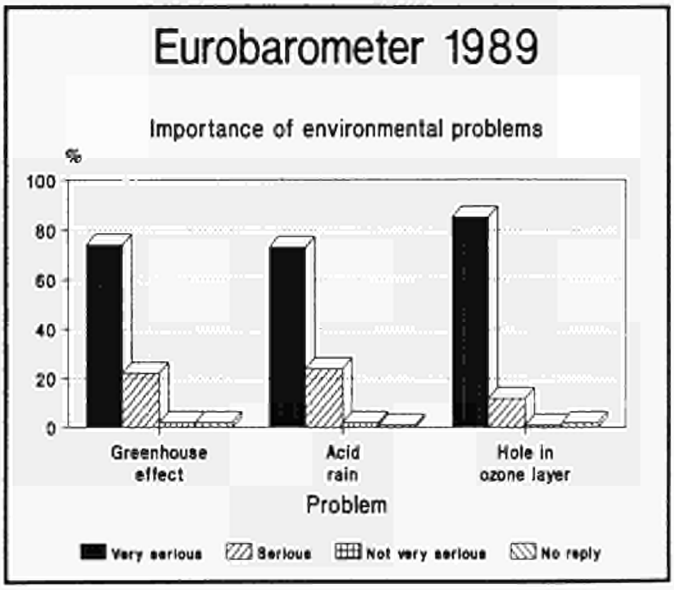
Atmospheric pollution

Given the public's concern about the environment, it might be logical to assume that they are informed about the problems of pollution and their causes. People were asked if they knew enough about three results of atmospheric pollution - the greenhouse effect, acid rain and the hole in the ozone layer - to discuss them. The answers were rather surprising, especially given the extensive coverage all three had had in the media. These are summarized below.

Can discuss the greenhouse effect	39%
Can discuss acid rain	46%
Can discuss the hole in the ozone layer	60%
Can discuss none of these	26%



There were very interesting variations from one country to the next. The percentage able to discuss the greenhouse effect ranged from 21% (in France and Greece) to 54% (UK). The range is even greater for acid rain, from 18% (Greece) to 68% (Netherlands), but narrower for the hole in the ozone layer (from 46% in Portugal to 69% in France).

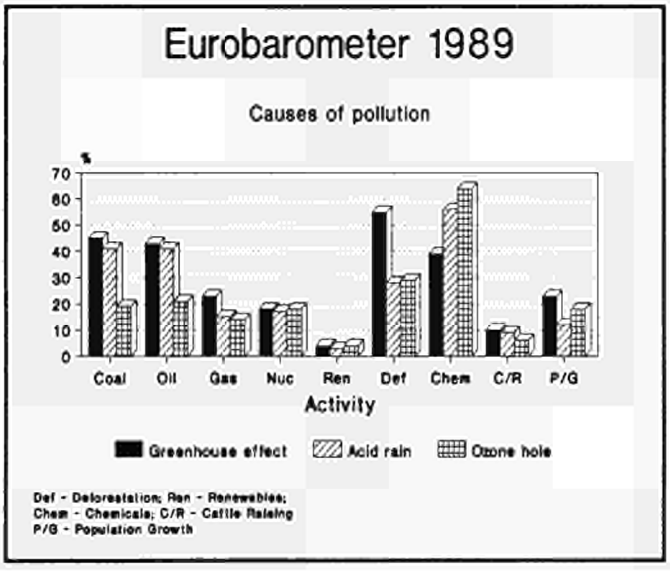


Only those people who knew enough about the three effects of atmospheric pollution were then asked to say how serious the problems were. In other words, the people who could not discuss the problems were not asked to give their impression as to their seriousness. The large majority regarded the effects as 'very serious' with nearly everybody else regarding them as 'quite serious'.

Energy and atmospheric pollution

The same people - i.e. the people who believed that they knew enough to discuss the effects of atmospheric pollution - were then asked to identify the cause or causes of each. They were given a list of nine causes to choose from. In addition to using the different forms of energy (coal, oil, gas, nuclear and renewables) the list included destruction of forests, use of chemicals in agriculture and industry, cattle raising and population growth. People could, if they wished, identify more than one cause for each effect. The results are summarized below.

	Greenhouse effect %	Acid rain %	Hole in the ozone layer %
Burning coal	45	41	19
Burning oil	43	41	21
Burning natural gas	23	15	14
Using nuclear energy	18	17	18
Using renewable energies	4	3	4
Deforestation	55	28	29
Using chemical products	39	56	64
Cattle raising	10	9	6
Rapid population growth	23	12	18



There are a number of simple conclusions that one can draw from these figures:

(i) Greater blame is placed on deforestation as a cause of the greenhouse effect than on the burning of fossil fuels. This is probably a result of the impact of media coverage with more air time and column centimetres being devoted to the destruction of the tropical rain forests than to emissions from fossil fuel burning. (It may also be comforting to think that it is someone else - in those countries with tropical rain forests to burn - that is causing the problem rather than ourselves).

(ii) More than half of those able to discuss acid rain blamed the use of chemicals in agriculture and industry as its cause. This was more than blamed burning coal and oil. Nearly three people in every ten blamed deforestation.

(iii) Only two people out of every five blame the greenhouse effect and acid rain on burning coal and oil. Taking into account the fact that only 40% of the population could discuss these two effects, this means that only about one person in five in the Community makes the link between the greenhouse effect and acid rain and the burning of fossil fuels.

(iv) After the use of chemicals, deforestation was seen as an important contributor to the hole in the ozone layer.

(v) Nuclear power, which does not emit sulphur dioxide, carbon dioxide or nitrogen oxides, was seen by one person in every five as a contributor to all three effects. This is around the same number that identified natural gas.

These 'Community average' numbers conceal some very interesting regional variations. This seems to especially true regarding people's attitudes to nuclear power.

Greenhouse effect - Less than one person in five (18%) in Portugal and only one person in four in Greece (27%) and Spain (24%) blamed coal for causing the greenhouse effect. In fact, in Portugal more people (19%) blamed nuclear power for the greenhouse effect than blamed coal burning, oil burning (14%) or gas burning (7%). One out of four people in Belgium and Luxembourg identified nuclear power as a cause of the greenhouse effect together with nearly 30% of the people in Greece. One person in ten in Luxembourg also blamed the use of renewable energy sources.

Acid rain - While 71% of the people in Denmark blame coal burning as a cause of acid rain only 7% of the people in Portugal do. In Greece, Spain and Portugal nuclear power is thought to contribute more to acid rain than the burning of any of the fossil fuels. In the first two countries at least one person in three identified nuclear power as a cause of acid rain and in Portugal three times as many people identified nuclear power as a cause of acid rain than identified the burning of coal. Stock rearing is seen by 43% of the Dutch as a cause of acid rain!

Hole in the ozone layer - Two people out of every five in Portugal (43%) and Greece (39%) identified destruction of forests as a cause of the hole in the ozone layer as did 36% of the people in France and 30% of those in Italy. One person in four (26%) in Ireland, one person in three (33%) in Portugal and a very surprising one person in every two (50%) in Greece identified nuclear power as a cause of the hole.

There appears to be a strong element of people having heard that a particular activity carries some environmental risk and then blaming this activity for a range of problems. The blame given to the destruction of forests as a cause of acid rain and the hole in the ozone layer is probably a result of their well publicized role in the greenhouse effect. It would seem that many people are aware that there are problems associated with certain activities - but are often unclear what the problems are.

While it is tempting to draw the general conclusion that it is those countries without nuclear power plants that blame nuclear power for atmospheric pollution, this is not always the case. The number of people pointing the finger of blame at nuclear in Belgium - a country with a very big nuclear power programme - was above the Community average for all three effects while the least blame came from Denmark in every case.

Gas, on the other hand, seems to have benefited from the advertising campaigns which project an environmentally friendly image. This is particularly the case in the southern European countries and Ireland where very few people associate it with the greenhouse effect.

Public opinion on nuclear power .....

One of the questions in the Eurobarometer, more than any other, has become a 'standard' or 'yardstick' by which the public's support for nuclear power is measured. Due to the interest which is often placed in the response to this question it is worth spelling it out in full.

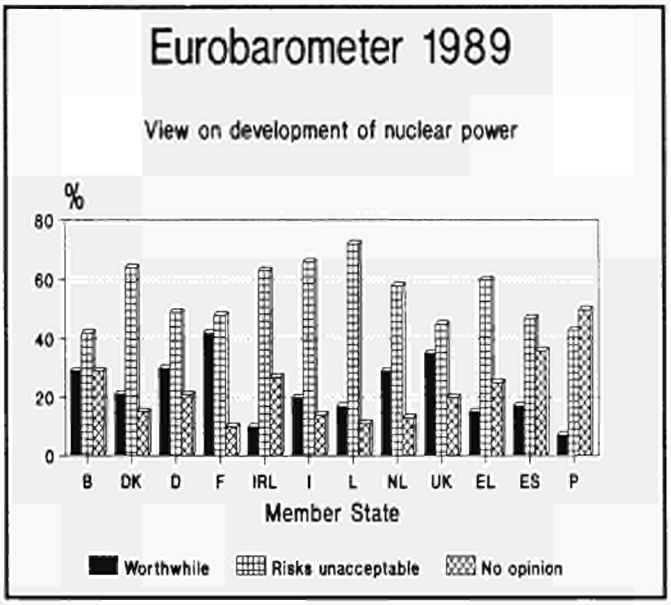
All new development in the industrial field implies efforts, time and money. It may also involve risk. Here are three opinions about the development of nuclear power stations, which use atomic energy for the production of electricity. Which of these three statements comes closest to your own opinion of the development of nuclear power?

(i) It is worthwhile
(ii) No particular interest
(iii) The risks involved are unacceptable

The answers to this question - on a country by country basis - are given in the following table together with the percentages for the 1987 survey.

	Worthwhile	No interest	Unacceptable
	1989 (1987) %	1989 (1987) %	1989 (1987) %
Belgium	29 (36)	6 (8)	42 (42)
Denmark	21 (17)	7 (9)	64 (66)
FR of Germany	30 (32)	5 (5)	49 (51)
France	42 (45)	4 (4)	48 (42)
Ireland	10 (7)	9 (12)	63 (71)
Italy	20 (22)	5 (5)	66 (68)
Luxembourg	17 (16)	5 (4)	72 (74)
Netherlands	29 (27)	6 (8)	58 (54)
United Kingdom	35 (40)	9 13)	45 (41)
Greece	15 (17)	3 (4)	60 (64)
Spain	17 (21)	6 (9)	47 (46)
Portugal	7 (12)	17 (27)	43 (39)
European Community	**28 (31)**	**6 (8)**	**51 (50)**

Most people's initial reaction to this table is to compare the 28% 'in favour' of nuclear power with the 51% 'against' it. This is probably a mistake. What we have here is a comparison between those who feel rather relaxed about nuclear power and those who are somewhat worried - or maybe just uneasy - by what they see to be the risks associated with it.



The French and the British seem to feel the most 'at ease' with nuclear power, followed by the people of Belgium and the Federal Republic of Germany. It is interesting to note that while nuclear does not appear to be popular with many people on the Iberian Peninsula, less than half of the population appeared worried by the risks thought to be associated with it. It is also interesting that in both Spain and Portugal, one person in three did not reply to this question.

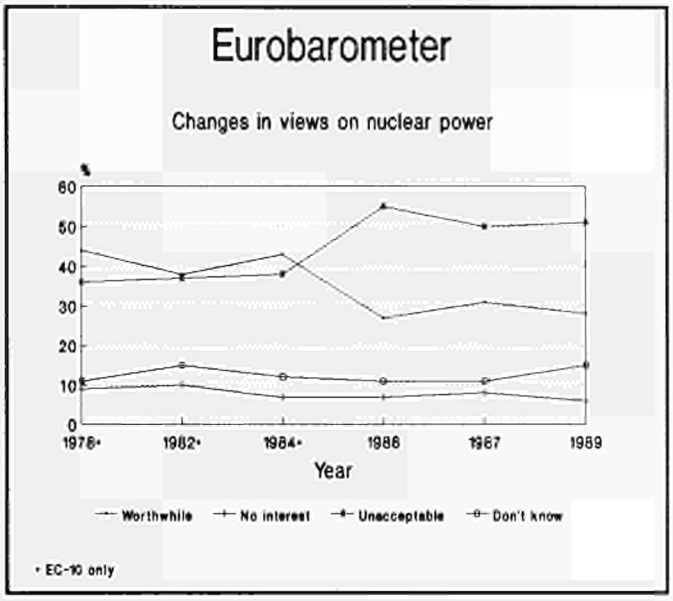
It could be that many of the people in Denmark, Ireland and Luxembourg could be most concerned about one particular plant in each case (Barsebäck, Sellafield and Cattenom respectively). These are plants for which people have been particularly 'sensitized' to the risks by the media coverage - and plants from which they themselves derive no *obvious* benefits.

The main reason for this question is to have an indication as to how the public's perception of nuclear power has changed over time. The results of the time series from 1978 to the present are summarized below.

	1978*	1982*	1984*	1986	1987	1989
Worthwhile	44	38	43	27	31	28
No interest	9	10	7	7	8	6
Dangers unacceptable	36	37	38	55	50	51
No reply	11	15	12	11	11	15

* Data for 1978, 1982 and 1984 for EC -10 only.

This shows very clearly the 'Chernobyl effect' - the 1986 survey was carried out after the accident. There was some small movement back towards the pre-Chernobyl views on nuclear in the 1987 survey, but this was not sustained. There was, in fact, a slight reversal in 1989. Community wide, the difference between the replies in the 1987 and 1989 surveys on this question are not statistically significant. In some countries the differences are a little more marked. In Belgium, for example, those thinking of nuclear as 'worthwhile' decreased from 36% in 1987 to 29% in 1989. This could be partly a result of the 'Transnuklear-Mol affair'. It could also be a reflection of the general growing concern over the protection of the environment and, in particular, the role of energy as a polluter.



People were asked for their views on the advantages of nuclear power for generating electricity. Specifically we asked if they thought nuclear power to be:

(i) Worthwhile from the point of view of costs;
(ii) Worthwhile as means of increasing energy independence of a country; and
(iii) A clean form of energy.

The replies are summarized in the next table.

	Interesting costs		Increases independence		Clean energy	
	1989	(1986)	1989	(1986)	1989	(1986)
	%		%		%	
Agree completely	16	(18)	19	(25)	14	(16)
Some agreement	28	(28)	31	(33)	22	(21)
Little agreement	15	(14)	13	(12)	14	(14)
Do not agree	20	(20)	17	(15)	32	(33)
No reply	21	(20)	20	(15)	18	(16)

From these figures, it appears that - among those people with a view on the matter - nuclear is seen as increasing the energy independence of a country and being an economically attractive method of generating electricity. On the other hand, many people (46% of those questioned) do not see it as a clean form of energy.

There was a relatively high percentage of "don't knows" in reply to this question. One person in five did not feel that they could give an opinion. There was considerable regional variation. On average, between 40 and 50% of the people in Greece, Spain and Portugal did not reply to these questions. One person in three in Belgium and one in four in Ireland did not express an opinion. On the other hand, the Germans seemed the most informed with only one person in twenty not replying. (It is, perhaps, also interesting to note that over 50% of Germans agreed with all three statements as to the advantages of nuclear power).

..... and other energy sources

People were asked to take into account their own country's energy resources and say which energy source they thought would:

(i) be the most stable in terms of price over the next ten years;

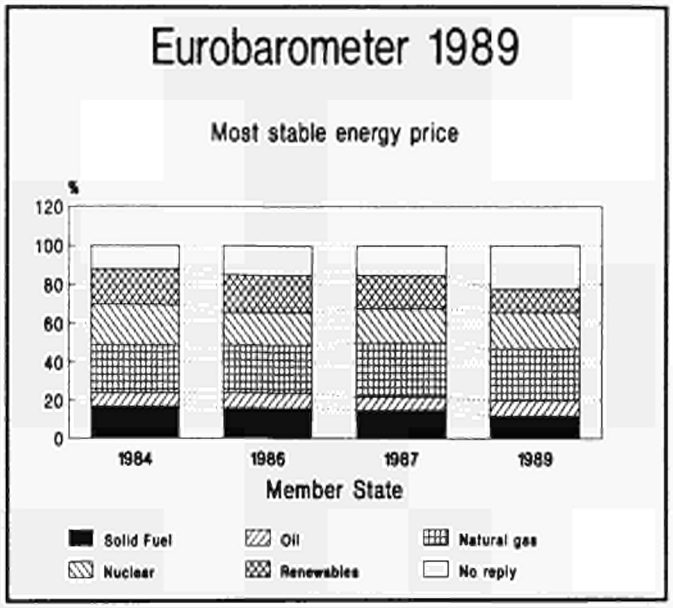
(ii) be the most reliable in terms of supplies; and

(iii) involve the lowest risk of pollution for the future.

Most stable energy price

The results are summarized in the following table.

	1984 %	1986 %	1987 %	1989 %
Solid fuels	17	16	15	12
Oil	7	8	7	8
Natural gas	25	25	28	27
Nuclear energy	21	17	18	19
Renewable energies	18	19	17	12
No reply	12	15	15	22



In the recent survey, as in previous ones, natural gas is expected to be the energy source with the most stable price. Nuclear, as often in the past, is in second place. What is interesting here is the rather sharp drop in the number of people citing renewable energies and the continuing decline in the numbers thinking solid fuels will give stable prices. It would appear that the public are starting to think of renewables as a more expensive option than they did. But it is not easy to understand the trend in solid fuels given the present state of the world coal markets, with abundant supply and low prices.

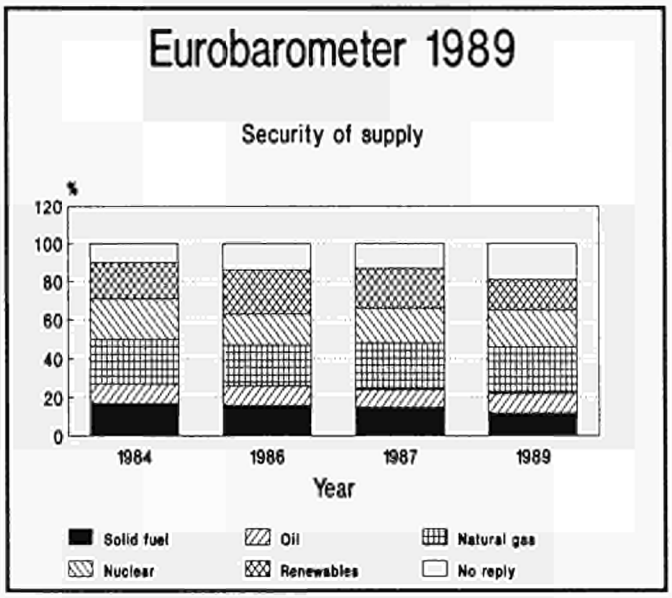
As might have been expected, those Member States with abundant supplies of natural gas thought it was the source with the greatest stability of price. More than half of the people in the Netherlands (55%) thought this. It was given the highest rating in every other Member State except two. In Spain, renewable energies were rated as giving the greatest stability of price, while nuclear was the most popular in France.

Concerning nuclear power, the countries without nuclear plants give nuclear power a relatively low rating on this question (Denmark, Greece, Ireland and Portugal) just as, for example, Portugal does for natural gas as it has no distribution network. On the other hand, most countries with significant nuclear programmes rate nuclear above the Community average. The main exception to this was Spain where only 6% thought nuclear power would give stable prices.

A similar argument cannot be put forward to explain the different national views on solid fuels. Neither the UK nor Germany rated highly the stability of energy from

fossil fuels (12% and 16% respectively). While Denmark gave them the lowest rating (4%), the Irish rated solid fuels second (with 26%) after natural gas. No country thought much of oil as a stable influence on energy prices with the Netherlands (3%) and the UK (4%) giving it the lowest rating of all.

Security of supply

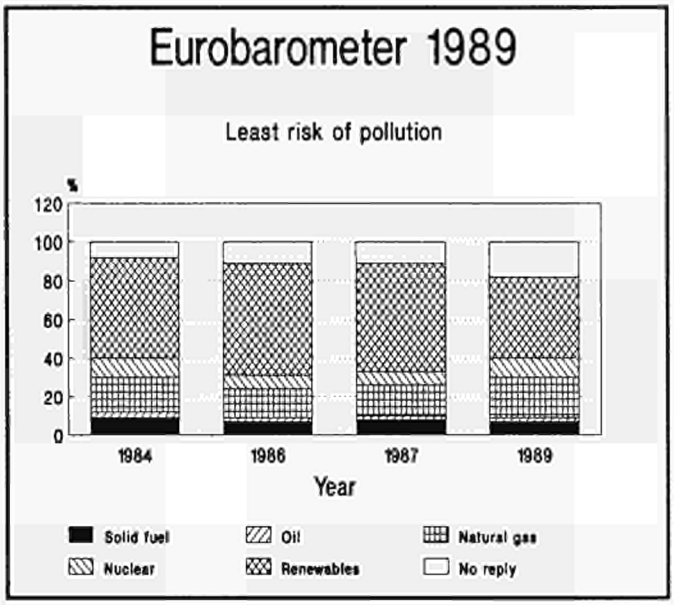


	1984 %	1986 %	1987 %	1989 %
Solid fuels	17	16	15	12
Oil		10	10	9
Natural gas	23	21	24	24
Nuclear energy	21	16	18	19
Renewable energies	19	23	21	16
No reply	10	14	13	19

We have a similar pattern for security of supply as we had for price stability. Natural gas is the number one choice, nuclear is in second place - but in this case taking over from renewable energies (which fell quite sharply in popularity since 1987). The steady decline in support for solid fuels also continued.

On a regional basis, Portugal rated the security of both nuclear and natural gas as very low (4% and 5% respectively) preferring renewables (23%) and solid fuels (15%). People in Spain also opted for renewable as the most secure source of supply (25%). After the Netherlands (60%), Ireland was the greatest supporter of natural gas (37%) and also gave a far higher rating to coal than did any other country (29%). People in Greece, Ireland and Portugal did not think much of nuclear as a secure source of energy supply. Again, they were joined in this view by Spain (in spite of its healthy nuclear programme). France and the UK, on the other hand, both thought that nuclear was the most secure source of energy.

The least pollution risk for the future



	1984 %	1986 %	1987 %	1989 %
Solid fuels	9	7	8	7
Oil	3	2	2	2
Natural gas	18	15	16	21
Nuclear energy	10	7	7	10
Renewable energies	52	58	56	42
No reply	8	11	11	18

It is no surprise that renewable energies are thought to be the least polluting source. However, these figures also show that far fewer people now expect them to make a significant contribution to our energy supplies during the next decade or so. People are, perhaps, becoming rather disillusioned as solar, wave and wind energies make very little impact on supply. This is particularly the case in Belgium, Greece, France, Italy and the Netherlands were renewables have lost nearly half of their support regarding their being

pollution free. Natural gas shows a significant increase in popularity, doubling its support in Greece, France, Italy and the Netherlands at the expense of renewable energies. Nuclear energy moves into third position, with an increased support in most Member States. On a regional basis, the support for nuclear energy is lowest in Portugal (2%), Greece (2%), Ireland (4%) and Spain (4%) and "strongest" in France (14%), Belgium (13%), Germany (13%) and the UK (13%).

Taking all three questions, it is interesting that the number of 'don't knows' has risen for each of these three questions by 50% in the last two years. One person in five did not reply to these questions. As for many of the other questions there is a great deal of variation from one Member State to the next. In Germany and the Netherlands less than 10% of those questioned failed to reply. However, in Greece, Spain and Portugal at least 40% - and sometimes over 50% - did not reply! Is the reason for the increase in "don't knows" a result of people not being as well informed about energy as they were in the past - or do they simply care less than they did? Maybe they are becoming confused by all the claims and counter-claims made about each energy source. There is probably a very important message in this for those of us working in the energy information field.

Conclusions

The 1989 Eurobarometer survey shows that:

(i) Europeans are becoming increasingly concerned about the protection of the environment. In 1987, 61% of those questioned thought the problem to be a 'very important' one, but this increased to 78% by 1989. People now regard it as more important than the fight against unemployment and poverty.

(ii) In spite of the public's concern about the environment, a relatively small percentage of Europeans are informed about the causes of atmospheric pollution. This is surprising in view of the tremendous publicity given to the greenhouse effect, acid rain and the hole in the ozone layer during the last two to three years.

(iii) Only 40% of those questioned felt that they knew enough about the 'greenhouse effect' to discuss it. Of those that did, only two out of five identified the burning of coal and oil as a cause of the effect. This indicates that no more than one person in five in the Community links the burning of fossil fuels with the greenhouse effect. The same is true for acid rain. One person in ten identified nuclear power as a cause of both acid rain and the greenhouse effect.

(iv) Three people out of five know enough about the hole in the ozone layer to discuss it and over 60% of these identified the use of chemicals as its cause. However 30% also identified deforestation and 20% identified burning of fossil fuels and the use of nuclear power.

(v) The public's view of nuclear has changed little over the last two to three years. Nuclear's main advantage is still seen as increasing a country's energy independence and it is also interesting from the point of view of electricity production costs. However, 46% do not see it as a clean form of energy and 51% find the risks associated with its development as 'unacceptable'.

(vi) Natural gas is seen as being the source of energy which offers the greatest security of supply and stability of price. One person in four holds this view. Nuclear comes in second position being chosen by one person in five.

(vii) Two out of every five people (42%) think that new and renewable energies (solar, biomass, wave) are the least polluting sources of energy for the future. This is fewer than in the 1987 survey when 56% of those questioned held that view. One person in every five thinks that natural gas is the least polluting and one in ten identified nuclear power.

Eurobarometer 1989

Copies of the report 'Public opinion in the European Community on energy in 1989' are available free, on request, from the Librarian, DG XVII, 200 rue de la Loi, B-1049 Brussels, Belgium. The report is available in English, French and German.

Cooperative programme on energy and development (Coped) - overview of the last nine years

The Cooperative programme on energy and development (Coped), a network of Third World and European research centres in the field of energy economics and planning has been in existence for the past nine years. The European Community has supported the network since it was introduced. As we approach ten years of its existence this article presents a short history of Coped's evolution, an analysis of its approach to energy problems in developing countries and an evaluation of its activities.

History of Coped

The creation of the Coped network must be seen against a background of the energy crisis of the late 1970s. It was apparent at that time that despite the attention being paid to the world energy situation, not enough attention was being paid to the specific energy problems of developing countries. Research centres from various developing countries and also some European countries were concerned at this situation and had a common interest in combining forces.

These concerns were shared by the Commission in the context of the Community's cooperation and development policy. In order to acquire a better knowledge of the developing countries' present and future energy needs, the Commission was of the opinion that it was advisable to have direct access to research work in the countries themselves, rather than rely on European expertise alone. A joint research programme, supported by the Commission, was the solution to this need.

During 1979 and 1980, preparatory work was undertaken and a programme called 'the network' was established in 1981, with Commission backing, by representatives of six Research Centres:

(i) AIE/COPPE - Area Interdisciplinar de Energia Coordenacao dos Programas de Pos-Graduacao de Engenharia of the Energy Department of the University of Rio de Janeiro, Brazil.

(ii) AIT - Asian Institute of Tehnology, Bangkok, Thailand.

(iii) ENDA-TM - Environnement et Développement du Tiers Monde, Dakar, Senegal.

(iv) IDEE - Instituto de Economia Energetica, Bariloche, Argentina.

(v) TERI - TATA Energy Research Institute, New Delhi, India.

(vi) IEJE - Institut Economique et Juridique de l'Energie, Grenoble, France.

During its first few years the network was extended to other centres and now includes also the Science Policy Research Unit (SPRU) University of Sussex; Arab Centre for Energy Studies (ACES), Kuwait; Instituto de Investigaciones Electricas (IIE), Cuernavaca, Mexico; Institute of Nuclear Energy Technology (INET), Beijing, China.

While academic freedom and respect for the uniqueness of each centre has been the rule within the network, the continuity of the work has made it possible to reach common thinking on many issues and to develop a dynamic process of exchange of experience among members. The network has become very active not only in the context of North-South cooperation but also in furthering South-South cooperation with active exchanges of information between Africa, Asia, Latin America and Europe.

The network holds an annual meeting which lasts for approximately a week and affords an opportunity for all to review past performance and future objectives and for the Commission to assess its support. The last meeting took place in Cuernavaca, Mexico in 1989.

The approach adopted by the network has seen changes since its inception and we can now see two phases; the first phase ending with the publication of *Energy and development*[1] in 1984 and the second phase covering the period 1985 to the present.

[1] Lavoisier Publishing Inc. 1984

Energy and development: the main concepts

From the start, Coped network members shared the conviction that energy problems in developing countries could not be considered in isolation but as a consequence of the very nature of the under-development which affects these countries. Taking into account the specific characteristics of energy as a sector in developing countries, Coped observed that these features were largely ignored in the methods advocated for use in developing countries at that time.

Consequently it was realized that the first priority was to draw up a coherent set of methods for analysis and action which would be consistent with the conditions and objectives of developing countries, and with the special characteristics of their energy systems.

A coherent set of methods was subsequently elaborated covering the following areas:

(i) energy information;

(ii) analysis and forecasting of energy requirements and supply;

(iii) case studies at local level.

Briefly, this approach led to improved methods of collecting information in the energy area through the use of a common format of presentation which evolved to become the integral energy balance. It is interesting to note that basic energy information collected for these energy balances is fed into the DG XVII information system. Coped also developed the concept of energy diagnosis which complements the energy balance by collecting and presenting the energy information in a systematic way, including qualitative and institutional information on the various economic operators (producers, consumers, governments) active in the energy field, their past behaviour and present strategies.

In the analysis and forecasting field, it was apparent to Coped members that there was a need to develop new methods which would be appropriate to developing countries. As a result a computational model called REQLOCHE was built up which incorporated these ideas.

Coped realized the value of information collected at local rather than national level and consequently devoted some attention to this area which provides supplementary knowledge of the energy system in its economic and social context. Prior to 1985, eleven such studies were carried out in Africa, Asia and Latin America, which provided valuable information, particularly on rural areas. Since then, the programme of case studies has continued and has demonstrated the validity and applicability in developing countries of the methods devised in the earlier phase.

1985 onwards

From 1985 onwards, while some work continued on methodology, it was decided to pursue a new series of research topics relevant to developing countries, including energy prices and tariffs, the relationship between energy and technology, energy and the environment and also a long-term international energy forecasting study. All these studies are ongoing and it is anticipated that the results will be useful as policy guidelines for decision-makers.

Also from 1985 onwards, Coped began to shift its priorities towards practical exercises, through which the methods and instruments already in place could be concretely applied and tested. The Commission (DG XVII) agreed with this approach seeing this development as an important part of its cooperation activities.

Accordingly, a number of cooperation projects of a practical nature have since been carried out by Coped centres. These fall into two broad categories: firstly, projects which consider the energy system and energy policy as a whole in a given geographic area; and secondly case studies of specific aspects of the energy system or particular sectors or social groups.

Examples of such projects which are ongoing or have been completed are 'Energy demand analysis and forecasting in Thailand' prepared by AIT for the Thai National Energy Administration; the 'Integral energy study of Argentina's North East' carried out by IDEE/Bariloche and the National Energy Bureau and provinces in the region; and a case study on 'Energy consumption and needs in rural Mexico' carried out by IIE in two States of the South Pacific region.

Through the implementation of these projects, Coped centres have developed working relations with decision-making bodies at all levels including governments, local authorities, energy companies, etc. The projects have also provided valuable opportunities for intensified cooperation among Coped members.

Amongst other activities which have received attention from Coped, training in particular has been integrated into projects very soon after the inception of the network.

Throughout the nine years of its operation Coped, in full agreement with Commission policy in this area, has developed links with institutions at international level such as the UN, the IAEA and Olade (the Latin American Energy Organization).

At the latest of the network meetings in Cuernavaca, an important development took place. It was agreed to conduct a joint study covering the Third World as a whole but with each institute making its specific contribution to the study in a coordinated fashion. The theme of the study is 'Key issues facing the electricity systems of developing countries, a 21st century perspective'. In addition, the network will give more visibility to its valuable research activities by increasing its publication effort.

Conclusions

In general the evidence of the past nine years is that Coped has achieved its initial objectives. It has contributed effectively, at the international level, to a better understanding of energy problems in developing countries and to the building up of their abilities to devise and implement effective energy planning and energy policies. It has also promoted a spirit of both North-South and South-South cooperation.

The special characteristics of the Coped network, particularly its flexibility and academic freedom, the participation with full equality of all its members, and the balance maintained between the different components of each project, have all helped to make the network a success.

DG XVII's support is recognized by the network as a key element in its success, and as an established form of cooperation which should continue to benefit the work of all those involved in the programme and in energy planning in the developing world.

Stockdraw and the market: implementation and monitoring of stockdraw

This article prepared by Mr John Bishop of the Directorate-General for Energy is a personal contribution of the author to the ongoing discussion on the above subject.

Possible actions that can be taken by government to implement 'stockdraw'

1. Introduction

It would not be meaningful, or indeed even possible, to determine ahead of time what actions governments will take in times of supply difficulties. Such actions will always be selected in the light of the specific circumstances at the time; the nature of the supply difficulties; the opportunities or options available to governments; and the results that governments seek to obtain from their actions.

That having been said, the purpose of this presentation is to identify some of the principal results that governments are likely to want to achieve, as a result of their actions, and to determine, in general, the types of action that appear most appropriate for the achievement of those results. This requires careful definition of objectives which, at the time of supply difficulty, need to be clearly established and fully understood.

2. Objectives

It needs to be recognized that stockdraw can take place in differing circumstances and that consequently, government objectives will not always be the same. There are basically two totally different contexts in which stockdraw may be employed:

(i) to supplement limited supply. This sort of use takes the form of emergency run down obligation (ERDO), such that, well into a crisis, when shortage of supply is already being experienced at consumer levels, use of stock allows demand restraint measures to be less drastic than they would otherwise need to be;

(ii) to reduce spot market tension when a crisis is threatening but has not yet materialized in the form of physical shortages at consumer levels. This sort of stock use takes the form of coordinated emergency response measures (CERM).

In the context of the International energy programme (IEP) and Emergency measures manual (EMM), ERDO is already fully understood. The purpose therefore of this presentation is to concentrate on the objectives and appropriate actions necessary for early stockdraw of the sort foreseen for CERM.

To do this, it is necessary to consider the circumstances likely to be prevailing at such times.

Early in the development of a crisis, the international trading market becomes unstable, leading to what are often totally unrealistic and unjustified price rises, which spread rapidly throughout the world economy. It is this instability that early stockdraw is aimed at limiting or preventing, and this is the primary objective.

3. Market structure considerations

Reference was made earlier to the 'international trading market', and it is in this market that stockdraw is intended to have an effect. To obtain maximum effect from every unit of stockdraw, it is necessary to examine the structure of the market and 'aim' the effects of stockdraw towards those parts of the market where they will be most effective.

The market we need to consider is essentially a 'wholesale' market in which it is important to distinguish between the true 'spot market', in which 'spot prices' are developed, and the very much larger section of the oil trade, that uses spot prices for its transactions. These 'spot related' deals will contribute to the damaging effects of price rises, because of the way in which their prices are linked, in advance, to published spot quotations ruling on the eventual date of delivery. They are, however, not themselves spot deals.

True spot deals are relatively few, and volumes are not high. For some products, several days may pass without the conclusion of a single spot transaction. But it is these spot deals that set the published prices!

The types of deal that go to make up the spot market, under normal circumstances, are as follows:

(i) Distressed sales, to make space to solve an unexpected operational problem.

(ii) Distressed purchases to cover a shortfall that, for operational reasons, cannot be covered in any other way.

(iii) Balancing purchases or sales, usually by refiners who need to cover more or less demand than they had programmed for.

(iv) Purchases or sales by entrepreneurs, who find a buyer or seller that they can profitably 'back to back' with the spot market.

(v) Purchases by distributors/marketers who have chosen the spot market as a regular source for part of their supplies.

In times of threatening or actual crisis, three changes take place:

(i) Refiners' sales tend to dry up, as the refiners prefer to hold on to their surpluses as much as tankage will allow.

(ii) Companies that fear or know that the crisis will restrict their normal supplies, seek to become new buyers on the spot market to cover their shortages.

(iii) Speculators seek to buy in a rising price market, in order to sell later and make a profit.

This reduction in sellers' volumes, coupled with the increases in buyers' demand, produces an imbalance which destabilizes the spot market and leads to rapid price rises. The situation is compounded, because, as the speed at which price rises increase, more speculators are tempted to enter the market as buyers. Although, by definition, speculators are not net buyers over a reasonable time period (because they only buy in order to resell for a profit later and in the same market), their buying in the early stages does increase **apparent demand** quite substantially and boosts yet again, the price rises which the combination of circumstances now make inevitable.

4. Actions needed

Since, as already mentioned, early stockdraw may well take place before real physical shortage arrives at consumer or even international wholesale market levels, there clearly needs to be a strong psychological element to the stockdraw actions.

They need to be arranged and publicized so as to:

(i) maintain, in normal routine spot market buyers, the confidence that, when they need to buy their supplies, oil will be available at reasonable prices; and

(ii) destroy speculator confidence that prices will rise, by convincing them that the combination of remaining normal supply, plus stockdraw, will allow total demand to be met sufficiently satisfactorily for price rises to be most unlikely. This should kill speculator interest in buying and persuade refiners to refrain from hoarding and maintain their normal level of supply to the spot market.

To achieve this, consideration needs to be given to how much stock needs to be released. In the worst case, all categories of normal and incremental demand will have to be met. This could be quite a lot. But, in the best case, the certainty of this happening will limit incremental demand to real needs only, with zero interest in speculation. This could involve very little.

Therefore 'actions needed' are those that will put the volumes of oil required for sale on the spot market - directly or indirectly, and convince all concerned that '**all demand will be met**'.

Actions can be divided into three categories:

(i) Direct sales

Government can tell companies to offer oil for sale and deliver to buyers directly from their stocks.

(ii) Semi-direct sales

Following government instructions to 'sell oil on the spot market' companies can sell parts of incoming cargoes and use part of their stock for delivery downstream to consumers in their own system.

(iii) Indirect sales

Companies which would have been buyers in the spot market are told to abstain from purchasing and use their stocks instead.

Outside the spot market, companies sell to others which would otherwise have had to turn to the spot market for supplies.

The best and most easily verifiable actions would be direct or semi-direct sales, and governments could 'order companies to undertake such sales and make full reports on them to government'.

The question of monitoring company performance of government orders will be dealt with in a later presentation. At this stage, it is merely necessary to stress that government will need to ORDER companies to follow quite specific lines of action.

The fact that government actions are set in motion by giving ORDERS is important for three reasons:

(i) Whereas persuasion can be done secretly behind closed doors, an order tends generally to be clear and public. Thus, speculators see that a stock release order has been given.

(ii) Because of operational/trading profit centres in oil companies and because market tension traditionally pushes up prices, oil companies would never voluntarily release stock BEFORE the price rise. Unless ORDERED to the contrary, they would normally hold or build stock and seek to sell only at the price peak.

(iii) Even if senior management sought to override the profit centres in the interest of longer term stability, rather than short-term profit, such actions, without a government order, could, and probably would, lead to successful legal actions being taken against them.

Whilst it is appreciated that many governments do not like to give firm, direct, unambiguous orders, for early stock release they must! Ironically, they should not fear industry resentment. By and large, industry does want to preserve stability and therefore it wants and certainly needs direct legally established orders to 'do the right thing'.

The sort of orders governments could give include:

(i) Orders that stocks be put at government disposal, with government arranging sales by tender, as in the USA. (Governments would need qualified staff for this).

(ii) Governments calling for 'hardship' claims from potential buyers, on the basis of which government could order direct sales of company stocks to those in need.

(iii) Governments could order companies to "auction" stocks and keep government informed of all tenders and subsequent activity.

The important point that needs to be recognized is that it will not be sufficient merely to allow or require or even order that companies lower their stock levels in some unspecified manner of their own choosing.

5. The futures markets

It is not yet clear what part Nymex and International Petroleum Exchange (IPE) futures and options prices may play in mainstream supply price formation. It is evident, however, that they do play some part, and their significance is increasing. It is possible therefore that stable futures prices could help to stabilize spot market and related mainstream prices. Should this clearly become the case, there could be great merit in government ordering companies to enter the futures market as substantial sellers, backed up to delivery, where appropriate, from their stocks. Where delivery is not possible, companies could be required to re-enter as sellers each time their short position is liquidated. This sort of action could keep prices stable without requiring any physical delivery of oil. Clearly, the futures markets potential needs to be carefully observed, since it could afford interesting possibilities for future action.

Monitoring stockdraw

1. Introduction

As has already been stressed in other presentations, there are some substantial differences between early CERM type stockdraw and the later use of stocks as ERDO in the application of the IEP as an alternative to consumption reduction.

The direction in which a stock movement takes place is diametrically opposite in the two cases, and consequently the method and location of monitoring will need to be different.

In the case of ERDO, stocks will be channelled downstream in the form of deliveries to consumers to supplement deliveries that can be made from the restricted day to day supplies remaining available.

The monitoring of this type of stock use is relatively easy and will not be dealt with further in this presentation.

Turning in particular to CERM type stockdraw, three points need to be fully recognized:

(i) to be most effective, CERM stockdraw should be taking place **before** physical shortages have started to be felt in the downstream market;

(ii) at such times the stock movement needs to be, not towards consumers downstream, but somewhat upstream into the wholesale or spot market;

(iii) at such times no oil company would choose, on a voluntary basis, to reduce its stock level by delivering to third parties that are not even its customers; more likely its competitors. The commercial objective at such times must be to build stocks, in case of future shortage, or in hope of future re-sale profit, or a combination of both.

This highlights the problems of monitoring a situation in which it must be recognized that companies will have powerful motivation to **appear** to shed stocks while in reality building them.

2. The objectives

The objective is to monitor the stockdraw activity of commercial oil companies, where they are the ones that own the stock. Government or public entity stockdraw is probably sufficiently transparent to render monitoring unnecessary, although some tracking of company activity at times of government drawdown would be useful, and knowledge of company actions is essential, in cases where private entity stockdraw consists only of making deliveries to its oil company participants.

Thus monitoring should concentrate on companies:

(i) to verify that the company has, in reality, followed government instructions; and

(ii) to provide a sufficiently 'visible' procedure, the evident presence of which will strongly dissuade any company from trying to avoid compliance with government instructions.

There is another rather different form of objective, which is to avoid vast expensive bureaucratic machinery. This begs many questions in the determination of the desirable scope of any monitoring exercise.

If one starts in a vacuum with nothing, and designs a complete and comprehensive system for monitoring all company activities in the context of stockdraw, the result would look over-complex and too heavy. But we are not working in a vacuum - or at least we shouldn't be! - we should have, already in place, procedures for recording and verifying levels of stock, on a routine month by month basis. These procedures then provide the starting point for stockdraw monitoring. With the very minimum of scope it could be said that merely checking reported stock levels each month, would indicate whether stockdraw was occurring or not, but in the context of the inevitable company attitude towards drawdown already described, this would be too simplistic. Also it can be assumed that government instructions will be more precise than a simple call for stock reduction and therefore the monitoring system must extend to allow the monitoring verification of all the forms of stockdraw action that governments propose to tell companies to undertake.

This again starts to sound like a major addition to existing systems and, if applied to every company and party active in the oil market, it could involve the need for a level of specialist manpower not available to government.

To overcome this problem; provide adequate monitoring with an acceptable work load and ensure that companies are deterred from circumnavigating the umpire, it may be necessary to adopt a two phase approach.

The first phase would be the routine fast and relatively simple checking system that could be followed on a discretionary basis by a detailed meticulous 'audit quality' analysis of anything from individual company activity to the whole market.

The important aspect of this approach is that the detailed verification must be credible. Companies must recognize that they run a substantial risk of becoming subject to

detailed investigation. Further, they must know that the penalties for detected infraction will be heavy.

3. Examples of possible checking systems

I. Stock reports

As already discussed, these represent the simplest and most direct indicators of company stockdraw. The extent to which they can be relied upon will depend on the following:

(i) frequency and accuracy of government checks on company stocks. In this context there are major differences between areas in which the only procedure is the receipt of stock reports, and those where material balances are calculated, especially when such calculations are made by independent auditors. Stock numbers within a country, are much more reliable when they form part of an on-going material balance operation. The adoption of the more accurate system only in times of crisis would probably not be feasible but, at such times, acceleration of government checks may be desirable;

(ii) a reduction in reported stock levels in one country could be offset by stock increases elsewhere. It is therefore important for all countries to be monitoring reported stock levels, to eliminate havens in which stock can be built up unseen;

(iii) stock reduction does not necessarily indicate a sale of stocks in the market. Stock levels can also be reduced by:

- transfers to secondary or tertiary storage locations;
- advance deliveries to large consumers; and
- slow steaming of inbound supply shipping.

This last point is important, since increasing oil afloat is the easiest way of reducing stocks on land. Specifically therefore, in the context of CERM stock release, there could be strong motivation for asking companies to provide frequent reports on oil afloat during the CERM operation. However, it must be recognized that most of such information would come from international traders, outside the jurisdiction of IEA country governments and it would consequently be unverifiable.

II. Evidence of sales

The buying and selling operations of oil companies are so complex, that merely requesting evidence of sales in general, would serve little purpose. If specific sales are to be verified, it will be necessary to distinguish between those specific sales that represent stockdraw, and all the other transactions representing normal business.

If companies themselves were asked to identify sales that represent stockdraw, the information would not be easily verifiable.

> This approach will only work properly if specific sales are set up in advance as an identifiable part of the government's stockdraw implementation programme. This could be done in several ways, as discussed in the earlier presentation on possible actions that can be taken by government to implement 'stockdraw'.

Perhaps to this category should also be added "evidence of purchase" which could be obtained if sellers are asked to identify the buyers to whom they have sold. This would not provide a perfect control, since companies could sell to off-shore traders, outside IEA control, and then buy back. However, if too many sales were seen to be going this way, it could provide enough justification for some deals to be traced through to establish final buyer's identity. The threat of this sort of disclosure might be sufficient to deter companies from making such artificial sales.

III.Sales into the futures markets

Whilst it remains a question of debate, whether futures prices follow the spot market or vice versa, it is interesting to ponder on the effectiveness of many companies taking short positions in the futures markets, backed up by stocks. If this was done, the exchanges handling the deals could be called upon to verify company activity.

IV. Global audit

After the event, analysis, undertaken by a company's auditors or independent inspectors, should be able to establish to what extent stocks were reduced as a result of spot market or other short-term sales to traders and others who buy for onward distribution rather than consumption. Some standardized methodology would need to be developed if this course of verification action is considered worthwhile. Much will depend, however, on the level of

penalties that might be imposed on any company not properly undertaking stockdraw. Litigation on such a complex issue would clearly be very difficult.

Such difficulties should, however, not be used to justify the absence of comprehensive monitoring capabilities. These capabilities, however infrequently used, must be in place to deter those who, for self-evident reasons of self interest, will be tempted to give only token cooperation in a stock release exercise upon the success of which the future health of the economies of the world may depend.

A new development in economic information in Europe: The creation of the Euroilstock Foundation (by Mr Th. Verougstraete, Chairman of the Euroilstock Foundation)

In opening its columns to the Euroilstock Foundation Energy in Europe *welcomes a new statistical institution whose objectives tie in with the completion of the internal energy market. We at the European Commission are happy to support the constant efforts of the oil industry in its quest for economic information to meet the demands of our time.*

Economic information in Europe

Since the end of World War II, there have been spectacular developments in information covering the political, economic, social and cultural fields. It has widely contributed towards greater integration of the individual into civic life. This integration has come about through greater insight into public management on the one hand, and into economic life, whose main protagonists are corporate bodies, on the other hand.

Equally significant has been the growth and development of these companies. The development of small and medium-sized undertakings, whose role in Europe remains a prominent one, has gone hand in hand with the emergence or consolidated growth of large corporations which, for their part, were given unprecedented momentum and resources by the growing importance of the capital market. The authorities, anxious to safeguard the common good, called on the economic operators involved in large-scale industrial and social projects to make public the information concerning them. These same authorities - both national and international - such as the EEC and OECD, have over the years adopted a series of rules and regulations to promote the transparency of economic information.

Such information must be of benefit to the economic world at large: it is a prerequisite for progress and is inconceivable without the objective cooperation between the authorities and the industry. More about this later.

Economic environment of the oil industry

It would be helpful we think to retrace very briefly the events which have been landmarks in the oil history since 1945.

After the war, oil companies developing natural resources pursued a market-regulation policy by gearing production to suit demand.

One prominent development was the creation of OPEC, in Baghdad in 1960. The 1970s were the decade of nationalization programmes undertaken as of 1972 and at the time of the first two oil shocks. 1973 saw the barrel price of Arabian light soar from USD1.80 (1970 value) to USD11.65. The same barrel reached the reference price of USD24.00 in 1979, the year of the overthrow of the imperial regime in Iran.

The upward trend then continued with prices topping the USD34.00 mark in 1981. The events of the 1970s served as a prelude to the current imbalance between supply (production) and demand (consumer countries' needs).

Deprived of means of regulation, oil companies are today looking to make production and consumption evaluations. However, this information is often lacking in precision. International institutions such as the European Commission and the International Energy Agency have also deployed considerable efforts to set up forward projection systems of information.

Oil companies, for their part, are constantly on the look-out for information that provides a ready-reference within the scope of their daily resources management. This pressing need for reliable up-to-the minute economic indicators lies at the origin of the Euroilstock system.

The establishment of a statistical foundation

Back in 1981, a number of oil companies began looking into the idea of setting up a ready-reference system for hydrocarbon stocks in Europe. The EC lent its support to the initiative, coordinated the efforts of a select study group

and made available a subsidy to remunerate the services of independent consultants. The consultant appointed was KPMG Klynveld Kraayenhof.

From 1981 to June 1986, the study group made up of corporate and EC representatives set about defining a series of rules and methods which form the basis of the system.

On 1 July 1986, the industry decided to set up a Dutch Law Foundation to take over the management of the stock-reporting system and subsequently integrate other statistical projects. This major initiative taken by our industry was to prove to become an objective contribution to the achievement of the internal energy market in Europe.

Stock-reporting system

Within five working days of the close of the current month, the companies file physical stock reports for crude oils and finished products to the consultants KPMG Klynveld Kraayenhof. They, in turn, bound by very strict rules of confidentiality, consolidate the figures of participating companies to arrive at national totals for each country of the European Community. Klynveld then feed back the consolidated figures to the participants no later than seven working days after the close of the month.

It was necessary to establish a uniform scale of correlation for products, a scale which could be used in every country of the Community and was consistent with the IEA statistical system, so that Euroilstock's monthly results could be compared a posteriori with the monthly IEA statistics available three to four months after the close of the month of transmission. This constant reference to IEA statistics is an essential benchmark for our system.

Let us just remind you that Community laws on competition lay down rules about the industry's disclosure of the information gathered from its ranks. The Foundation therefore decided to publish the information through the intermediary of Petroleum Economics Group. This company disseminates the information - on a subscription basis - combining it with an independent analysis.

Today, the average cover rate for stocks in the Community is higher than 90%, the margin of error lower than 2%. Virtually all oil companies operating on the Community's territory participate in our works.

These outstanding results must not however obscure a weak point to be overcome - as we are endeavouring to do. It concerns the non-participation of independent oil storage companies in the ARA area, bound by agreements with customers whose decision-making centres lie outside the EEC, decision-making centres found mainly in countries which are parties to the Charter of the Cooperation Council for the Arab States in the Gulf.

These countries' participation in the Euroilstock system, however, seems to us to be a logical follow-on from the recently concluded Cooperation Agreement between the EEC on the one hand, and the Cooperation Council for the Arab States of the Gulf on the other hand. Article 6 of this Agreement in fact stipulates that:

'In the field of energy, the Contracting Parties shall strive to encourage and facilitate, *inter alia*:

> exchanges of views and information on matters relating to energy in general and respective energy policies, without prejudice to the parties' international obligations (etc...)'.

The Foundation is most eager to see lifted the burden constantly weighing on the transparency of stocks in the ARA area.

Systems of reporting refineries' throughput and production

The Foundation decided in November 1988 to extend the current system of monthly reporting of stocks to include refinery crude oil throughput.

We are also considering this information by country, the rate of cover being 95%.

Moving on from the throughput stage the Foundation recently decided to extend its statistics to include refinery production in the twelve Community countries. This information will be available from the second half of this year.

Refinery crude oil throughput and production can also be considered as basic indicators of the industry. They highlight demand and the level of stocks and provide a regular overview of refining; through our information the rates of utilization can easily be obtained.

Monthly reporting of land stocks, monthly crude oil throughput in the refineries and refinery production figures (naphtha, petrol, gas oil and fuel oil), that is what the Foundation has achieved after four years of existence.

We are thus approaching the completion of national oil balances. Reporting of the trade patterns (imports and exports) should allow us in time to obtain important information concerning internal consumption.

The Euroilstock Foundation and the American Petroleum Institute

As to whether the Euroilstock Foundation is in any way related to the American Petroleum Institute, let us just say that the European oil industry has not sought to model its young institution on the American entity. It is developing in the European environment and has its own specific nature.

Article 2 of the Statutes of the API outlining its objects does, however, stipulate:

'The objects of the Institute, as expressed in its charter, shall be, in all lawful ways:

to afford a means of cooperation with the government in all matters of national concern (etc...)'.

These provisions are an expression of the API's desire to cooperate with the authorities under given circumstances. The American Petroleum Institute and the Foundation share a concern for the common good. In this respect, we sincerely hope to develop our already very positive relations with both the International Energy Agency and the European Commission whose Statistical Office in Luxembourg and DG XVII seem to us to be natural talking partners.

Nuclear questions: disposal of radioactive wastes

In public opinion surveys carried out in the European Community, the majority of those questioned identified the disposal of radioactive waste as their main concern about nuclear power. It is in this area - more than in any other - that the view of the population at large contrasts strongly with that of the nuclear industry. For the industry's part waste disposal is seen as a technical question for which there is not only one but a number of satisfactory answers. From the point of view of the public it appears as a rather insoluble problem for which no solution has yet been demonstrated. Both cannot be correct.

This article summarizes what has already been done in the area of disposal of radioactive waste - and what is still left to be achieved. Following on from a Commission coordinated six-year safety assessment of high-level radioactive waste disposal, it also responds to the question 'Can we dispose of radioactive waste safely?'

All Member States of the European Community produce radioactive wastes from medical and non-nuclear industrial activities and research. These wastes account for a significant proportion of total waste. Those Member States with nuclear power programmes also have to cope with the wastes from nuclear electricity generating stations or factories which produce or reprocess nuclear fuel. These wastes, in terms of the radioactivity they contain, account for the largest part of radioactives wastes produced each year.

Between now and the end of the century a total of around 600 000 cubic metres of radioactive wastes will be produced. Around 90% of these wastes will be what are known as 'low- or medium-level' wastes. Less than 0.3% (around 2 500 cubic metres) will be 'high-level' wastes. The balance (around 40 000 m^3) will be 'alpha' wastes. These different categories are described in the next section.

While 600 000 cubic metres could be considered as a large volume (a cube with sides 85 m long) it should be looked at in the context of the quantities of all types - nuclear and non-nuclear - of wastes produced *each year* in the Community. This amounts to 2 200 million tonnes. More importantly, among this quantity are 20 million tonnes of 'dangerous' wastes which, if not adequately stored or disposed of, can be dangerous to man.

It should also be noted that in over thirty years of experience of radioactive waste management, around one million cubic metres of low- and medium-level radioactive wastes have already been definitively disposed of and over 60 000 m^3 of alpha-wastes and 2 000 m^3 of high-level wastes treated and stored. These amounts are roughly equivalent to - or exceed - quantities which will be generated over the next ten or so years.

Categories of nuclear wastes and their origins

Radioactive wastes are made up of a great variety of materials. These materials can have different physical/chemical states, can emit several types of radiation[1] and can have radioactivity levels ranging over several orders of magnitude.

This diversity results in widely differing potential hazards and therefore necessitates different types of management. Radioactive waste must therefore be classified by categories.

The classification described below was chosen because it is the best way of presenting, in the case of the Community, quantitative data on the treated and conditioned radioactive waste produced in the Member States. It also possesses the advantage of grouping the radioactive waste into categories which correspond to the disposal options applied at present or contemplated in the Member States.

Four main waste categories are distinguished:

(i) low-level waste
(ii) medium-level waste
(iii) alpha waste
(iv) high-level waste

These categories, and the inclusion of a 'type' of waste in one category rather than in another, are not of a regulatory nature. The management practices in some Member States may be such that categories or types of waste identical to those considered in this report may not exist at national level. For example, in the Federal Republic of Germany, medium-level waste and alpha waste which produce only negligible amounts of heat are combined with waste in the

[1] Mainly alpha, beta and gamma radiation

low-level category in view of the fact that deep-lying geological formations will be used for the disposal of all categories of waste.

(i) The **low-level waste** category covers waste containing or suspected of containing beta-gamma emitters and mainly naturally occurring alpha emitters in low concentrations (and therefore of low activity) produced by research centres and arising from industrial and medical uses of radioactive elements and from the operations conducted in various installations involved in the nuclear fuel cycle. The concentration of the other alpha emitters (plutonium, americium, etc.) in this waste category is very low and is very strictly monitored. The radioactivity of such wastes becomes negligible through natural decay after several centuries at most. The waste produces only negligible amounts of heat.

(ii) The **medium-level waste** category comprises waste containing mainly beta-gamma emitters in relatively high concentrations. This waste originates, for the most part, in nuclear power stations (ion-exchange resins, filter cartridges, evaporator concentrates, etc.). The alpha-emitter concentration in waste of this category is extremely low, as in the case of low-activity waste. Only negligible amounts of heat are generated.

(iii) The waste in the **alpha waste category** comprises waste from nuclear laboratories conducting research on transuranics, plants fabricating uranium-plutonium mixed-oxide fuel elements and spent-fuel reprocessing plants. Some of this waste is low-level waste containing only alpha emitters. The remainder is medium-level waste containing alpha, beta and gamma emitters which arises at reprocessing plants and includes hulls, caps and fines from fuel elements. The radioactivity in such wastes persists for very long periods because long-lived alpha emitters are present. Only small amounts of heat are generated.

(iv) The **high-level waste** category comprises, for the purposes of this report, solely vitrified waste containing the 'ashes' arising from nuclear combustion (fission products and transplutonium elements which are alpha and beta-gamma mitters). These 'ashes' are separated from the unburnt nuclear fuel (uranium and plutonium) in radiochemical installations (reprocessing plants) which treat the spent fuel discharged from the nuclear power stations. Such waste contains the greater part of the radioactivity; it remains dangerous for very long periods and emits an appreciable amount of heat for several centuries.

If the decision is taken not to reprocess the **spent fuel** discharged from the nuclear power stations, it is considered to be waste and pertains to the category of high-level waste.

A special category of low-level waste which is not covered by this article is made up of the residues from the extraction and processing of uranium ores. The quantities produced at the extraction site are very great, and the natural radionuclides present release a radioactive gas called radon (^{222}Rn). Discharges containing such waste undergo special treatment to reduce the radiological risk to the public.

Quantities of nuclear wastes

The most recently published calculations as to the quantities of radioactive wastes likely to arise in the Community to the end of the century were contained in the CEC Communication to the Council of Ministers (COM(87)312 final of July 1987). These calculations were based on an expected installed nuclear capacity in the Community of 109 GWe in 1990, rising to 125 GWe in 1995 and 142 GWe by 2000. More recent estimates of the growth in nuclear capacities are much more modest with the present capacity of 100 GWe rising to between 110 and 115 GWe by the end of the century. As there is a close correlation between the quantities of wastes generated and the size of the nuclear programmes, the actual quantities of wastes likely to be generated are significantly lower than those shown in the following table.

Waste category	1991-1995	1996-2000	TOTAL
Low-level (m^3)	316 500	359 500	376 000
Medium-level (m^3)	62 750	68 750	131 500
Alpha (m^3)	20 250	19 400	39 650
High-level (m^3)	980	1 455	2 435

Treatment and conditioning of nuclear wastes

(a) Low- and medium-level wastes

Almost 93% of the volume of radioactive waste currently produced in the Community is accounted for by low- and medium-level waste.

Processes for the treatment and conditioning of such waste are available and the corresponding industrial installations have been applying them successfully since the early 1950s.

The **treatment** prepares the waste, as produced at source, for conditioning; it chiefly takes the form of:

(i) compaction or incineration in the case of solid waste;

(ii) evaporation, insolubilization or chemical precipitation followed by filtration in the case of aqueous waste.

Conditioning imparts to the treated waste forms which reduce to a minimum the risk of dispersion of the radioelements in the waste during handling and transport operations or in the event of attack by external agents (mainly water) after disposal. To that end, the treated waste is most frequently incorporated in matrices which solidify into blocks or structures possessing, with or without external containers, the requisite safety features (good mechanical strength, resistance to fire, a low leaching rate, satisfactory long-term behaviour, etc.).

The matrices most often used in the Community are as follows:

(i) cements, which have been employed since the 1950s mainly for low-level waste;

(ii) bitumens, which were introduced between 1960 and 1965, are used by several Member States;

(iii) polymers, which were recently introduced.

Although such operations have been carried out for several decades, they continue to benefit significantly from technological advances.

(b) Alpha waste

Of the radioactive waste produced in the Community, 7 to 8% consists of products contaminated by long-lived alpha emitters, the radioactivity of which remains at a significant level over long periods.

Most of such waste remains untreated at present, pending the development of treatment and conditioning processes and the availability of underground disposal facilities. The basic technologies are available and the current R&D activities are focused on techniques for the treatment of liquid and solid waste contaminated by alpha emitters and on the conditioning of the hulls of spent fuel elements. The objective of these activities is to develop conditioning processes which would ensure safe storage and disposal over long periods.

New processes have been developed and tested up to the pilot-installation stage, chiefly for solid plutonium-contaminated waste. Where liquid alpha waste is concerned, only the ultracentrifugation process combined with chemical precipitation (developed at Harwell in the United Kingdom) is far enough advanced to be used in an active-waste pilot installation. This has a capacity of $5m^3$/day. The separation of long-lived radio-elements (actinides), either with a view to recycling them or to degrade most of such waste into waste of other categories, is also under study.

(c) High-level waste

Of the volume of radioactive waste produced in the Community, 0.3% is made up of high-level waste (also containing alpha emitters) which is or is to be vitrified. This waste contains almost all the radioactivity in waste arising from the nuclear power programmes. The release of heat due to radioactivity is in consequence a major concern in the management of such waste.

Radioactivity and heat emission decrease until levels similar to those of alpha waste are reached after several hundred years. At that moment, the high-level waste is similar to alpha waste.

Most of the high-level waste is nowadays temporarily stored in the liquid state in tanks provided with special cooling and safety systems. The objective of the treatment and conditioning processes is to immobilize this waste in solid matrices, such as glasses, which maintain satisfactory integrity in the long term.

Industrial development of various conditioning processes is at present under way in the Community. Of such processes, the French vitrification process (AVM) is available on a commercial scale and is being applied in several major facilities. In the Germano-Belgian installation Pamela, high-level liquid waste from the Eurochemic reprocessing plant has also been successfully vitrified by means of the Pamela process.

All sources of production of high-level liquid waste (mainly reprocessing plants) in existence or planned in the Community will be provided in due course with vitrification facilities in order to ensure that the waste is immobilized and adequately conditioned with a view to its final disposal.

Disposal of nuclear wastes

As has already been said, the differences between the types of wastes mean they should be managed differently. They can also be disposed of differently. Low and medium-level wastes contain fission products which virtually disappear after several hundred years through decay and only very small quantities of radionuclides with a long half-life. These wastes generate very little heat. They can normally be disposed of in a different way to the high-level wastes which contain nearly all of the fission products and long-lived radionuclides and release considerable amounts of heat. Alpha wastes, which also contain appreciable quantities of radionuclides with a long half-life, are often combined with the high-level wastes for disposal purposes.

With the exception of sea dumping, which relied largely upon dilution and dispersion in the environment, but is now suspended, all disposal concepts for low- and medium-level wastes rely on isolation from the biosphere at least initially and until radioactive decay has made subsequent releases to the environment compatible with radiation protection criteria. Multi-barrier containment systems have been designed for this purpose and most countries have already defined and sometimes implemented disposal practices and policies.

The length of the isolation period required is governed by the radiotoxic properties of the waste and particularly the half-lives of the radionuclides contained. A surface or near-surface facility is usually regarded as suitable for short-lived, low-level waste, provided some form of site surveillance is maintained after closure of the site, notably to prevent intrusion by man. However, it is clearly recognized that the maintenance of institutional control (i.e. any form of surveillance by man carried out on a continuous basis under the supervision of the responsible regulatory authorities) cannot be relied upon beyond a limited time period and a maximum of 300 years is usually regarded as a prudent limit in this respect. This results in a clear requirement for surface and near-surface disposal facilities: the waste they can accept should be such that the site could be released for unrestricted use, e.g., roads, houses or even farming, at the end of the agreed institutional control period.

In contrast, deep geologic isolation as a totally passive system is considered necessary for long-lived waste. In this case, institutional control measures would not be needed in the far future to preserve the long-term integrity of a well-selected site because the probability of interference by natural events and human actions is very limited. This reasoning, however, does not exclude the possibility of deep geological disposal for short-lived waste, which would make institutional control superfluous from a strict safety viewpoint.

Low- and medium-level waste

This waste is generally treated and conditioned quite soon after it has been produced.

Interim storage takes place:

- either at the production site, which sometimes possesses quite a large storage capacity;
- or in a centralized storage facility, which is often close to the disposal site and is protected and monitored.

Land disposal is carried out:

- either by disposal near to the surface, mainly used for low-level short-lived waste;
- or in deep geological formations.

Disused mines can be considered when they are known to be rather free of water introusion, e.g. in the Federal Republic of Germany the Asse salt mine was used up to 1978 and the abandoned Konrad iron mine is now being considered for use in future.

France's first near-surface repository, the *'Centre de la Manche'*, has been in operation since 1969 in a 12 hectare

area located at the western tip of the Cotentin Peninsula, close to the La Hague reprocessing plant. The total capacity of this centre is about 500 000m^3 of waste and up to now, it has received about 400 000m^3 of waste. The centre will be filled completely at the beginning of the 1990s. It is planned to start operation of a new disposal facility, Centre de l'Aube in north-eastern France, by early 1991. The disposal capacity will be 1 million m^3 of waste.

The UK has been burying low-level waste in trenches at Drigg since 1971. Around 600 000 m^3 of wastes have been buried at this site.

In Spain the construction of a near-surface storage/disposal facility for low and intermediate level waste at El Cabril will start shortly. The projected capacity of this facility is 60 000 m^3.

Alpha-wastes

Since a very long period of isolation is necessary in order to prevent the radionuclides from re-entering the biosphere and such isolation can be ensured only by disposal in deep-lying geological formations or possibly in the sediments of the seabed at great depths, waste of this type is often combined with high-level waste for the purposes of disposal.

High-level wastes

Among the options discussed for disposing of high-level wastes, an international concensus has emerged that deep geological disposal on land is the most appropriate means for isolating such wastes permanently from man's environment. However other options are also being studied especially disposal in geological formations under the deep ocean floor.

The basic requirement for any geological formation is its ability to contain and isolate the radioactive wastes from man's environment until the radiotoxicity of the wastes has decayed to non-hazardous levels. In order to increase the safety of geological disposal, most such disposal concepts rely on a system of independent and often redundant barriers to the movement of radionuclides in an effort to provide a high degree of assurance that exposures to man will remain at acceptably low levels. These barriers generally include: (1) the leach-resistant waste form itself, (2) corrosion-resistant containers into which the wastes are encapsulated, (3) special radionuclides- and groundwater-retarding material placed around the waste containers, commonly referred to as backfill, and (4) the geological formation itself - the principal barrier - which should both retard the transport of radionuclides in circulating groundwater, and isolate the waste from man's environment.

The geological formations considered suitable for the disposal of such waste are subject to limitations as regards the maximum temperature they are capable of withstanding in contact with the waste, and a site as a whole can accept only a limited heat injection if the entire structure is not to deteriorate. Though high-level waste produces considerable amounts of heat, this gradually reduces with time (somewhat over 1 000 watts is generated per tonne of uranium from spent fuel ten years after discharge from the reactor, but this drops to about 200 watts after 100 years of decay).

Interim storage of vitrified waste over periods up to 50 years is hence advantageous. Installations for this purpose either exist (Marcoule, Mol) or are planned (La Hague, Sellafield) at existing or planned vitrification plants.

Disposal in deep-lying geological formations (several hundred metres) is being studied by several Member States with emphasis on clay, salt and granite formations.

Disposal in **clay formations** is of interest to several Member States. Belgium is studying disposal in a clay stratum below the Mol research centre (Hades project) which is between 110 and 270 metres deep. An underground laboratory was constructed at a depth of 225 metres and hydrogeological, geomechanical and technological tests have been under way there since 1984.

A pilot test installation for disposal in a **salt dome** is in operation in the Asse mine in the Federal Republic of Germany. Also in Germany, the Gorleben salt dome is undergoing qualification as a definitive disposal site envisaged to be operational about the year 2000.

In France, where **granite, shale, salt and clay formations** are at present being investigated, a proposal will be made (around 1992) for a site for an underground laboratory. Here studies will be done *insitu* of conditions suitable for the construction of a deep repository centre is scheduled to be proposed around 1992.

In the United Kingdom a site investigation programme has started at two potential sites for deep disposal of low and intermediate level waste. These are at Sellafield and Dounreay.

One possible alternative solution is **disposal in seabed sediments** at great depths, either by the drilling of boreholes or by using free-fall penetrators to put the waste in place. This solution has been studied at international level by the Seabed Working Group under the auspices of the Nuclear Energy Agency of the OECD.

Community research and policy activities

For nearly 15 years the Commission of the European Communities has promoted R&D activities in the Member States, notably by means of financial support. A Community programme on radioactive waste management and disposal was launched in the mid-1970s and has been renewed since then every five years. Implemented by means of shared-cost actions with bodies of the Community Member States (universities, national laboratories, private industries), the present programme pools the activities of more than 40 European bodies and 500 European scientists.

A large part of the programme is devoted to the construction and operation of deep underground experimental facilities and to the research activities required to establish the industrial feasibility and safety of geological disposal.

The Community 'Plan of action in the field of radioactive waste' 1980-92 provides an appropriate general framework to discuss and develop various issues, notably as far as radioactive waste management strategies or policies are concerned. It also asks the Member States and the Commission to continue and step up their efforts to ensure that the public receives full information on activities related to radioactive waste management and disposal.

Safety assessments: The Pagis study

In the framework of its research programme the Commission of the European Communities initiated in 1982 the project Pagis (Performance assessment of geological isolation systems). The project was carried out over a six-year period.

The essential aim of the project was to assess the general capability of possible waste disposal systems to confine, or severely restrict the release of radionuclides incorporated in conditioned high-level radioactive waste (HLW) after the closure of the underground repositories. This was done by evaluating the efficiency of disposal systems in selected geological formations, coupling natural and man-made barriers in view of protecting present and future generations and their environment from possible deleterious effects due to high-level waste repositories.

Three host rock formations were considered which are commonly found in the European countries: clay, granite and salt; disposal into sediments of the deep sea has been added as an alternative to land-based disposal.

All these host rocks may provide an efficient barrier for the radionuclide migration thanks to their peculiar characteristics. Clay for instance, has a very low permeability and high retention capacity; granite offers low permeability and long migration pathways; salt provides a dry environment to the waste packages; the sub-seabed sediments have, like clay, high retention factors, and have the benefit of the extremely high dilution capacity of the world oceans.

Reference sites were selected for each option, the choice being dictated by the availability of input data obtained previously through extensive research and field campaigns. However, it was decided that the disposal feasibility study for any option should not rely on a single site. Consequently, one or more variant sites were selected for each option.

The selection of real sites and the use, as far as possible, of on-site measured data is a singular feature, as it represents an intermediate step between the generalized safety studies made in the past and the site-specific assessments for the purpose of waste repository licensing.

The main conclusions of the Pagis study are that:

(i) during many thousands of years after disposal no radioactivity at all will reach the biosphere;

(ii) the most efficient barrier is the natural geological barrier; if well chosen, its chemico-physical properties and hydrology impose radionuclide travel times which allow a substantial decay and dilution before the biosphere is reached;

(iii) the engineered barriers may play a role essentially in accidental situations; their contribution in the normal evolution of the repository is very low;

(iv) the analysis of a selection of natural events which may alter the normal evolution of the disposal system (e.g. climatic changes, tectonic displacements, etc.) has shown no significant increases of the potential dose rate;

(v) human intrusion scenarios into or near the underground repository need consideration since exposure may occur at earlier times and at significantly higher dose rates than in the normal evolution scenarios, although results from Pagis did not show unacceptable levels, additional site-specific work may be desirable;

(vi) as the site-specific parameters are dominant for achieving low individual and collective dose rates, no general conclusion on preferred geological formations may be drawn;

(vii) applying the methods proposed by the International Commission for Radiation Protection, all risks and exposures are far below the limits recommended by this organization and national authorities for all possible sites analysed.

It may be stated, therefore, that there are no reasons to doubt the possibility of achieving safe disposal of vitrified HLW in any of the formations examined, provided that appropriate sites are selected and repositories are designed and built according to sound engineering practices[1].

[1] This overall conclusion, established in the context of the nuclear technology and scientific knowledge now existing in the European Community, joins similar ones which resulted from national studies, such as those carried out in Sweden (KBS) and Switzerland (Gewahr), which were made on different basis.

Financial support for demonstration and hydrocarbons technology projects

The Commission has announced the award of financial support of 116.2 MECU to demonstration and hydrocarbons technology projects received in response to the 1989 call for proposals. A total of 550 proposals were received, of which 209 were granted support.

The following table shows the distribution of the successful projects, comparing the 1989 figures with awards over the past five years.

	1989			1984-89		
	No of projects	Financial support		No of projects	Financial support	
		MECU	% of total		MECU	% of total
Energy efficiency	57	28.7	24.7	376	172.5	25.3
Renewable energy sources	90	29.9	25.7	529	162.3	23.9
Biomass and waste	15	9.1	7.8	104	50.8	7.5
Geothermal	11	4.1	3.6	63	24.5	3.6
Hydroelectric	22	4.7	4.0	107	24.5	3.6
Solar energy	22	5.1	4.4	155	30.4	4.5
Wind energy	20	6.9	5.9	100	32.0	4.7
Solid fuels	10	21.8	18.8	80	151.8	22.3
Hydrocarbons	52	35.8	30.8	319	194.5	28.5
Total	**209**	**116.2**	**100.0**	**1,304**	**681.1**	**100.0**

The distribution of financial support between the various sectors follows a similar pattern to that of the past five years, except that there was a reduction in support to solid fuels projects. This is due to the completion of many of the large multi-phase liquefaction and gasification projects under previous rounds, which meant that they did not require support under the 1989 round. Over the past five years it is seen that there has been roughly a four-way split in financial support between each of the four major sectors: energy efficiency, renewable energy sources, solid fuels and hydrocarbons.

The regulations governing the demonstration and hydrocarbons technology programmes expired at the end of 1989, so this was the last award of financial support under these programmes. This accounts for the somewhat lower level of financial support than in the last few years (116.2 MECU, as against an average of 141.2 MECU over the previous four years); the remaining residue of the budgeting under the regulations was being used up.

Future energy technology projects will be funded from the new Thermie programme for the promotion of European energy technologies, which was adopted at the Council of Energy Ministers on 21 May 1990.

Thermie will cover the four major sectors indicated, but will have a strong accent on the dissemination and promotion of energy technology, rather than focusing only on demonstration.

The Thermie programme is designed to run from 1990-94 with a budgetary allocation of 700 MECU.

A somewhat limited call for proposals for 1990 was published in the first half of this year, and a much more extensive call for proposals for 1991 will be published in the latter part of the year.

Energy grants and loans from the Community in 1988

In 1988 the Community awarded the energy sector grants and loans totalling ECU 2.8 billion, of which ECU 988.9 million took the form of grants and ECU 1808.9 million took the form of European Investment Bank (EIB), European Coal and Steel Community (ECSC), New Community Instrument (NCI) and Euratom loans.

Grants from the general budget and the ECSC budget

Community grants to the energy sector in 1988 (see Table 1) rose by 12.3% in 1988 compared with 1987, mainly because of the increase in Regional Fund support for individual projects, for which 1988 was the last year of validity of the old regulation, and because of the 52% increase in ECSC redeployment loans compared with 1987.

Table 1
Community energy grants in 1987 and 1988 by budget heading

	1987		1988	
	MECU	%	MECU	%
Energy (Chapter 70)	148.2	16.8	137.9	13.9
Energy R&D (Chapter 73)	404.4	45.9	405.1	41.0
ERDF	220.5	25.0	250.9	25.4
Projects	150.9	17.1	215.0	21.8
Valoren programme	43.2	4.9	6.8	0.7
IMP contributions	12.0	1.4	15.0	1.5
Specific measures	14.4	1.6	14.1	1.4
Integrated Mediterranean programmes Additional contribution	11.0	1.2	13.0	1.3
European Agricultural Guidance & Guarantee Funds (EAGGF) contribution to IMPs	3.0	0.3	4.3	0.4
ECSC budget	93.8	10.7	177.7	18.0
Total	**880.9**	**100.0**	**988.9**	**100.0**

European Regional Development Fund (ERDF) commitments for the Valoren programme slowed down considerably in 1988, partly as a result of the delays in implementing the national programmes. Decisions were taken on most of them in the course of 1987 and the first Community funds were not provided until the end of the financial year. These appropriations, which represent 12.7% of the overall programme allocation, were therefore absorbed in 1988. Adding together the support for projects, aid granted under the Valoren programme and the integrated Mediterranean programmes (IMPs) in Greece, the ERDF contribution in the energy sector amounted to ECU 250.9 million, i.e. 6.8% of the Fund's total assistance. While this is slightly up on 1987, it is on the low side compared with commitments for the energy sector in previous years.

Energy R&D appropriations were still by far the biggest single item in the Community's energy grants budget, with ECU 405.1 million or 41% of the total. The thermo-nuclear fusion programme is the biggest single item where research funding is concerned. In July, the Council adopted a decision on a new multiannual programme (1988-92) for controlled thermo-nuclear fusion, with a budget of ECU 735 million.

The support granted in 1988 to projects using new energy technologies totalled ECU 41.7 million in the case of oil and gas and ECU 86.6 million for demonstration projects, giving a total of ECU 128.3 million.

ECSC coal research appropriations increased by 4.8% compared with 1987, totalling ECU 26.3 million in 1988. The interest subsidy granted to facilitate the marketing of Community coal (ECU 3 million in 1988) also increased by 30% over 1987. Redeployment grants (Article 56(2)(b) of the ECSC Treaty) increased significantly to complement the modernization and rationalization measures taken by the Community coal industry (ECU 148.4 million in 1988).

The breakdown of the energy grants paid out in 1987 and 1988 by recipient sector is set out in Table 2.

Table 2
Community energy grants in 1987 and 1988 by recipient sector

	1987 MECU	%	1988 MECU	%
Solid fuels	111.0	12.7	207.5	21.0
Oil and gas	61.7	7.0	97.7	9.9
Nuclear energy	341.4	38.7	373.8	37.8
fission	117.4	13.3	145.4	14.7
fusion	224.0	25.4	228.4	23.1
Electricity	128.0	14.5	159.8	16.2
New and renewable energy sources	84.1	9.5	55.6	5.6
Rational use of energy (Valoren)	81.0	9.2	46.2	4.7
Others (Valoren ERDF / IMPs)	66.2	7.7	39.1	3.9
Energy planning and studies	7.5	0.9	9.2	0.9
Total	**880.9**	**100.0**	**988.9**	**100.0**

With ECU 228.4 million, the fusion programme (direct action projects and shared-cost action projects) was in 1988 the biggest beneficiary of Community assistance in the energy sector, accounting for 23% of the total. Adding the aid granted for fission, mainly research carried out by the JRC, nuclear energy accounted for nearly 40% of the total Community subsidies for the energy sector.

Subsidies for solid fuels amounted to 21% of the total aid for energy, as a result of the exceptionally large volume of redeployment grants, which increased by 123% compared with 1987.

The energy infrastructure projects co-financed by the ERDF mainly concerned oil and gas (natural gas transmission and distribution) and electricity (power stations and distribution grids), which showed an increased compared with 1987.

There was a 10% reduction, compared with 1987, in the promotion and development of new and renewable energy sources and the rational use of energy, because of the low level of financial commitments under the Valoren programme in the course of 1988, combined with the fact that the comparatively low price of oil and gas was not particularly conducive to energy saving and the development of alternative sources.

Energy loans from Community financial instruments

The slowing down observed in 1987 in the Community's general lending activity in the energy sector continued in 1988. Total lending amounted to ECU 1 808.9 million,[1] a reduction of 42.4% over 1987. Energy's relative share of the lending activities of the financial instruments was only 19% of the total loans granted in 1988 compared with 36% in 1987.

The breakdown of this total volume of ECU 1.8 billion is examined below by source of funding, by recipient sector and by Member State:

Table 3
Loans granted in 1988 by recipient sector

	Solid fuels	Oil and gas	Nuclear energy	Electricity	RUE &NRES	Total	%
EIB	1.4	626.6	288.2	432.4	423.4	1.772.0	98.0
NCI	-	2.2	-	-	3.9	6.1	0.3
ECSC	-	-	-	9.0	21.8	30.8	1.7
Euratom	-	-	-	-	-	-	-
Total	**1.4**	**628.8**	**288.2**	**441.1**	**449.1**	**1.808.9**	
%	**0.1**	**34.8**	**15.9**	**24.4**	**24.8**	**100.0**	

[1] The figures concerning EIB, NCI and ECSC loans in this paper and in the tables may differ from those published in the Commission's annual reports to the Council and the European Parliament on the Community's borrowing and lending activities, because they take account not only of loans granted to the energy sector as producer, processor and distributor but also of those to other sectors of the economy (industry, transport, services) if the investments are designed to further the Community's energy objectives, and in particular the rational use of energy in industry and environmental protection.

By source of funding

With 98% of the total loans granted in the energy sector in 1988, the EIB remains the main source of Community loans for European companies investing in energy production, consumption and transmission projects.

No ECSC loans were granted to the coal sector in 1988, but mention should be made of two decisions to grant sizeable loans to the coal industries of two Member States. These decisions were taken in 1988, but the loans in question will not be paid out until later.

ECSC loans for the financing of thermal power stations returned to their 1986 level (ECU 9 million) following their spectacular increase in 1987 (to ECU 123.3 million). Projects in the Federal Republic of Germany were the recipients.

Also, loans at reduced rates of interest totalling ECU 21.8 million were granted for investment designed to promote the consumption of Community coal in Germany, France and the United Kingdom.

No Euratom loans were granted in 1988, mainly of course because the circumstances at present are not such as to encourage the establishment of new facilities in this sector. In addition, the Council has not yet taken a decision on the Commission proposal submitted on 25 July 1988 to raise the ceiling for Euratom loans to ECU 4 billion.

NCI IV, which the Council approved in 1987, is intended solely for small and medium-sized enterprises. Where energy is concerned, it is confined to the financing of investment in energy saving. Global loans totalling ECU 6.1 million were granted in 1988 to seven energy production and distribution projects.

By recipient sector

The slowing down in lending activity in 1988 affected the various energy subsectors in different ways. Solid fuels' share fell by ECU 300 million in 1987 to ECU 1.4 million in 1988 (one individual EIB loan). The main reason for this was that there were no ECSC loans to the coal industry.

The lack of Euratom loans in 1988 also explains the reduction in nuclear energy's share despite the increase in EIB assistance following the financing of a nuclear fuel reprocessing project at Sellafield (UK) amounting to ECU 288.2 million.

Oil and gas stayed more or less at the 1987 level, with ECU 630 million, but increased in relative terms to 34.8% as a result of EIB investment to encourage the development of natural gas (Denmark, Ireland and Italy) and the refining industry (Greece).

Loans to the electricity sector fell by ECU 500 million compared with 1987, representing 24.4% of energy financing in 1988. This was the result of a slowing down of ECSC lending for thermal power stations and a reduction in EIB loans of some ECU 400 million compared with 1987. The funds were mainly for electricity power station projects in Italy (Puglia and Sardinia), and in Portugal (Sines) and projects to ensure compliance with environmental protection standards in Germany (Saarland, North Rhine - Westphalia and Lower Saxony).

Funding for projects to encourage the development of alternative sources and the rational use of energy fell from ECU 730 million in 1987 to ECU 450 million in 1988. This sector's relative share is one-quarter of all the energy loans.

By recipient Member State

With a share of nearly 44% of the total amount of loans, Italy was again the biggest borrower of funds from the Community lending institutions. However, the total of ECU 794 million is 11% down on 1987, reflecting to some extent the general slowing down in energy lending activity.

Applications from the United Kingdom fell markedly compared with 1987. EIB funding for a nuclear fuel reprocessing project accounted for virtually all its applications for Community loans. Its relative share (16.5%) is lower than in previous years, but the United Kingdom is still in second place among the Community financial instruments' customers for energy loans.

In 1988 Denmark applied to the EIB for a contribution towards the financing of natural gas infrastructure throughout the country. The main projects concerned are underground storage facilities in Lille Torup and extension of the gas pipeline network to Aalborg, and extension of the transmission and distribution grids. The loans in question, totalling ECU 246 million, put Denmark in third place with 14% of the total Community funding.

Portugal made considerable use of the EIB loans for major investments in the electricity sector, totalling ECU 220 million in 1988, a 300% increase over 1987. This puts

European Community programme for energy technology: presentation of two projects relating to renewable energy sources

Construction of an inflatable weir -Project No HY/314/84-DE

Inflatable weirs are flexible dams in the form of a rubber-based fabric tube which is inflated by air or water and anchored to a base which can be an existing weir to increase head. By varying the pressure within the tube, the height of the weir can be adjusted. This is usually carried out simply and automatically with hardly any external power source, so that the weir is safe under all conditions.

General description

Water inflatable weirs are, just like the well-known bear trap weirs, hydrostatic weirs, where the envelope is filled with water and maintained erect by means of water pressure.

These flexible weirs were developed in the USA during the 1950s. Since then, these weirs have been used in the USA, Czechoslovakia, and especially in Japan and Western Europe.

Compared with other types of adjustable weirs, the energy required for erection and deflation of the weir is provided in a most simple way:

- deflation through the water pressure of the overflowing water;
- erection by means of a small pump.

The great advantage of inflatable weirs is their relatively low cost, in particular for increasing the head of an existing weir, and their ability to deflate automatically in flood conditions. Furthermore, they do not require swivel joints, they are not prone to leakage and corrosion and the rubber hose is easy to replace.

Applications

Inflatable weirs are particularly useful in the place of automatic weir gates when the required length is significantly greater than the height (ratio length/height 5 m).

The smallest inflatable weir length averages 5 m, the largest can be over 50 m. The weir walls can be straight or oblique.

These weirs can be used for various tasks:

(i) automatic weir dams for hydropower plants;

(ii) automatic weirs for irrigation purposes;

(iii) as a protection against floods, and as an alternative to fixed weirs;

(iv) dam constructions in lakes or ponds;

(v) flexible construction parts in coastal protection;

(vi) automatic dams in water cleaning plants, canalization and stilling pounds.

Impact on the environment

Inflatable weirs have a number of advantages for the environment too:

(i) they do not require the use of lubricants, oils or similar water polluting substances;

(ii) no corrosion protection is necessary;

(iii) they blend well with the landscape as there is no high super-structure;

(iv) automatic control is carried out in a very simple way, making the inflatable weir well suited to the need of irrigation, landscaping, river ecology;

(v) they may be used as a cultural weir.

Mode of operation

The inflatable weir consists of a flexible conduit of textile reinforced rubber which is fastened to a concrete bottom sill, thus creating a closed hose. In the sill are pipes which provide the water to fill it. These pipes are also connected to the regulating shaft which maintains a constant water

Portugal in fourth position with 12% of the total amount of Community loans granted to Member States.

Germany's share (8.7%) was much lower than in 1987 (when it was 13.4%) and the volume of loans granted to Germany fell by 42%. Emphasis was placed on environmental protection at thermal power stations and on energy saving.

In 1988 Ireland applied to the EIB for a contribution to the funding of work to strengthen the electricity transmission and distribution grid and to extend the Cork-Dublin gas pipeline. The loans granted, totalling ECU 58.6 million, represented 3.2% of the total energy loans in 1988.

Energy investment loans in France amounted to only 1.1% of the total in 1988 compared with 9% in 1987. Nevertheless, France's loans from the EIB for non-energy sectors, in particular local authorities, small and medium-sized enterprises and transport infrastructure rose by 35%.

In 1988 Greece and Spain joined the ranks of the Benelux countries, which traditionally make very little or no use ofthe Community's instruments to finance their energy investments.

Table 4
Loans granted in 1988 (MECU)
by recipient Member State

Country	Amount	%	Country	Amount	%
Italy	793.6	43.9	Ireland	58.6	3.2
United Kingdom	298.8	16.5	France	19.5	1.1
Denmark	247.5	13.7	Greece	10.4	0.6
Portugal	220.5	12.2	Spain	1.7	0.1
FR of Germany	158.3	8.7	EEC	1.808.9	100.0

column, thus ensuring a constant pressure (30% of normal water level).

In this basic weir model, the water intake is regulated solely through the equilibrium of pressure on the outer surface of the weir. If the headwater level is low, the external pressure is weak, and the inflatable fills up with water. The water supply inside the weir is kept constant by a small re-supply pump.

On the contrary, when the headwater level rises, the external pressure is higher than the pressure inside the weir; the water inside the weir is pushed out through the regulating shaft, until the weir is completely empty. The overflow must reach 5 to 10cm to start the deflation process.

In this simple way, the water level is automatically regulated within certain limits. The pump allows the replacement of occasional water leakage.

Operating safety

The deflation of the inflatable weir under headwater flow does not require the use of energy or complicated and expensive energy accumulators. The erection of the weir requires very little power. Disruption could only be caused by a failure of the pump, damage to the rubber texture by heavy bed-load or voluntarily inflicted damage.

The special texture of the inflatable weir and its structure make any "rupture" of the weir very unlikely. Minor damage may cause some water leakage, which can be re-supplied by pumping more water into the shaft.

Repairing minor damage is very easy and can be carried out on site. Inflatable weirs do not require any maintenance work. The high quality of the materials used in the making of the weir allows a service life of 20 years. After that time steel construction parts would require total renewal of their corrosion protection. The costs for this would be the same as for a replacement hose.

Operation results

These inflatable weirs used in the demonstration project were exclusively designed, determined and installed by Floecksmühle.

Just like any other type of dam, inflatable weirs are designed according to prevailing local conditions.

The choice of a suitable rubber-based fabric for any inflatable weir is very important, and Tip Top Stahlgruber, a West German specialist firm of rubber manufacturers, have collaborated with Floecksmühle in the development of a material with appropriate characteristics.

The innovative inflatable weir system Floecksmühle was constructed at the weir plant near Neuenbürg in the northern part of the Black Forest. The inflatable weir works in connection with a newly constructed hydropower plant which has an output of approximately 240 kW. Instead of using an old weir, the main body has been totally reconstructed.

The first test phase for the newly developed system started in the summer of 1985 with the erection of a trial weir. Over a period of two months several tests and measurements were taken, and the results were incorporated into the final construction. After the test phase, the final commissioning was in the spring of 1987. The subsequent measurement phase was conducted until 31 December 1988. Thus, the regulating system has been operating now for two and a half years. During this time there have been only brief interruptions for repair work.

The inflatable weir itself is necessary for damning the water needed for power generation but it is not directly involved. Therefore it is not directly generating power.

The data are as follows:

- water flow: 7.32 m^3
- head: 4.50 m
- output: approximately 240 kW.

By the installation of the regulating system, the overflow level at the weir was improved by 15% i.e. an extra head of water of 20 cm. This also reduces losses in the upstream canal so that with a flow of 7.32 m^3. This is an increase of power output of 15 kW or an annual increase of approximately 85 000 kWh.

Cost

The operational costs of the plant are quite low. During normal operation only half an hour per week is necessary for the plant inspection, and this includes the cleaning of the intake rake, which is necessary from time to time.

Ongoing operational costs

30h/annum	DM 30.00 each hour	DM 900.00
30h/inspection	DM 50.00 each hour	DM 1 500.00

As the inspection is required only once every five years, the annual operational costs are:

DM 900.00 + 1/5 DM 1 500.00 = DM 1 200.00

Total investment

			DM[1]
Phase	I	Planning, approval	13.800
	II	Design, individual parts	16.250
	III	Establishment of the geometry	16.500
	IV	Trial weir	51.545
	V	Site surveys + hydro comput	13.000
	VI	Construction phase	80.212
	VII	Commissioning	14.277
	VIII	Measuring phase	58.738
	IX	Public relations, publicity	14.123
TOTAL			278.445
EC demonstration programme grant (40% phase IV-IX)			81.460

[1] ECU 1 = DM 2.05, USD 1 = DM 1.85.

The new inflatable weir has been the subject of many visits and publications, and has completely justified its role as a demonstration project.

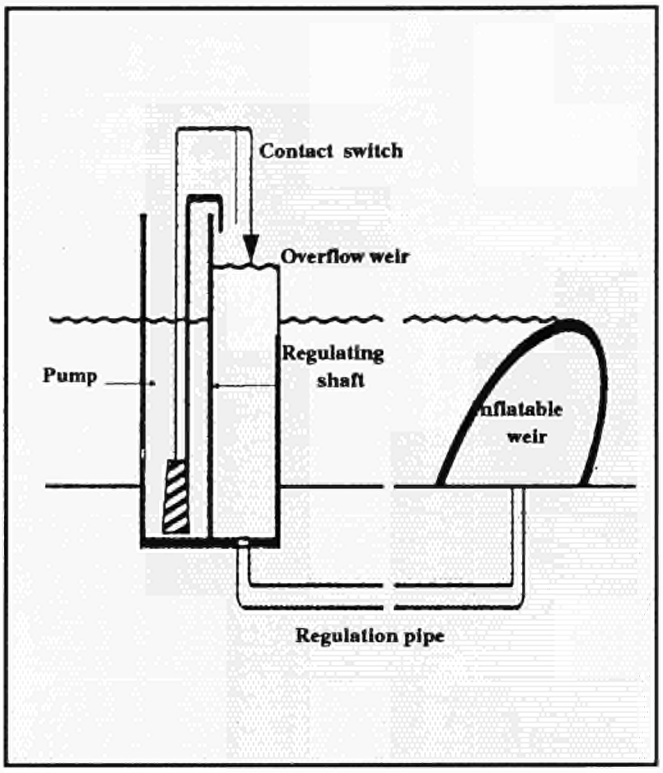
Further information on this project may be obtained from:

Floecksmühle,
Bachstrasse 62-64
D-5100 Aachen
Tel. 49 241 53 11 75
Fax: 49 241 50 68 89

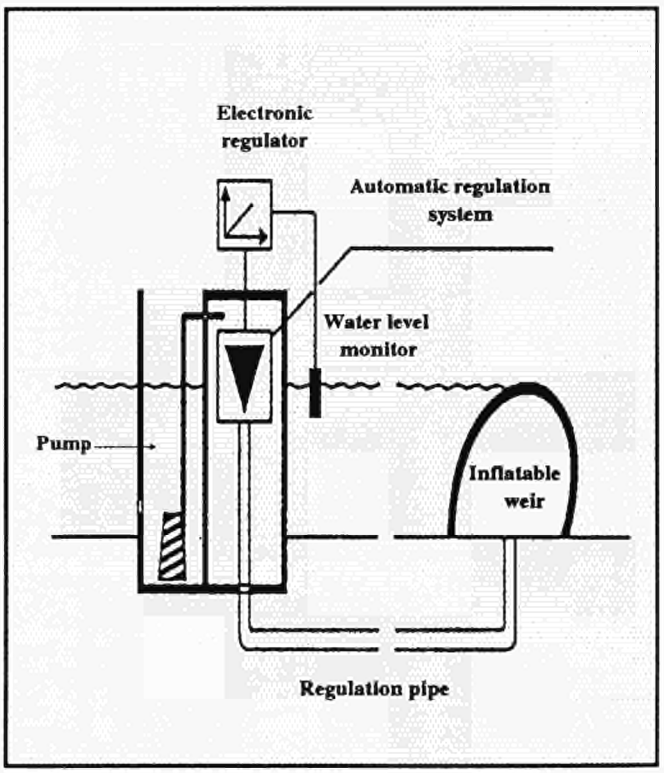
or

Mr J.J. Boullet,
Commission of the European Communities,
200 rue de la Loi,
B-1049 Brussels.
Tel. 32 2 235 67 84
Fax: 32 2 235 01 50

Conventional system



Floecksmühle Regulation System



Wood roasting unit - Project No bm/333/84-f

This project deals with the implementation of a wood roasting demonstration unit with a nominal capacity of 15 000t/year. Roasted wood is an intermediate product between raw wood and charcoal. Compared with the latter, it has the advantage of being less crumbly and dirty, it lights easily and does not absorb moisture.

Project objective

The project consisted of building a wood roasting unit and demonstrating on an industrial scale that the roasting process is technically and economically viable.

The process was patented by Armines in 1983.

Roasted wood is obtained by subjecting wood to thermocondensation at a temperature of between 250 and 300°C. It is therefore an intermediate product between wood and charcoal, having most of the advantages of both products. As a reducing agent, Pechiney Electrometallurgic (PEM) acquired sole rights to exploit the Armines patent and decided to move up from the laboratory scale to a commercial operation. The unit at Laval de Cere (Le Bois Torrefié du Lot), Bretenoux France is thus the first industrial installation to operate this wood roasting process.

Economics

Profitability was affected by teething troubles which persisted for two years.

Now that the technology has been mastered, profitability will depend on maintaining sales to the electrometallurgy industry and increasing sales to the general public. On the basis of a 3/4 to 1/4 split, the payback period should be four years at a production rate of 12 000 t/year of roasted wood.

Description of the unit

The Laval de Cere demonstration unit separates the production process into three stages, namely:

- chopping
- drying
- roasting

The wood comes from forests in the neighbourhood and is received in the form of round wood or edgings.

A drum chopper[1] cuts the round wood on edgings into chips, 50 to 80 mm long and 15 mm thick at a rate of 20 t/hour.

At the chopper outlet, a screen[2] removes any pieces larger than 80 mm (which are then recycled) and any fines smaller than 15 mm (which are used as fuel for a boiler).

The wood chips (with a moisture content of 40%) are transported to a tunnel kiln[3] for drying. The kiln is heated by means of a heat transfer fluid, backed up by hot air obtained by burning gases produced during roasting. The heat transfer fluid is heated by being passed through the boiler, fuelled by the fines recovered in the screening process. A set of valves coupled to regulators maintains the required temperature levels in the various sections of the dryer. By the time the wood reaches the dryer outlet, the moisture content has dropped to 10%.

In the roaster[4] the previously dried wood is heated in a vacuum. This is a form of mixer, heated by a heat transfer fluid (Gilotherm). Heat transfer is by conduction between the walls and the contents of the roaster.

Inside the roaster, thermostats coupled to regulators maintain the temperature at a level within $\pm$ 5°C, as required to obtain a product of constant quality. To avoid the danger of spontaneous combustion, the temperature is reduced at the roaster outlet.

The wood distillation gases generated in the roaster are burned in an incinerator.[5] The dust is removed from the fumes, then they are diluted and returned to the dryer. The installation is thus non-polluting.

1 Manufactured by Klöchner (Federal Republic of Germany).
2 Manufactured by DYB (France).
3 Manufactured by Maber (France).
4 Manufactured by List (Switzerland).
5 Manufactured by Pillard (France).

A roaster product screen[6] is used to separate three grades of product:

(i) roasted fines: the commercial prospects for these are under investigation;

(ii) the 'consumer' product: coarse-grained for the barbecue market;

(iii) the 'electrometallurgical' product: used by PEM.

The process is continuously monitored for the parameters of temperature, pressure and flow rate, all the measuring instruments being mounted in a control room laboratory. Checks are carried out during production on the commercial product and on consignments. The results obtained on an industrial scale have confirmed the initial assumptions on feasibility and quality.

None the less, there were major initial difficulties connected with the dryer and the need for a special incinerator, which resulted in investment costs being higher than forecast - this is the main reason for the lack of profitability at the demonstration level. However, the profitability of any future projects should be assured, now that these difficulties have been overcome.

It now remains to:

(i) improve the final product quality (reduce the fires content and achieve a consistent quality);

(ii) bring down production costs to improve competitiveness;

(iii) sell significant quantities to the consumer sector.

Cost[1]	**Million FF** (1985 value)
Total investment	**19.0**
Financial aid towards investment	
EC subsidy	2.2
EC loan	2.2
Regional employment Premium	0.6
Agricultura l guidance Premium	1.2

[1] ECU 1 = FF 7, USD 1 = FF 6.2 at current rates.

[6] Manufactured by DYB (France).

Energy production

In 1988, a total of 10 000 t of roasted wood was produced. Assuming a net calorific value of 22 200 KJ/kg for the roasted wood, this gives an energy equivalent of 5 300 toe/year.

It should be emphasized that the energy yield from roasted wood is far superior to that from charcoal, since the former contains 90% of the energy of original wood.

Prospects and replication

The qualities of roasted wood give it good marketing prospects.

At present the electrometallurgy industry is the main customer for the product, using it in electric furnaces as a reducing agent instead of charcoal which is less reactive.

In the leisure market, roasted wood is used as a fuel for barbecues where it has the advantages of being easily ignited, producing embers quickly and being clear and more convenient to handle.

So far, there have been no attempts to use the roasted wood for commercial energy production but a study carried out in 1986 shows that it is a high-quality product.

As roasted wood contains 90% of the energy present in the original wood, there are possible applications in developing countries. It would be a more rational use of forest biomass and could thus represent an alternative to the deforestation which is currently taking place in many countries.

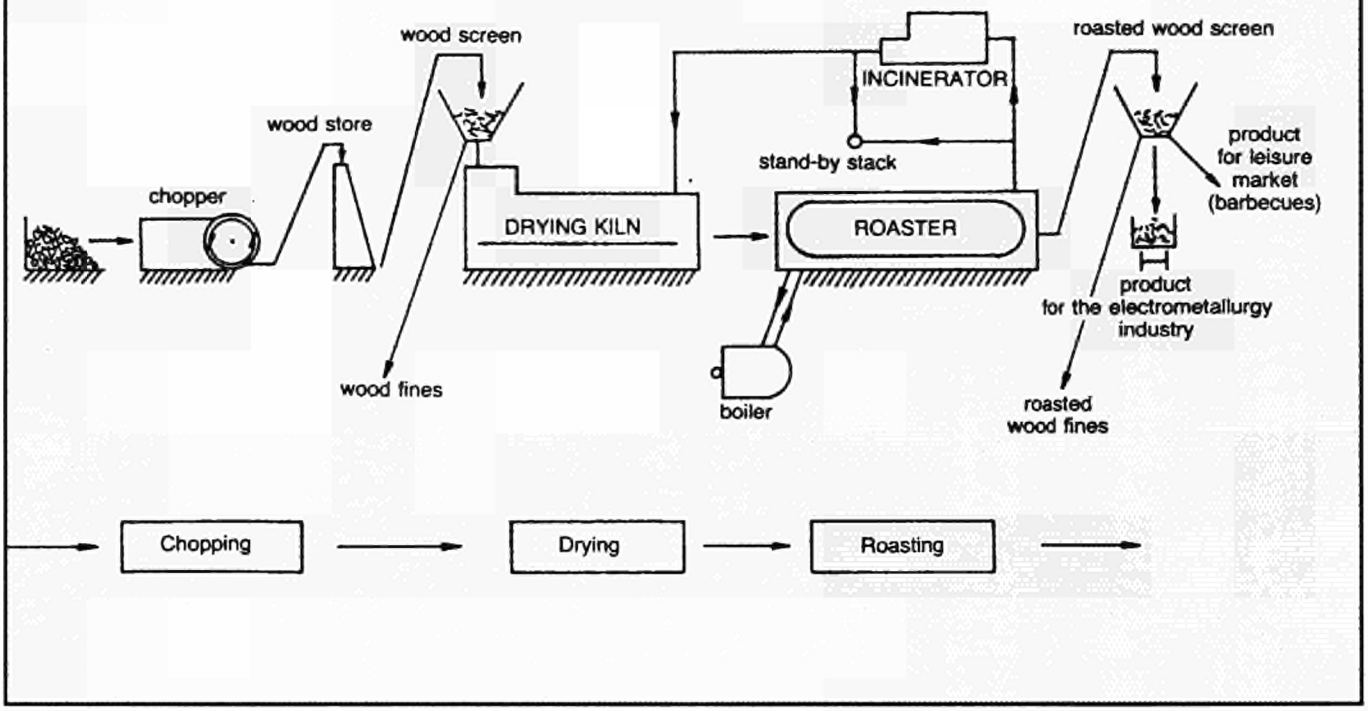
Further information on this project may be obtained from:

Le Bois Torrifié du Lot
Laval de Cère
F-46130 Bretenoux
Te l: 33 65 33 84 16

or

Mr. G. L. Ferrero
Commission of the European Communities
DG XVII D/3
200 rue de la Loi
B-1049 Brussels
Tel: 32 2 235 74 72

Simplified plan of the installation



Energy technology dissemination activities of the Commission

Technology and European urban traffic experiences: energy conservation and environment

European technologies for cleaner diesel vehicles

Attended by 100 participants, these two conferences were held in Castelgandolfo, Rome, 4 to 6 September 1989.

The following topics were covered:

(i) Reallocation of urban space and more attractive public transport;

(ii) current experiences and technological prospects;

(iii) pollutant emissions from heavy duty vehicles - status and perspectives;

(iv) improved burning and particle traps - latest developments and results;

(v) catalyser for diesel;

(vi) emulsystem for diesel engines.

These two conferences were very successful in achieving their aim: there was a useful exchange of experience and technological developments between traffic managers from various Member States, in the light of energy efficiency in the transport sector and environmental protection. A priority was established: the decision-makers in the transport field from the various Member States should be encouraged to cooperate together in the launching of target projects.

Mr C. Jones and Mr M. Roma represented DG XVII.

The report of the proceedings was published at the end of June 1990.

European seminar on cogeneration

Co-financed by the CEC, a European seminar on Cogeneration, attended by 300 people, was held in Madrid, 10 and 11 October 1989. This seminar aimed to present a panorama of the current situation on cogeneration in European industry. Among the topics covered at the seminar were:

(i) international experience and legislation;

(ii) state of advancement in the EC Member States;

(iii) financial aspects;

(iv) environmental impact;

(v) EC demonstration projects.

These topics stimulated a useful exchange of experience between suppliers, manufacturers and potential end-users, and were of special interest to senior energy managers, researchers and consultants.

Mr Kindermann, Mr Sirchis, Mr Korres and Mr Fee represented the Energy Directorate-General (DG XVII).

Deep offshore technology

Jointly organized by 'Petrole Information' and 'GEP-ASTEO' and with the patronage of the Directorate-General for Energy of the CEC, the fifth biennial conference 'Deep Offshore Technology' took place in Marbella, Spain from 16 to 18 October 1989 with more than 400 delegates attending.

In contrast with the conferences in Sorrento in 1985 and in Monte Carlo in 1987, there was an absence of major technological developments to report, reflecting the standstill in technological evolution in this area over the past couple of years.

None the less, this conference made an important contribution to the exchange of information and to a comprehensive analysis of technological evolution. DG XVII had a strong participation, with a stand showing the role of the Community in the development of new oil technologies, and speeches were given by Mr Millich and Mr Joulia on energy technology policy and on the global results of the EC hydrocarbons programme.

Technologies and processes for the rational use of energy in the textile industry, especially in spinning, dyeing and finishing

Jointly organized by the CEC (DG XVII) and by Federtessile (Italy), a seminar on technologies and processes for the rational use of energy in the textile industry was held in Como, Italy, 20 and 21 October 1989, with around 100 participants.

The aims of this seminar were to disseminate energy saving techniques which have arisen from the energy demonstration programme of the EC and to foster new and innovative ideas which can be pursued by companies in the textile industry. The seminar presented a number of demonstration projects, some concluded and some ongoing, covering the following areas:

(i) direct and indirect heat recovery;

(ii) process optimization;

(iii) application of modern technology to textile processes;

(iv) the energy demonstration programme.

The seminar was considered to have attained its objectives and a book on the proceedings will be published later this year.

Energy efficiency in the cement industry

Organized by the CEC and by Cimpor - Cimentos de Portugal EP and with the cooperation of Cembureau - European Cement Association, a European Seminar on Energy Efficiency in the Cement Industry was held in Oporto, Portugal 6 and 7 November 1989, attended by about 200 people.

The following topics were considered:

(i) specific technology and ECdemonstration projects;

(ii) engineering and energy management.

The conference provided an exchange of information between people involved in the industry and emphasized the scope for potential energy savings in the cement industry.

Mr Sirchis represented the Energy Directorate-General (DG XVII).

Energy efficiency in buildings

The Directorate-General for Energy (DG XVII) organized this European conference, from 28 to 30 November 1989, at the Palais des Congrès, Lille, France, with the collaboration of the Conseil Régional Nord-Pas de Calais. The objectives were:

(i) to publicize the results of the demonstration programmes of the EC and the Member States over the past decade;

(ii) to assess the progress achieved in this sector in the Member States of the Community;

(iii) to examine the opportunities for future improvements;

(iv) to stimulate the use of new energy technologies in buildings.

The 200 participants heard presentations from 25 international speakers who came from 9 Member States and the USA.

The main themes arising from the conference were:

(i) there is enormous scope for achieving greater energy efficiency in buildings;

(ii) the priority in this sector is not the establishment of further new innovatory technologies but the application of existing ones;

(iii) barriers to implementation of energy efficiency measures in buildings are as much political as technical;

(iv) there is an urgent need for more consumer education, training and dissemination activities in this area.

DG XVII displayed a stand at the exhibition, Mr Maniatopoulos gave one of the opening addresses, Mr von Scholz gave a paper, Mr Gowen acted as a rapporteur, and the final session, involving a Round Table discussion, was chaired by Mr De Bauw.

Proceedings will be published in the first half of 1990.

National energy management exhibition and conference, Nemex 1989

Organized by the Energy Systems Trade Association (ESTA), Nemex is one of the major energy events each year in the UK. As in previous years, both the exhibition and conference were held at the Metropole Hotel, Birmingham, 21 and 22 November 1989.

Over 1 100 visitors came to the exhibition and 900 took part in the conference, including energy managers from both the private and public sectors.

A large proportion of these people visited the EC's exhibition stand, and were interested in general EC energy policy and developments within the Community, as well as more specific technological matters. There were more than 180 stands in the exhibition, showing UK achievements in energy technology.

DG XVII also participated in the conference sessions, particularly through a speech by Mr von Scholz on EC energy policy, long-term energy forecasts, regional energy policy aspects and energy technology developments.

Energy in Eastern Europe

This is a first, short article presenting the energy situation in Eastern Europe and the Phare programme. Energy in Europe *will continue to cover energy related issues in Eastern European countries.*

Overall, Eastern Europe (excluding the USSR) consumes some 500 million toe (tonnes of oil equivalent) of primary energy annually, of which more than half is coal and lignite. With the exception of the USSR, the energy market in these countries is almost invariably marked by a precarious balance between supply and demand and by excessive dependence on a single source of supply.

There is no real correlation between domestic energy prices and those charged on the international market. The use of energy tends to be very inefficient and damaging to the environment. As a result, the average specific energy consumption of these countries, by unit of GDP, is almost twice that of the Community, and the levels of polluting emissions are significantly higher. These countries are lagging behind considerably in the technological field, and their infrastructures are inadequate or are not adapted to all stages of the fuel cycle.

In view of this situation, the priorities for cooperation with the European Community are clear: improving the efficiency of energy systems and reducing polluting emissions of all kinds. The first step should therefore be to assist these countries as regards energy planning and with a view to introducing market mechanisms. A contribution will also need to be made to carrying out energy audits designed to pinpoint the sectors where the use of tried and tested technologies is liable to produce a rapid improvement in the efficiency of energy use and a substantial drop in polluting emissions.

Specific cooperation has been undertaken as part of the Commission's aid programme for energy planning which stresses the operation of market forces and activities liable to lead to more efficient use of energy.

With regard to Hungary, four specific projects for cooperation with the Commission have been identified. The first involves assistance in devising an energy policy in a market economy, and the second analyses the potential which exists for use of third-party financing. The third project provides for a number of energy audits in the foodstuffs industry, while the fourth concerns the organization of seminars and other training activities geared in particular towards improved use of energy.

Negotiations are in progress on the opening of an Energy Centre in Budapest to facilitate cooperation on energy and the transfer of technology.

Discussions are also being held with the Polish authorities with a view to pinpointing requirements and proposing a bilateral cooperation programme, and cooperation is already underway with Yugoslavia. In addition, preliminary contacts have been made with East Germany and Czechoslovakia to draw up the broad outlines of possible future cooperation programmes.

The financial resources available for these activities are meagre (Article 706 of the Community budget). A total of ECU 1.2 million has been earmarked for 1990. Consequently, the programme is of necessity confined to support measures such as studies and energy policy assessments, information and training systems, audits, forecasting, seminars, study visits, etc. However, adoption of the Thermie programme should enable other more specific projects relating to the transfer of technologies to be financed. Priority in this field may be given to the Eastern European countries. More substantial funds are available under the Phare programme of economic aid to Poland and Hungary (see below).

The countries of Central and Eastern Europe also possess a number of nuclear power stations. Since some of these (VVERs), although different from those in the Community, have some features in common with PWRs, contacts and exchanges might be encouraged, in particular in the form of 'twinning' schemes between power stations in these countries and in the Community. This kind of cooperation could take the form of audits, training periods and joint development of operator training on advanced simulators.

The Commission is currently studying a new plan of action for coordinated assistance, along the lines of the Phare programme, covering all the Eastern European countries. Several of the memoranda received by the Commission from the recipient countries mention energy as a priority area. Cooperation projects in the energy sector will therefore be eligible for assistance under the new Phare programme and will be included as a sub-category of the environment category, which is to receive priority.

Phare - Aid programme: Poland and Hungary

Environment protection and energy supply and demand are among the priority areas (together with food aid, promotion of investments, market access and training) listed in Council Regulation 3906/89 (OJ L 375 of 23.12.1989) on economic assistance to Poland and Hungary (Phare). This plan fits in with the wider commitment undertaken at the Western Economic Summit of Paris in July, which asked the Commission to coordinate the action of 24 western countries (G-24), to Poland and Hungary.

Under chairmanship of the Commission, various G-24 working parties have been set up. DG XVII participates in the group dealing with both countries environment groups and chairs the one dealing with Hungary.

The high interdepence between energy and environment is particularly striking in the case of Poland and Hungary, where, generally speaking, increasing energy efficiency, better management of availabilities and using modern technologies, can reverse the trend of a dramatically deteriorating environment.

Two exploratory missions were organized by the Commission in the field of energy and environment, one to Budapest, late October 1989 and one to Warsaw, early November 1989. These missions were able to identify, on a preliminary basis, a number of projects. For Hungary, directly energy-related projects concerning cogeneration, fluidized combustion and energy conservation; and for Poland, the installation of desulphurization systems and fluidized boilers.

In the specific field of environment protection, actions aiming at improving the quality of air, protecting water and disposing of wastes were envisaged.

A meeting between the G-24 and the Polish and Hungarian authorities where projects were discussed in depth took place in Brussels in December.

On the spot examination with the assistance of experts from G-24 countries took place in January 1990, enabling a commonly agreed list of selected projects to be drawn up.

On that basis the Commission has prepared programmes for both countries to be supported from the 1990 budget. These programmes were submitted on 30 April to the Committee established by Regulation 3906/89 which gave a positive opinion.

The Commission decided, on 16 May, to adopt these programmes, amounting to 22 MECU for Poland and 25 MECU for Hungary. The programmes consist of the creation of a fund aimed at financing projects in the field of air and water pollution (including abatement of power plant toxic emissions), waste management and disposal, training, energy management in industry, and nature protection.

They also provide for technical assistance to the beneficiary countries' authorities for the implementation and monitoring of the projects, and for preparing future programmes.

Within the programme, specifically energy-related projects amount to about 8 MECU for Poland and 6 MECU for Hungary.

The Rechar initiative

At its meeting on 2 August 1989, the Commission decided in principle to undertake a Community initiative concerning the economic conversion of coal mining areas (Rechar).

On 22 November 1989, the Commission fixed the indicative financial envelope for the Rechar initiative. The notice was published in the *Official Journal of European Communities* on 27 January 1990.

This initiative has been created along the same lines as for the steel and shipbuilding sectors (Resider, Reneval).

The Commission has taken this decision because many coal-mining areas are among the areas of the Community which have been, or are likely to be, hardest hit by problems of industrial restructuring, and because they have special difficulties in adjusting rapidly to changing economic circumstances.

The Commission, after consultation with the interested Member States, determined and approved the list of eligible coal-mining areas on 18 April 1990.

Eligible areas for Rechar will be delineated in terms of small spatial units which are strongly dependent on coal-mining activities vital to their economic development and where the loss or threatened loss of coal-mining jobs has led, or will lead, to a serious worsening of unemployment.

The Rechar programme will help with any measure which contributes to the economic conversion of the area concerned, for example:

- the environmental improvement of areas damaged by coal activity;
- the renovation and modernization of social and economic infrastructures;
- the construction of new advance factory units;
- the promotion of alternative economic activities;
- the promotion of tourism activities;
- training and employment measures, especially for the unemployed or those threatened with unemployment and for those employed in small and medium-sized enterprises.

The Rechar programme will be the subject of joint financing by the Member State and the Community. On the Community side, the Rechar programme will be financed from contributions from the European Regional Development Fund (ERDF) and the European Social Fund (ESF) totalling about 300 MECU. In addition to this the coal- mining areas could benefit from loans from the European Investment Bank (EIB) and also from the European Coal and Steel Community (ECSC) budget of 120 MECU for interest rebates on loans, and in 1990 from some 40 MECU in supplementary redeployment aids for coal-mining workers under Article 56 of the ECSC Treaty with further amounts in subsequent years up to 1993, to be determined in the light of availability resources.

Community news

Energy Council - May 1990

On 21 May the Council of Ministers adopted two directives, on **price transparency** (see Section 1) and on the **transit of electricity** (Section 2), which were part of the overall package presented by the Commission to complete the common market for energy. The Council also held a discussion on other matters which were included in this package but on which agreement has not yet been reached: the **transit of gas** (Section 3) and **investment projects of interest to the Community** (Section 4).

The Council adopted the **Thermie** programme to promote energy technology in Europe (Section 5), and adopted conclusions on the Commission communication on **energy and the environment** (Section 6).

Commissioner Cardoso e Cunha made a statement on the conference organized by DG XVII on 'Energy for a New Century: the European Perspective' (Section 7), and adopted without debate an amendment to the system for **registering crude oil imports in the Community** (Section 8).

The results of the discussions on the various items on the agenda are set out below:

1. Transparency of gas and electricity prices charged to industrial end-users

The Council reached agreement on the directive concerning a Community procedure to improve the transparency of gas and electricity prices charged to industrial end-users.

The aim of the directive is to ensure that the Member States take the steps necessary to ensure that undertakings which supply gas or electricity to industrial end-users communicate to the Statistical Office of the European Communities (SOEC):

- the prices and terms of sale of gas and electricity to industrial end-users;
- the price systems in use;
- the breakdown of consumers and the corresponding volumes by category of consumption to ensure that these categories are representative at national level.

On the basis of the data thus assembled, the SOEC will publish twice yearly, in an appropriate form, the prices of gas and electricity for industrial uses in the Member States and the pricing systems used to that end.

2. Transit of electricity through transmission grids

The Council adopted a common position on the proposal for a directive on the transit of electricity through transmission grids. In accordance with the institutional process instituted by the Single European Act, this proposal for a directive will now go before the European Parliament for a second reading before coming back to the Council for final adoption at a forthcoming meeting.

The directive is designed to contribute to the greater integration of the European electricity market by abolishing obstacles to increased electricity exchanges between transmission grids.

It provides that the Member States should take the measures necessary to facilitate transit of electricity through high-voltage grids through their territory.

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

- transmission is through a high-voltage electricity grid, with the exception of distribution grids, in a Member State's territory which contributes to the efficient operation of European high-voltage interconnections;
- the grid of origin or of final destination is situated in the Community;
- the crossing of at least one border within the Community is involved.

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

The Member States must without delay take the measures necessary to ensure that the entities mentioned above:

- notify the Commission and the national authorities concerned of any request for transit in connection with minimum one-year contracts for the sale of electricity;
- open negotiations on the conditions of the electricity transit required;
- inform the Commission and the national authorities concerned of the conclusion of a transit contract;
- inform the Commission and the national authorities concerned of the reasons 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, shall set in motion the procedures provided for by Community law.

The Member States must comply with this directive not later than 1 July 1991.

3. Transit of natural gas through the major systems

Pending the opinion of the European Parliament, the Council held a policy debate on the proposal for a directive on the transit of natural gas through the major systems.

It emerged from the debate that the proposal raised a number of problems as regards the general approach, taking into account in particular the specific nature of this energy source.

At the Close of its discussions the council, having stressed the importance of this matter, agreed to resume its discussion of the subject at a later meeting.

4. Investment projects of interest to the Community in the petroleum, natural gas and electricity sectors

The Council held an exchange of views on the Commission proposal aimed at amending the Regulation of 18 May 1972 concerning the notification to the Commission of investment projects of interest to the Community in the petroleum, natural gas and electricity sectors.

Following the discussion it was agreed, on the initiative of Mr Cardoso e Cunha, to improve, as a matter of priority, the application of all the provisions of the 1972 regulation and to return in due course to the Commission proposal in the light of the experienced gained.

5. Promotion of energy technology in Europe - Thermie programme

The Council approved the substance of the Regulation concerning the promotion of energy technology in Europe (Thermie programme 1990-94).

This programme is in line with the resolution of 16 September 1986 concerning new Community energy policy objectives for 1995 and convergence of the policies of the Member States, in particular the passages relating to the promotion of technological innovations. It aims to ensure the continuity of the projects previously undertaken in the framework of energy demonstration projects and industrial pilot projects and the programme to support technological development in the oil and gas sector, which expired at the end of 1989. The Regulation is aimed at creating the conditions necessary for giving Community financial assistance to projects promoting energy technology in the areas of:

- the rational use of energy;
- renewable energy sources;
- solid fuels;
- oil and gas.

Community support may be given to projects aimed at the development, application and/or promotion of advanced innovative energy technologies, the implementation of

which represents a considerable technical and economic risk, such that they would very probably not be carried out without Community assistance.

In order to promote the application and market penetration of energy technologies, the Regulation also provides for the implementation of associated measures.

The programme covers the five-year period 1990-94. For the first three years (1990-92) the amount deemed necessary to implement the programme has been fixed, in the Regulation, at ECU 350 million. As regards finance for the last two years, the Council stated that it was aware of the need to keep the programme operating at the same level of activity as that established in the period 1990-92. It noted that in the Commission's view the overall allocation required for the five-year programme was ECU 700 million and that ECU 350 million would be earmarked for 1993/94, an amount which would be confirmed if covered by the financial perspective to be defined in due course for those years.

6. Energy and the environment

Following a policy debate on the Commission communication on energy and the environment, the Council adopted a number of conclusions, including a set of guidelines designed to make energy measures environment-friendly.

The Council therefore agreed with the Commission that, in making its proposals for environment-friendly energy measures, it should be guided by the following considerations:

- use of the best available technologies not entailing excessive costs;
- environmental impact and risk assessments in the context of existing Community legislation;
- ensuring that energy costs reflect, as far as possible, the full environmental costs;
- respect for a high level of environmental protection through economic, standardization and fiscal measures, taking account of the specific ecological, economic and energy conditions of the Member States and peripheral regions of the Community, and the results already obtained in the area of the environment;
- establish a legislative framework offering flexible yet stable conditions;
- improving institutional links and cooperation between administrations responsible for energy and the environment;
- continued scientific research;
- collection and development of related statistical information;
- ensuring consistency between the measures to be applied in the energy sector and those adopted in other areas.

The Council recognized that using nuclear energy rather than fossil fuels helps reduce polluting emissions.

Finally, the Council welcomed the Commission's view that the discussion on nuclear energy and environmental issues, covering safety, transport and waste (including waste from the decommissioning process), should be pursued.

7. Energy for a new century: the European Perspective

The Council took note of a statement made by **Mr Cardoso e Cunha** on the outcome of the conference held on 3 and 4 May 1990 in Brussels on "Energy for a New Century: the European Perspective".

8. Registration of crude oil imports in the Community

The Council adopted the Regulation amending Regulation No 2592/79 laying down rules for carrying out the registration of crude oil imports in the Community provided for in Regulation No 1893/79.

The aim of this amendment is to adapt the reporting requirements provided for under Regulation No 2592/79 to accord with trading conditions prevailing on the international oil markets, to relieve operators of the obligation to report certain data no longer essential for analysing the Community's supply costs and, as far as possible, to bring reporting requirements into line with those of national administrations and international organizations.

Energy conservation indicators - II

The improvement of energy efficiency in all sectors of energy use as well as for all fuels is an established priority of the energy policy of the European Communities. In a resolution of 16 September 1986, the Council of Ministers called for a rigorous policy for rational energy use and set the objective of achieving a further 20% improvement in the intensity of final energy demand by 1995.

But oil and gas prices have dropped significantly since 1986, reaching price levels below those of 1973 in real terms. Therefore, the price incentive for improved efficiency of fossil fuels is substantially reduced today, although technological progress has improved the profitability of fuel-saving reinvestments.

The threat of an increase in global mean temperature due to rising concentrations of energy-related trace gases such as CO_2, methane, nitrous oxide, and indirectly produced tropospherical ozone, contributes a new aspect to the objectives of the Council. The urgency of reducing future CO_2 and other energy-related emissions by curtailing fossil fuel combustion is more widely recognized than ever before. The single most important option to reduce energy-induced effects on future global warming is the degree of investment in improved energy efficiency.

But how can one measure this energy efficiency progress? **Energy conservation indicators** provide one answer. A methodology to break down energy consumption data into their component parts, such as those due to yearly weather fluctuations, business cycle, structural changes in the economy, or higher efficiencies, has been developed in close cooperation between the Directorate-General for Science, Research and Development, the Directorate-General for Energy, and the Fraunhofer-Institute for Systems and Innovation Research (ISI). The methodology provides a detailed and consistent basis for measuring and explaining the changes of the energy intensity of the Community as well as of each Member State. At the same time it allows results to be compared among the Member States since the structure of the database used is identical for each of them.

Energy conservation indicators are now applied for the first time to all member countries for the period from 1979 to 1985. The results differ among the member countries, but show consistent trends with respect to behaviour of energy consumers in response to changes in energy price, to the efforts of fuel substitution, growth in the share of electricity on final energy, and long-term structural trends. Thus, this methodology represents a first tool for a long-term monitoring of the efforts toward the goal defined by the Council of Ministers of the European Communities. Aside from their importance in monitoring progress towards this goal, energy conservation indicators can also be used by the Commission of the European Communities for further considerations regarding energy conservation policies for the Community.

The results of this second report are split up into two parts: the first part presents the findings for EUR 12 on an aggregate and sectoral level; the second outlines the national results. The importance of the results encourages the Commission to consider continuing the analysis in the future. The next application of energy conservation indicators will cover the period between 1979 and 1987, as well as preliminary results for EUR 12 in 1988.

The progress made in this field would not have been possible without close collaboration of experts from all member countries, who placed a great amount of data available only on national levels at the authors' disposal. The estimates and if normal opinions and advice given by the national and Commission experts at the various stages of the work have been of immense value.

The report 'Energy conservation indicators II' (ISBN 3-540-51294-2/ISBN 0-387-51294-2) can be obtained from the Editor, *Energy in Europe*, DG XVII, 200 rue de la Loi, B-1049 Brussels, Belgium.

Seminar on technologies and European urban traffic experiences - Castelgandolfo, Rome, 4 and 5 September 1989

In the context of the transport sector, urban traffic accounts for an increasing proportion of final energy consumption (about half of the total consumption on the roads, according to the latest estimates).

Moreover, the circumstances under which this consumption takes place (high density areas, almost 'direct' contact of emissions with people and historic buildings) and other aspects such as noise, damage to health, etc. render urban traffic one of the issues of greatest concern in relation to energy and the environment.

This international seminar, held in Castelgandolfo (Rome) in September 1989, aimed at giving an overview of European technologies and experience in the management of urban traffic. Both decision-makers and traffic managers made lively contributions to the seminar and confirmed the importance of promoting existing technologies and sharing information on European experience at Community level. The proceedings of the seminar, containing all of the speeches which were made during the sessions, are a first step along this way.

In the preface to the proceedings the Director-General for Energy Mr C.S. Maniatopoulos writes that he believes "that the new Thermie programme will give us a unique opportunity to do much more: besides the systematic dissemination of European energy technologies, the Commission will also be able to support 'targeted projects' where technical bottle-necks exist or where there is a need for accelerating progress. Significant advances of this type are required in the field of urban traffic management and can be achieved.

I am convinced that there is particular scope for developing such projects on a transnational and cooperative basis.

It is difficult to think of something more sensitive and close to the heart of the European citizen than urban traffic. He spends a considerable amount of his time (and his money) on it, and in a sense he is 'submerged' in it.

He concludes that 'For these reasons I consider that, if our work in this area is successful, we will not only manage our energy balance more effectively, but we will also give a major impetus to the protection of the environment and to the quality of life: this is one of the basic objectives in the process of European integration.'

Copies of the proceedings can be obtained by writing to the Editor, *Energy in Europe*, DG XVII, 200 rue de la Loi, B-1049 Brussels, Belgium.

European seminar on CHP (cogeneration) - Madrid, 10 and11 October 1989

During the opening session Mr Perez Prim, Director-General for Energy at the Spanish Ministry of Industry and Energy, talked on the commitment of the Spanish Government - along the lines of the European Commission - for combined heat and power. He announced that national decisions on new legislation could be taken in the very short term.

Mr Kindermann, Head of Division at the EC Directorate-General for Energy, gave a general overview of the Commission's programme in the field of energy conservation in the framework of the common European policy and Mr Serrano, Director-General of IDAE, gave an overview of the cogeneration in Spain and the IDAE involvement in the field.

During the second session on overviews of technologies, Mr Albisu (Sener, Spain) reviewed the principles on which the interest in and possibilities of cogeneration are based. He compared different alternatives and their main results and Mr Gyftopoulos (MIT, USA) made a wide survey of already made small and medium-sized projects of cogeneration with special examples of wood and biomass fuelled systems.

Mr Contreras and Mrs Golez Angulo (IDAE, Spain) gave a detailed analysis of the technology possibilities, the legal framework and the financial solutions of cogeneration projects in Spain, in the past, present and future.

During the third session on financing and legislations, Mrs Hamrin (Independant Energy Producers Ass., USA) made an in-depth presentation of the conditions necessary for the development of cogeneration: financing, projects, risks, general constraints, environmental implications, with special references to the State of California.

Mr Fee (European Commission) spoke on the role of the Commission and Member States in promoting energy saving companies (Escos) and in novel financing mechanisms. He described the work of the Commission in this field.

Mr Driscol (IEA) has given an overview of the legal obstacles to cogeneration in ten non-EC industrial countries.

The fourth session was a round table with many interesting questions from the audience on 'cogeneration and environment'.

This concluded that cogeneration is the way in these changing times because it increases energy efficiency and, at the same time, it helps to improve the overall environment.

During the fifth and last session on 'cogeneration demonstration projects' there were seven descriptions of plants in paper and chemical industries, district heating and theoretical and practical technology achievements.

Visit by Mr R. Sobreira, Secretary, Ministry for Mines and Energy, State of Bahia, Brazil, 20 October 1989

Mr R. Sobreira, the Secretary of the Ministry for Mines and Energy, State of Bahia, Brazil and Mr C. A. Simes, Chairman of the Energy Committee of the Assembly of Bahia visited DG XVII on 20 October. Brazil and the EC have as one common interest an energy cooperation project in Bahia which is cofinanced by DG XVII, the French and Portuguese authorities and the State of Bahia. The visitors had meetings with Mr Clive Jones (Deputy Director-General), Mr De Bauw (Director, Energy Technology), Mr Juul (Head, Energy Planning Division), and Mr Neto (Analysis and Forecasts Division).

The Brazilian authorities reported that the project, which is divided into two distinct areas, regional energy planning and the potential for the introduction of small hydropower plants in the State of Bahia, is proceeding satisfactorily with all objectives being met. They were particularly interested in learning more about energy technology and energy forecasting methods within the Community and their possible application in Brazil. Their visit proved useful in furthering their knowledge of present Community developments in these areas.

The visitors were assured of the Community's continuing willingness to cooperate with Brazil in energy matters.

EC/Hungary cooperation

A mission from DG XVII visited Budapest, Hungary, from 23 to 26 October 1989 to have preliminary talks on the Phare initiative and to discuss bilateral cooperation activities within the framework of the EC/Hungary cooperation agreement.

The DG XVII mission was led by Mr De Bauw (Director, Energy Technology) for the aspects relating to Phare. Mr Juul (Head, Energy Planning Division) discussed the bilateral cooperation aspects.

At the opening meeting, Mr Czipper, Deputy Minister for Industry, gave an overview of Hungarian energy policy and emphasized Hungary's dependence on imported oil; the possibility of a shortage of electricity developing over the next five years and the fact that the easiest savings had been made through energy conservation.

The Minister expressed an interest in the possibility of an EC-Hungary Energy Management Centre and exchanges of information between the EC and Hungary.

A meeting was also held with the Institute for Energetics which acts in an advisory capacity to the Government and the Institute for Electric Power Research. A meeting also took place with the State Authority for Energy Management and Energy Safety. All these bodies expressed a strong interest in EC/Hungary cooperation.

The concluding meeting with Mr Czipper identified areas for bilateral cooperation. It was agreed that the following areas would receive priority:

(i) computer aided energy management;

(ii) joint survey of energy consumption in the food processing industry;

(iii) training of energy managers in the food processing industry;

(iv) third-party financing;

(v) energy planning;

(vi) dissemination of energy technologies (subject to further consideration).

It was also agreed that these areas would form the basis for concrete bilateral cooperation activities with Hungary in 1990.

Symposium on solar energy technologies - Petropolis, Brazil, 31 October to 3 November 1989

A symposium on solar energy technologies took place from 31 October to 3 November 1989 at Petropolis, Rio de Janeiro, Brazil. The symposium was organized by the National Energy Commission of the Ministry of Mines and Energy, Brazil and the Commission of the European Communities (DG XVII). The aim of the seminar was to promote industrial investment in solar, thermal active and passive and photovoltaic technologies.

The symposium was attended by some 70 delegates, representing Brazilian and European interests in the solar energy area, from both the private and public sectors. The symposium was opened by Mr Lourival Monaco, Executive Secretary of the National Energy Commission, Brazil on behalf of the Brazilian Minister for Mines and Energy. DG XVII was represented by Mr Nacfaire and Mr Molina. The Head of the EC Delegation in Brazil, Mr De Azevedo, delivered the opening speech which dealt with Europe and 1992.

The symposium covered a wide range of topics including presentations on successful DG XVII demonstration projects relevant to the Brazilian situation; state of the art of European technologies in the solar area and presentations by the Brazilian delegates of development of these technologies in Brazil itself.

The symposium closed with a round-table discussion on possible Euro-Brazilian cooperation schemes and identified projects for future consideration. These included the creation of a centre or centres for the promotion of renewable energies in Brazil; energy conservation in buildings; monitoring of solar installations and training of Brazilian students in appropriate European institutions.

Seminar on problems and prospects of electricity in the Mediterranean Basin, 7 to 10 November 1989, Rabat, Morocco

A seminar on electricity prospects in the Mediterranean was held in Rabat, Morocco from 7 to 10 November 1989. This was organized by the European Commission (DG XVII and DG I), the Moroccan Ministry for Energy and the Observatoire Mediterraneén de l'énergie (OME). The seminar was opened by Clive Jones, Deputy Director-General of DG XVII. Mr J. C. Guibal, Director, Task Force on Community Integration, addressed the seminar on the internal energy market. The main objective was to bring together key individuals in the electricity sector to enable them to exchange experiences and compare points of view on future trends and possible fields for cooperation.

More than 80 participants attended the seminar, including many senior officials from electricity supply authorities representing the majority of countries from the Mediterranean Basin. In addition the European Investment Bank (EIB) and several international organizations were represented.

Areas discussed included planning strategies; impact on the environment; production technologies; energy conservation; renewable energy; interconnections and the EC single market.

National presentations confirmed many of the findings of the UN 'Blue Plan'[1] for instance, the likely need for the Mediterranean Basin to almost double its electricity generation capacity between 1988 and 2010, representing an investment of some ECU 250 billion.

The seminar highlighted some responses to the problems of electricity in the Mediterranean Basin including the need to improve planning, to promote energy conservation policies and transfer of technologies, and to set up interconnection projects. The seminar also drew attention to the problems of financing investments in the electricity sector.

A positive feature of this important seminar was the interest of all participants in cooperating in energy matters. The majority of participants drew attention to the need for an appropriate forum in which dialogue and action could be organized.

EC/India Energy Management Centre Governing Council meeting, 16 November 1989

The second meeting of the Governing Council of the EC/India Energy Management Centre, took place on 16 November 1989 at New Delhi, India. Established with the cooperation of the European Commission (DG XVII and DG I) the Energy Management Centre is an autonomous society under the Department of Power of the Ministry for Energy, Government of India. This meeting was attended by Mr Juul, Head of Energy Planning Unit, DG XVII. At the meeting due recognition was given by the Indian side to the effective support from the Commission in launching the Centre's activities. In addition the Indian authorities emphasized the importance to them of the appointment of an EC Senior Adviser. An Adviser was appointed and took up his duties in March 1990. It was clear from the meeting

[1] Published by United Nations Environment Programme - Mediterranean Blue Plan Regional Activity Centre, Sophia Antipolis, 06560 Valbonne, France 1988

that the Indian authorities are interested in making the Centre an important instrument for the promotion of energy efficiency in India.

The Centre, which opened in April 1989, represents an important development as it will serve as a focal point for energy conservation and management in the entire country. Up until now these functions have been dispersed between several different institutions. The Centre will be responsible for organizing exchange of research results on energy policy and management, support for energy conservation activities and arrangement of joint EC/India programmes and exchanges. The Centre will also train energy managers and assist in the organization of short-term training programmes for Indian personnel in European institutions, as well as visits to European energy organizations.

Since the inauguration of the Centre several cooperation projects have been initiated including a seminar for senior executives on energy management, and training for Indian personnel on auditing for power stations. Several other training activities for the future were described at the Council meeting. With the appointment of the EC Senior Adviser and additional staff there is no doubt that the Centre shall make a valuable contribution to the promotion of energy management in India.

Annual meeting between Mr Cardoso e Cunha and the Norwegian Energy Minister - 26 to 28 November 1989

The meeting was held at the Ministry in Oslo. The Norwegian Minister Mr Reiten was accompanied by Mr Manshaus, Secretary-General, Mr Eivinn Berg, Ambassador the EC, Mr A. Walther, Ambassador to the IEA and Special Energy Adviser, Ms M. Engebretsen, Director-General, Markets and Economics Department, Mr G. Gjerde, Assistant Director-General, Development and Production Section, Mr O.S. Haraldsen, Assistant Director-General, Petroleum Markets Section, Mr S.R. Brunborg, Adviser and Head of Energy Planning Division, Mr E. Helle, Senior Information Officer and Mr K. Mansika, Acting Head of Gas Market Division.

Mr Cardoso e Cunha was accompanied by Mr de Sampaio Nunes, Deputy Chef de Cabinet, Mr Svend Kramer, Counsellor at EC Delegation Oslo and Mr J.M. Maters, Head of Hydrocarbons Unit, DG XVII.

Mr Cardoso e Cunha put the Community's external relations in the context of current developments both within and outside the Community (the single market, East European developments, trends for integration). He explained the change that the Community's energy policy is undergoing. Mr Cardoso e Cunha mentioned the following three basic principles:

(i) changes should not jeopardize either the stability or the quality of the energy supply;

(ii) competition should be increased in order to acquire the desired integration; and

(iii) there should not be any damage to the environment.

He referred to the Commission's 2010 study and particularly the scenario for sustained economic growth in which energy consumption and its environmental impact are controlled. He explained the Commission's policy of social cohesion and, in that context, put a question mark on the energy consumption 'freeze' suggested by Norway and other northern countries as a solution to the global warming problem. The Community's approach will be to continue and increase its efforts to achieve a more efficient use of energy. As efficiency of energy use is influenced by the price, taxation, in the personal opinion of Mr Cardoso e Cunha, could be an instrument but is not yet included in the Commission's approach. Mr Cardoso e Cunha mentioned the broad acceptance by the Council of the Thermie programme in which such an important place is given to the rational use of energy. As regards this programme, the Commission is open to cooperation with countries like Norway.

Regarding external relations, Mr Cardoso e Cunha referred to the period of stability through which we are going. The Commission keeps an open line with the Gulf Cooperation Council with which refinery policy and downstream processing are being discussed. The Commission has regular meetings with OPEC and OAPEC and will continue and increase exchanges of views, particularly regarding environmental issues such as global warming. It is clear that stability is of interest to both sides.

Mr Reiten stressed his Government's opinion on the need for open dialogue between producers and consumers. He agreed with Mr Cardoso e Cunha that things should be handled in a pragmatic way. The Norwegian Government shares most of the elements of the Community's philosophy as presented by Mr Cardoso e Cunha and particularly the

hydrocarbon policy, no dramatic changes in exploration policy are planned. However, concession rounds will be speeded up and more emphasis will be given to exploration further north. Oil production is planned to increase from 1.5 million barrels/day in 1989 to 1.7-1.9 million barrels/day in the 1990s. However, new oil deposits have to be discovered in order to maintain this level in the longer run. The 1989 level of 26 Mtoe of gas production will increase to 35-40 Mtoe around the year 2000. The market is the limiting factor for Norwegian gas; only 65% of proven reserves are committed. The Norwegian Government also emphasizes the need for measures to encourage more efficient use of energy and stimulation of development of appropriate technology. Mr Reiten agreed with Mr Cardoso e Cunha that rather than focusing on absolute levels of consumption, one should strive towards changing the relation between economic growth and growth of energy consumption. Price and taxation policies, according to Mr Reiten, will have an influence on the energy consumption curve.

Meeting at the Ministry of Foreign Affairs

Mr Cardoso e Cunha also saw Ms Kullmann Five, Minister for Trade and Shipping.

Ms Kullmann Five expressed Norway's great interest in cooperation with the Community on research and development. As far as gas is concerned, Norway is keen on getting access to the UK market. Ms Kullmann Five was interested in an offer by Mr Cardoso e Cunha that Norway participate as an observer at the Commission/OAPEC Seminar in June 1990 in Casablanca.

General Affairs Council - November 1989

On 27 November, acting on a proposal from the Commission and in the light of the opinion of Parliament, the Council adopted a Directive (89/618/Euratom) on informing the population about health protection measures to be applied and steps to be taken in the event of a radiological emergency.

The Council also adopted conclusions on Community cooperation in the field of assistance in the event of a nuclear accident or radiological emergency and expressed its support for the measures which the Commission had announced in its April communication on this subject.

Acting on a proposal from the Commission, the Council adopted a Decision approving the conclusion of the Convention of 26 September 1986 on assistance in the case of a nuclear accident or radiological emergency negotiated in the framework of the International Atomic Energy Association.

Finally, the Council also adopted conclusions on the transport of radioactive materials in the Community on the basis of a Commission communication. It stressed the importance of this field of activity, especially with the prospect of the single market, and asked the Commission to pursue its efforts to continue to ensure that the transport of radioactive materials within the Community is conducted in complete safety.

EC/OAPEC high-level meeting, Brussels, 4 and 5 December 1989

The eighth annual high-level meeting between the Commission of the European Communities (EC Commission) and the General Secretariat of the Organization of Arab Petroleum Exporting Countries (OAPEC) took place in Brussels on 4 and 5 December 1989. Delegations were headed at ministerial level for the first time since 1978.

The OAPEC delegation was headed by Dr Mana Saeed Al-Otaiba, Minister for Petroleum and Mineral Resources in the United Arab Emirates and current Chairman of OAPEC's Ministerial Council. The Commission delegation was headed by Mr Cardoso e Cunha, Member of the Commission responsible for Energy. The EC Commission delegation also included Mr Maniatopoulos, Director-General for Energy. The OAPEC delegation included Mr Alwattari, Acting Secretary-General for Energy. Senior officials from both sides also participated.

Mr Cardoso e Cunha indicated that one of the key forces for further integration within the European Community is the drive towards completion of the Community internal energy market by the end of 1992 which will be of benefit to consumers as well as producers inside and outside the Community. He stressed the fact that for this process to succeed it was essential that oil markets remain stable. He welcomed, therefore, the efforts that OAPEC and OPEC members are exerting in order to attain stability in the oil market and restore confidence between buyers and sellers.

Dr Mana Saeed Al-Otaiba reviewed regional and international developments which presaged an optimistic atmosphere for both Europe and the Arab world. Dr Mana Saeed Al-Otaiba stressed the commitment of OAPEC members to oil market stability and referred to the investment they are making to expand oil production capacity in order to meet any future increase in demand.

The EC delegation presented a summary of its short-term forecast for energy and its recent work regarding the long-term energy outlook called 'Energy 2010'. OAPEC was invited to participate in a special seminar to be held on 3 and 4 May 1990 and which will be devoted to a large exchange of views with other interested parties on its main results.

On the question of integration of energy markets, the OAPEC delegation indicated that the existence of regional groupings in the Arab world, namely the MAU (Maghreb Arab Union), the ACC (Arab Cooperation Council) and the GCC (Gulf Cooperation Council) will enhance integration of energy infrastructures and markets in particular in the gas and electricity sectors.

As far as refining and product trade issues were concerned, the EC Commission stressed the continuing efforts made by the industry to restructure and modernize its processes in particular to meet environmental regulations. The OAPEC delegation indicated that no new grass root export-oriented refineries were reported as planned or under construction.

The OAPEC and EC delegations underlined their concern and expressed their willingness to cooperate on the study and analysis of environmental issues which are of common interest between the two regions and to the world community.

Both delegations discussed the organizational questions relating to the joint seminar that they will hold in Fez in Morocco on 4 to 6 June 1990 under the co-chairmanship of Mr Cardoso e Cunha, the Commissioner in charge of Energy and Mr Kandil, Chairman of the OAPEC Council of Ministers and Minister for Petroleum of Egypt on the integration of energy markets in the EC and Arab regions.

The meeting also reviewed technical cooperation on training between the OAPEC/APTI and the EC Commission. Both delegations agreed to strengthen the existing cooperation activities and enlarge the areas for cooperation to include energy efficiency and technology transfer.

The next OAPEC/EC meeting will take place in Kuwait on 1 and 2 December 1990.

Commissioner Cardoso e Cunha's visit to the USA - 5 to 9 February, 1990

The European Community's Commissioner for Energy, Antonio Cardoso e Cunha, accompanied by the Commission's Director-General for Energy, Constantinos Maniatopoulos, met US Deputy Secretary of Energy, Henson Moore and US Ambassador-at-Large Richard Kennedy, Department of State, for a general exchange of views on energy policy. He also met Martin Allday, Chairman of the Federal Energy Regulatory Commission and had extensive contacts with representatives of the energy industry.

In meetings with the representatives of the electricity sector (at the Edison Electric Institute) the Commissioner learned about the cooperation of the US utilities with regard to long-term planning, the transparency of rates and costs, and the large degree of 'wheeling' of power between the utilities. It was explained that the interstate transit of electricity in the US is forced more by economics and the threat of anti-trust laws (abuse of dominant position), than by specific Federal regulations.

The American gas sector is further advanced than electricity in direction of 'open access'. Federal open access rules mandate the pipeline companies to provide the right of transit to additional customers by voluntary contractual agreements. Representatives of the American Gas Association and the Interstate Natural Gas Association overwhelmingly supported the principle of open access. After some problems of adaptation (in particular with regard to take-or-pay clauses) the gas industry would be better off with more competition today than before deregulation.

Commissioner Cardoso also met representatives from the American Business Conference (a group of the most dynamic small and medium-sized firms) and Michael Farren, Under-Secretary of Commerce. He and Mr Farren agreed to improve between their services, the exchange of information on the EC and US data networks for SMEs.

EC/GCC industrial conference - Granada - 18 to 22 February 1990

The Commission of the European Communities and the Secretariat General of the Gulf Cooperation Council countries organized from18 to 22 February 1990 a conference on industrial and investment cooperation in Granada, Spain. Over 300 participants from the EC and GCC countries attended this first action in the context of the EC-GCC Cooperation Agreement of June 1988. The domains covered were oil and gas sectors, petrochemicals, pharmaceuticals, banking and financial institutions, investment opportunities in the GCC and energy-based industries. There were important addresses to the conference by Vice-President Dr Martin Bangemann, Commissioner Mr Matutes, Commissioner Mr Cardoso e Cunha as well as Mr Bishara, GCC Secretary-General and Mr Shirawi, Minister for Industry and Development, Bahrein. Mr Cardoso e Cunha centred his speech on the prospects for the oil and gas industries of both regions to develop joint ventures in the upstream and downstream parts of the business. He also referred to the necessity for the oil and gas industry of the EC and the GCC to cooperate in finding solutions to the problems relating to the protection of the environment. Speakers from the oil and gas industries came from BP, Total, Repsol and Cepsa on the EC side and from Aramco, KPC, Bahrein and Qatar oil companies on the Arab side. The conference permitted constructive dialogue to take place between top level industrialists of the EC and GCC and will stimulate the industrialists to organize future smaller meetings and seminars to exchange views and pursue industrial and investment cooperation.

EC/OPEC expert meeting - 1 and 2 March 1990

When Dr Subroto, Secretary-General of OPEC paid a visit to Mr Cardoso e Cunha, Member of the Commission responsible for Energy, in October 1989, it was decided to develop technical cooperation between the two organizations and hold regular exchanges of views on subjects of common interest. A first meeting , at working level, took place on 1 and 2 March 1990 at DG XVII offices. The main points covered were the short and long-term energy outlook (including the 2010 Conference) and energy and the environment on the basis of the recent Communication from the Commission to the Council.

Report on the operation of Euratom safeguards (Document: SEC (90)452 final - 19 March)

Following events in the field of nuclear affairs over the last few years, the activities of the Euratom Safeguards Directorate, Directorate E of Directorate-General XVII Energy, have attracted the particular attention of the European general public.

The aims of these activities, according to the terms of Chapter VII of the Euratom Treaty are, on the one hand, to make certain that nuclear material is not diverted from its intended and declared uses (namely to unlawful non-peaceful applications) and on the other hand, to implement undertakings arising from International Agreements concluded by the Community (e.g. restrictions on retransfers outside the Community).

Discussions within the various European authorities on nuclear affairs have pointed to the advisability and necessity of compiling a report on the operational aspects of Euratom Safeguards. The Council of Minister's Atomic Question Group had requested that the Commission should prepare a detailed report on Euratom Safeguards. At the plenary session of the European Parliament on 26 October 1988, the Commission stated, *inter alia*, that it was ready to draw up such a report in accordance with the resolution of the European Parliament on the results of the Committee of Inquiry on the Transnuklear affair.

This report was drafted and adopted by the Commission on 29 March 1990. It has seven chapters:

I. Introduction
II. Safeguards operation
III. Nuclear material accountancy
IV. Financial, material and human resources
V. Relations with the International Atomic Energy Agency
VI. Trends
VII. Summary

The report aims to provide a comprehensive survey on the operation of Euratom safeguards in the civil nuclear fuel cycle including research and other related activities of the European Community. The survey includes the safeguards findings with particular reference to 1988, the issues under discussion or consultation with operators or under

consultation with national authorities, a survey on the available resources and an indication of the challenges to safeguards during the years to come.

The effectiveness of Euratom safeguards depends, as outlined in this report, on the manner in which the inspection service is organized and motivated, on the promptness and the extent to which operators and State authorities fulfil the responsibilities and on the resources available to safeguards.

Relating to the mandate, the intensity and depth of Euratom safeguards, the Commission has been entrusted with extensive responsibilities. However, the budgetary appropriations made available largely determine the discharge of these responsibilities as well as the ability to make progress in the way indicated in this report.

In view of the challenges to safeguards during the years to come, particularly with respect to the use of recycled plutonium in the European nuclear fuel cycle, the Commission has established a medium-term plan of staffing which, if adopted and put into effect, will make a decisive contribution to enable its responsibilities under the Euratom Treaty to continue to be discharged effectively and, in concert with the IAEA inspectorate, to enable the implementation of non-proliferation safeguards in the European Community to remain at its present high level.

The Director-General for Energy visits Portugal

The Director-General for Energy, Mr Maniatopoulos, visited Portugal from 22 to 24 March 1990. He met the Portuguese Secretary of State for Energy, Mr Ribeiro da Silva and with Mr Miguens, Director General for Energy, as well as with representatives of a number of energy supply industries including Petrogal, EDM (coal), ENU (uranium) and EDP (electricity). A wide variety of issues were discussed, in particular the internal energy market, Valoren, the Regen initiative, the gas and electricity consultative committees and uranium. Mr Maniatopoulos gave a press conference at which he reviewed the internal energy market, described Thermie and talked about the Commission's activities related to energy and the environment. Several questions were raised about the gas project and Community support.

Seminar to present the Madeira energy plan - 26 to30 March 1990 in Funchal, Madeira

A seminar organized by the regional government of the autonomous region of Madeira was held in Funchal from 26 to 30 March.

The main aim of the seminar was to present the Madeira energy plan, the result of a study co-financed by the regional authorities and the Commission (DG XVII). More general discussions were also held on the problems of energy supply to islands.

The seminar was attended by some 100 delegates representing the national and regional governments, regional and national public and private companies involved in implementing the results of the study, and consultants.

Commissioner Cardoso e Cunha, who took part in the opening session of the seminar, delivered a very well-received speech which focused on energy and the environment in the modern world, the objectives of energy policy, the need to integrate the isolated regions of the Community to a greater extent and the means devised to implement a policy of integration, as well as on the Madeira energy study.

Other speakers included the State Secretary for Energy, Mr Ribeiro da Silva, and the Vice-President of the regional government, Mr De Sousa.

Mr Gerini, Head of the Flanking Measures Unit in the Commission's Directorate-General for Energy (DG XVII) gave a talk on regional energy programming in the Community, emphasizing the priorities for action in the 1990-92 period and the invitation to tender for 1990 published in OJ C 77 of 27 March 1990.

The main features of the energy situation in Madeira can be summarized as follows:

- population 272 500; area 796 km^2
- energy consumption: 122 ktoe
  of which: 85% oil prod.;
  15% hydroelectricity and biomass;

for: 51% resid./tertiary; 41% transport; 7% industry; 1% agriculture;

- local economically viable energy potential: approximately 100 ktoe.

The findings of the Madeira study highlighted the considerable local economically viable energy potential and the absolute need for a locally based team to create the conditions in which these resources can be exploited (regional body).

Two main conclusions can be drawn from the seminar:

(i) the regional government firmly intends to set up a structure to implement the energy action plan pending the administrative decision, a task force is to be set up immediately;

(ii) the action plan has enabled a series of projects to be pinpointed for inclusion in the Valoren programme, under which an amount of about ECU 6 million is earmarked for the island of Madeira.

White House Conference on science and economic research related to global change - Washington, 17 and 18 April 1990

The European Commission participated in the White House Conference convened by President Bush to give impetus to science and economic research related to global change.

It is the Commission's view that increased and sustained research efforts are essential for developing our knowledge of the mechanisms governing such change, its effects and impacts. This knowledge will assist us not only in defining a worldwide long-term response strategy against the risks involved but in monitoring the effectiveness and impacts of policy measures taken.

Scientific uncertainties are mainly due to the enormous complexity of the systems which govern global change, which is now being accelerated by human activities. Even more uncertain is the assessment of the socio-economic impacts of that change, especially at the regional level. In view of the importance of these impacts for the EC and the world at large, the Commission has been running research programmes concerning environmental change and its impacts. (Epoch - European programme on climatology and natural hazards; Joule - Joint opportunities for unconventional or long-term energy supply).

The Commission intends to expand this research considerably in the near future. It considers that worldwide cooperation is essential in these matters and is willing to play an active role in it.

With regard to policy actions on global change, the EC position is based on three main considerations:

- First, the available scientific knowledge shows that we are facing potential climate changes which could, in the long term, have unacceptable disruptive consequences for all mankind. Therefore, in spite of remaining uncertainties on some aspects of the issue, an effective response policy must be established now, without any further delay.

- Secondly, a number of cost effective response policy measures are at hand for short and medium-term concrete action, which are justified and beneficial also on grounds other than preventing climate change. Such measures would have low or no costs; in some cases they could even bring direct net economic benefits.

- Finally, the future contribution to the greenhouse effect by developing countries could increase in a dramatic way in the absence of appropriate policies and of sufficient resources to promote sustainable development. It is essential that these countries are fully involved in the negotiation process which should open shortly, with a view of establishing an international agreement on climate stabilization. That could only be ensured if industrialized countries take the lead and show a firm commitment to concrete action aiming at reducing their greenhouse gases emissions.

Before the end of this year, the Commission will make proposals on concrete and immediate policy measures to reduce the Communities' CO_2 emissions. Action will be taken to substantially increase energy efficiency in the transport, industrial and residential/commercial sectors.

At the Noordwijk International Ministerial Conference on Atmospheric Pollution and Climate Change, held on 6 and 7 November 1989, the EC Member States pushed for a clear commitment by industrialized countries to stabilize their CO_2 emissions, as a first step, at the latest by the year 2000.

The Commission considers that negotiations should be launched at the Ministerial meeting which will be held in November this year, on the occasion of the Second World Climate Convention to create a framework for developing a global strategy, and protocols for immediate action on CO_2 emissions and on protection of tropical forests.

However, despite last-minute efforts to reconcile the various positions, the Washington Conference ended with some differences of opinion between those who believe that the phenomenon of global warming has far-reaching implications for our future which must be tackled with urgency, and those who maintain with slight differences of emphasis, that action can be delayed pending the results of further studies.

The Commission's view is that there can be no further delay in taking effective and internationally coordinated action.

In the view of the Commissioner for the Environment, Mr Ripa di Meana, the time has now come to set to work with an open mind and firm resolve to find common ground for joint action by the Europeans and the Americans by the next bilateral meeting on the environment scheduled for July. President Bush gave an encouraging signal in this respect when he declared at the end of the conference that the USA had never considered research a substitute for action.

United States/Commission high-level energy talks - Brussels, 7 May 1990

The international energy conference hosted by the Commission on 3 and 4 May in Brussels, 'Energy for a New Century - the European Perspective', was attended by US Deputy Secretary for Energy, Henson Moore accompanied by senior representatives from the US Departments of Energy and State, at the personal invitation of Commissioner Cardoso e Cunha (see Special Issue). Following the conference, high-level bilateral energy discussions were held between the Directorate-General for Energy of the Commission and the US Administration.

The delegations were led by Mr Easton (Assistant Secretary, DOE) and Mr Ramsay (Deputy Assistant Secretary, State Dept.) and Director-General Maniatopoulos for the Commission.

The exchange of views focused on energy policy issues raised at the conference as well as on both sides of the Atlantic. These include the drive to complete the Community's internal energy market; environmental challenges to energy policy; developments in international markets; energy technology and energy efficiency; and emergency preparedness.

Both the Commission and the United States are considering revised energy policy guidelines in the light of the fundamental changes which are taking place on the international energy market. These include changes in market conditions, increased environmental awareness, developments in Eastern Europe, and integration within the European Community. Both sides agreed that security of supply remains a cornerstone of their respective energy policies in order to underpin world economic growth and political stability.

Sustained transfer of technology to and cooperation with the rest of the world is essential to achieving this goal. As far as Eastern European countries are concerned, the effectiveness of coordination of cooperation programmes by the G-24 countries was acknowledged. Both sides agreed that energy was a priority in that area.

The US delegation gave details on the interim report on US National Energy Strategy published in Washington a month ago and outlined the timetable which would lead to a final report delivered to President Bush by the end of the year. The Commission confirmed that new Community energy policy guidelines would be developed and proposed to Ministers at about the same time on the basis of the outcome of the 'Energy for a New Century - the European Perspective' conference. Both sides agreed that recent international developments affecting energy policy were now of paramount importance and that further exchanges of information were needed during the policy formulation process.

In referring to the talks, Mr Easton said: 'We appreciate this opportunity to discuss with the Commission the wide range of shared objectives in the energy field, including energy security and emergency preparedness, energy efficiency, safeguarding the environment, research, development and deployment of energy technologies, and the need to create and maintain open markets for trade in energy and energy equipment. We look forward to annual consultations on these and other energy policy objectives'.

In closing the discussions, Mr Maniatopoulos declared: 'The talks highlighted some of the major concerns that energy policy makers from either side of the Atlantic have at the present time. What is remarkable is the degree of common understanding we have regarding the problems

and the solutions required; what is stimulating is our willingness to act along those common understandings'.

It was agreed that the talks had been instructive, useful and extremely stimulating. In future they would be held on an annual basis, alternately in Brussels and Washington.

Progress on Thermie

Agreement was reached on the new Thermie programme, for the promotion of European energy technology, at the Energy Council on 21 May (see also separate article on Energy Council). The programme will cover the fields of rational use of energy, renewable energy sources, solid fuels and hydrocarbons, and will run for five years from 1990 to 1994. 350 MECU will be earmarked to the programme for its first three years, and it will continue at the same level for the subsequent two years, dependent on the future financial perspectives of the Community.

In this first year of operation, the funds available for Thermie are fairly limited, amounting to 45 MECU. A somewhat restricted call for tender has been published for this year, inviting proposals to be submitted by 20 June. A much more extensive call for tender for the 1991 allocation of funds will be published later this year, probably inviting projects to be submitted by the end of the year.

Visit of Mr Cardoso e Cunha to Algeria, 1 to 3 June 1990

Mr Cardoso e Cunha, European Commissioner with special responsibility for energy, accompanied by Mr C.S. Maniatopoulos, Director-General for Energy, paid an official visit to Algeria from 1 to 3 June 1990.

During his stay in Algeria, Mr Cardoso e Cunha had talks with Mr Sadek Boussena, Minister for Mines and Energy and Acting President of OPEC as well as with Mr Chérif Hadjslimane, High Commissioner for Research.

Mr Cardoso e Cunha visited the Centre for Solar Energy in Algiers and the Arzew Petrochemical and Gas Liquefaction Complex.

The discussions centred mainly on the gas pipeline project linking Algeria, Morocco and Spain. The Commissioner expressed the willingness of the Commission to play an active role in promoting this strategic project.

Regarding energy technologies, the Commissioner underlined the need to continue and expand the existing cooperation in new and renewable energies as well as in the energy conservation field.

Seminar on the integration of energy markets: Prospects for Euro-Arab Cooperation - Fez, Morocco, 4 to 6 June 1990

A joint seminar on the integration of energy markets: Prospects for Euro-Arab Cooperation, organized by the Organization of Arab Petroleum Exporting countries and the European Commission, was held in Fez, Morocco from 4 to 6 June 1990.

The OAPEC delegation was headed by HE Dr Mana bin Said Al-Otaiba, Minister for Petroleum and Mineral Resources of the United Arab Emirates and Chairman of OAPEC Ministerial Council. It included the OAPEC Secretary-General, Mr Abdul-Aziz Al-Turki and senior officials of the Secretariat-General.

The EC delegation was headed by HE Mr Robert Molloy, Minister for Energy of the Republic of Ireland and President of the EC Council of Ministers for Energy and by Mr Cardoso e Cunha, Member of the Commission responsible for Energy. The delegation included Mr Maniatopoulos, Director-General for Energy and other senior officials of the EC Commission.

HE Mr Mohammed Fettah, Minister for Energy and Mines of Morocco, made a welcome statement at the opening session.

Around one hundred participants from OAPEC and other Arab countries and from EC and other European countries had exchange of views and information in the four sessions and the panel discussion.

The first session discussed recent developments in Euro-Arab relations and the prospects for greater cooperation in view of the trend towards closer integration in both Europe and the Arab world and the revived interest in the Euro-Arab dialogue.

The second session dealt with prospects for trade in oil, gas and downstream products in light of the expected growth in the European Community's oil and gas consumption, which will lead to greater requirements from the Arab countries.

The third session discussed the achievement of an integrated internal energy market by the end of 1992 in the European Community and the formation and consolidation of regional groupings in the Arab world and their implications for the energy sector in each region.

The fourth session discussed the financial and technological aspects of the development of the energy infrastructures in the Arab and EC regions. Attention was focused on the development of networks for electricity and natural gas connections inside each region and between the two regions. The natural gas pipeline project linking Algeria with Spain via Morocco as well as the development of electricity interconnections in the Mediterranean region were extensively discussed in view of their potential beneficial impact on both the Arab countries and the European Community.

The concluding session consisted of a panel discussion by prominent decision makers and industrialists in the oil and energy related activities in the Arab and European countries on the theme "Prospects for cooperation between the Arab and European regions".

The seminar provided a useful opportunity for exchanging views on the likely developments in the energy market and the opportunities for cooperation in view of the imminent realization of a single market in the EC, the formation and consolidation of regional groupings in the Arab world and the increasing requirements for Arab oil and gas.

It was agreed that OAPEC and EC will continue to exchange views on developments of mutual concern in a spirit of cooperation.

Document update

Main Commission energy documents, proposals, directives

COM/89/0369	Communication from the Commission to the Council on "Energy and the environment"
C../89/1272	Commission decision of 24.7.1989 on the granting of financial support for pilot industrial and demonstration projects in the field of liquefaction and gasification of solid fuels
C../89/1273	Commission decision of 24.7.1989 on the granting of financial support for demonstration projects in the field of substitution of hydrocarbons by solid fuels
C../89/1386	Commission decision of 1.8.1989 on the granting of financial support to technological development projects in the hydrocarbons sector
	Proposal for a Council decision concerning the conclusion of an agreement between the European Economic Community and the European Atomic Energy Community and the Union of Soviet Socialist Republics on trade and commercial and economic cooperation. OJ C 58 - 8.3.1990
90/24/Euratom	Commission decision of 12 January 1990 concerning the final conclusion, on behalf of the European Atomic Energy community, of the framework agreement for scientific and technical cooperation between the European Communities and the Republic of Iceland OJ L 14 - 18.1.1990 p.22
SEC/90/452	Report on the operation of Euratom Safeguards
COM/90/89final	Amendment to the proposal for a Council Regulation concerning the promotion of energy technology in Europe - Thermie
COM/90/124final	The internal energy market - First progress report
COM/90/207final	Amendment to the proposal for a Council Directive on the transit of electricity through transmission grids (COM/89/336final)

New energy publications

Demonstration project

No 116	Recovery of materials by recycling and re-using plastic materials from various industrial and urban waste sources - "Revive" system Ricupero di risorse mediante riciclo e reimpiego di materie plastiche di diversa origine provenienti da scarti industriali e rifiuti urbani - sistema "Revive"
No 117	Eucalyptus Globulus Debarking Plant
No 118	Deersum energy project Energieproject Deersum
No 121	Allumage direct au charbon pulvérisé Direct ignition of pulverized fuel
	Mechanical vapour recompression in the agro-food industry La recompression mécanique de la vapeur dans l'industrie agro-alimentaire
	Energy saving in agriculture and the agro-food industry Economies d'énergie en agriculture et dans l'industrie agro-alimentaire

Statistics

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Statistical aspects of the coal economy in 1989 - Provisional results.

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