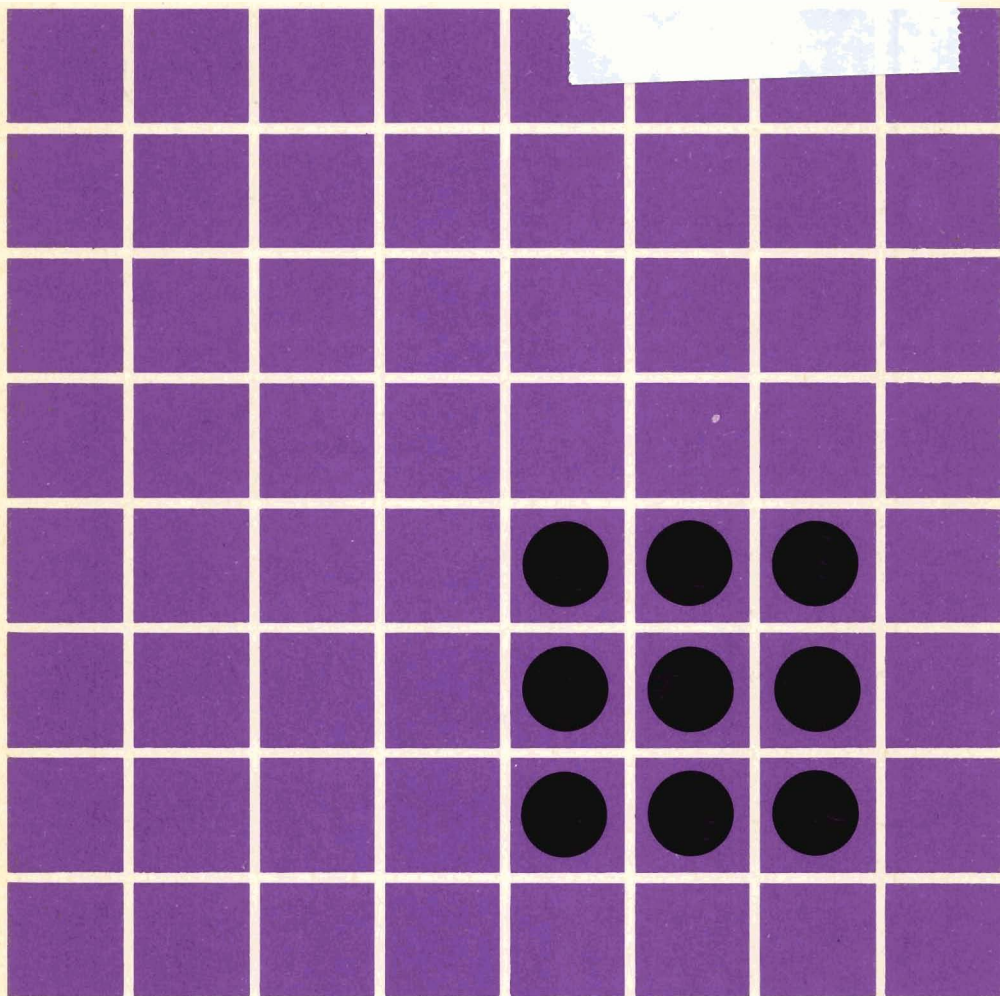


The European Community and the energy problem



EUROPEAN
DOCUMENTATION

periodical

1975/2

The European Community and the energy problem

The energy crisis into which the world was plunged at the end of 1973, although precipitated by political and military events in the Middle East, was not caused by them. Instead its roots are to be found in the pattern of the energy market which existed before the crisis itself broke out.

I. Market trends before the crisis

For Western Europe in general and the countries of the European Community in particular, pre-crisis energy market trends were as follows:

1. Volumes

The demand for energy in Europe—already high compared with the world average—increased sharply over the last twenty years. In the industrialised countries, primary energy consumption increased on the whole by more than 100 per cent and by 1973 the nine Community Member States had a combined energy consumption of almost 1,000 million tons oil equivalent (mtoe). At that time, there were no signs of demand saturation or of a decline in growth. The European Commission was still forecasting a doubling of energy requirements in fifteen years and estimated total requirements for 1985 at some 1,800 mtoe.

2. Structure

The post-Second World War boom in energy consumption was accompanied by radical changes in the pattern of consumption. Immediately after the War, more than 80 per cent of the total energy requirements of the Nine were met by solid fuels (coal and lignite), while oil accounted for only about one-tenth of the total. The present pattern is completely different.

Now solid fuels cover just over one-fifth of total requirements (23 per cent in 1973), whereas oil accounts for three-fifths (59 per cent). Natural gas—Europe's newest energy source—represents over 12 per cent. The balance of Europe's energy requirements (just over 4 per cent) are covered by hydroelectric, geothermal and nuclear energy.

The rapid post-war increase in consumption has therefore been met by massive recourse to imported oil and natural gas. In addition, the uses to which petroleum products are put have now been extended considerably. Whereas in the past they were used mainly as fuel, they are now increasingly used to produce heat.

In 1973 it was generally thought that the pattern of energy supplies would continue to follow much the same trends. According to the forecasts drawn up by the European Commission at the end of 1972:

- (i) solid fuels would continue to decline in importance and by 1985 would only be responsible for 10 per cent of total energy requirements;
- (ii) oil and natural gas would increase their share, accounting respectively for 64 per cent and 15 per cent of energy requirements in 1985;

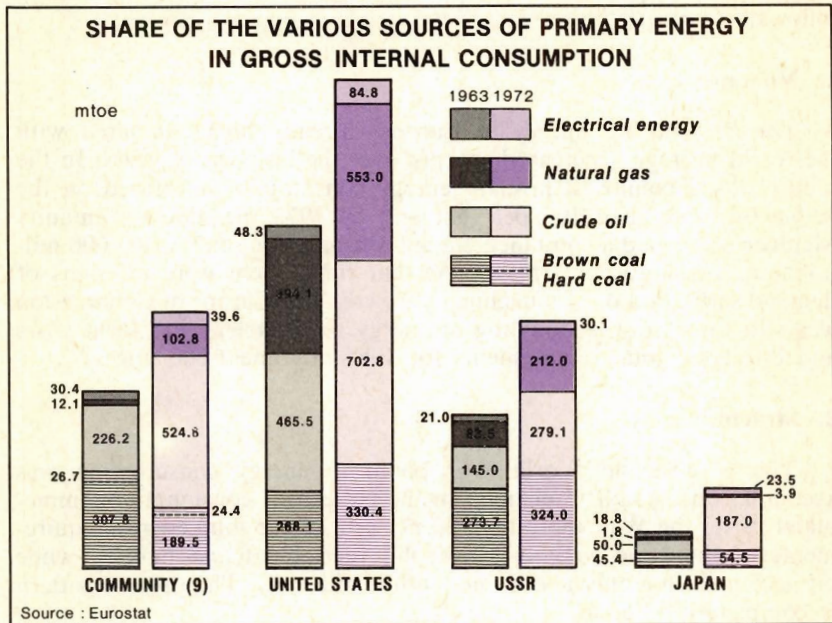


Table 1

SHARE OF THE VARIOUS SOURCES OF PRIMARY ENERGY IN GROSS INTERNAL CONSUMPTION

toe = ton oil equivalent

	Hard coal and equivalent		Brown coal and equivalent		Oil and equivalent		Natural gas		Other fuels		Electrical energy		Total	
	1963	1973	1963	1973	1963	1973	1963	1973	1963	1973	1963	1973	1963	1973
Germany	88.7	60.0	23.5	22.6	56.0	146.0	1.2	27.5	0.2	0.7	3.7	8.3	137.7	265.2
	51.1	22.6	13.5	8.5	32.5	55.1	0.7	10.4	0.1	0.3	2.1	3.1	100	100
France	46.8	28.1	1.2	1.0	41.3	123.8	4.2	13.8	—	0.2	11.1	13.2	104.6	180.2
	44.7	15.6	1.2	0.5	39.5	68.7	4.0	7.7	—	0.1	10.6	7.3	100	100
Italy	8.3	7.7	0.5	0.3	36.5	97.8	6.1	14.5	0.1	0.2	12.1	9.7	63.6	130.2
	13.1	5.9	0.7	0.3	57.5	75.1	9.5	11.1	0.1	0.2	19.1	7.4	100	100
Netherlands	11.3	2.8	0.2	0.0	15.7	29.4	0.5	29.0	—	—	0.0	-0.1	27.7	61.2
	40.9	4.6	8.5	0.1	56.7	48.0	1.8	47.5	—	—	0.0	-0.2	100	100
Belgium	17.7	11.4	0.0	0.0	10.8	27.8	0.1	7.3	—	0.0	-0.1	-0.1	28.5	46.5
	62.1	24.4	0.0	0.0	37.9	59.9	0.2	15.8	—	0.0	-0.2	-0.2	100	100
Luxembourg	2.8	2.5	0.1	0.0	0.6	1.7	—	0.2	—	0.0	0.2	0.7	3.6	5.1
	77.0	48.9	2.0	0.4	16.1	33.1	—	3.9	—	0.0	4.8	13.7	100	100
Community (6)	175.6	112.5	25.4	24.0	161.4	426.5	12.0	92.4	0.3	1.2	27.0	31.8	401.7	688.3
	43.7	16.3	6.3	3.5	40.2	62.0	3.0	13.4	0.1	0.2	6.7	4.6	100	100
United Kingdom	127.2	80.0	—	—	55.9	108.2	0.1	25.6	—	—	3.1	8.2	186.3	221.9
	68.3	36.0	—	—	30.0	48.8	0.1	11.5	—	—	1.6	3.7	100	100
Ireland	1.2	0.6	0.8	1.1	1.7	5.6	—	—	—	—	0.2	0.2	3.9	7.5
	29.9	7.8	20.6	15.2	43.6	74.5	—	—	—	—	5.9	2.5	100	100
Denmark	3.8	2.5	0.5	—	7.3	17.0	—	—	—	—	0.1	-0.0	11.7	19.5
	32.4	12.8	4.0	—	62.5	87.4	—	—	—	—	1.1	-0.2	100	100
Community (9)	307.8	195.6	26.7	25.1	226.3	557.3	12.1	118.0	0.3	1.2	30.4	40.1	603.6	937.2
	51.0	20.9	4.4	2.7	37.5	59.5	2.0	12.6	0.0	0.1	5.0	4.3	100	100

Source: Eurostat.

- (iii) hydroelectric and geothermal energy would be of even less importance, covering only 2 per cent of requirements, while nuclear energy would increase its share from 1.4 per cent in 1973 to some 9 per cent in 1985.

The changing pattern of EEC energy consumption has been accompanied by a change in the ratio between energy produced in the Community and imported energy. The Community has always been poor in oil resources and despite the recent North Sea discoveries, demand for oil cannot be met by internal production.

This meant in fact that the Community became increasingly dependent on imported energy. In 1950, energy imports accounted for little over 10 per cent of Community supplies whereas now they cover more than 60 per cent of the Nine's energy requirements. The Commission's 1973 energy forecasts (which are no longer valid on account of the economic crisis and because of the measures taken meanwhile by the Community) did not anticipate any substantial fall in this degree of dependence on external energy supplies. Even the new oil and gas supplies from the North Sea would have been partly counterbalanced by an increase in imports of coal, natural gas and nuclear fuel.

3. Prices

During the first half of the period between the end of the Second World War and the advent of the energy crisis, Community energy prices were largely governed by the price of coal—at that time still the largest source of energy. Independently of schemes to aid the coal industry, which varied widely from one country to another, the general policy was that coal should not be priced out of the energy market. Coal was thus protected by the maintenance of high price levels for other sources of energy and in particular those of imported energy—especially oil.

During the 1960s, however, it seemed more advantageous to allow imported energy to compete more freely on the energy market—even if this meant increasing aid to coal, accompanied by a planned cutback in production.

As a result, the importance of coal rapidly declined and the Community's energy market came to be dominated increasingly by oil and oil prices.

From 1960 to 1970, however, the world oil market was characterised by an abundance of supplies at low and stable prices. In real terms, the price of oil, if anything, tended to fall. Moreover, because it was available at low prices, oil was able to capture the lion's share of the increase in demand.

During this period, the Community benefited, not only from cheap oil, but also from the influence cheap oil had on the energy market

as a whole. Because abundant supplies of cheap oil existed to meet the growth in demand, the price of other energy sources tended to be kept down.

But the relative fall in prices also had the effect of speeding-up the cutback in coal and of slowing down the development of nuclear energy.

4. Other aspects

The Community's energy supply pattern has therefore undergone a change, the major features of which have been a drop in the relative importance of solid fuels, greater use of liquid and gaseous fuels and increased dependence on imported fuel.

This change has had important results within the Community.

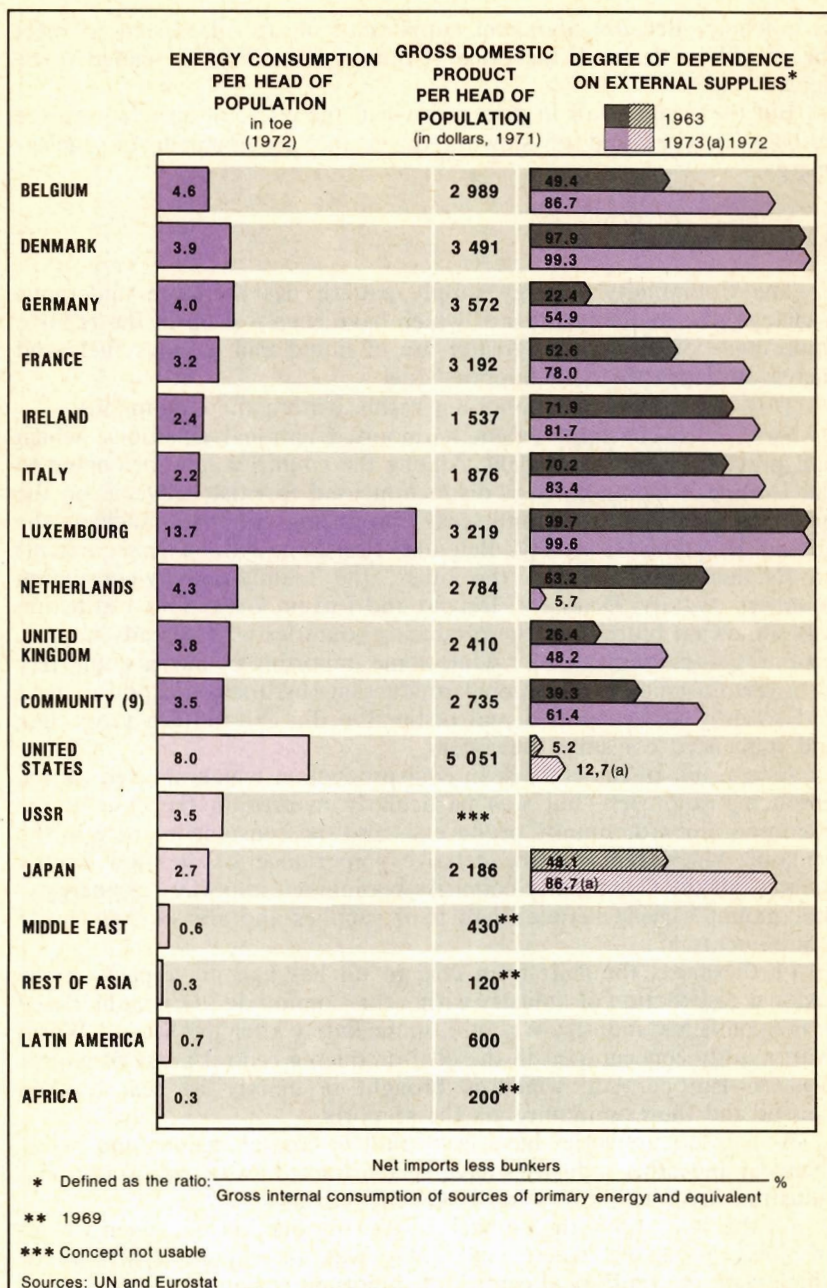
First, it has to some extent harmonised national situations, which had previously differed widely. Among the countries now belonging to the European Community, a distinction used to exist between, on the one hand the energy—mainly coal—producing countries, such as the United Kingdom, Germany, Belgium, France and (to a lesser extent) the Netherlands, and, on the other, the mainly energy-consuming countries of Italy, Denmark, Ireland and Luxembourg. This distinction was somewhat blurred, as the producing countries were already importing energy—particularly oil—while some importing countries could rely on a certain amount of national production (hydroelectric power, peat and so on). Nevertheless a real distinction did exist fifteen years ago, and influenced consumer behaviour.

As a result of the cutback in coal production which affected all the producing countries—but was particularly marked in the case of the less important Community producers—and the constant increase in the demand which reduced the relative importance of internal energy sources, all the Community countries became net importers of energy—the amount varying between half their supplies and almost their entire requirements.

Furthermore, the shift from coal to oil has had an impact on the regional distribution of industry within the Community. Originally based in the coalfields, industry was still, immediately after the Second World War, mainly concentrated in the coal-producing central areas of North-Western Europe. Oil, which is brought in mainly by sea, reached Europe and the Community via the seaports.

As a result, refineries have been built in coastal regions and petrochemical and other industries have been attracted away from traditional industrial areas to the new development regions.

As the same time, the cutback in coal production has given rise to problems in regions where coalmining was an important activity or which were the traditional centres of important consumer industries.



The change in the energy supply pattern has also had considerable international repercussions. The discovery and development of massive, easily-extracted deposits of very low-cost oil in the Middle East led to a ready availability of cheap oil supplies on world markets—the main customers for which were Western Europe and Japan.

However, the growing dependence of Europe and Japan for their oil supplies on a small number of countries located in or around a politically and militarily unstable zone, meant that the shift towards oil had strategic implications extending far beyond the economic aspects of the supply situation.

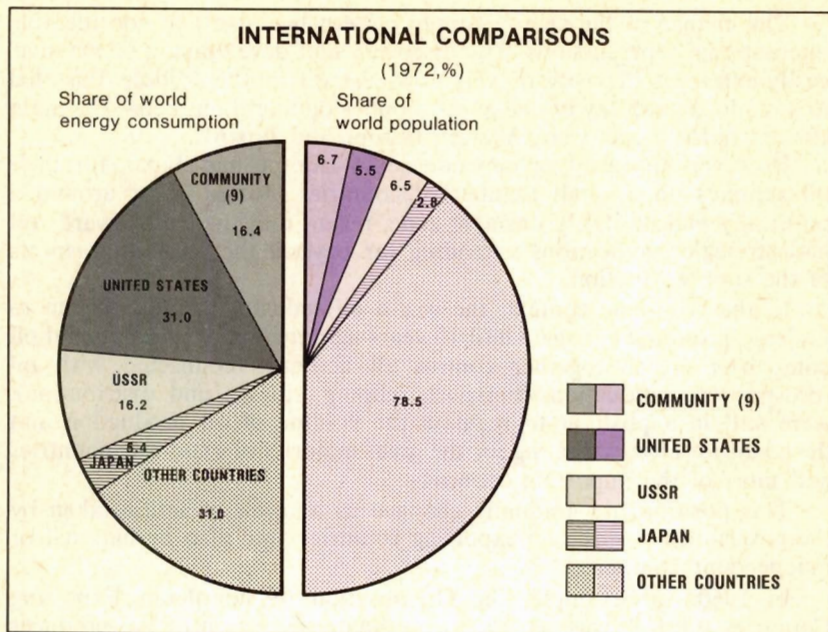
In the economic context, the world oil industry has also begun to undergo profound change. Until 10 years ago, the major international oil companies, which together control all activities connected with oil (prospection, production, transport, refining, storage and distribution), were still in a position to regulate the volume of oil production and the conditions for marketing for the great majority of exporting countries and most of the importing countries.

This position has gradually changed as a result of action taken by the governments of the oil-exporting countries, and also by national or independent companies.

In 1960, for example, the Organisation of Petroleum Exporting Countries (OPEC) was set up to coordinate the action of the producer countries. As far back as 1965, the Libyan government, using the threat of an imposed cutback in production, brought about a change in the fiscal arrangements applying to concession companies operating within its territory. Changes in supply patterns have also had an impact on the interrelationships between the United States, Europe and Japan, and also on their relationships vis-à-vis the rest of the world.

The United States are able to satisfy almost all their energy needs from domestic production, or, at any rate from the American continent, so that for a long time the country has enjoyed price advantages over its industrial competitors. American coal has always benefited from very favourable mining conditions, and Europe used to obtain oil mainly from Venezuela at prices based on the cost to the United States plus the cost of sea freight.

But from the moment when Europe was able to draw increasing supplies from the Middle East and North Africa—regions which are much closer to Europe than to the United States and have low production costs—the situation was bound to be reversed. Japan also benefited from this trend, and in their turn the two major regions which are the industrial competitors of the United States were able to take advantage of lower energy prices. This inevitably had an impact on competitive conditions between the United States on the one hand and Europe and Japan on the other, and also influenced economic, financial and monetary relations.



Particularly towards the end of the Sixties, Europe and Japan were able to enjoy more rapid and more sustained economic development than the United States.

II. Recent major changes on the energy market

The situation in fact began to change towards the end of 1969. At that time the world demand for energy, especially oil, was increasing faster than the producing companies had foreseen.

A poor level of investment in some areas—particularly transport—together with difficulties and delays in the exploiting of new resources, especially for environmental reasons (e.g. Alaska), combined with a high level of demand from Europe and Japan and expanding purchases by the United States, turned a buyers' market into a sellers' market.

The exporting countries, grouped together under the banner of OPEC, realising the advantage to be gained from this new situation, pursued a concerted policy to obtain an increase in their oil revenues, guarantees to maintain the real value of these revenues and greater control of the economic management and exploitation of their oil resources.

In economic terms, oil is both a source of revenue (often almost the only one) and a development instrument for the exporting countries. Among the exporting countries of North Africa and the Middle East, which together supply about four-fifths of the Community's imported oil, two groups can be distinguished.

First there are the countries such as Algeria, Iran and perhaps Iraq, which, because of their population structure and geography, have an assured potential for agriculture and industrial development. In these countries, oil revenues are mainly invested in infrastructures and in capital goods purchased from the industrialised countries.

The other countries can do little but invest their oil revenues abroad and these investments, for the most part short-term, constitute floating masses of capital which accentuate the monetary fluctuations in currency parities—an effect which becomes more marked as their volume increases.

Whichever category they belong to, these oil-exporting countries have an interest in protecting their revenue from losses in real value and purchasing power brought about by inflation. Some exporting countries are, moreover, seriously considering reducing the rate of increase of their production in order both to husband reserves—which though very substantial in the Middle East are not inexhaustible—and to allow the capital represented by this oil to appreciate in value underground to a greater extent and at a faster rate than the same capital would do if invested anywhere else.

Lastly, these countries are determined to exploit their oil themselves at the earliest opportunity in order to manage their resources as efficiently as possible.

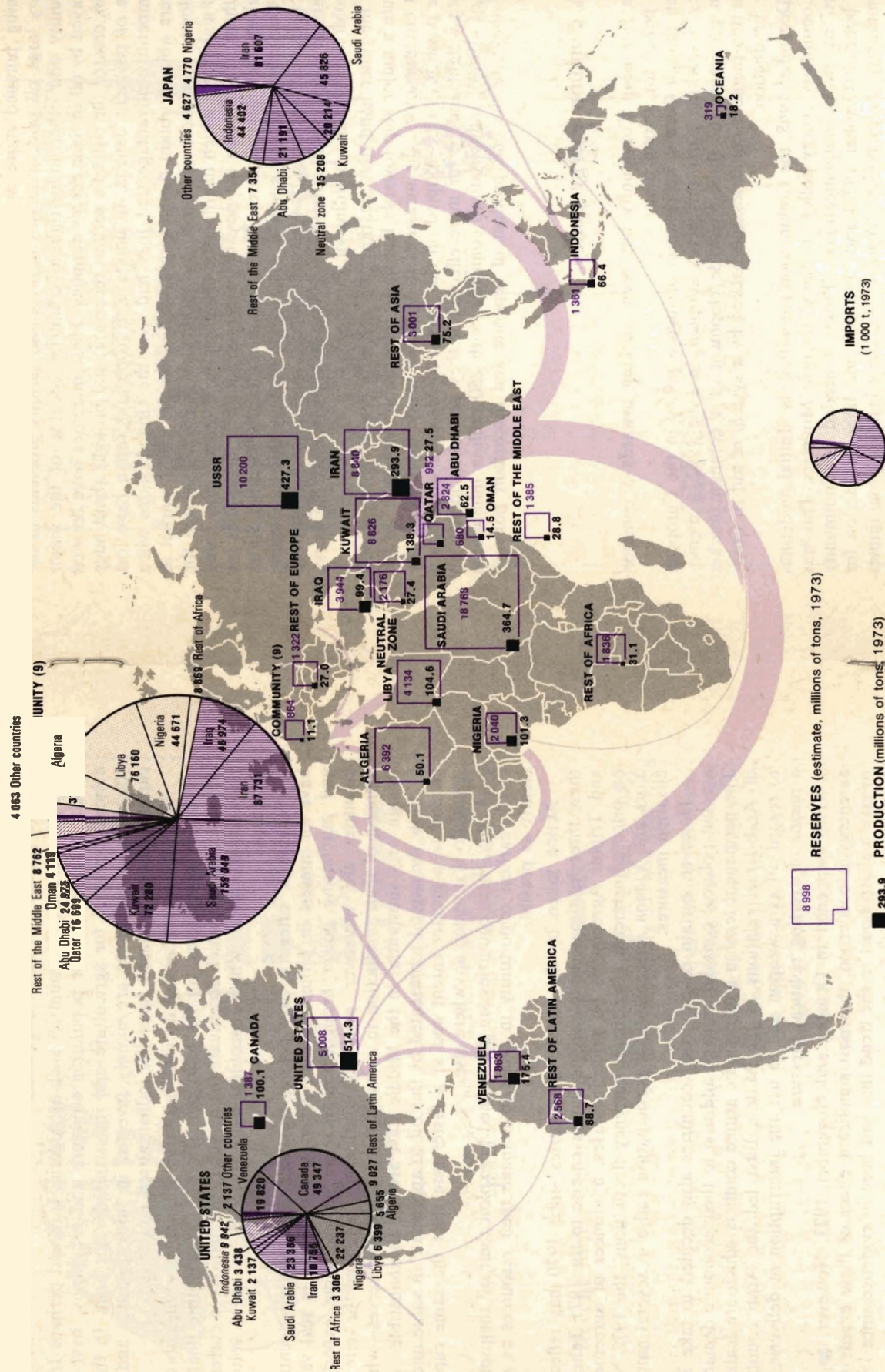
Action taken by the exporting countries since 1970 has reflected these three legitimate concerns and has given rise to the 1971 Teheran and Tripoli Agreements on price increases, a number of agreements on price adjustments after major currency fluctuations, the 1972 New York and Vienna Agreements on participation and also several nationalisation measures.

However, certain oil-exporting countries also decided to take into account political considerations in addition to their economic demands. The permanent tension and periodic armed conflicts which are features of Arab-Israel relations in the Middle East led the Arab countries to regard oil as a weapon and to use the interruption of deliveries as a means of exerting political pressure.

This happened in October and November 1973. However, as far as energy is concerned, the most significant effect of these events was to give a sharp boost to the trend that had been in evidence since 1970.

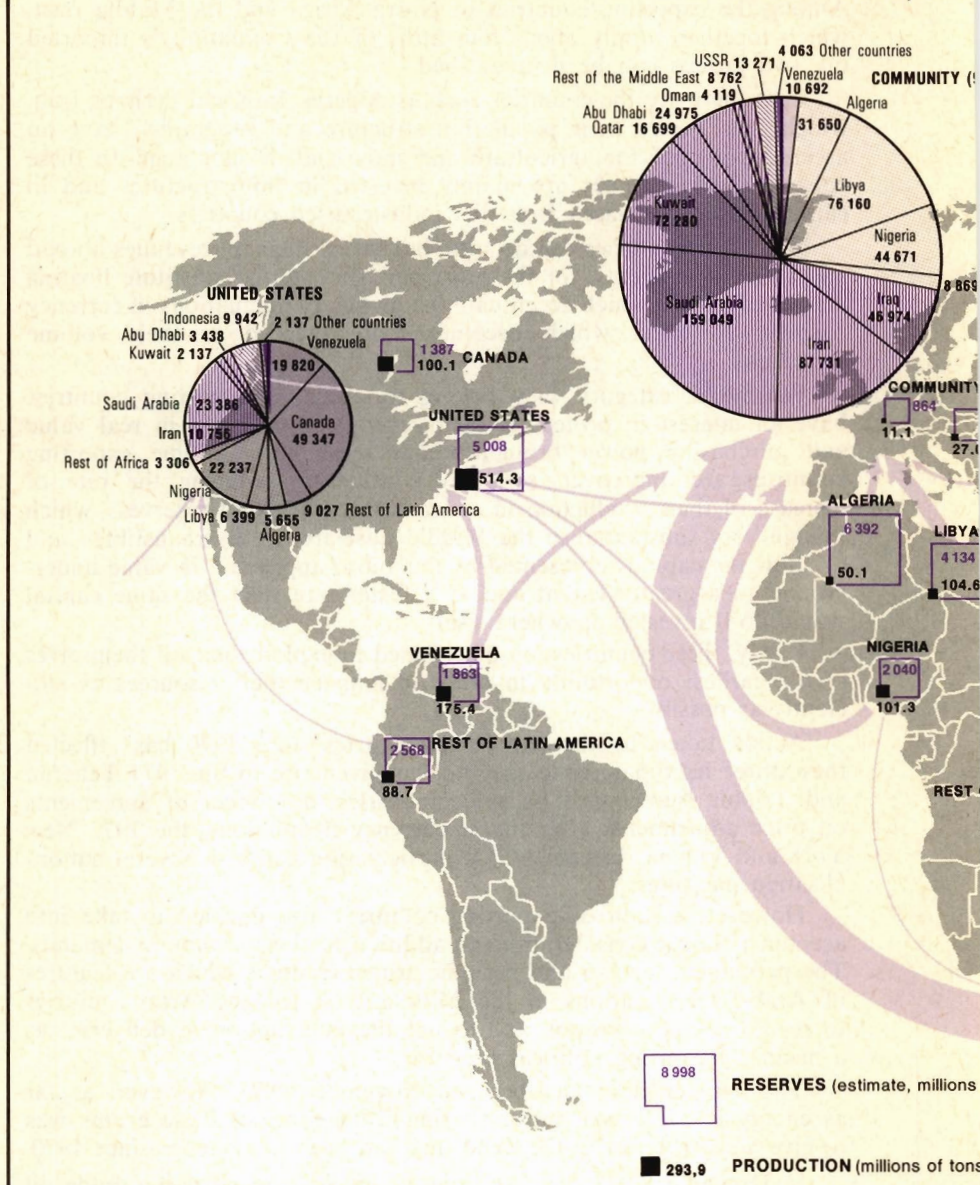
In December 1973, the exporting countries stopped fixing crude oil prices by agreement with the oil companies and decided that in future

OIL PRODUCTION, RESERVES AND IMPORTS



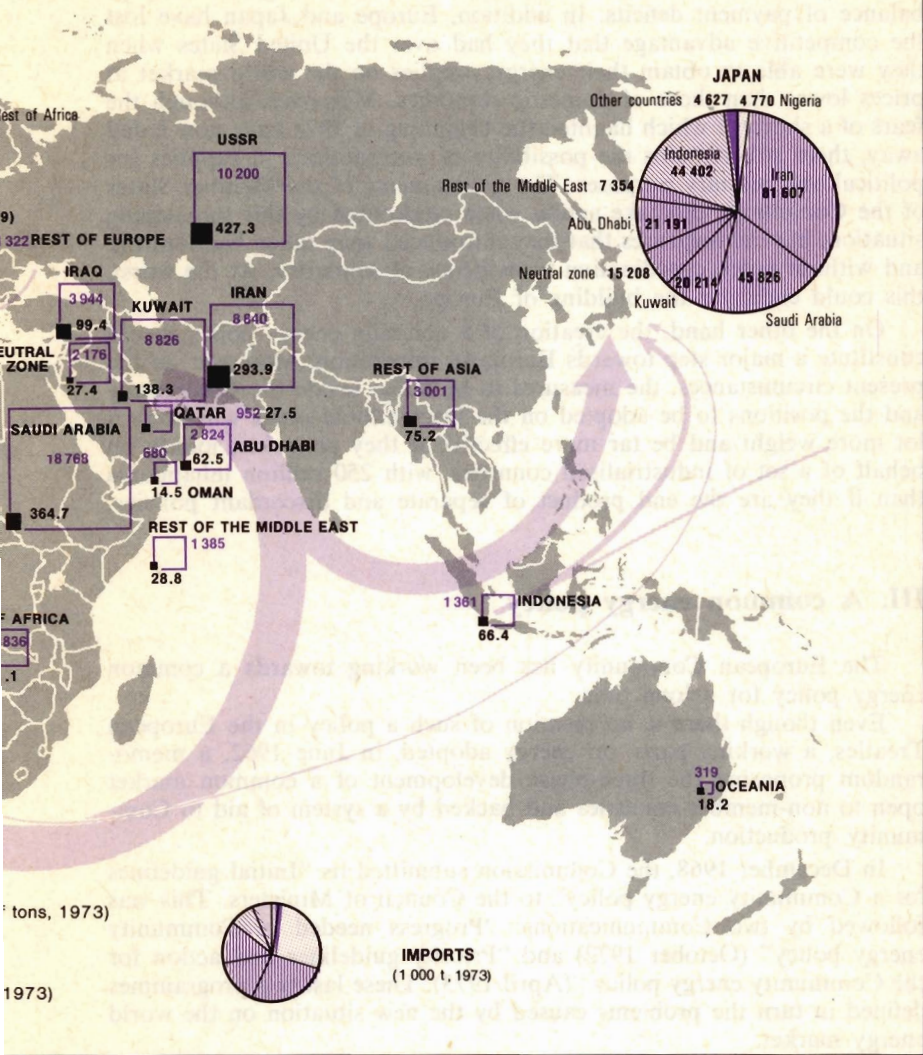
Sources : Eurostat / Oil and Gas Journal

OIL PRODUCTION, RESERVES



Sources : Eurostat /Oil and Gas Journal

RESERVES AND IMPORTS



they would determine the level of these prices unilaterally. Subsequently, crude oil prices more than tripled.

Participation demands were also stepped up and this objective is now being pursued more rapidly in various oil-producing countries. The very large oil price increases have caused serious problems in the Community and other industrialised countries because of the major part played by oil in their energy supplies. These increases have boosted inflation, created the risk of a serious recession, and brought about huge balance of payment deficits. In addition, Europe and Japan have lost the competitive advantage that they had over the United States when they were able to obtain their energy supplies on the world market at prices lower than those of domestic resources. Moreover, although the fears of a shortage which haunted the beginning of 1974 have now faded away, there still remains the possibility of interruptions in supplies for political and military purposes. The governments of the Member States of the Community did take action when confronted by this threatening situation, but the measures that they introduced were taken haphazardly and without much coordination or evidence of solidarity. At the worst, this could endanger the building of Europe.

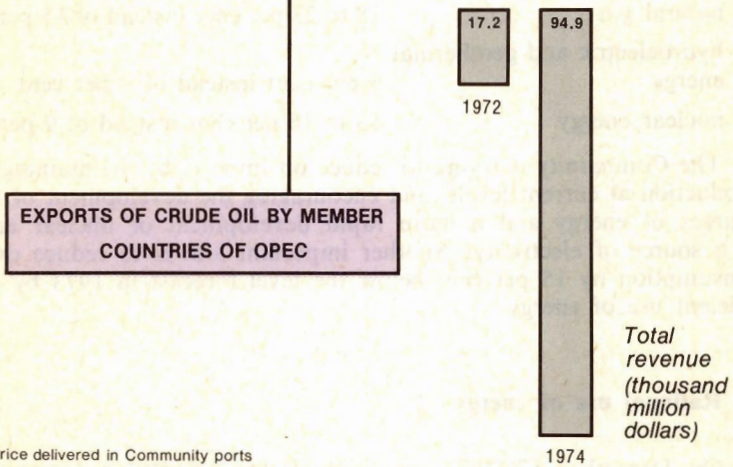
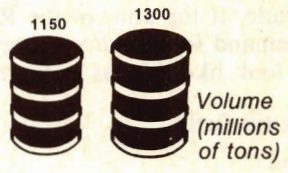
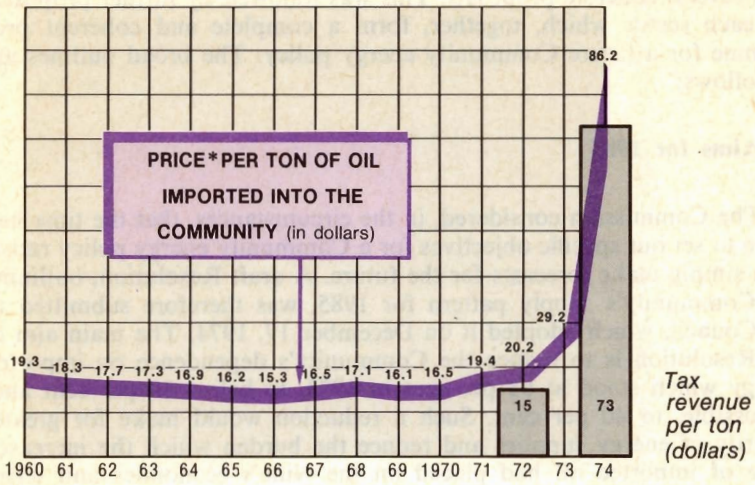
On the other hand, the creation of a common energy policy would constitute a major step towards European integration. Moreover, in the present circumstances, the measures to be taken inside the Community and the positions to be adopted on the international scene will carry a lot more weight and be far more effective if they are taken jointly on behalf of a set of industrialised countries, with 250 million inhabitants than if they are the end product of separate and discordant policies.

III. A common energy policy

The European Community has been working towards a common energy policy for a long time.

Even though there is no mention of such a policy in the European Treaties, a working party on energy adopted, in June 1962, a memorandum proposing the three-phase development of a common market open to non-member countries and backed by a system of aid to Community production.

In December 1968, the Commission submitted its "Initial guidelines for a Community energy policy" to the Council of Ministers. This was followed by two Communications: "Progress needed in Community energy policy" (October 1972) and "Priority guidelines and action for the Community energy policy" (April 1973). These last two programmes defined in turn the problems caused by the new situation on the world energy market.



* Price delivered in Community ports

When the energy crisis broke out at the end of 1973, the Commission submitted a Communication to the Council in May 1974 entitled "Towards a new energy policy strategy for the Community", together with several concrete proposals. This was followed by further proposals for each sector which, together, form a complete and coherent programme for a future Community energy policy. The broad outlines are as follows:

1. Aims for 1985

The Commission considered, in the circumstances, that the time had come to set out specific objectives for a Community energy policy rather than simply make forecasts for the future. A draft Resolution, outlining the Community's supply pattern for 1985, was therefore submitted to the Council, which adopted it on December 17, 1974. The main aim of the Resolution is to reduce the Community's dependence on imported energy which stood at 63 per cent in 1973, to below 50 per cent and, if possible, to 40 per cent. Such a reduction would make for greater security of energy supplies and reduce the burden which the increased price of imported oil had placed on the Nine's economies and terms of trade. If the aims of the Resolution are achieved, the overall pattern of demand for primary energy in 1985, compared with present demand, will look like this, as compared with the earlier forecasts:

— solid fuels	17 per cent instead of 10 per cent
— oil	49 to 41 per cent instead of 64 per cent
— natural gas	18 to 23 per cent instead of 15 per cent
— hydroelectric and geothermal energy	3 per cent instead of 2 per cent
— nuclear energy	13 to 16 per cent instead of 9 per cent

The Community is trying to reduce oil imports by maintaining coal production at current levels, and encouraging the development of other sources of energy and a more rapid development of nuclear energy as a source of electricity. Another important aim is to reduce overall consumption by 15 per cent below the level forecast in 1973 by more efficient use of energy.

2. Rational use of energy

On December 17, 1974 the Council also adopted a Commission proposal for a Community action programme for the rational use

of energy. The aim of this programme is to help achieve the desired 15 per cent reduction in consumption by 1985 (i.e. about 240 mtoe) which would entail a saving of some 22,000 million dollars. The Resolution lays down an implementing procedure and priority actions for the domestic and tertiary sector, the transport sector, and for the manufacturing and energy industries. The Council noted the measures planned and requested the Commission to submit concrete short-term proposals and to report periodically on progress made towards attaining these goals.

3. Greater use of internal and secure resources

The Commission has already pointed out some of the many steps which could be taken.

The Commission proposed, firstly, to change its coal policy and maintain coal production at the present level of 250 million tons until 1985. By increasing the production of lignite and increasing coal imports from non-member countries, this policy would result in solid fuels providing a larger share of Community energy supplies (17 per cent instead of 10 per cent) and oil imports would then be reduced proportionally. The Community also agreed that efforts should be made to develop the Community's inshore and offshore hydrocarbon resources—notably those under the North Sea. Community oil production could thus be increased to 180 mtoe, and natural gas production to 175 mtoe or, if possible, to 275 million tons, by 1985. The Community already grants financial assistance to Community research projects into new techniques of prospecting and exploiting hydrocarbons in particularly difficult areas such as the North Sea.

As with coal, the Community intends to increase imports of natural gas from non-member countries. This may not alleviate the balance of payments problems but it will diversify the types and sources of non-Community energy supplies. In addition to its programme for rational use of energy, the Commission has proposed that the use of natural gas in power stations be limited. This has been approved by the Council. A similar proposal has been adopted for oil products.

4. Greater use of nuclear energy

The Commission believes nuclear energy to be one of the most important substitutes for imported oil, and aims to create by 1985, a nuclear power system with an installed capacity of 160 GWe and, if possible, 200 GWe. This would cover more than one-third and possibly even half of the Community's electricity needs and between 13 and 16 per cent of total EEC energy consumption. However, electricity industries in the Community will need to be developed in a concerted

fashion in the future before nuclear energy programmes can be speeded up or before the plans for coal production and natural gas and oil consumption in power stations can be carried out. The Commission has outlined the main aspects of such a development in its "Guidelines for the Community electricity sector".

The development of nuclear energy raises other problems. The Commission has considered it necessary to draw up a nuclear fuel supply policy in order to ensure sufficient supplies of natural uranium at reasonable prices, together with sufficient enrichment and processing facilities for used fuels.

The Commission has also proposed ways of facilitating the financing of nuclear plants which require very large investments. The Commission intends, moreover, to coordinate the development of nuclear activities by publishing annual illustrative programmes as provided for in Article 40 of the Treaty establishing the European Atomic Energy Community.

In February 1974, the Commission drew up a development programme for nuclear energy with a definite timetable of measures planned or proposed by the Commission to protect public health and the environment. It has also just drawn up an initial programme on the control of radioactive waste in the interests of public health and environmental protection. This supplements work carried out by the Commission in this field since 1958.

The Commission is also encouraging the development of new and more economical reactors to produce direct heat, rather than electricity-derived heat, for industry and urban areas.

5. Scientific and technical research

The will to solve the energy supply problem, although of fundamental importance, is not sufficient in itself. Technological progress will have to be made in a number of sectors before any improvements in energy production can be realised. In addition, a number of short-term solutions open to the Community, such as nuclear energy, entail elements of risk. Consequently it is essential for any Community energy policy strategy to be backed by a Community research programme.

In December 1974, the Commission proposed the following programmes to supplement those already under way, particularly in the field of nuclear energy:

- energy conservation by improving production techniques,
- production and use of hydrogen as a new source of energy,
- use of solar energy,
- use of geothermal energy,
- energy systems modelling.

The Commission is also due to propose a development programme for thermonuclear fusion which will both continue and extend previous work in this field. By the same token, the Commission's technical coal research programmes will be supplemented by an in situ coal gasification and liquefaction programme.

6. Organisation of the market

It has become clear from recent developments in the energy market that the latter needs to be better organised and monitored.

The Council has taken steps to provide the Community with information on hydrocarbon imports and exports and on planned investments above and beyond the information on the nuclear and coal sectors called for in the Euratom and ECSC Treaties. The Commission considers, however, that this information should be backed by a policy of cooperation with public authorities and industry—particularly as regards trade in hydrocarbons and investments in the energy sector.

7. Economic policy

The Commission has had compulsory minimum stock level arrangements for oil for a long time. The level has been raised from 65 to 90 days of consumption.

Now the Commission is considering introducing minimum stock levels for coal and nuclear fuels. It has also proposed that a minimum level of fuel stocks at power stations be made compulsory.

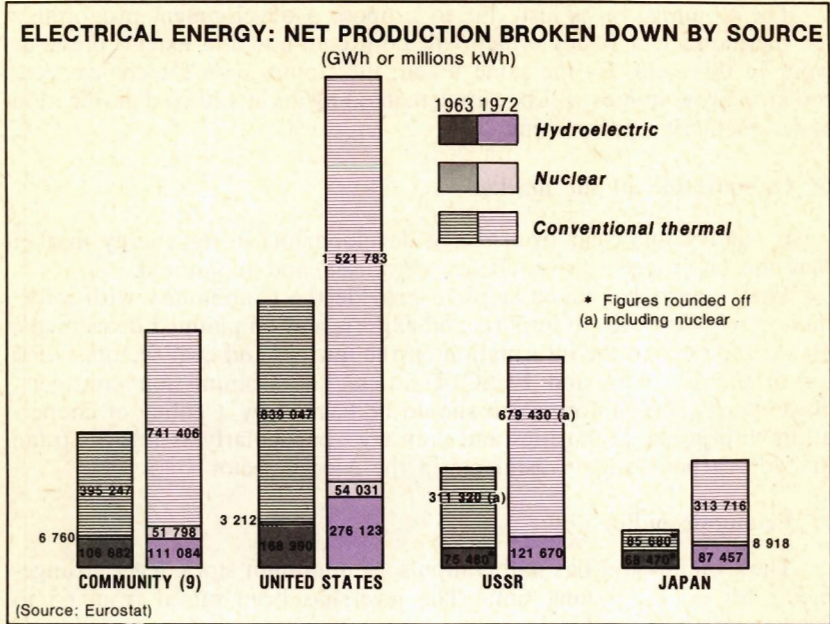
In addition the Commission considers it would be advisable to ensure that all energy-consuming and transforming plants, particularly power stations, be equipped for multi-fuel operation so that they can convert from one source of energy to another (e.g. from coal to oil) to ensure maximum supply flexibility.

8. International action

The predominant role of imported energy in the Community's energy supplies and the importance they will continue to have in the supply pattern means that one of the main preoccupations of the Community's common energy policy will be international relations.

An International Energy Agency was set up within the framework of the OECD in November 1974 and the European Commission is taking part in the Agency's current work as an observer. The Agency represents most of the industrialised and consumer countries in the Western world, including eight Community Member States.

One of the most pressing aspects of the Agency's work is preparing the ground for talks between the industrialised, oil-consuming countries, the oil-exporting countries and the non-producer developing countries.



*
**

These are the broad lines along which the Community's energy policy has developed so far.

It is a policy which is based directly on the present situation in the energy market. It must be flexible enough to keep pace with new developments which, as has been seen in the past, can sometimes be sudden and far-reaching. It must, on the other hand, be placed in the much larger context of economic, social, financial and monetary problems. Such a policy can only be effective if the Member States give the Community institutions the power to enforce any measures which need to be taken.

Selected Bibliography

- HILL Peter and VIELVOYE Roger, *Energy in crisis. A guide to world oil supply and demand and alternative resources*, London, Yeatman, 1974, 223 p.
- FISHER John C., *Energy crisis in perspective*, New York, Wiley, 1974, ix+196 p.
- GORDON Richard L., *The evolution of energy policy in Western Europe. The reluctant retreat from coal*, New York, Praeger, 1970, xxix+330 p.

Table 2

ELECTRICAL ENERGY: NET PRODUCTION BROKEN DOWN BY SOURCE (GWh)

		Hydroelectric				Conventional thermal				Gas, derivatives thereof and other fuels	Total	Grand total
		Nuclear	Hard coal	Brown coal	Oil products	Natural gas						
Germany	1963	12,187	78,022	36,498	8,773	618	4,222	128,133	140,374			
	1973	15,272	96,953	68,977	40,541	33,836	13,416	253,723	280,148			
France	1963	43,613	28,361	440	6,647	5,168	3,813	44,439	88,471			
	1973	47,543	26,592	663	69,003	9,674	7,036	112,968	174,480			
Italy	1963	45,906	1,196	1,198	15,508	2,332	1,029	21,263	69,723 *			
	1973	38,901	1,737	1,114	84,189	4,221	3,649	94,910	139,103 *			
Netherlands	1963	—	13,104	—	6,086	142	507	19,839	19,839			
	1973	—	1,459	—	6,173	40,018	1,562	49,212	50,227			
Belgium	1963	141	12,650	—	3,478	22	1,467	17,617	17,800			
	1973	615	4,873	—	20,345	9,240	3,980	38,438	39,121			
Luxembourg	1963	486	54	—	158	—	1,067	1,279	1,765			
	1973	826	12	—	369	136	762	1,279	2,105			
United Kingdom	1963	3,645	126,936	—	23,821	—	2,789	153,546	163,140			
	1973	4,537	161,296	—	68,613	2,613	1,479	234,001	262,848			
Ireland	1963	679	106	962 (Peat)	1,100	—	—	2,168	2,847			
	1973	639	70	1,627 (Peat)	4,626	—	—	6,323	6,962			
Denmark	1963	25	3,760	975	11,557	—	6	6,963	6,988			
	1973	24	6,423	—	—	—	—	17,980	18,004			
Community (9)	1963	106,682	264,189	40,073	67,793	8,282	14,910	395,247	510,947 *			
	1973	108,357	299,415	72,381	305,416	99,738	31,884	808,834	972,998 *			

* Including geothermal production in Italy (2,258 GWh in 1963, 2,319 GWh in 1973).

Source: Eurostat.

Glossary

• **Toe: ton oil equivalent.** This unit makes it possible to express in comparable fashion and hence to totalize the different energy sources in terms of their equivalent calorific values. The standard used is the calorific value of one ton of oil.

1 toe = 4×10^7 kcal or 10 million kilocalories.

1 mtoe = 1 million toe = 1×10^{13} kcal.

• **Tce: ton coal equivalent,** Another unit of equivalence: based on coal.

1 tce = 7×10^6 kcal or 7 million kilocalories, or 0.7 toe.

1 mtce = 1 million tce = 7×10^{12} kcal.

• **Calorie:** quantity of heat required to raise the temperature of 1 gramme of water by 1 degree C.

1 kilocalorie or kcal = 1,000 calories.

• **Kilowatt or kW:** unit of power equal to 1,000 watts. It is used in particular for electricity; in this case the term is the electric kilowatt or kWe.

There are many other multiples of the watt, including:

- the electric Megawatt or MWe = 1×10^3 kWe = one thousand electric kilowatts.
- the electric Gigawatt or GWe = 1×10^6 kWe = one million electric kilowatts.

• **Kilowatt-hour or kWh:** unit of energy equivalent to the energy supplied during one hour by a machine with a power output of one kilowatt.

The more usual multiples are:

- the Gigawatt-hour or GWh = 1×10^6 kWh = 1 million kilowatt/hour.
- the Terawatt-hour or TWh = 1×10^9 kWh = 1 thousand million kilowatt/hour.

• **Primary energy:** energy obtained directly from nature. The following are examples of primary energy:

- fossil fuels: coal, crude oil, natural gas, brown coal/lignite, peat;
- hydroelectric energy;
- geothermal energy (hot water or steam sources);
- tidal energy;
- wind energy;
- solar energy;
- nuclear energy (produced by controlled reactions in the nucleus of the atoms of certain substances).

In certain cases, these forms of energy may be used directly (e.g. coal burnt in the hearth) or else transformed (e.g. coal burnt in a power station to produce electricity).

• **Secondary energy:** energy resulting from a transformation process. A typical example is electricity which is generated in thermal power stations by transforming fossil fuels (however, some electricity is generated directly in hydroelectric and geothermal plants).

Nuclear energy is difficult to classify because so far it has been generated in the form of electricity by processing fossil matter (uranium, thorium, plutonium). It is generally classified as primary energy.

In the same collection

Education of migrant workers' children in the European Community*
The European Community and the developing countries

* School Series only.

EUROPEAN COMMUNITIES - INFORMATION

Commission of the European Communities, 200, rue de la Loi, B-1049 Bruxelles.

Sales offices

Information offices

DUBLIN: 29 Merrion Square,
Dublin 2, tel. 760353.

LONDON: 20 Kensington Palace Gardens,
London W8 4 QQ, tel. 727 8090.

WASHINGTON: 2100 M. Street, N.W.
Suite 707, Washington DC 20037-USA,
tel. 202-872 8350.

IRELAND: Stationery Office,
The Controller, Beggar's Bush, Dublin 4,
tel. 76 54 01.

UNITED KINGDOM: H.M. Stationery
Office P.O. Box 569, London S.E. 1,
tel. 928 6977, ext. 365.

OFFICE FOR OFFICIAL PUBLICATIONS
OF THE EUROPEAN COMMUNITIES,
tel. 49 00 81, case postale 1003, Luxembourg.