"WESTERN EUROPEAN NATURAL GAS MARKET IN TRANSITION"
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(1) programma e lista dei partecipanti
(2) Adamson,David M.: "France, Soviet gas, and European security"
(3) CEDIGAZ: "Natural gas in the world in 1983. Natural gas in Western Europe"
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North American Natural Gas Market in Transition

May 3-4, 1984
Hotel El Presidente Chapultepec
Mexico City

Executive Forum
International Natural Gas Study
(El Colegio de Mexico, Canadian Energy Research Institute, Harvard University)

PROGRAM

MAY 3:

8:30 - 8:40 Opening Remarks: Bijan Mossavar-Rahmani (Harvard University)

8:40 - 9:00 Keynote Presentation: Mario Ramon Beteta (PEMEX)

9:00 - 12:30 Session I: National Policies and Perspectives

Moderator: Henry Lee (Harvard University)
Speakers: Eliseo Mendoza Berrueto (Ministry of Energy, Mexico)
Roland Priddle (Energy, Mines, and Resources, Canada)
Rayburn Hanzlik (Department of Energy, U.S.A.)

12:30 - 2:00 Lunch

2:00 - 5:30 Session II: Factors Driving North American Supply and Demand

Moderator: Miguel S. Wionczek (El Colegio de Mexico)
Speakers: Norman MacMurchy (Alberta Energy and Natural Resources)
A. A. Douloff (TransCanada Pipelines)
James F. Cordes (ANR Pipeline)
Adrian Lajous Vargas (PEMEX)

6:00 - 7:00 Reception

7:00 - 9:00 Dinner (Spouses Invited)

Speaker: Victor L. Urquidi (El Colegio de Mexico)

MAY 4:

9:00 - 12:00 Session III: Setting Up Trading Relations: Negotiations, Contracts, and Risks

Moderator: Gerald E. Angevine (Canadian Energy Research Institute)
Speakers: James T. Jensen (Jensen Associates)
Joseph E. Ramsey (Tennessee Gas Transmission)
Jorge Eduardo Navarrete (Ministry of Foreign Relations, Mexico)
Douglas G. Stoneman (Shell Canada)

12:30 - 2:00 Lunch

2:00 - 5:00 Session IV: Wrap-Up -- Where Do We Go From Here?

Discussion Leaders: John C. Sawhill (McKinsey)
William. W. Hogan (Harvard University)

(2)

FRANCE, SOVIET GAS, AND EUROPEAN SECURITY

David M. Adamson February 24, 1984

Apart from the East-West military balance, access to energy represents the most important security issue for the Western industrial democracies. This has been clear since at least October 1973, when the Arab oil embargo and the ratcheting up of the price of oil brought into focus the West's dependence on external sources of energy and its potential vulnerability to changes in the physical availability or price of that energy.[1] Reversing the postwar trend, the West since 1973 -- and particularly since the second oil crisis of 1979-80 -- has reduced its foreign energy dependence. Yet the West would still pay a heavy price for a major interruption of its external energy supply.[2]

Foreign oil, mainly from the Organization of Petroleum Exporting Countries (OPEC) and other developing nations, remains the fulcrum of the West's potential energy vulnerability. Nevertheless, the decisions in recent years by key Western European countries to import increasing amounts of Soviet natural gas have raised new questions relating to Western Europe's energy security. The expanding Soviet-West European gas trade has also contributed to growing discord between the United States and its European allies over how to manage East-West relations.

The purpose of this article is to probe the energy security issues associated with Western Europe's imports of Soviet gas. For reasons of economy of space and because France may become the most dependent of the West Europeans on Soviet gas, the prime focus will be on France. The article begins with a brief overview of France's energy profile, followed by a review of Franco-Soviet energy trade. It then addresses French and comparative West European vulnerability to an interruption of Soviet gas supplies. The article concludes with a discussion of ways to strengthen European gas security.

The Energy Profile of France

As was the case with the West as a whole, postwar economic growth in France had as a byproduct the diminution of France's energy autonomy. France moved from a domestic coal-fueled economy in which energy imports played an important but not overwhelming role to one based on foreign oil and (to a much lesser extent) foreign natural gas. As a result of this transition France's foreign energy dependence doubled -- from 38% in 1960 to 75.2% in 1973.[3]

In the face of the increasing cost of imported oil and ever-dwindling domestic energy reserves, France after the oil crisis of 1973 embarked upon an aggressive domestic energy program under the center-right Administration of President Valery Giscard d'Estaing (1974-81). This program was designed to reduce French oil exposure through energy conservation and a vastly expanded nuclear power program, and by diversifying types and sources of energy imports.

Despite the relative anti-nuclear power bias of the Socialist Party, the election of Francois Mitterrand to the French Presidency in 1981 brought little modification to the main lines of French energy policy. The Socialist government sought only marginal changes in the overall projected energy mix, notably by placing slightly less emphasis on nuclear power. In 1981 the Socialists projected relatively high energy supply needs for France, consistent with their expansionary economic policy.

In 1982, however, the Mitterrand government shifted economic gears from reflation toward austerity. At this time, in anticipation of the preparation of France's Ninth Economic Plan (1984-89), the government established a commission headed by Noel Josephe to examine France's long-term energy requirements. The Josephe Report, completed in July 1983, drastically revised downward the Mitterrand government's forecasts of future French energy demand.[4]

France's post-1973 energy policy and the price incentives created by the oil price shocks of 1973-74 and 1979-80 combined to produce significant shifts in France's energy profile. From 1973 to 1980 energy consumption rose by only 7.2% in France, while GNP rose by over 22%. Energy consumption actually fell each year beginning in 1980 despite continued (if very low) economic growth. Despite having the fourth highest per capita consumption of petroleum products of the major OECD countries in 1973, France had the second lowest in 1981. The shift away from the consumption of (foreign) oil was permitted by increases in the shares of hydroelectricity, natural gas and -- by far most important -- nuclear power in the French energy mix. By 1981 France had become the world's second largest nuclear power producer (after the U.S.). And with respect to the crucial figure of energy independence, France between 1973 and 1981 made larger advances than any of the other major OECD countries except energy-rich Britain.[5]

Just as the evolution of France's energy independence figure between 1973 and 1981 reflects hard-won gains, however, so it mirrors France's continuing massive dependence. With an energy independence figure of 35.4% in 1982 -- as against 24.8% nine years before -- France still depended on external sources for almost two-thirds of its energy. Similarly, while the share of oil -- almost all of it imported -- in France's energy mix had fallen from 66% in 1973 to 46.7% in 1982, France remained greatly dependent on foreign oil. And French efforts to diversify sources of oil had brought only limited results. While in 1973 the Middle East and North Africa provided 84.7% of French oil imports and Saudi Arabia alone 22.4%, in 1982 the figures were 67.3% and 35.8% respectively. Thus the proportion of Middle Eastern and North African oil within France's oil imports had fallen appreciably (largely due to greater French imports from the North Sea and Mexico). Yet, dependence on France's most important oil trading partner had risen. [6]

Within its overall energy mix, France's reliance on Middle East and North African oil had fallen sharply -- from 55.9% in 1973 to 31.4% in 1982. Still, the latter represented almost a third of France's energy, much of it (i.e., fuel for motor vehicles) difficult to replace with different energy types. Thus, as the Josephe Report cautiously put it, a deep and prolonged cut in Middle East oil supply would probably entail "crisis scenarios difficult to imagine."[7]

Franco-Soviet Energy Trade

Energy trade between Russia and Western Europe dates to Czarist times. In the postwar period, however, Soviet oil exports to Western Europe became significant only in the 1960s. By 1980 the Soviet share of the Western European oil import market as a whole and of the French market in particular stood at about 6%.[8]

For several reasons Soviet oil exports to Western Europe clearly have not engendered serious European vulnerability to a Soviet oil cut-off. First and most important, the Soviet market share remains small. Second, the world oil market currently is saturated (and may remain so for some time to come). Third, the EEC countries maintain oil stocks equivalent to 90 days of oil imports. Thus, given the easy transportability of oil, any drop in Soviet supply could quickly and easily be replaced. In the future Soviet oil exports to Western Europe are expected to decline because of the tightening internal Soviet oil market; hence there is little prospect of future Soviet oil leverage over Western Europe.

Other energy products imported by Western Europe from the Soviet Union include coal and natural gas. The quantity of the former involved is modest and does not entail significant dependence even when considered in combination with Polish coal exports to Western Europe.[9]

Until recently, French and other Western European natural gas orders from the Soviet Union also were modest. There was little use of natural gas in Europe until 1963, after the discovery of large reserves at Groningen in the Netherlands. The FRG and Italy were the first EEC countries to import Soviet gas, in 1973 and 1974 respectively. France began importing Soviet gas in 1976, after gas for the first time exceeded 10% of the overall French energy mix (in 1965 it accounted for less than 5% of French energy consumption) and only a few years after the Soviet Union itself became a significant net exporter of gas. The 1976 imports resulted from the signing in September of 1975 of two Franco-Soviet gas contracts with durations of 20-25 years and involving annual deliveries of up to about 4 billion cubic meters (bcm) of gas. Until 1980, when a pipeline link through the FRG was completed, the Soviet supplies contracted by France actually were delivered to Italy through a swap arrangement under which France in turn received Dutch natural gas originally destined for Italy. The quantities involved in 1977-79 were on the order of 2-3 bcm annually. Subsequently in 1980, 1981, and 1982, quantities delivered approximated 4 bcm annually.[10]

Soviet-West European consideration of additional, major exports of natural gas from western Siberia to Europe via a new pipeline began in 1978 with talks between the Soviets and West Germans. These talks gathered momentum in 1980 in the wake of the demise after the Iranian revolution of the tripartite Soviet-Iranian-West European natural gas deal which would have brought 10.9 bcm of gas to Western Europe, including 3.5 bcm to France. But the Western European-Soviet discussions had as a more direct forebear the Soviet-American talks about the development of Siberian gas fields. These talks began in the heyday of detente and foundered with the steady deterioration of Soviet-American relations later in the 1970s.[11]

France as well as several other Western European nations became involved in pipeline discussions with the Soviets in 1980. French interest was stimulated by difficulties over the importation of Algerian gas. The French government began to study the question of additional Soviet gas imports seriously in early 1981, but was divided on the question. The Minister of Foreign Affairs, in light of the poor state of East-West relations, opposed a new gas deal with the Soviets. The national gas utility (Gaz de France) and its overseer, the Minister of Industry, favored a deal. The latter wrote in a memorandum to President Giscard in March 1981 that given the anticipated French supply/demand balance for natural gas and continuing difficulties with Algerian gas, it would be necessary to secure a new Soviet contract for about 5 bcm of natural gas a year. A final decision by Giscard was precluded by Mitterrand's assumption of the Presidency in May 1981.[12]

The initially optimistic economic forecasts and stimulatory economic policy of the Mitterrand government contributed to an enhancement of the amount of new Soviet gas imports that French energy officials judged desirable. As a result, and despite the stiffening of France's Soviet policy under Mitterrand, France on January 22, 1982 signed a new contract for the importation of Soviet gas over 20-25 years beginning in 1984. The deliveries were to attain an annual level of 8 bcm in 1986 or 1987, but contract provisions allowed France to diminish deliveries by up to about 20% at no penalty. The price was of the order of $4.65/MBTU (Million British Thermal Units) plus 30¢ for transport. The price, however, was indexed to a basket of crude oil and petroleum product prices and subject to a "floor" that according to some sources was above market price levels. Whatever the initial price may have been, French officials point out that the price is subject to periodic renegotiation.[13]

Given the Soviet-inspired declaration of martial law in Poland in December 1981 and the attendant further deterioration in East-West relations, the signing of the new Franco-Soviet contract was ill-timed from a political standpoint. (The first of the new Soviet-West European contracts, between the FRG and the Soviet Union, was signed November 20, 1981 -- three weeks before the December 13 declaration of martial law in Poland.) The signing of the Franco-Soviet contract was hastened, however, by the impending (February 3) signing of a new Franco-Algerian gas contract. Hailed by the French government as a model for North-South relationships, this contract involved an extremely high gas price. The early signature of the Soviet deal was designed to forestall comparable Soviet price demands as well as to detract from any precedential effect of the Algerian contract on subsequent contracts with other parties.[14]

Leaving aside the timing of the Franco-Soviet deal, the more important issue remained whether contracted French imports of Soviet gas would add a serious new energy vulnerability to France's longstanding exposure to imported oil. Two questions stood out. Would the Soviets be likely to try to use their gas export leverage? And how dependent would France become?

The Prospect of a Soviet Embargo

Western Europeans tend to depreciate the prospect of the Soviets endeavoring to translate their growing gas exports to Western Europe into political leverage. A number of arguments support this view: 1) The dependence created by the pipeline cuts both ways. For the Soviets have a critical need for hard currency to purchase Western technology and agricultural products. Even if the Soviets turn increasingly inward, they are likely to continue to seek such purchases as the quickest and cheapest way to correct deficiencies in their own economic system. This Soviet dependence

extends to the Soviet's own energy sector: the Soviets increasing reliance on natural gas for internal (as well as external) purposes and their concomitant need for Western energy technology mean that any conflict that impeded inflows of Western technology would hamper the development of the Soviets' own domestic energy system. 2) Because of its transport and distribution requirements, gas, unlike oil, cannot easily be diverted from one customer to another. Thus if the Soviets cut off the flow of gas through the East-West grid, they could not readily sell it to overseas customers and much of the Soviet investment in their grid to West Europe would have been for naught. 3) The interconnecting nature of the West European gas grid would make it difficult for the Soviets selectively to cut off exports. In particular, gas destined for France transits the FRG, making a cut-off to West Germany alone contingent upon (presumably doubtful) German willingness to allow Soviet gas freely to transit German territory in those circumstances. 4) A Soviet cut-off would undermine the Soviet diplomatic objective of politically separating European NATO countries from the United States, as any such cut-off would undermine intra-European detente and would tend to push the Europeans toward the U.S. Thus a Soviet cut-off of Europe could be anticipated only in the most dire of circumstances, such as a European war. But in this circumstance, the gas cut-off would be a secondary concern at best. 5) The Soviets have a record of reliability in commercial transactions and would be unlikely to engage in any kind of economic sanction.

The last of these arguments is most easily challenged. Given Soviet ideology and the history of Soviet foreign conduct, there can be little question about Soviet willingness to use economic leverage for political ends -- if and when this suits Soviet interests. Relevant historical examples

abound. For political reasons the Soviets curtailed deliveries of oil to Yugoslavia in 1948, to Israel in 1956, to Finland in 1958, and to China in 1960. The Soviets also embargoed chromium exports to the U.S. from 1950 to 1960 and threatened energy-related sanctions against Poland in 1981-82.[15]

Nor would a deliberate political decision constitute the only reason why the Soviets would curtail gas deliveries. On the contrary, technical reasons or conflicting economic priorities could also affect Soviet deliveries. For instance, in 1980 to French dismay the Soviets cut short deliveries of anthracite coal to France in order to compensate in Eastern Europe for the slowdown at Polish mines.[16] Similarly, during the winter of 1980-81 the Soviets temporarily cut back on contractual deliveries of natural gas to Western Europe, allegedly because of "technical difficulties" related to particularly cold weather in Siberia. Some European officials believed, however, that diversion of supplies to Eastern Europe and the Soviet domestic market were the real reasons. Whatever the reason, Soviet supply reliability was called into question.[17]

A number of other considerations also bear on the question of West European vulnerability to Soviet natural gas leverage. First, a Soviet gas cut-off of Europe could have an immediate economic impact on Europe, but only a longer term economic effect on the USSR. Second, the nature of the Soviet political system is such that it more easily tolerates economic stress than the Western democracies. Third, the Soviets would not necessarily need to interrupt gas deliveries to Europe in order to influence the latter. Rather, if European vulnerability to an embargo were sensed by both sides to be acute, that fact alone -- possibly coupled with subtle (or even not so subtle) Soviet threats -- could affect European behavior. For like military power, economic power is most effective when it is not necessary directly to

employ it. Finally, the Europeans might well find themselves in a situation in which they would strongly desire to forego Soviet gas -- say, a Soviet invasion of Poland (which during the recent Polish crisis was understood as likely to cause a rupture of the pipeline negotiations). But given domestic political realities the Europeans could do so only if the economic costs involved were manageable.

Notwithstanding the apparent Soviet discentives to attempting blackmail over natural gas, then, prudence requires that France and other Western European governments limit their potential vulnerability to the "gas weapon." Until now, French and Western European vulnerability clearly fell within a prudent range, but by the late 1980s the situation will be much less clear.

French Dependence on Soviet Natural Gas

Since 1960 French natural gas consumption has been marked by two trends. The first trend has been a gradual increase in the share of gas in the national energy mix, a trend which slowed after 1973 and came to a halt in 1981 and 1982, when gas' share stagnated at about 13%.[18] As Table 1 indicates, the Josephe Report anticipates that gas' share will remain stagnant through 1990, regardless of whether a slow (A) or a high economic growth (C) scenario is assumed.

TABLE 1: FRENCH ENERGY SUPPLY[19]

(Million Tons of Oil Equivalent)

	1973		1982		1990			2000		
		%		%	A	C	%	C	%	%
Coal	30.5	17.1	32.5	17.7	18-20	20-23	11.0	25-35	11.2	15.6
of which domestic production	19.3		12.0		10-12	10-12		8-12		
Oil	117.3	66.2	85.3	46.5	60-65	60-70	33.1	55-65	26.7	26.7
of which domestic production	1.3		2.5					2.5		
Natural gas	14.9	8.4	23.4	12.7	28-30	28-30	13.0	20-30	13.4	9.0
of which domestic production	6.0		6.2		3.0	3.0		1.5		
Nuclear	3.1	1.7	22.9	12.5	54-62	57-65	31.0	70-85	35.6	35.6
Hydroelectric	9.8	5.5	15.8	8.6	15	15	7.6	16	7.1	7.1
New and renewable	2.0	1.1	3.6	2.0	6.8	8-9	4.3	10-16	6.0	6.0
Total primary energy	177.6	100.0	182.7	100.0	178-187	190-200	100.0	220-235	100.0	100.0
National production/ consumption	23%		34%			51%			54%	

The text of the Report suggests, in fact, that the numbers indicated in Table 1 for natural gas consumption in 1990 incline to the high side in order to correspond to already contracted supplies; some of the drafters believed absolute consumption would remain at about 1982 levels.[20] With respect to the year 2000 (for which Josephe Report calculations had large margins of error), gas consumption even in a high growth scenario would likely remain stagnant or (depending particularly on energy prices and national energy strategy choices vis-a-vis gas and coal) decline.

The second trend relates to sources of supply, which have gradually become more distant (see Table 2).

TABLE 2

SOURCES OF FRENCH NATURAL GAS[21]

(Million Tons of Oil Equivalent)

	1960	1970	1975	1981	1982
France	2.7	6.3	6.7	6.5	6.2 (25%)
Netherlands	-	2.6	8.2	8.1	4.9 (20.1%)
Algeria	-	0.6	2.4	4.0	6.4 (26.1%)
Norway	-	-	-	2.4	2.5 (10.4%)
U.S.S.R.	-	-	-	3.9	3.4 (14.1%)
Others	-	-	-	1.1	0.9 (4%)
TOTAL	2.7	9.5	17.3	25.0	24.3

In a first stage, France was independent in natural gas as a result of production from its Lacq fields; in a second stage, France depended on nearby sources, notably Lacq and the Netherlands; in a third stage, only now approaching, France will depend predominantly on distant sources, notably the Soviet Union.

Table 3 indicates supply availabilities for 1990, based on maximum and minimum contract lifting requirements.

TABLE 3[22]

FRENCH GAS SUPPLY AVAILABILITIES 1990
(Billion Cubic Meters)

	Maximum	Minimum
Netherlands	8 (24%)	4 (13%)
Algeria	8.5 (24%)	8.5 (28%)
U.S.S.R.	12 (34%)	10.5 (35%)
Lacq and others	3 (8%)	3 (10%)
North Sea	4 (11%)	4 (13%)
Total	35.5	30

Table 3 suggests that France will have more than enough gas in 1990, and may well need to lift contract minimums.[23] The Josephe Report indicates that the potential surplus will be even more acute until 1988.[24] Table 3 also shows that France will be about 35% dependent on Soviet natural gas in 1990, equivalent to 4.55% of its total energy supply. Given the long term nature of the Soviet contracts and the unlikelihood of any increase in French gas use in the 1990s, the prospect during that decade would be for at least a maintenance, if not an increase, in the Soviet share of total French natural gas supplies.

From a security perspective, the relatively high Soviet share of future French natural gas supplies raises two questions. How reliable are France's other natural gas suppliers? And what alternatives would France face in the event of an interruption in the supply of gas from its "unreliable" sources?

The French Shift from "Reliable" to "Unreliable" Sources

The answer to the first question hinges on Algeria, which became France's first non-Western European supplier of natural gas in 1965. The initial

contract called for annual deliveries of .5 bcm of liquefied natural gas a year for 25 years. A second contract dates from 1972 and involves annual shipments of 3.5 bcm. France and Algeria signed a third contract in 1976 entailing about 5 bcm of gas deliveries annually from 1981 for 20 years. This contract stipulated that a uniform price would be applied to all Algerian gas exports to France beginning in 1980.[25]

Serious differences over supplies arose between France and Algeria in 1980. A champion of the developing world's demand for higher raw materials prices and in particular a proponent of bringing natural gas export prices into parity with those of oil, Algeria in early 1980 unilaterally hiked its natural gas export prices to France. While acknowledging the prior understanding that a uniform natural gas price needed to be established between it and Algeria, France rejected the price stipulated by Algeria. In short order Algeria suspended some gas deliveries to France, allegedly for "technical" reasons; France interpreted the slowdown in Algerian deliveries as a deliberate pressure tactic. Algeria added to the pressure by refusing in late 1980 to renew an oil supply contract with one of the state-controlled French oil companies, at a time when the outbreak of the Iran-Iraq war was disrupting Iraq's oil exports to France.[26]

During 1980-81 Algerian gas exports to France remained at a reduced level, with Algeria maintaining its price demand and France paying the old price into blocked accounts. Algeria did not commence any of the deliveries foreseen in the third France-Algerian contract. Major efforts by the Giscard government to resolve the problem failed.

In May 1981 Franco-Algerian relations improved with Mitterrand's assumption of power. After further negotiation, Algeria and France on 3 February 1982 signed a rider to their three previous contracts setting a

uniform (and retroactive) price for Algerian gas. The French government acknowledged that the new price was at above market rates but insisted that the price was justified as a "model" for North-South relations and (less disinterestedly) as an impetus to greater Algerian imports from France.[27]

Algeria's price demands and the accompanying Algerian manipulation of its oil and gas exports to France -- at a time when France was potentially vulnerable because of the second oil crisis and the Iran-Iraq war -- clearly call into question Algeria's reliability as a gas supplier in the event of an interruption in Soviet gas deliveries or a disruption of Persian Gulf oil exports. Nor have France's problems been unique; other Algerian clients, including West German, Belgian, Italian, U.S. and UK companies, have had similar difficulties. On the other hand, Algeria's increasing reliance on gas exports as its oil reserves diminish may engender greater Algerian caution in the manipulation of gas exports. On balance, however, French officials point to Algeria as a less certain partner in gas trade than the Soviet Union, and the historical record bears this out.[28]

French Contingency Plans

France surmounted the interruption of some of its Algerian gas imports in 1980-81 primarily by temporarily suspending gas deliveries to clients holding interruptible contracts. Other contingency options available to Gaz de France included drawing on gas reserve stocks; using contract flexibilities to increase imports from other sources; and increasing production from Lacq.[29] These four options represent the essential methods which France could use in the event of a future interruption in supplies, and they therefore warrant individual scrutiny. It is worthy of note that all four options represent mechanisms to bring supply into balance with demand; more drastic, demand curtailing measures would presumably be instituted only after supply-enhancement measures were running their course.

Interruptible contracts are normally held by some industrial users with alternate energy supply arrangements (i.e., gas/oil or gas/coal dual firing) who pay less for gas with the provision that deliveries may be suspended. While interruptible contracts are mainly designed to balance load, especially on a seasonal basis, they can also help address supply disruptions. In 1982 French interruptible demand represented about 50 billion kilowatt hours (about 4 mtoe),[30] or about 17% of Gaz de France's total direct sales of 283.5 billion kwh (24.3 mtoe).[31] According to the Josephe Report, France plans by 1990 to increase interruptible demand to 75-80 billion kwh (6.7 mtoe) or about 23% of anticipated demand of 29 mtoe.[32]

Gas reserve stocks are more expensive than oil stocks because of the larger volume of the former. Operational stocks are normally held in all distribution systems to meet demand fluctuations, but only in a few countries, including France, are there plans for strategic stocks to guard against an interruption in supplies. At the beginning of the winter of 1982-1983, French stocks (held underground) equaled 51.8 billion kwh (roughly 4 mtoe or about 17% of consumption).[33] According to the Joseph Report, plans call for French stocks to equal 130 billion kwh (11 mtoe) in 1990, or about 38% of anticipated demand of 29 mtoe.[34]

As Table 3 illustrates, France's contract with the Netherlands represents France's main source of, in effect, external surge capacity. Thus, if France were drawing only the contracted minimum, in the event of a supply disruption in 1990 France could increase its Dutch imports by 4 bcm (3.3 mtoe).

French domestic production at Lacq represents a possible source of domestic surge capacity. However, Lacq's production is petering out. And while theoretically Lacq production could be decreased substantially in order

to make it a sort of French strategic reserve, domestic political considerations make this difficult. Thus, barring new discoveries, France should not have significant domestic surge capacity in the future.

At present, most French gas still comes from Western European sources and there is a medium-term supply glut of gas (as well as of other energy sources). These factors tend to minimize France's potential gas supply vulnerability. By 1990, however, the situation will be different. Soviet and Algerian gas will then represent the bulk of France's gas supply, and increased gas demand may have taken up much of the slack in the domestic gas market.

More specifically, in 1990 two scenarios -- best-case and worst-case -- can be envisaged, each with two variants based on maximum and minimum probable demand. As they correspond roughly to the Josephe Report's range of demand forecasts for 1990, we may take the maximum (35.5 bcm or 29.2 mtoe) and minimum (30 bcm or 24.67 mtoe) French supply availabilities in 1990 indicated in Table 3 as suggestive of maximum and minimum demand at that time. For a best-case scenario, we may draw on the 1990 contingency targets noted in the Josephe Report. In a maximum demand situation, then, interruptible contracts would cover 23% of demand and reserve stocks 38%. Together, they would equal 61% of a year's consumption, while Soviet and Algerian exports would total 58% of a year's supply. Thus, interruptible contracts and stocks together could replace Soviet and Algerian imports for a year. Soviet exports alone (representing 34% of supply) could be replaced for a year and three-quarters. In a minimum demand scenario, interruptible contracts (27% of demand) and stocks (45% of demand) would be supplemented by a potential increase in Dutch imports of 4 bcm or 11% of demand. The three together could replace 83% of annual demand, well over the 63% accounted for by Soviet and Algerian imports. These calculations bear out the Josephe Report's conclusion that

around 1990 interruptible contracts and gas stocks should "permit the gas industry to continue to satisfy firm client demand during more than a year's interruption of supply from the largest foreign supplier, even in the event of a cold winter and a halt in deliveries from the second largest foreign supplier for many months."[35]

To be sure, the interruptible demand and stock targets for 1990 indicated in the Josephe Report, upon which the above calculations are based, may err on the side of optimism. Dual-firing fuel systems and gas stocks are expensive, and France's economic situation may remain difficult for much of the 1980s. In these circumstances, the targets cited might not be attained.

To construct a worst-case scenario for 1990, we should assume much lower levels of interruptible contracts and gas stocks. According to some private French sources, interruptible contracts may decline by about a third from 1982 levels. We may thus assume a level equal to 2.5 mtoe or 3 bcm. French sources widely anticipate an increase in French gas stocks, but some believe that financial constraints may jeopardize fulfilment of the targeted level. Thus, we may assume a stock level of 6.6 mtoe or 8 bcm -- 50% above 1982 levels, but only 60% of the target in the Josephe Report. With these assumptions, a complete interruption of Soviet and Algerian gas in 1990 could be covered for almost nine months in a maximum demand situation, and for over 10 months in a minimum demand situation. If only Soviet gas were interrupted, contingency options could cover such a situation for almost a year in a maximum demand situation, and for almost 14 months in a minimum demand situation.

For the year 2000, prognoses are even more uncertain. Nevertheless, if we assume stagnant demand in the 1990s, no increase in Soviet or Algerian shares of the French market, and no changes in stock or interruptible demand levels from 1990, then the situation in 2000 would not differ significantly

from the situation in 1990. If demand declined and Soviet and Algerian market shares increased, the French gas security situation would deteriorate unless stocks or interruptible demand were expanded.

To sum up, in a worst-case scenario for 1990 in which both Soviet and Algerian gas were cut off, France could replace these for nine months, or, if only Soviet gas were interrupted, for a year. Within these time periods France would probably have to cut firm demand by raising domestic gas prices or rationing if the interruption persisted. Both of these would be politically difficult, especially since the residential and commercial sectors account for about a half of French energy consumption.[36] On the other hand, within these time periods it would be possible to begin fuel-switching -- notably to oil -- and supplementary gas sources might be arranged. To be sure, these measures would not be without cost; even new gas supplies (or renewed Algerian supplies) would probably entail surcharges reflecting market tightness. Even so, the problem should be manageable given the relatively limited share of gas in the projected 1990 French energy mix -- at 13%, well behind oil (33.1%) and nuclear (31%), and just ahead of coal (11%).

In a best-case situation, in which they build up their stocks and interruptible demand to the ambitious levels indicated in the Josephe Report, the French could replace both Soviet and Algerian gas for a year, and Soviet gas alone for almost double that. In these circumstances France would be relatively well-insulated from a Soviet threat.

Comparative Western European Dependencies on Soviet Gas

From the standpoint of French security, the contracted Soviet gas imports would appear to be a manageable, if by no means cost-free, problem. From a broader European security standpoint, however, the situations of the FRG and Italy must also be taken into account. For the FRG and Italy, along with

France, represent the main markets for Soviet gas among the EEC (and NATO-Europe) countries and they are at present the only EEC countries that import Soviet gas.

General energy consumption trends within the EEC, of which the FRG, France, Italy, and the UK represent the dominant economies, have paralleled those in France alone. Specifically, oil consumption as a percentage of energy consumption has fallen, and energy consumption itself has been in decline in recent years as a result of structural economic change and the cyclical economic downturn.[37] Similarly, consumption of natural gas grew in the 1970s, but more recently has peaked. And for the EEC generally as for France specifically, the share of non-Western European gas in total gas consumption has risen recently.[38]

Table 4 suggests the likely mix of EEC natural gas supplies in 1990, though because the data date from early 1982 gas consumption levels in general and projected French and Italian total imports in particular are inflated. As the Table indicates, the FRG is expected to take considerably more Soviet imports than either France or Italy. Whether France or Italy will come second hinges on whether Italy decides to follow through on a contract for more Soviet gas.

TABLE 4
EUROPEAN COMMUNITY NATURAL GAS SUPPLIES 1990[39]

10^9 m^3 Groningen

	Total Natural Gas Consumption	Ind. Prod.	Intra Community Trade (Exp.- Imp.+)	Estimated Imports from Third Countries					Natural Gas Imports from Third Countries as:	
				Total	Algeria	Libya	Norway	USSR	% of Total Energy Consumption	% of Natural Gas Consumption
Fed. Rep. of Germany	68.0	17.5	22.5	28.0	-	-	8.0	20.0	7%	41%
France	42.9	3.1	6.5	33.3	9.2	-	2.9	12.0	11%	78%
Italy	45.5	7.8	6.5	31.2	13.0	2.6	-	7.0 (8.0)[2]	14%	69%
Netherlands	38.0	75.8	-39.8[1]	2.0	-	-	2.0	-	2%	5%
Belgium	12.7	-	4.3	8.4	5.0	-	2.9	(0.5)[3]	11%	66%
Luxembourg	0.7	-	0.7	-	-	-	-	-	-	-
United Kingdom	61.5	45.0	-	16.5	-	-	16.5	-	5%	27%
Ireland	2.1	2.1	-	-	-	-	-	-	-	-
Denmark	1.9	2.6	-0.7	-	-	-	-	-	-	-
Greece	0.1	0.1	-	-	-	-	-	-	-	-
EUR 10	273.4	154.0	0	119.4	27.2	2.6	32.3	39.0(8.5)[2,3]	8%	44%

(1) Based on forecasts for importers.
(2) Contract not yet Government approved.
(3) Under negotiation. Quantity given would be the estimated take in 1990.

Notes (i) The sum of the imports given by source country is not necessarily equal to total imports as the source of some supplies is not yet settled.
(ii) Forecasts based on expert group work. Not necessarily official Member State forecasts.

On the whole, the FRG would appear to be the least vulnerable to supply interruptions for several reasons: 1) the USSR is the FRG's only "unreliable supplier" (the FRG does not import from Algeria); 2) the FRG itself produces a relatively high proportion of its gas; and 3) the FRG imports relatively large amounts of Dutch and Norwegian gas. Further, the overall FRG energy position is stronger than that of either France or Italy because of its comparative wealth in energy resources, notably coal. On the other hand, the high proportion of Soviet gas in the overall FRG gas mix may make it almost as sensitive as France to a Soviet interruption alone.

Italy's gas vulnerability in 1990 turns on whether it takes a further increment of Soviet gas. If not, Italy would be relatively secure vis-a-vis the Soviet Union alone, though a simultaneous interruption from both the Soviet Union and Algeria could have an impact on Italy comparable to that of such an eventuality on France. If Italy does import a further substantial amount of Soviet gas, it could become the most vulnerable of the Europeans both to outside supply interruptions generally and a Soviet interruption specifically. Italy's vulnerability is magnified by its relative energy penury even compared to France, as reflected for example in the fact that Italy still depends on oil imports for 67.1% of its energy as against 48.5% for France.[40]

Barring further Italian imports of Soviet gas, then, neither the FRG nor Italy in 1990 is likely to be in a more vulnerable position than France vis-a-vis gas imports in general and Soviet gas imports in particular. If the Italians do take a large increment of Soviet gas, though, they will probably be the most exposed.

As with France, the gas supply interruption vulnerability of both the FRG and Italy will be significantly affected by their domestic contingency options. The FRG has a high proportion of interruptible gas demand, while Italy is planning a substantial reserve gas stock. That these and other arrangements will give them security comparable to that of France is suggested by the outcome of a 1983 IEA study, which reportedly concluded that Western Europe in 1990 could withstand disruption of outside gas supplies for up to one year.[41]

Strengthening European Gas Security

Even when the full amounts of contracted Soviet gas imports come on line later in the decade, Western Europe should be able to withstand a complete disruption of its outside gas supplies for many months. This conclusion, however, is subject to several qualifications having to do with the inflexibility of the gas supply chain.

First, France, Italy, and Germany must not allow complacency engendered by the current energy glut to inhibit their development of domestic safeguards adequate in the near term to deal with an interruption of politically unreliable gas supplies. In the current economic climate, the costs of such measures will be a further inhibition. Nevertheless, the alternative -- extreme vulnerability to outside supply disruption -- would be dangerous: it would expose Europe to political blackmail, as well as to pressure to accept higher gas prices.

Second, Europe should consider its options for dealing with a long-term interruption of unreliable gas supplies. The possibilities of alternative long-term suppliers and the means and costs of fuel-switching should be examined.

Third, in the 1990s Western Europe should take care not to further increase reliance on Soviet or Algerian gas and in the interim the Europeans should consider renegotiating present contracts if possible. France for one, because of the unrealistic economic and energy assumptions of the Mitterrand government in its first year, overcontracted for Soviet and Algerian gas, creating an unnecessarily high dependence on these sources of supply. Greater caution should have been exercised in contracting Soviet and Algerian supplies, for example by insisting on greater flexibility in the amount of gas France is required to lift from these sources under "take or pay" provisions, or simply by delaying the signing of contracts of high magnitudes and durations until the demand and supply situation of the 1990s were clearer. Such caution would have spared France the difficulties it will have over at least the next few years in effectively utilizing all its gas and would have lessened expensive stocking and interruptible demand requirements. In deciding whether to take additional Soviet imports, Italy should bear in mind the French experience and should carefully weigh the security implications.

With regard to the future, the Organization for Economic Cooperation and Development and the International Energy Agency already have agreed that "their countries would seek to avoid undue dependence on any one source of gas imports and to obtain future gas supplies from secure sources, with emphasis on indigenous OECD sources."[42] This understanding militates against further contracting of Soviet or Algerian gas in the 1990s.

The problems associated with enhancing Western European gas security raise the question of whether measures should be taken on the international level. Already the efforts of the OECD and IEA to develop greater common understanding of the gas security problem have been useful. However, the scope for concrete measures on an OECD or IEA level would appear to be

limited. Unlike oil, which has a flexible supply chain and for which a world market exists, gas' fungibility is circumscribed by inflexibilities in supply and distribution. As a result there is little scope for an IEA gas mechanism akin to its emergency oil mechanism. Further, France bulks larger in the gas security problem than in the oil security problem, and hence its absence from the IEA represents a greater handicap to IEA gas measures than to IEA oil measures.[43]

On the other hand, the EEC should be relatively well-suited to gas security initiatives. The EEC is the main OECD recipient of Soviet (and Algerian) gas, and a West European gas grid is in place. Further, given present internecine EEC problems, an injection of cooperation would surely have a beneficial effect on the Community as an institution. Already the EEC has undertaken relevant analytical work. Future work could usefully analyze the cost of safeguard measures such as stocks and interruptible contracts, and of fuel-switching. Other undertakings that could be considered on the EEC level include: 1) common measures to deal with an outside gas supply interruption; 2) expansion of the European gas grid to include the UK, with its extensive gas resources; 3) a common standard of individual gas security (e.g., ability to withstand disruption of non-West European supplies for a year without restraining firm demand), with each country left to determine the best mix of domestic measures necessary to achieve that standard; 4) exploration of the Netherlands' future role as residual supplier of gas; 5) talks with Norway on its role as a future supplier (Norway may well be in a position to replace the Netherlands as residual supplier as the latter's reserves approach exhaustion).[44] While the last of these possible measures in particular could require special price inducements, the EEC must bear in mind that Soviet and Algerian gas in effect already entail a security surcharge as reflected in the associated costs of gas stocks and interruptible contracts (not to mention the premium prices paid for Algerian gas).

The role and influence of the United States in strengthening European gas security would appear to be limited. U.S. efforts, notably the pipeline sanctions, did increase European consciousness of the security risks of Soviet gas, but at a considerable cost to trans-Atlantic relations. During the 1980s the U.S. would do well to keep the gas security issue on the international agenda, as it did with beneficial results at the OECD and IEA in 1982-83. The U.S. should stay on the centrist path that facilitated the shaping of consensus within the OECD and IEA; unilateral American initiatives risk producing negative European counterreactions. As well, the U.S. should weigh the risks of Soviet gas against the risks of gas and oil from other non-OECD sources, which may be more unreliable.

For at prudent levels and with adequate security measures, Western European imports of Soviet gas enhance European security by reducing the need for OPEC and particularly Middle Eastern oil. Imported oil still accounts for 36.1% of the EEC's energy, and France, Italy, Germany, the Netherlands and Belgium remain heavily dependent on imports from the Middle East alone.[45] Oil security and gas security are not, however, disconnected. In the event of a gas cut-off, Europe would look mainly to oil to satisfy interruptible demand and, in the event of a protracted gas cut-off, as the object of fuel-switching. By the same token, in the event of a new Arab oil embargo, both Algeria and the Soviet Union would be tempted to employ their gas leverage. And in the event of a Soviet military thrust into the Persian Gulf oil-producing region, Soviet gas exports to Europe would enhance their power position vis-a-vis the West. Thus not only the inflexibility of the gas supply chain, but also the link between oil and gas security limits the role of gas from non-secure sources in mitigating Europe's oil vulnerability.

NOTES

1. While dependence refers to the amount of imported energy, vulnerability concerns the anticipated damage from a supply interruption. See Alvin L. Alm, William Colglazier, and Barbara Kates-Garnick, "Coping with Interruptions," in David A. Deese and Joseph S. Nye, eds., Energy and Security (Cambridge, Massachusetts: Ballinger, 1981), p. 311.

2. See for example Congressional Research Service, "Western Vulnerability to a Disruption of Persian Oil Supplies: U.S. Interests and Options," 24 March 1983 (Report 83-24F).

3. OECD, Economic Survey of France (Paris: OECD, May 1980), pp. 48-50; Les chiffres cles de l'energie 1983-1984 (Paris: Ministere de l'Industrie, 1983), pp. 33, 47 and 63.

4. Rapport du Groupe Long Terme sur l'Energie, (Paris: Commissariat General du Plan, July 1983), p. 54.

5. OECD, Economic Survey of France (1980), p. 49; Gilbert Nicolaon, "Energy Use and Planning in France" (New York: French Embassy, 1983), p. 4; Les chiffres cles, pp. 21, 25, 45 and 110-111.

6. Figures for 1982 are estimates. Rapport du Groupe Long Terme sur l'Energie, p. 62; Les chiffres cles, pp. 33, 55 and 63. Figures for the first nine months of 1983, however, indicated a further growth in oil imports from the North Sea and Mexico, and a drop in the Saudi import share to 22%, the same figure as in 1973. Bulletin de l'industrie petroliere, No. 4974, 16 November 1983.

7. Rapport du Groupe Long Terme sur l'Energie, p. 190.

8. John B. Hannigan and Carl H. McMillan, The Soviet-West European Energy Relationship: Implications of the Shift from Oil to Gas (Ottawa: Carleton University, May 1983), pp.13-14, 17 and 23; Comite Professionel du Petrole, Paris, France.

9. See IEA, World Energy Outlook (Paris: OECD/IEA, 1982), pp. 318-325.

10. Les chiffres cles, pp. 75 and 79; Hannigan and McMillan, The Soviet-West European Energy Relationship, pp. 6 and 45; Financial Times, 16 July 1980; Jeremy L. Russell, Geopolitics of Natural Gas (Cambridge, MA.: Ballinger, 1983), Ch. 5.

11. Michel Herblay, "La logigue du gaz," L'Expansion, 19 February 1982, pp. 86-93; Jonathan Stern, "Specters and Pipedreams," Foreign Policy, No. 48 (Fall 1982), p. 22; Axel Lebahn, "The Yamal Gas Pipeline from the U.S.S.R. to Western Europe in the East-West Conflict," Aussenpolitik, III (1983), pp. 10-11; Hannigan and McMillan, The Soviet-West European Energy Relationship, pp. 65-70.

12. Le Figaro, 5 February 1982, p. 1.

13. Reports differ on the precise duration of the Franco-Soviet contract as well as on the price and quantities involved, but it is clear that there is flexibility in the latter two elements. Comite Professionel du Petrole, rappel des principaux evenements concernant l'industrie du petrole en France (1982), December 1982, p. 9; interviews in Paris, 1983.

14. Interviews in Paris, 1983.

15. Marshall I. Goldman, "The Role of Communist Countries," in Deese and Nye, eds., Energy and Security, p, 128; Hanns W. Maull, Natural Gas and Economic Security (Paris: The Atlantic Institute, 1981), p. 46; Gary C. Hufbauer and Jeffrey J. Schott, Economic Sanctions in Support of Foreign Poicy Goals (Washington, D.C.: Institute for International Economics, October 1983).

16. Le Figaro, 5 February 1982, p. 1.

17. Angela E. Stent, Soviet Energy and Western Europe (New York: Praeger, 1982), pp. 52-53.

18. Rapport du Groupe Long Terme sur l'Energie, pp. 13 and 72; Les chiffres cles, p. 75.

19. Rapport du Groupe Long Terme sur l'Energie, p. 257; Revue de l'Energie, No. 357 (October 1983), p. 704. Scenario A assumes 1.2% GNP growth, 1980-1990, and 1.8% growth in the 1990s, while scenario C assumes 2.2% in the 1980s and 4.6% growth in the 1990s. The results of a second high growth scenario (B) varied little from the results of C.

20. Rapport du Groupe Long Terme sur l'Energie, p. 256.

21. Rapport du Groupe Long Terme sur l'Energie, p. 72.

22. Petroles Informations, 15 July 1983.

23. One million tons of oil equivalent corresponds to 1.216 billion cubic meters (bcm) of natural gas. Thus 30 million tons of oil equivalent, the maximum demand for 1990 foreseen by the Josephe Report, corresponds to 36.5 bcm, while 24.3 tons of oil equivalent (the 1982 consumption figure) corresponds to 29.5 bcm.

24. Rapport du Groupe Long Terme sur l'Energie, p. 270.

25. Revue de l'Energie, No. 342 (March 1982), p. 307; Le Monde, 2 March 1982, p. 1.

26. Le Figaro, 5 Feruary 1982, p. 1. Eventually Algeria agreed to new commercial arrangements that reduced France's oil lifts by 50%. Le Monde, 2 March 1982, p. 37.

27. New York Times, 4 February 1982, p. 1; Quotidien de Paris, 19 February 1982, p. 18; Le Monde, 4 January 1983, p. 35.

28. Interviews in Paris, 1983; Petroleum Economist, July 1983, pp. 257-259.

29. Interviews in Paris, 1983.

30. 10,000 kilowatt hours corresponds to .86 tons of oil equivalent.

31. Gaz de France, 1982 Annual Report, p. 5. 283.5 billion kwh = 24.4 mtoe = 29.7 bcm.

32. Rapport du Groupe Long Terme sur l'Energie, p. 193.

33. Gaz de France, 1982 Annual Report, p. 24.

34. Rapport du Groupe Long Terme sur l'Energie, p. 193.

35. Rapport du Groupe Long Terme sur l'Energie, p. 193.

36. Les chiffres cles, p. 76.

37. Commission of the European Communities, "Community Energy Strategy: Progress and Guidelines for Future Action," (Brussels: 2 June 1983), Annex 1, Table 1.

38. Commission of the European Communities, "Communication from the Commission to the Council on Community Natural Gas Supplies," (Brussels: 15 October 1982), p. 2.

39. Commission of the European Communities, "Communication from the Commission to the Council on Community Natural Gas Supplies," Table 1, p.3.

40. Commission of the European Communities, "Community Energy Strategy," Annex 1, Table 3.

41. Platt's Oilgram News, Vol. 61, No. 85 (3 May 1983), p. 1. The impact of disruptions after 1990 reportedly could not be simulated with any certainty.

42. OECD Ministerial Communique, Paris, 10 May 1983, Annex, p. 5; IEA Ministerial Communique, Paris, 8 May 1983, Annex I, p. 9.

43. For political reasons France has remained outside the IEA, unlike the other EEC countries.

44. As Jonathan Stern notes, "The hope throughout Western Europe is that the traditional Dutch role can be assumed by Norway -- a country with massive gas reserves..." "Gas for Western Europe: Choices for the 1990s," The World Today (July-August 1982) p. 307.

45. Commission of the European Communities, "Community Energy Strategy," Annex 1, Table 3; Fereidun Fesharaki, "The Oil Market and Western European Energy Security," PSIS Occasional Paper #1, January 1983.

(3)

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SUR LE GAZ NATUREL ET TOUS HYDROCARBURES GAZEUX

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WESTERN EUROPEAN NATURAL GAS MARKET IN TRANSITION
OSLO - SEPTEMBER 13-14,1984

NATURAL GAS IN THE WORLD IN 1983

NATURAL GAS IN WESTERN EUROPE

all data are given in cubic meters (1 m^3 = 35,315 cuft)

Profound upheavals occurred in 1983 under the cover of an apparent statistical stability.

Proved world reserves of natural gas increased 3.3% to a total of 90 325 10^9 m^3 as of 1 January 1984. This increase was especially marked in Western Europe, where three countries strongly reassessed their reserves (+599 10^9 m^3 in Norway, +385 10^9 m^3 in the Netherlands, and +79 10^9 m^3 in the United Kingdom).

Although about the same as in 1982, the gross production of natural gas (1870 10^9 m^3 in 1983) underwent important changes in its geographic breakdown. For example, the Soviet Union became the leading producer of natural gas in the world with about 547 10^9 m^3. At the same time, better use was made of world gross production as the result of a decrease in flaring (mainly in the OPEC countries) which drained off only 6% (106 10^9 m^3) of total production in 1983. Gas reinjection was up slightly (+2% over 1982), thus also showing the effort being made to make more rational use of gas production, and in particular of associated gas. Gas reinjection involved 152 10^9 m^3 in 1983, i.e. 8% of total world production. Processing shrinkage also reflected the general trend to diminish the wasting of associated gas which is often rich in liquefiable fractions. World processing shrinkage was stable in 1983 with 64 10^9 m^3.

The stability of the marketed production of natural gas in 1983 (1548 10^9 m^3) masks very different evolutions by country. The drop in production in the United States (-10.5% compared to 1982) is by far the most important phenomenon of the year.

International natural gas trade by pipeline and tanker increased 4.5% to a total of 193.45 10^9 m^3 in 1983. This upturn was due to the increase in LNG trade (+24% in 1983), made possible by the startup of a new liquefaction plant in Malaysia and also by the building up of new contracts in Algeria. In this way, Algeria became the leading world exporter of natural gas in liquefied form.

Although natural gas consumption remained on the same level in 1983, there was a rise in Soviet consumption, with the Soviet Union becoming the world's leading consumer. This was offset by a drop in U.S. consumption as the result of a depressed market and competition by other energy sources.

International prices continued their downward movement in 1983. For the most important import contracts, they were in the range of $3.80 to 4.70 per 10^6 Btu (FOB) as against $4.20 to 4.90 in 1982.

The upward trend of consumption, which got underway in most of the leading Western industrialized countries, should continue and spread in the next few years. This trend and the advances being made by natural gas in Third-World countries and in planned-economy countries should result in an appreciable rise in the marketed production of natural gas in the world. This production could reach 1625 to 1650 10^9 m^3 in 1984 and 1680 to 1720 10^9 m^3 in 1985.

PROVED NATURAL GAS RESERVES IN THE WORLD
(10^9 m3)

	on 1.1.84
NORTH AMERICA	**8 258**
Canada	2 613
United States	5 645
LATIN AMERICA	**5 431**
Argentina	680
Bolivia	139
Brazil	82
Chile	117
Colombia	117
Ecuador	116
Mexico	2 180
Peru	25
Trinidad-Tobago	430
Venezuela	1 545
WESTERN EUROPE	**5 472**
Austria	12
Denmark	160
France	44
Ireland	36
Italy	190
Netherlands	1 927
Norway	2 039
Spain	25
Turkey	42
United Kingdom	712
Yugoslavia	90
West Germany	195
EASTERN EUROPE	**36 548**
Albania	8
Bulgaria	5
Czechoslovakia	10
East Germany	60
Hungary	120
Poland	115
Romania	230
Soviet Union	36 000
AFRICA	**5 832**
Algeria	3 155
Angola	53
Cameroon	110
Congo	70
Egypt	200
Gabon	12
Ivory Coast	60
Libya	555
Morocco	4
Nigeria	1 370
Rwanda	40
Tanzania	118
Tunisia	85
MIDDLE EAST	**22 394**
Abu Dhabi	2 700
Bahrein	220
Dubai	134
Iran	11 380
Iraq	821
Israel	1
Kuwait	975
Neutral Zone	136
Oman	87
Qatar	3 400
Ras al Khaimah	31
Saudi Arabia	2 120
Sharjah	285
Syria	104
ASIA/OCEANIA	**6 390**
Afghanistan	60
Australia	945
Bangladesh	340
Brunei	210
Burma	210
China	800
Formosa (Taiwan)	23
India	475
Indonesia	1 000
Japan	25
Malaysia	1 400
New Zealand	152
Pakistan	510
Thailand	240
WORLD TOTAL	**90 325**

ESTIMATE OF GROSS AND MARKETED PRODUCTION OF NATURAL GAS IN THE WORLD IN 1983

(10^9 m^3)

	GROSS PROD.	GAS REIN-JECTED	GAS FLARED VENTED	OTHER LOSSES	MARKTD PROD.
NORTH AMERICA	616.01	53.07	4.01	37.39	521.54
CANADA	97.11	12.21	1.60	11.96	71.34
UNITED STATES	518.90	40.86	2.41	25.43	450.20
LATIN AMERICA	117.23	22.04	14.63	7.38	73.18
ARGENTINA	16.15	0.90	2.70	0.00	12.55
BOLIVIA	5.04	2.24	0.20	0.00	2.60
BRAZIL	4.01	0.72	1.36	0.38	1.55
CHILE	4.80	3.31	0.00	0.15	1.34
COLOMBIA	5.19	1.57	0.74	0.00	2.88
ECUADOR	0.42	0.00	0.32	0.00	0.10
MEXICO	41.90	0.00	4.49	6.30	31.11
PERU	2.20	0.15	0.80	0.00	1.25
TRINIDAD-TOBAGO	5.99	0.00	2.44	0.00	3.55
VENEZUELA	31.53	13.15	1.58	0.55	16.25
WESTERN EUROPE	200.54	9.79	4.19	6.45	180.11
AUSTRIA	1.23	0.00	0.00	0.00	1.23
DENMARK	0.57	0.41	0.12	0.00	0.04
FRANCE	9.54	0.00	0.00	2.88	6.66
IRELAND	2.36	0.00	0.00	0.00	2.36
ITALY	13.07	0.00	0.00	0.00	13.07
NORWAY	29.37	4.68	0.27	0.00	24.42
NETHERLANDS	74.36	0.00	0.00	1.38	72.98
GERMANY,FED.REP.	17.73	0.00	0.00	0.00	17.73
UNITED KINGDOM	50.22	4.70	3.80	2.19	39.53
YUGOSLAVIA	2.09	0.00	0.00	0.00	2.09
EASTERN EUROPE	607.02	0.00	10.75	0.15	596.12
ALBANIA	0.30	0.00	0.00	0.00	0.30
BULGARIA	0.10	0.00	0.00	0.00	0.10
HUNGARY	6.50	0.00	0.00	0.00	6.50
POLAND	5.47	0.00	0.00	0.00	5.47
GERMANY,DEM.REP.	7.60	0.00	0.00	0.00	7.60
ROMANIA	39.75	0.00	0.00	0.15	39.60
CZECHOSLOVAKIA	0.60	0.00	0.00	0.00	0.60
U.S.S.R.	546.70	0.00	10.75	0.00	535.95
AFRICA	122.24	52.46	20.36	3.52	45.90
ALGERIA	85.27	44.03	2.45	3.20	35.59
ANGOLA	2.00	0.83	0.74	0.08	0.35
CONGO	0.74	0.00	0.72	0.00	0.02
EGYPT	4.06	0.00	0.73	0.12	3.21
GABON	1.92	0.00	1.77	0.00	0.15
LIBYAN ARAB JAM.	12.50	6.40	1.93	0.12	4.05
MOROCCO	0.09	0.00	0.00	0.00	0.09
NIGERIA	14.60	1.20	11.40	0.00	2.00
TUNISIA	1.06	0.00	0.62	0.00	0.44

	GROSS PROD.	GAS REIN-JECTED	GAS FLARED VENTED	OTHER LOSSES	MARKTD PROD.
MIDDLE EAST	96.76	7.52	42.45	7.24	39.55
ABU-DHABI	9.61	0.00	1.91	1.20	6.50
SAUDI ARABIA	26.90	1.30	16.32	3.75	5.53
BAHREIN	5.27	0.80	0.44	0.08	3.95
DUBAI	3.13	0.00	1.64	0.20	1.29
IRAN	25.70	3.60	12.85	0.35	8.90
IRAQ	4.01	0.00	3.36	0.00	0.65
ISRAEL	0.06	0.00	0.00	0.00	0.06
KUWAIT	6.74	0.22	1.35	0.67	4.50
OMAN	5.04	1.60	0.10	0.15	3.19
QATAR	5.79	0.00	0.43	0.63	4.73
SHARJAH	2.77	0.00	2.56	0.21	0.00
SYRIAN ARAB REP.	1.74	0.00	1.49	0.00	0.25
ASIA	94.88	7.08	9.98	0.64	77.18
AFGHANISTAN	2.85	0.00	0.00	0.00	2.85
BANGLADESH	2.20	0.00	0.00	0.00	2.20
BURMA	0.68	0.15	0.00	0.00	0.53
BRUNEI	9.77	0.00	0.39	0.00	9.38
CHINA	21.50	0.00	1.70	0.00	19.80
INDIA	3.84	0.15	0.58	0.12	2.99
INDONESIA	33.59	6.78	5.46	0.52	20.83
JAPAN	2.12	0.00	0.00	0.00	2.12
MALAYSIA	5.55	0.00	1.85	0.00	3.70
PAKISTAN	9.72	0.00	0.00	0.00	9.72
TAIWAN	1.45	0.00	0.00	0.00	1.45
THAILAND	1.61	0.00	0.00	0.00	1.61
OCEANIA	15.17	0.00	0.00	1.01	14.16
AUSTRALIA	11.99	0.00	0.00	1.01	10.98
NEW-ZEALAND	3.18	0.00	0.00	0.00	3.18
WORLD TOTAL	1869.85	151.96	106.37	63.78	1547.74
INDUST.COUNTRIES	833.90	62.86	8.20	44.85	717.99
CPE's	628.52	0.00	12.45	0.15	615.92
OPEC	264.48	76.68	65.33	11.40	111.07
LDC (excl.OPEC)	142.95	12.42	20.39	7.38	102.76

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ESTIMATE OF INTERNATIONAL GAS TRADE

BY TANKER IN 1983

(10^9 m^3)

Zone Exporting Country / Zone Importing Country	NORTH AM.	AFRICA			MIDDLE EAST	ASIA/OCEANIA				TOTAL
	U.S.A.	Algeria	Libya	Total	Abu Dhabi	Brunei	Indonesia	Malaisia	Total	IMPORTS BY TANKER
NORTH AMERICA		3.76		3.76						3.76
United States		3.76		3.76						3.76
WESTERN EUROPE		12.69	0.77	13.46						13.46
Belgium		2.28		2.28						2.28
France		8.76		8.76						8.76
Italy			0.03	0.03						0.03
Spain		1.65	0.74	2.39						2.39
ASIA/OCEANIA	1.37				2.41	7.16	12.97	1.55	21.68	25.26
Japan	1.37				2.41	7.16	12.97	1.55	21.68	25.26
TOTAL	1.37	16.45	0.77	17.22	2.41	7.16	12.97	1.55	21.68	42.68

ESTIMATE OF INTERNATIONAL GAS TRADE BY PIPELINE IN 1983

(10^9 m^3)

Zone Exporting Country / Zone Importing Country	NORTH AMERICA			LATIN AMERICA			WESTERN EUROPE				EASTERN EUROPE			AFRICA	ASIA/ OCEA.	TOTAL IMPORTS BY PIPELINE	TOTAL IMPORTS BY PIPELINE AND TANKER
	Canada	United-States	Total	Bolivia	Mexico	Total	Nether-lands	Norway	West-Germany	Total	Romania	U.S.S.R.	Total	Algeria	Afgha-nistan		
NORTH AMERICA	20.71		20.71		2.03	2.03										22.74	26.50
United States	20.71		20.71		2.03	2.03										22.74	26.50
LATIN AMERICA		0.19	0.19	2.23		2.23										2.42	2.42
Argentina				2.23		2.23										2.23	2.23
Mexico		0.19	0.19													0.19	0.19
WESTERN EUROPE							36.72	23.36	1.56	61.64		27.12	27.12	2.15		90.91	104.37
Austria												2.45	2.45			2.45	2.45
Belgium							5.82	1.67		7.49						7.49	9.77
Denmark									0.10	0.10						0.10	0.10
Finland												0.82	0.82			0.82	0.82
France							7.69	2.31	0.50	10.50		3.69	3.69			14.19	22.95
Italy							4.85			4.85		7.65	7.65	2.15		14.65	14.68
Luxembourg							0.36			0.36						0.36	0.36
Netherlands								2.70		2.70						2.70	2.70
Spain																	2.39
Switzerland							0.52		0.96	1.48						1.48	1.48
United Kingdom								10.54		10.54						10.54	10.54
West Germany							17.48	6.14		23.62		9.88	9.88			33.50	33.50
Yougoslavia												2.63	2.63			2.63	2.63
EASTERN EUROPE											0.20	32.10	32.30		2.28	34.58	34.58
Bulgaria												5.10	5.10			5.10	5.10
Czechoslovakia												9.20	9.20			9.20	9.20
East Germany												6.75	6.75			6.75	6.75
Hungary											0.20	4.00	4.20			4.20	4.20
Poland												5.55	5.55			5.55	5.55
Romania												1.50	1.50			1.50	1.50
U.S.S.R.															2.28	2.28	2.28
AFRICA														0.12		0.12	0.12
Tunisia														0.12		0.12	0.12
ASIA/OCEANIA																	25.26
Japan																	25.26
TOTAL	20.71	0.19	20.90	2.23	2.03	4.26	36.72	23.36	1.56	61.64	0.20	59.22	59.42	2.27	2.28	150.77	193.45

ESTIMATE OF NATURAL GAS TRADE AND CONSUMPTION IN THE WORLD IN 1983

(10^9 m^3)

	MARKTD PROD.	EXPORTS	IMPORTS	CONSUMP TION
NORTH AMERICA	521.54	22.27	26.50	525.77
CANADA	71.34	20.71	0.00	50.63
UNITED STATES	450.20	1.56	26.50	475.14
LATIN AMERICA	73.18	4.26	2.42	71.34
ARGENTINA	12.55	0.00	2.23	14.78
BOLIVIA	2.60	2.23	0.00	0.37
BRAZIL	1.55	0.00	0.00	1.55
CHILE	1.34	0.00	0.00	1.34
COLOMBIA	2.88	0.00	0.00	2.88
ECUADOR	0.10	0.00	0.00	0.10
MEXICO	31.11	2.03	0.19	29.27
PERU	1.25	0.00	0.00	1.25
TRINIDAD-TOBAGO	3.55	0.00	0.00	3.55
VENEZUELA	16.25	0.00	0.00	16.25
WESTERN EUROPE	180.11	61.64	104.37	222.84
AUSTRIA	1.23	0.00	2.45	3.68
BELGIUM	0.00	0.00	9.77	9.77
DENMARK	0.04	0.00	0.10	0.14
SPAIN	0.00	0.00	2.39	2.39
FINLAND	0.00	0.00	0.82	0.82
FRANCE	6.66	0.00	22.95	29.61
IRELAND	2.36	0.00	0.00	2.36
ITALY	13.07	0.00	14.68	27.75
LUXEMBOURG	0.00	0.00	0.36	0.36
NORWAY	24.42	23.36	0.00	1.06
NETHERLANDS	72.98	36.72	2.70	38.96
GERMANY,FED.REP.	17.73	1.56	33.50	49.67
UNITED KINGDOM	39.53	0.00	10.54	50.07
SWITZERLAND	0.00	0.00	1.48	1.48
YUGOSLAVIA	2.09	0.00	2.63	4.72
EASTERN EUROPE	596.12	59.42	34.58	571.28
ALBANIA	0.30	0.00	0.00	0.30
BULGARIA	0.10	0.00	5.10	5.20
HUNGARY	6.50	0.00	4.20	10.70
POLAND	5.47	0.00	5.55	11.02
GERMANY,DEM.REP.	7.60	0.00	6.75	14.35
ROMANIA	39.60	0.20	1.50	40.90
CZECHOSLOVAKIA	0.60	0.00	9.20	9.80
U.S.S.R.	535.95	59.22	2.28	479.01
AFRICA	45.90	19.49	0.12	26.53
ALGERIA	35.59	18.72	0.00	16.87
ANGOLA	0.35	0.00	0.00	0.35
CONGO	0.02	0.00	0.00	0.02
EGYPT	3.21	0.00	0.00	3.21
GABON	0.15	0.00	0.00	0.15
LIBYAN ARAB JAM.	4.05	0.77	0.00	3.28
MOROCCO	0.09	0.00	0.00	0.09
NIGERIA	2.00	0.00	0.00	2.00
TUNISIA	0.44	0.00	0.12	0.56

	MARKTD PROD.	EXPORTS	IMPORTS	CONSUMP TION
MIDDLE EAST	39.55	2.41	0.00	37.14
ABU-DHABI	6.50	2.41	0.00	4.09
SAUDI ARABIA	5.53	0.00	0.00	5.53
BAHREIN	3.95	0.00	0.00	3.95
DUBAI	1.29	0.00	0.00	1.29
IRAN	8.90	0.00	0.00	8.90
IRAQ	0.65	0.00	0.00	0.65
ISRAEL	0.06	0.00	0.00	0.06
KUWAIT	4.50	0.00	0.00	4.50
OMAN	3.19	0.00	0.00	3.19
QATAR	4.73	0.00	0.00	4.73
SYRIAN ARAB REP.	0.25	0.00	0.00	0.25
ASIA	77.18	23.96	25.46	78.68
AFGHANISTAN	2.85	2.28	0.00	0.57
BANGLADESH	2.20	0.00	0.00	2.20
BURMA	0.53	0.00	0.00	0.53
BRUNEI	9.38	7.16	0.00	2.22
CHINA	19.80	0.00	0.00	19.80
INDIA	2.99	0.00	0.00	2.99
INDONESIA	20.83	12.97	0.00	7.86
JAPAN	2.12	0.00	25.46	27.58
MALAYSIA	3.70	1.55	0.00	2.15
PAKISTAN	9.72	0.00	0.00	9.72
TAIWAN	1.45	0.00	0.00	1.45
THAILAND	1.61	0.00	0.00	1.61
OCEANIA	14.16	0.00	0.00	14.16
AUSTRALIA	10.98	0.00	0.00	10.98
NEW-ZEALAND	3.18	0.00	0.00	3.18
WORLD TOTAL	1547.74	193.45	193.45	1547.74
INDUST.COUNTRIES	717.99	83.91	156.33	790.41
CPE's	615.92	59.42	34.58	591.08
OPEC	111.07	34.87	0.00	76.20
LDC (excl.OPEC)	102.76	15.25	2.54	90.05

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RESERVES ON JANUARY,1 IN WESTERN EUROPE (UNIT:10 M)

	1960	1970	1975	1980	1981	1982	1983	1984
WESTERN EUROPE	312.	3571.	3962.	3870.	4315.	4309.	4301.	5433.
AUSTRIA	25.	12.	14.	12.	11.	10.	10.	12.
BELGIUM	0.	0.	0.	0.	0.	0.	0.	0.
DENMARK	0.	0.	50.	110.	139.	141.	153.	160.
SPAIN	0.	0.	11.	13.	14.	15.	18.	25.
FINLAND	0.	0.	0.	0.	0.	0.	0.	0.
FRANCE	165.	205.	154.	63.	56.	55.	47.	44.
GREECE	0.	0.	1.	1.	1.	1.	3.	3.
IRELAND	0.	0.	0.	30.	32.	35.	38.	36.
ITALY	90.	164.	207.	185.	181.	179.	186.	190.
LUXEMBOURG	0.	0.	0.	0.	0.	0.	0.	0.
NORWAY	0.	0.	550.	839.	1314.	1409.	1440.	2039.
NETHERLANDS	10.	2042.	1936.	1626.	1578.	1550.	1515.	1927.
GERMANY,FED.REP.	20.	268.	235.	183.	190.	178.	176.	195.
UNITED KINGDOM	0.	850.	762.	754.	739.	664.	633.	712.
SWITZERLAND	0.	0.	0.	0.	0.	0.	0.	0.
YUGOSLAVIA	2.	30.	42.	54.	60.	72.	82.	90.

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NATURAL GAS TRADE AND CONSUMPTION IN WESTERN EUROPE
(Unit : 10^9 m3)

1970	MARKTD PROD.	EXPORTS	IMPORTS	CONSUMPTION
WESTERN EUROPE	78.44	11.18	13.64	80.90
AUSTRIA	1.90	0.00	0.98	2.88
BELGIUM	0.00	0.00	4.49	4.49
FRANCE	6.99	0.00	3.54	10.53
ITALY	13.14	0.00	0.00	13.14
NETHERLANDS	31.67	11.18	0.00	20.49
GERMANY,FED.REP.	12.66	0.00	3.71	16.37
UNITED KINGDOM	11.10	0.00	0.92	12.02
YUGOSLAVIA	0.98	0.00	0.00	0.98
GRAND TOTAL	78.44	11.18	13.64	80.90

1975	MARKTD PROD.	EXPORTS	IMPORTS	CONSUMPTION
WESTERN EUROPE	171.45	46.55	60.92	185.82
AUSTRIA	2.36	0.00	1.88	4.24
BELGIUM	0.00	0.00	10.75	10.75
SPAIN	0.00	0.00	0.99	0.99
FINLAND	0.00	0.00	0.72	0.72
FRANCE	7.36	0.00	11.93	19.29
ITALY	14.59	0.00	8.70	23.29
LUXEMBOURG	0.00	0.00	0.50	0.50
NORWAY	0.19	0.00	0.00	0.19
NETHERLANDS	90.85	46.46	0.00	44.39
GERMANY,FED.REP.	18.28	0.09	24.44	42.63
UNITED KINGDOM	36.27	0.00	0.92	37.19
SWITZERLAND	0.00	0.00	0.09	0.09
YUGOSLAVIA	1.55	0.00	0.00	1.55
GRAND TOTAL	171.45	46.55	60.92	185.82

1980	MARKTD PROD.	EXPORTS	IMPORTS	CONSUMPTION
WESTERN EUROPE	195.63	74.55	106.03	227.11
AUSTRIA	1.80	0.00	3.01	4.81
BELGIUM	0.00	0.00	10.47	10.47
SPAIN	0.00	0.00	1.87	1.87
FINLAND	0.00	0.00	0.93	0.93
FRANCE	7.54	0.00	20.54	28.08
IRELAND	0.92	0.00	0.00	0.92
ITALY	12.53	0.00	14.40	26.93
LUXEMBOURG	0.00	0.00	0.51	0.51
NORWAY	25.76	24.95	0.00	0.81
NETHERLANDS	89.03	48.18	3.13	43.98
GERMANY,FED.REP.	18.94	1.42	37.49	55.01
UNITED KINGDOM	37.29	0.00	10.91	48.20
SWITZERLAND	0.00	0.00	1.16	1.16
YUGOSLAVIA	1.82	0.00	1.61	3.43
GRAND TOTAL	195.63	74.55	106.03	227.11

1981	MARKTD PROD.	EXPORTS	IMPORTS	CONSUMPTION
WESTERN EUROPE	190.91	69.45	103.97	225.43
AUSTRIA	1.47	0.00	3.02	4.49
BELGIUM	0.00	0.00	10.38	10.38
SPAIN	0.00	0.00	2.17	2.17
FINLAND	0.00	0.00	0.76	0.76
FRANCE	7.08	0.00	21.49	28.57
IRELAND	1.40	0.00	0.00	1.40
ITALY	14.04	0.00	13.90	27.94
LUXEMBOURG	0.00	0.00	0.43	0.43
NORWAY	26.47	25.23	0.00	1.24
NETHERLANDS	81.55	42.80	2.65	41.40
GERMANY,FED.REP.	19.30	1.42	34.31	52.19
UNITED KINGDOM	37.40	0.00	11.62	49.02
SWITZERLAND	0.00	0.00	1.21	1.21
YUGOSLAVIA	2.20	0.00	2.03	4.23
GRAND TOTAL	190.91	69.45	103.97	225.43

NATURAL GAS TRADE AND CONSUMPTION IN WESTERN EUROPE
(Unit : 10 9 m3)

1982	MARKTD PROD.	EXPORTS	IMPORTS	CONSUMPTION
WESTERN EUROPE	176.46	61.34	98.61	213.73
AUSTRIA	1.29	0.00	2.91	4.20
BELGIUM	0.00	0.00	9.03	9.03
DENMARK	0.03	0.00	0.01	0.04
SPAIN	0.00	0.00	2.24	2.24
FINLAND	0.00	0.00	0.73	0.73
FRANCE	6.59	0.00	19.73	26.32
IRELAND	2.05	0.00	0.00	2.05
ITALY	14.59	0.00	13.48	28.07
LUXEMBOURG	0.00	0.00	0.37	0.37
NORWAY	24.89	23.90	0.00	0.99
NETHERLANDS	69.73	35.82	2.86	36.77
GERMANY,FED.REP.	16.82	1.62	33.60	48.80
UNITED KINGDOM	38.28	0.00	10.13	48.41
SWITZERLAND	0.00	0.00	1.13	1.13
YUGOSLAVIA	2.19	0.00	2.39	4.58
GRAND TOTAL	176.46	61.34	98.61	213.73

1983	MARKTD PROD.	EXPORTS	IMPORTS	CONSUMPTION
WESTERN EUROPE	180.11	61.64	104.37	222.84
AUSTRIA	1.23	0.00	2.45	3.68
BELGIUM	0.00	0.00	9.77	9.77
DENMARK	0.04	0.00	0.10	0.14
SPAIN	0.00	0.00	2.39	2.39
FINLAND	0.00	0.00	0.82	0.82
FRANCE	6.66	0.00	22.95	29.61
IRELAND	2.36	0.00	0.00	2.36
ITALY	13.07	0.00	14.68	27.75
LUXEMBOURG	0.00	0.00	0.36	0.36
NORWAY	24.42	23.36	0.00	1.06
NETHERLANDS	72.98	36.72	2.70	38.96
GERMANY,FED.REP.	17.73	1.56	33.50	49.67
UNITED KINGDOM	39.53	0.00	10.54	50.07
SWITZERLAND	0.00	0.00	1.48	1.48
YUGOSLAVIA	2.09	0.00	2.63	4.72
GRAND TOTAL	180.11	61.64	104.37	222.84

INTERNATIONAL TRADE OF NATURAL GAS IN WESTERN EUROPE IN 1981 - 10 9 m3

( ) : share of the exporting country in the total (%)

Importing Country \ Exporting Country	Algeria	Libya	Netherlands	Norway	Soviet Union	West Germany	TOTAL
AUSTRIA					3.20 (100)		3.20
BELGIUM			7.72 (79)	2.00 (21)			9.72
FINLAND					0.85 (100)		0.85
FRANCE	4.09* (19)		9.72 (45)	2.54 (12)	4.18 (19)	1.07 (5)	21.60
ITALY			6.44 (47)		7.28 (53)		13.72
LUXEMBOURG			0.39 (100)				0.39
NETHERLANDS				2.85 (100)			2.85
SPAIN	1.41* (66)	0.73* (34)					2.14
SWITZERLAND			0.55 (55)			0.45 (45)	1.00
UNITED KINGDOM	0.47* (4)			11.21 (96)			11.68
WEST GERMANY			17.20 (49)	7.56 (21)	10.67 (30)		35.43
YOUGOSLAVIA					1.40 (100)		1.40
WESTERN EUROPE	**5.97 (6)**	**0.73 (1)**	**42.02 (40)**	**26.16 (25)**	**27.58 (27)**	**1.52 (1)**	**103.98**

* LNG

INTERNATIONAL TRADE OF NATURAL GAS IN WESTERN EUROPE IN 1982 - 10^9 m3
( ) : share of the exporting country in the total (%)

Importing Country \ Exporting Country	Algeria	Libya	Netherlands	Norway	Soviet Union	West Germany	TOTAL
AUSTRIA					2.91 (100)		2.91
BELGIUM	0.32* (3)		6.83 (76)	1.88 (21)			9.03
DENMARK						0.01 (100)	0.01
FINLAND					0.73 (100)		0.73
FRANCE	6.58* (34)		5.97 (30)	2.41 (12)	3.77 (19)	1.00 (5)	19.73
ITALY		0.02* (-)	4.85 (36)		8.61 (64)		13.48
LUXEMBOURG			0.37 (100)				0.37
NETHERLANDS				2.86 (100)			2.86
SPAIN	1.44* (64)	0.80* (36)					2.24
SWITZERLAND			0.52 (46)			0.61 (54)	1.13
UNITED KINGDOM	0.02* (-)			10.11 (100)			10.13
WEST GERMANY			17.28 (51)	6.64 (20)	9.68 (29)		33.60
YOUGOSLAVIA					2.39 (100)		2.39
WESTERN EUROPE	**8.36 (8)**	**0.82 (1)**	**35.82 (36)**	**23.90 (24)**	**28.09 (29)**	**1.62 (2)**	**98.61**

* LNG

INTERNATIONAL TRADE OF NATURAL GAS IN WESTERN EUROPE IN 1983 - 10^9 m3
( ) : share of the exporting country in the total (%)

Importing Country \ Exporting Country	Algeria	Libya	Netherlands	Norway	Soviet Union	West Germany	TOTA
AUSTRIA					2.45 (100)		2.45
BELGIUM	2.28* (23)		5.82 (60)	1.67 (17)			9.77
DENMARK						0.10 (100)	0.10
FINLAND					0.82 (100)		0.82
FRANCE	8.76* (38)		7.69 (34)	2.31 (10)	3.69 (16)	0.50 (2)	22.95
ITALY	2.15 (15)	0.03* (-)	4.85 (33)		7.65 (52)		14.68
LUXEMBOURG			0.36 (100)				0.36
NETHERLANDS				2.70 (100)			2.70
SPAIN	1.65* (69)	0.74* (31)					2.39
SWITZERLAND			0.52 (35)			0.96 (65)	1.48
UNITED KINGDOM				10.54 (100)			10.54
WEST GERMANY			17.48 (52)	6.14 (18)	9.88 (29)		33.50
YOUGOSLAVIA					2.63 (100)		2.63
WESTERN EUROPE	**14.84 (14)**	**0.77 (1)**	**36.72 (35)**	**23.36 (22)**	**27.12 (26)**	**1.56 (1)**	**104.37**

* LNG

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WESTERN EUROPEAN GAS IN TRANSITION

HARVARD UNIVERSITY INTERNATIONAL GAS STUDY

Developments in the Western European Natural Gas Market

J.M. Maters

COMMISSION OF THE EUROPEAN COMMUNITIES

O s l o , 13 September

WESTERN EUROPEAN GAS IN TRANSITION

HARVARD UNIVERSITY INTERNATIONAL GAS STUDY

Overview: Developments in the Western European Natural Gas Market

J.M. Maters

Commission of the European Communities

I. Introduction

- I should like to begin by providing a brief sketch of the early development of gas markets in the European Community.

- The introduction of Dutch supplies from the giant Groningen field during the sixties was the stimulus for the early build-up of natural gas pipeline infrastructure.

- Between 1969 and 1979 natural gas consumption in the Community roughly quadrupled, the bulk of this growth being provided from indigenous resources (see figure 1).

- The development of North Sea gas deposits in the 70's enhanced this trend.

- The early development was spurred by flexible pricing and trading conditions which stimulated gas penetration in a wide variety of end uses.

- As gas penetration increased the infrastructure to support this development - storage, pipelines, LNG terminals - were also expanded to the point that the Community today has - with the notable exception of the British Isles - an integrated natural gas infrastructure (see figure 2).

...

- The oil shock of 1973, as can be seen from figure 1, did little to slow the growth of gas consumption. This resilience in gas penetration combined with what in retrospect was an unduly optimistic view of economic prospects as seen from the period from 1975-1979, led to very high forecasts of future natural gas demand in different Member States.

- It was on the basis of such forecasts, many of which have since been revised downwards drastically, that the more recent contracts between Community countries and Algeria, Norway and the Soviet Union were signed.

- For many European gas companies the price and volume conditions of some of these contracts were soon to prove too difficult to bear and economically damaging.

II. Recent Developments 1979-1984

- For the first time in 20 years, gas consumption in the European Community actually dropped in 1979/80, a trend that was to persist for two further years.

- In addition to the normal recessionary pressures of the period, pressures which previously natural gas growth had appeared immune to, the major new factor in this decline was the uncompetitive position of natural gas against other fuels in its end-use markets.

- In natural gas use in electricity production the decline was reinforced by a 1975 Commission directorate restricting such use.

- Bulk gas users such as the chemical and other industries switched to cheaper energy forms, mainly coal, while the more captive elements of the market, the domestic and commercial sectors, showed a significant slowdown in growth.

- The declining competitivity of natural gas arose, among other reasons, from rather rigid pricing and delivery conditions of gas import contracts from third countries, particularly from Algeria.

- Algeria, after a period of heavy investment in LNG liquefaction facilities (over 30×10^9 m^3 capacity in 1983), and the construction of the Trans-Mediterranean pipeline linking Algeria, Tunisia and Italy (operational capacity 8×10^9 m^3 but rising later to 16×10^9 m^3) committed itself to a heavy reliance on gas exports to balance the declining contribution from its oil exports to its development revenues.

- This commitment was reinforced in the late 1970's by a determined attempt on Algeria's part to link the price of natural gas to that of crude oil on a thermal equivalence basis and in doing so to maximize the return on gas exports.

- To this end the Algerians, in their negotiations with Distrigaz of Belgium, Gaz de France and SNAM of Italy, successfully established a formula linking the gas price to a base price indexed to a "basket" of different crude prices, whose average density is always above that of Arabian light.

- The goal of the formula was of course to bring about a convergence of the natural gas and crude prices.

- The result of successfully negotiating this formula, first with Distrigaz, then with Gaz de France after intervention by the French Government and finally with Italy after a similar intervention by the Italian Government, has been to provide Algeria with a yield from natural gas exports up to 20% higher than the previous European supply prices (F.T. 17/11/82).

- It also resulted, however, in the progressive loss of its major American markets, starting with the El Paso contract in 1981 ($10 \times 10^9 m^3$ LNG) and followed later by the Panhandle contract ($4.5 \times 10^9 m^3$ LNG) which was suspended in December 1983. Distrigaz, the only other US importer ($1.2 \times 10^9 m^3$ LNG) has also had problems with regulatory approval, though deliveries have continued.

British Gas also failed to renew its import contract after 1980.

- Those companies that did agree to the Algerian conditions on price and minimum take provisions paid heavily both in erosion of their financial bases (Gaz de France losses 1982 : 2.5 milliard francs, 1983 : 2.4 milliard francs) and through static or declining gas consumption (between 1979-1982 gas consumption in France was static, in Italy it declined by 3.5% and in Belgium by 27%).

- The period also saw the closure of a new round of Russian contracts for Siberian gas.

- As a consequence an increasing awareness of supply security became noticeable among Community Member States. Natural gas import dependency, which as late as 1975 represented less than 7% of Community consumption had by 1983 grown to 30% of supply (see figure 1).

- European Governments, conscious of the security and economic implications of gas imports, became increasingly involved in import contract issues, a factor which persists to this day.

...

- This resulted in political pressure being added to the normal commercial considerations in the negotiation process.

- The early part of the period also saw the realization of what was anticipated as the basis of a major breakthrough for LNG into the European market. Faltering sales and uncompetitively high prices had by the end of the period shattered these prospects.

- 1983 saw gas demand grow again by almost 4% to reach 165 mtoe, of which 50 mtoe was imported, 40% from Norway, 35% from the Soviet Union and 25% from Algeria.

- The increase in demand in 1983 was spread unevenly between Member States, reflecting varying ability in the different gas markets to ride quickly out of recession.

- Surplus availability among other reasons due to the aforementioned rigidity in import contracts, resulted in diversion of these surpluses to central power plants for electricity production (Belgium, Italy, Netherlands and Denmark). In some cases this is done in an attempt to avoid even large financial losses which would result from the take or pay clauses in import contracts.

- Though the decline in oil prices in 1983 meant a parallel fall in the price of gas linked to oil product prices, its competitive position has not improved significantly in markets where inter-fuel competition has grown more intense (e.g. oil, coal and electricity now compete with gas for many markets in France). Moreover, the demand growth in 1983 reflected the economic upturn, the slackening in prices, and steady growth in new self-sufficient suppliers like Ireland.

- Overall natural gas has some way to go to regain the impetus of the 70's in market penetration, a situation that will be increasingly influenced by renegotiation of existing contracts and the terms and delivery conditions of new contracts.

- The relationship of gas prices, and particularly gas prices from third countries, to those of competing fuels in different Member States will determine the ultimate penetration rate of gas in every market. Contract flexibility will also play a not insignificant role in market developments.

- One further factor which may play an increasingly influential role will be whether spot market gas sales develop. The physical infrastructure already exists to facilitate such sales (figure 2). The recent case of the Belgian efforts to negotiate more attractive conditions for their ammonia producers indicates that the potential for such transactions is not limited to the United States.

- Presently the Commission for the purpose of analysing security and supply issues between now and the year 2000 assumes that gas remains competitive in each Member State's market.

- There is, however, no guarantee that this is a plausible assumption and much will depend, as stated earlier, on the terms of new or renegotiated contracts in the coming years.

III. The Community Natural Gas Supply Situation 1984-2000

- In line with the decline in forecasts of total energy demand, the period from 1980 onwards saw continous declines in the Commission's forecasts of the likely gas supply requirements of the Community. (1981 : 221 mtoe in 1990, 1982 : 206 mtoe, 1983 : 197 mtoe, 1984 : probably lower again).

- As a response to growing import dependency (2nd round of Russian contracts) the European Commission undertook in 1982 a study of the natural gas outlook with particular emphasis on the ability of the Community to sustain supply disruptions. The years 1985 and 1990 were taken as horizon years.

- The 1982 study indicated that on the basis of measures then envisaged, it would be possible for the Community to deal with a major interruption of supplies (at least 25% of normal supply for a six-month-period), with a minimum of repercussions for the final consumer. The Commission was asked by the Council of Energy Ministers to continue to follow the evolution of the situation and to extend its analyses to the 1990's with the year 2000 as horizon year.

- Also the decline in crude oil prices in 1983 and the general softening of energy markets arising from recession and efficiency improvements necessitated a reappraisal of the possible evolution of natural gas markets.

- In April 1984 the Commission produced a further natural gas study for the Council of Energy Ministers.

- It concluded (figure 3)

  A) that gas supplies under existing import contracts and from indigenous production capacity are more than adequate to meet demand until the early 90's;

  B) any new import contract requirement would probably lie in the range 20-55 mtoe by the year 2000, when overall import dependence would have reached 50-60% of supply;

  c) the reserves and transport infrastructure available to potential suppliers to the Community far exceed the suggested requirement for new contracts;

  and

...

D) given the increased level of import dependency there was justification for increased cooperation between Member States and their gas transmission companies to ensure that an adequate level of security could be maintained in the most cost effective manner.

- By 1990 the study suggested that the USSR (44%) would replace Norway (32%) as the Community's major third country supplier with Algeria (24%) retaining the balance of the 84 mtoe market for imports.

- For the new import requirement appearing in the mid-1990's the most likely suppliers are once again the Soviet Union, Algeria and Norway.

- Other sources which could possibly supply part of these requirements are Nigeria, Cameroon and the Ivory Coast.

- LNG imports from Canada or Middle Eastern countries such as Abu-Dhabi or Qatar are considered unlikely to contribute to European supply before the turn of the century.

- On existing estimates the total import requirement to the Community will rise from 30% in 1983 to 43% in 1990 and between 50-60% of total consumption in 2000.

- The import dependence of individual member states will vary greatly. For example supply dependence on the largest supplier in 1990, the USSR, will range from 0% to 36% of consumption.

- The need for an adequate level of diversification is therefore self-evident as one means of improving supply security.

- Further imports from Norway and the development of the giant Troll field in particular for Community use would be in line with the Community goal of limiting dependence on non-OECD suppliers.

- The pressure on the USSR to recoup its investment in gas production and transportation facilities, its need for hard currency earnings to balance the eventual decline in oil exports, and its enormous reserves (40% of the world total) are likely to ensure a strongly competitive approach by the USSR to Community markets.

- This has significant implications for its immediate competitors in Community markets, Norway and Algeria, and for any future competitors. In the future price and contract flexibility will be the key issues for most purchases. Source diversification will be important but will not be the only crucial consideration to many importing gas companies. The USSR's flexibility in price and contract conditions negotiation could give it a distinct edge over some of its competitors.

- This is reinforced by the increased inter-fuel competition to natural gas in its end-use markets, which has already caused loss of market share to some gas undertakings with high cost supplies.

- For Algeria likewise, the need to maximize the utilisation levels of its pipeline and LNG capacity to both maintain its income flow and avoid plant deterioration may create a more competitive approach to gas sales.

...

- In today's market conditions, gas transmission companies have become more reluctant to commit themselves to additional contracts from high cost sources outside the Community, than for example when the Statfjord and new Russian supplies were negotiated.

- If decisions on new import deals are delayed until the demand evolution is clearer, the fallback suppliers, i.e. those who could supply quickly and at reasonable low additional costs to the Community, will be the USSR and Algeria.

- Commitment to these countries to the exclusion of other OECD suppliers would conflict with Community policy on source diversification.

- There is a strong preference for the Community therefore to see the ordered development of reserves such as Sleipner and Troll.

- In addition against the background of the expected increase in import dependency in the 1990's, a major share of which is expected to come from non-OECD sources, the Commission and Member States are examining means of further improving their supply security through cross-border co-operation.

- Such co-operation could take several forms.

- Companies might collaborate more closely on the construction and utilisation of gas stocks in each other's territory.

- Thus, in the event of an emergency, a company might draw stock from a collaborating company's storage in another state.

- Companies might also consider agreements on access to either flexible production capacity or interruptible industrial contracts in each other's territory as a means of reducing the security burden on individual companies or Member States.

- It is critical to the gas market development that the link between gas import prices and market share is fully appreciated.

- The uncertainty in gas demand forecasting arises from a variety of factors.

- These include the related uncertainties in economic and social development in the Community, which affect total demand for energy and the availability of alternative fields such as oil, coal and electricity, and the impact of conservation policies.

- Most critical, however, is the price perceived by the consumer in the different end-use markets.

- This link between pricing and demand development is critical in my opinion to adressing the problems of developing and maintaining markets. Developing and maintaining markets for natural gas appears one of the key issues for the years to come.

...

IV. Summary

1. Natural gas has become a major element in the Community's energy strategy of reducing its dependency on oil. At present natural gas supplies 19% of total primary energy consumption.

2. This growth in natural gas consumption was based on competitively priced indigenous supplies with flexible delivery conditions.

3. The gas market is likely to remain in surplus for some time to come.

4. The level of about 19% of total primary consumption can only be maintained to the turn of the century, provided the gas companies find ways and means to market the gas competitively. It is felt that this is one of the key issues for the gas industry in the coming years.

5. Gas competitivity has declined over the last few years as a result of high priced contracts negotiated in the late 70's. The recent upturn will be difficult to sustain without considerable efforts by both importers and their suppliers to agree more flexible conditions.

6. New import contracts in the 1990's will require greater price and delivery flexibility than those concluded in the last decade.

7. Indigenous production will not keep pace with demand with the result that gas imports will grow in importance (1983 : 30%, 1990 : probably $\geq$ 40%, 2000 : probably $\geq$ 50%.

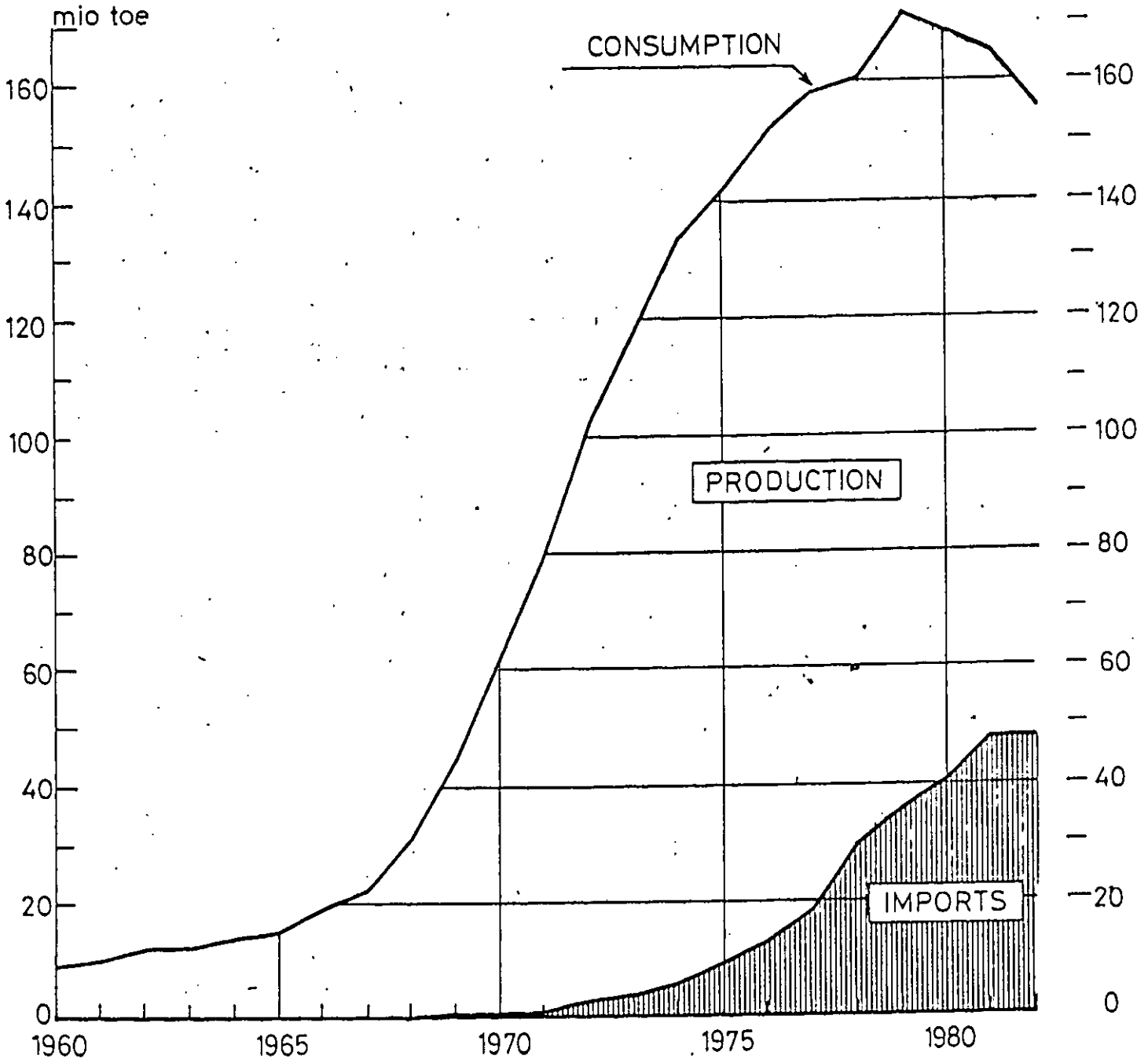
8. The Community's import needs may reach a level of between 20-55 mtoe.

9. If decisions on new import deals are delayed until demand evolution is clearer, the fallback suppliers, i.e. those who could supply quickly and at reasonable low additional costs to the Community, will be the USSR and Algeria.

Fig. 1

EUR-10 : Natural Gas Consumption 1960-1982

(Production and Imports)



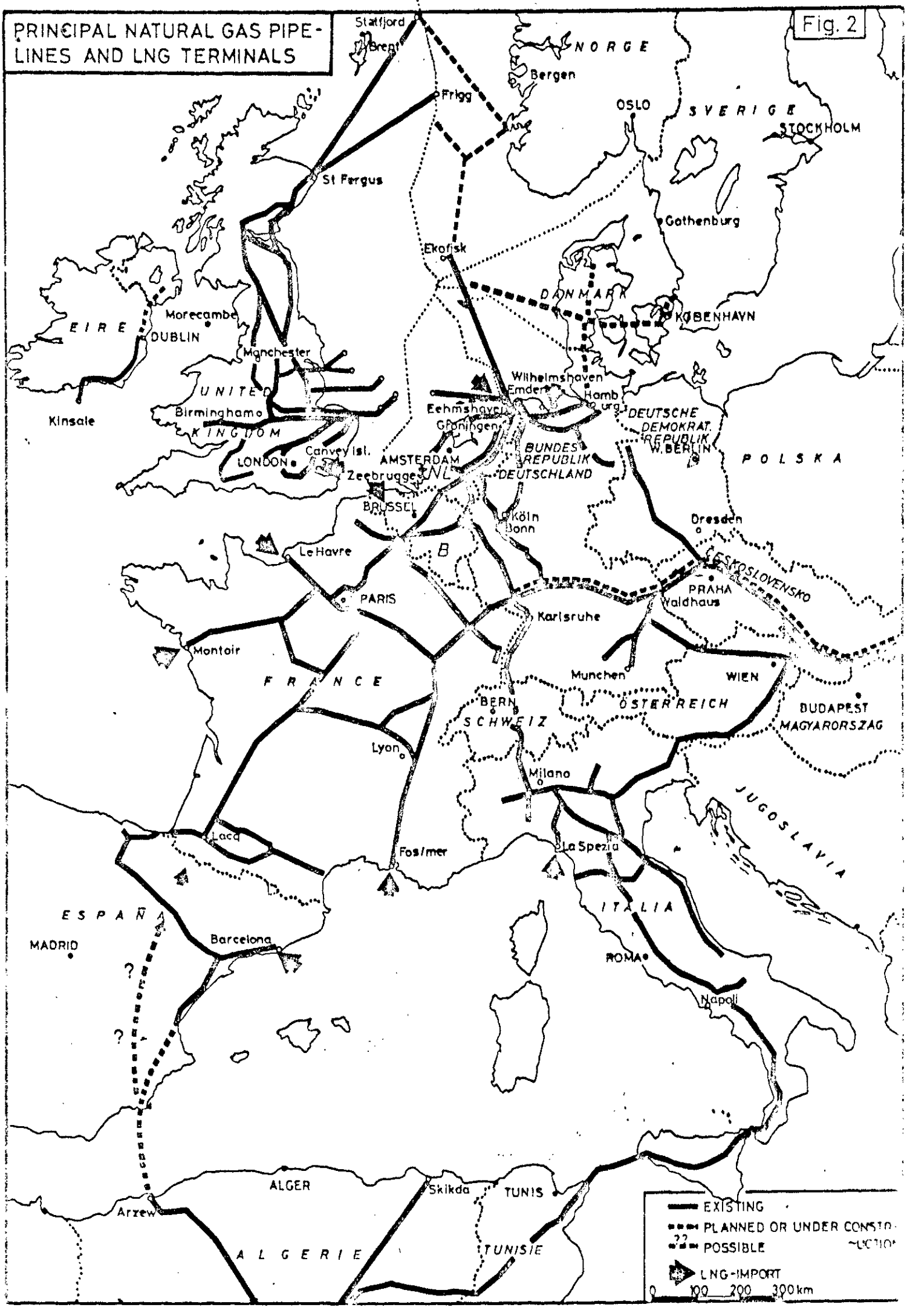

PRINCIPAL NATURAL GAS PIPE-LINES AND LNG TERMINALS
Fig. 2
Statfjord
Brent
Frigg
NORGE
Bergen
OSLO
SVERIGE
STOCKHOLM
St Fergus
Gothenburg
Ekofisk
DANMARK
KØBENHAVN
EIRE
DUBLIN
Morecambe
Manchester
UNITED KINGDOM
Birmingham
Kinsale
Wilhelmshaven
Emden
Hamburg
Eemshaven
Groningen
DEUTSCHE DEMOKRAT. REPUBLIK
W. BERLIN
POLSKA
BUNDES REPUBLIK DEUTSCHLAND
LONDON
Canvey Isl.
AMSTERDAM
NL
Zeebrugge
BRUSSEL
B
Köln
Bonn
Dresden
Le Havre
CESKOSLOVENSKO
PRAHA
Waldhaus
PARIS
Karlsruhe
Montoir
FRANCE
Munchen
WIEN
BERN
SCHWEIZ
ÖSTERREICH
BUDAPEST
MAGYARORSZAG
Lyon
Milano
JUGOSLAVIA
Lacq
Fos/mer
La Spezia
ESPAÑA
ITALIA
MADRID
Barcelona
ROMA
Napoli
ALGER
Skikda
TUNIS
Arzew
ALGERIE
TUNISIE
EXISTING
PLANNED OR UNDER CONSTRUCTION
POSSIBLE
LNG-IMPORT
0 100 200 300 km

Fig. 3

EUR-10 : NATURAL GAS DEMAND 1982-1990-2000

(mio toe)	1982		1990		2000	
	volume	%	volume	%	volume	%
Indigenous Production	116	72	112	57	89-97	40-50
Contracted Imports	46	28	84	43	77	35-40
of which : Norway	22	13	27	14	17	8-9
Algeria	6	4	20	10	20	9-11
USSR	18	11	37	19	40	18-21
Imports not yet contracted	-	-	-	-	19-54	10-25
TOTAL IMPORTS	46	28	84	43	96-131	50-60
TOTAL DEMAND	159+	98	196	100	193-220	100

+Storage and Losses = 3 mio toe (2%)

Dott. MEAZZINI SNAM

(5)

1.05 - 1.06.02

PENETRAZIONE DEL GAS E I COSTI

2° Seminario di Informazione sull'Energia

Roma - Centro di Documentazione per giornalisti

10 Gennaio - 14 Febbraio 1984

1. IL GAS NATURALE E IL P.E.N.

E' forse opportuno premettere una schematica situazione dell'industria del gas in Italia. (grafico 1).

Il gas copre circa il 16% del fabbisogno energetico italiano essendo il 64% circa ricoperto dal petrolio, il 10% dai combustibili solidi e il 10% dall'energia elettrica; è quindi il secondo settore per importanza.

Il gas naturale copre il 31% dei fabbisogni energetici nel settore civile, il 24% di quello industriale e l'1% di quello dei trasporti.

L'approvvigionamento in Italia e all'estero, il trasporto e la vendita sono compito della SNAM, società del Gruppo ENI che serve direttamente circa 3.000 aziende industriali e 1.700 Comuni con una rete di circa 16.000 Km. Nel 1983 la SNAM ha venduto circa 26,7 miliardi di metri cubi di metano.

La distribuzione cittadina è operata da aziende specializzate del settore con una ripartizione, riferita alle famiglie servite, del 33% di aziende controllate dalla SNAM, del 46% di aziende pubbliche (municipalizzate o gestioni comunali) e del 21% di aziende private.

L'utilizzazione del metano in Italia si è sviluppato in 3 fasi successive (figura 2).

La prima fase prende l'avvio nell'immediato dopoguerra, con la scoperta dei giacimenti nella Valle Padana. La rete dei metanodotti cominciò ad estendersi con gradualità, interessando anche le aree del Centro e del Mezzogiorno, in questo agevolata dai ritrovamenti di metano nel Ravennate, negli Abruzzi, in Puglia ed in Sicilia.

In questo periodo che comprende gli anni '50 e '60 si raggiungono livelli di produzione molto prossimi a quelli attuali: il gas nazionale copre il 100% delle vendite.

Nella seconda fase che comprende gli anni '70 iniziano le importazioni che arrivano a coprire circa il 50% delle vendite raddoppiando quindi le disponibilità. La prima importazione in Italia è stata attivata nel 1971, con l'arrivo al terminale di La Spezia del gas naturale liquefatto libico; all'anno 1974 risalgono invece i primi trasporti a lunga distanza di metano di produzione europea, con l'avvio delle importazioni via tubo dalla Russia e dall'Olanda.

La terza fase si apre con l'avvio dell'importazione algerina che rappresenta un primato nel campo dei grandi trasporti di gas, anche per quanto riguarda la posa di condotte sottomarine; essa è caratterizzata da un consolidamento delle penetrazione del gas, secondo gli obiettivi programmatici tracciati dal P.E.N. che porteranno a traguardi di vendita alla fine degli anni '80 di circa 3 volte il livello di vendita raggiunto alla fine della pri-

ma fase con una incidenza delle importazioni superiore ai 2/3 del totale.

I traguardi fissati dal P.E.N. sono stati oggetto da parte di operatori e studiosi di aggiornamenti delle previsioni comportanti un ridimensionamento della domanda di energia - al 1990 - ; tali valutazioni pur modificando le quantità non alterano sostanzialmente il quadro strategico ed in esso il ruolo del metano come è stato configurato.

Il ricorso ad una maggiore quota del metano nella copertura del fabbisogno energetico nazionale costituisce una delle tre grandi linee di diversificazione delle fonti primarie di energia e dei relativi mercati di approvvigionamento indicati dal P.E.N. insieme alla diffusione del carbone e del nucleare e ciò soprattutto per ridurre i rischi derivanti da una preponderante dipendenza dal petrolio.

Cercherò di esaminare quali sono i supporti più validi che giustificano, a mio avviso, gli obiettivi posti dal P.E.N. per il settore gas naturale.

- Prima di tutto la disponibilità; le risorse di metano nel mondo presentano, rispetto a quelle di petrolio una maggiore durata prevedibile (figura 3).
  Le riserve provate di metano infatti raggiungono il livello di circa 86.000 miliardi di metri cubi, equivalenti a circa 60 anni di consumo, con l'attuale ritmo di utilizzazione; le riserve di petrolio ora co-

nosciute ammontano a circa 92.000 milioni di tonnellate, quindi con una dimensione energetica non molto superiore a quella del metano ma con una durata, sulla base degli attuali consumi, corrispondente a 33 anni.

Secondariamente una maggiore diversificazione geopolitica rispetto al petrolio(e quindi una maggior sicurezza degli approvvigionamenti);il sistema gas pur essendo strutturalmente più rigido di quello del petrolio ha superato senza particolari difficoltà gli anni di crisi energetica sia in considerazione alle aree di approvvigionamento sia in conseguenza ai particolari tipi di contratti di fornitura che legano i contraenti con impegni di lunga durata ed investimenti consistenti delle due parti, sia per l'esistenza in Italia di rilevanti quantitativi di produzione che rappresenta se non l'unica la più consistente riserva energetica del nostro paese.

Un ruolo importante sulla sicurezza degli approvvigionamenti si ottiene inoltre con disponibilità di volumi contrattuali delle importazioni superiori a quello necessario per i consumi preferenziali e quindi con una opportuna quota di interrompibili; un ruolo fondamentale giocano gli stoccaggi strategici in giacimenti in esaurimento che raggiungeranno i 10 ÷ 12 10^9 mc. e sono in fase di allestimento

- Terzo elemento di validità degli obiettivi P.E.N. è il consistente apporto che il metano ha dato e può

dare per un miglioramento dell'ambiente; essendo un combustibile praticamente senza zolfo la combustione avviene senza emissioni di anidride solforosa che è il maggior inquinante dell'atmosfera; l'utilizzo del metano in luogo dei combustibili liquidi sostitutivi ha permesso nel 1983 di ridurre le emissioni solforose nell'atmosfera di circa 900.000 Tonn.
Uno studio dell'OCSE di Parigi ha recentemente identificato in 20 miliardi di dollari la spesa annua che i Paesi dell'Europa Occidentale devono sostenere per proteggersi dall'inquinamento di anidride solforosa.

- Inoltre l'ampliamento dell'uso del metano previsto dal P.E.N. come diversificazione degli approvvigionamenti energetici comporterà apprezzabili risparmi energetici in particolare in alcuni settori che possono meglio sfruttare le possibilità di maggior rendimento termico (caldaie a condensazione , riscaldamenti unifamigliari) o l'utilizzo come energia primaria (scaldabagni a gas). Una valutazione di larga massima quantizza in circa 1 milione di Tep il risparmio conseguibile con il nuovo apporto di gas naturale.

2. LA DISPONIBILITA' (figura 4)

Le disponibilità necessarie alla copertura del fabbisogno programmato provverranno dalla produzione nazionale, dai contratti operativi d'importazione dall'Olanda e dall'Unione Sovietica e dall'Algeria. A partire dalla seconda metà degli anni '80 è previsto il contributo del nuovo progetto d'importazione dall'URSS.

La produzione nazionale può fare affidamento su riserve accertate dell'ordine di 200 miliardi di metri cubi. Anche in relazione alle favorevoli prospettive dell'attività di ricerca dell'AGIP la produzione nazionale continuerà a mantenersi su livelli confrontabili a quelli attualmente in essere dell'ordine di 11 ÷ 12 miliardi di metri cubi anno. E' pertanto prevedibile per il 1990 un ruolo del gas nazionale più marcato di quello indicato dal P.E.N.

L'importazione dall'Olanda attivata nel 1974 prosegue regolarmente ad un livello di fornitura dell'ordine di 5 miliardi di metri cubi. L'importazione olandese presenta una apprezzabile importanza strategica per la sicurezza dell'approvvigionamento ed è prevista una diluizione su un periodo di tempo più lungo dei volumi contrattuali.

Per quanto riguarda la fornitura di gas dall'Unione Sovietica al di là dell'attuale contratto di circa 7 miliardi di metri cubi anno che ha operato validamente fino dal 1974, è noto che la SNAM ha sottoscritto un accordo preliminare per una ulteriore fornitura fino ad un massimo

di 8 miliardi di metri cubi all'anno per 25 anni.
Ragioni politiche hanno suggerito il dilazionamento dell'assenso governativo a questo contratto aggiuntivo che si concretizzò nella "pausa di riflessione". La posizione dell'ENI è nota; i programmi di vendita fanno prevedere nella seconda metà degli anni '80 la necessità di un incremento delle importazioni; non appena le ragioni politiche che avevano condizionato la dilazione del contratto fossero superate, la SNAM è disponibile alla definizione di un nuovo contratto, evidentemente alla luce delle variabili che la situazione energetica internazionale ha portato.

L'importazione algerina è stata attivata nello scorso mese di agosto a seguito degli accordi sottoscritti tra SNAM e SONATRACH il 24 febbraio 1983. Attualmente la fornitura è a livello previsto per il 2° anno contrattuale pari a circa 7 miliardi di metri cubi anno. In base agli accordi il contratto con la SONATRACH subirà una prima revisione nel 1° semestre del 1986 per un eventuale aggiornamento delle condizioni di fornitura. La fornitura a regime è prevista in 11 ÷ 12 miliardi di metri cubi anno.

L'importazione di gas naturale liquefatto dalla Libia è stata interrotta nel 1980, in relazione all'incompatibilità con il mercato finale degli adeguamenti di prezzo richiesti dall'esportatore. Il terminale di Panigaglia è stato comunque mantenuto operativo e, a seguito di modifiche realizzate, è ora in grado di poter trattare GNL di qualsiasi provenienza, nell'ottica di una sua utilizza-

zione stagionale finalizzata ad una maggiore disponibilità di portata di punta.

3. I PREZZI DEL GAS NEGLI APPROVVIGIONAMENTI INTERNAZIONALI

A differenza di quanto avviene per il petrolio, non esiste a livello mondiale un mercato omogeneo del metano.

Una componente importante nel prezzo finale del gas è rappresentata dai costi fissi conseguenti agli investimenti che le Parti hanno effettuato per la produzione, il trasporto e la distribuzione. E' perciò di peculiare rilevanza l'individuazione del "punto di consegna" del gas, in base al quale vengono ripartiti gli investimenti tra esportatore ed importatore (figura 5).

Nel caso dell'importazione olandese il gas viene venduto al confine dell'esportatore, mentre per il gas sovietico l'esportatore effettua il trasporto a proprie spese anche attraverso gli altri Paesi del Comecon. Per quanto riguarda infine l'importazione algerina, il punto di consegna è al confine tra Algeria e Tunisia, anche se la società esportatrice algerina partecipa al 50% con la SNAM nella società proprietaria del gasdotto attraverso il Canale di Sicilia.

Il gas naturale può essere importato ad un prezzo massimo commerciale che consenta di coprire i costi di trasporto, stoccaggio e distribuzione arrivando ad un prezzo di vendita all'utilizzatore finale competitivo con quello dei prodotti sostitutivi.

Ne risultano varie formulazioni di prezzo riconducibile

ad un prezzo riferito ad un paniere ponderato di prodotti sostituibili cui viene sottratto il costo per il trasporto e la distribuzione. Ha quindi rilevanza in questo contesto la definizione del mercato finale sostituibile, le distanze ed i costi di trasporto, nonché la flessibilità concessa al compratore sulle quantità da ritirare.

Questo prezzo deve poi mantenersi nel tempo in termini reali perciò in sede di aggiornamento del prezzo, la formula di indicizzazione deve essere coerente con i predetti criteri.

4. OBIETTIVI DI VENDITA

La presenza del gas naturale nel bilancio energetico 1983 è del 16%; le previsioni del P.E.N. indicano per il 1990 una penetrazione del metano del 19 ÷ 20%.

L'attuazione del programma indica per il 1990 un livello complessivo di vendita dell'ordine di 37,5 ÷ 39,5 miliardi di metri cubi, a fronte dei circa 26,7 miliardi attuali e quindi un aumento dei consumi di poco inferiore di 50%.

La situazione attuale delle vendite è rappresentata in figura 6.
I programmi di vendita sono riportati in figura 7.

Il settore degli usi civili è quello che meglio può apprezzare i pregi del metano, quali comodità, semplicità ed economicità di impiego, elevato rendimento, sicurezza e continuità nell'alimentazione, eliminazione serbatoi di deposito, trasparenza della quantità e della qualità del prodotto erogato, oltre che assoluta assenza delle emissioni inquinanti tipiche dei combustibili tradizionali, che contenendo zolfo, producono con la loro combustione anidride solforosa ed acido solforico.

A questo proposito può essere citato l'esempio della città di Venezia che, per il momento unica in Italia, è protetta da una legge speciale contro l'inquinamento.

D'altra parte è noto che lo "smog" londinese è diventato

un ricordo del passato grazie all'uso del gas naturale; tempo fa ho sentito dire da rappresentanti russi che rilevazioni di indici di inquinamento fanno considerare Mosca la città più pulita d'Europa avendo adottato per la quasi totalità il riscaldamento a metano.

Il programma della SNAM prevede per il settore degli usi civili uno sviluppo dagli attuali 12 miliardi di metri cubi all'anno a circa 17 miliardi nel 1990, con una penetrazione nel mercato stimata pari al 42%, a fronte dell'attuale 31%.

La diffusione del metano sia in termini estensivi, grazie all'acquisizione prevista di circa 3 milioni di nuovi utenti che si aggiungeranno agli oltre 8 milioni già allacciati, sia in termini intensivi, in relazione alla trasformazione a metano puro delle reti di distribuzione delle grandi città (Roma, Milano, Napoli) ed al relativo sviluppo dei riscaldamenti a metano (figura 8).

I programmi di vendita ai consumatori industriali indicano per il 1990 un livello di circa 13,5 miliardi di metri cubi, a fronte degli attuali 10 miliardi circa. Tale sviluppo determinerà una copertura del fabbisogno energetico del settore da parte del metano dell'ordine del 30% circa mentre attualmente risulta pari al 24%. L'acquisizione interesserà sia il mercato degli "usi prioritari", peraltro già in buona parte servito, che i consumi attualmente soddisfatti da olio combustibile.

La previsione di consumo per uso termoelettrico, dell'ordine di 5 miliardi di metri cubi, è coerente con il consistente apporto che gli idrocarburi dovranno ancora fornire a medio termine per la produzione di energia elettrica, anche in relazione ai ritardi accumulatisi nella costruzione di centrali a carbone e nucleari. Il metano può pertanto trovare una collocazione temporanea, in situazione di disponibilità durante la fase di avviamento dell'importazione; superato tale periodo i volumi destinati all'uso termoelettrico potranno essere gradualmente ridotti ed in parte destinati al mercato prioritario.

Comunque una adeguata quota di metano "interrompibile" è strutturale al sistema di approvvigionamento e distribuzione. Tale quota, unitamente alle quantità prelevabili dallo stoccaggio, assicura oltre alla modulazione stagionale della domanda, la necessaria continuità di alimentazione delle utenze prioritarie anche in caso di riduzione dalle importazioni e consente quindi di destinare rilevanti quantità di gas agli usi più pregiati.

Il recente accordo raggiunto tra SNAM ed ENEL si colloca in quest'ottica e consente, nel pieno rispetto della convenienza delle parti interessate, di sostituire olio combustibile che, per una quota rilevante, viene importato.

Non va infatti dimenticato che il gas naturale è un combustibile e come tale, nella gamma degli idrocarburi solidi liquidi e gassosi ha solo il pregio di migliori doti di combustione; stante le notevoli riserve provate avendo la

tecnica del grande trasporto raggiunto livelli e realizzazioni impensabili alcuni anni fa, una volta soddisfatti tutti gli usi prioritari, non si vedono apprezzabili motivi perchè, a parità di condizioni economiche, non si debba optare, anche nell'utilizzo delle centrali termiche, ed in particolari periodi di utilizzo, per l'uso del metano di provenienza magari dal deserto Sahariano o dalla Siberia in luogo del più inquinante olio combustibile proveniente dal Medio Oriente o dal Venezuela.

5. I PREZZI DI VENDITA DEL METANO

Le vendite del metano sono effettuate sulla base di sistemi tariffari uniformi sull'intero territorio nazionale.

In relazione a quanto stabilito dal CIPE con delibera del 20 settembre 1974, il prezzo del metano praticato dalla SNAM è soggetto al regime di sorveglianza. In linea generale sulla formazione di tale prezzo influiscono i costi di approvvigionamento del gas sul mercato nazionale e internazionale nonchè i costi di trasporto, stoccaggio e grande distribuzione. Per tenere conto della dinamica di tali costi, in sede di indicizzazione vengono assunti come riferimento parametri energetici caratteristici di ciascun settore di utilizzazione nonchè parametri inflattivi.

Nel settore degli usi civili la tariffa all'utente finale è formata da due componenti, una relativa al prezzo del gas erogato dalla SNAM alle Aziende Distributrici, che incide per circa i 3/4 sulla tariffa finale, l'altra relativa al costo sostenuto da queste ultime per la distribuzione urbana per l'ulteriore 1/4

Il prezzo di fornitura tra SNAM ed Aziende viene semestralmente aggiornato con riferimento alle quotazioni del gasolio per riscaldamento al netto di imposte. I costi di distribuzione delle Aziende, stabiliti mediante una procedura CIP ("Metodo") che assicura alle imprese il pareg-

gio del bilancio costi-ricavi in presenza di una remunerazione del capitale investito, vengono annualmente adeguati con l'inflazione ed il costo del lavoro.

In relazione alla natura "amministrata" delle tariffe finali, sussistono attualmente difficoltà, in sede di revisione tariffaria, per l'applicazione del regime di sorveglianza del prezzo SNAM. Poichè una grossa componente del costo SNAM è legata a fattori esogeni correlati ai costi petroliferi ed ai valori della lira sarà necessario con la definitiva sorveglianza dei prezzi del gasolio passare a una sorveglianza operativa anche i prezzi del metano SNAM, tenendo soprattutto presente che oggi circa 7 milioni di famiglie si scaldano col gasolio ma già 4 milioni si scaldano col metano e che fra pochi anni questi numeri sono destinati ad invertirsi.

Il ciclo distributivo del metano per uso civile si dimostra valido anche sul piano economico dal momento che consente la remunerazione dei costi degli operatori del settore e determina, per il consumatore finale, tariffe con margini di convenienza rispetto alle fonti energetiche sostitutive. Attualmente le famiglie che possono utilizzare il metano per la totalità degli usi domestici registrano risparmi dell'ordine del 20 ÷ 30% rispetto alla spesa annua delle famiglie utilizzanti altre fonti energetiche anche in relazione alla composizione dei vari utilizzi per cucina, acqua calda e riscaldamento.

Nel settore degli usi industriali gli accordi del dicembre scorso tra SNAM, Confindustria e Confapi validi per il triennio 1984 ÷ 1986 regolano il comparto degli usi tecnologici del metano, cui vengono praticate forniture di tipo continuo.

Il principale elemento innovativo degli accordi è costituito dalla introduzione di un sistema di prezzi di tipo binomio che favorisce una più razionale gestione della risorsa metano da parte dei consumatori. Sono state in particolare contemperate le esigenze sia dei piccoli che dei grandi consumatori, con l'offerta in opzione di due diverse strutture di prezzo, e vengon privilegiati i consumi effettuati nei periodi di minor carico del sistema distributivo del metano.

L'adeguamento dei prezzi viene effettuato con riferimento alle quotazioni dell'olio combustibile per quanto riguarda il termine proporzionale della tariffa binomia; il termine "fisso" risulta invece indicizzato a parametri inflattivi.

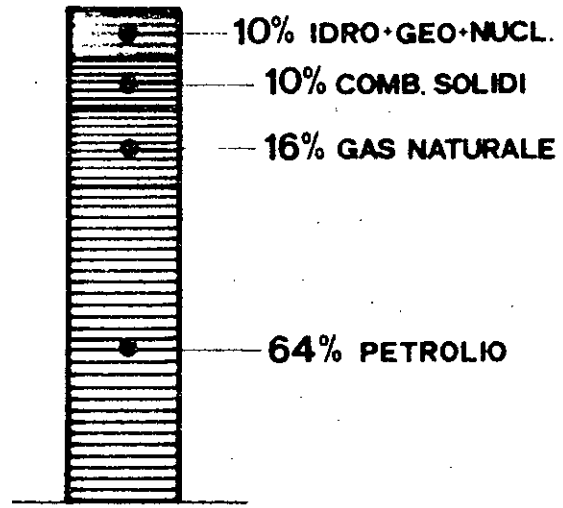
Per quanto concerne infine le forniture di tipo interrompibile sia per uso industriale che termoelettrico, il prezzo viene fissato in relazione alle quotazioni di mercato dell'olio combustibile denso ad alto tenore di zolfo, adottato dai singoli consumatori in alternativa al metano.

CONCLUSIONI

Credo con questa esposizione si siano toccati i temi attuali dell'industria del gas naturale; lo sviluppo degli usi del gas allo stato attuale delle cose si sta dimostrando tutto sommato la più consistente ed attendibile alternativa di politica energetica del nostro Paese; gli obiettivi possono essere giudicati ambiziosi ma riteniamo siano perseguibili e stiamo operando perchè si realizzino.

SITUAZIONE DEL SETTORE GAS NATURALE IN ITALIA

COPERTURA DEL FABBISOGNO ENERGETICO ALL'83



Snam 1983

26'700'000'000 m³ di metano distribuito

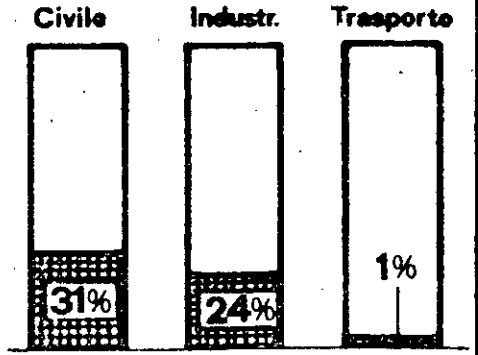
16'000 km di gasdotti

3'000 utenti industriali

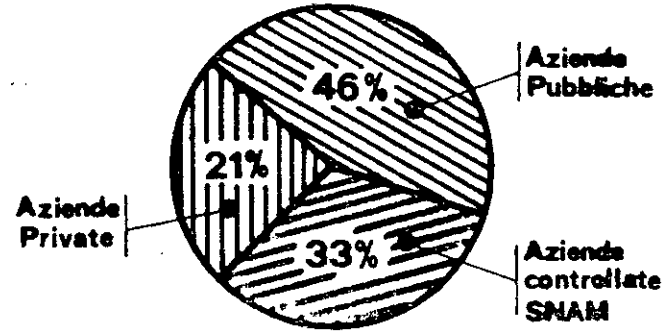
1'700 Comuni allacciati

8'000'000 di famiglie servite

COPERTURA DEI SETTORI

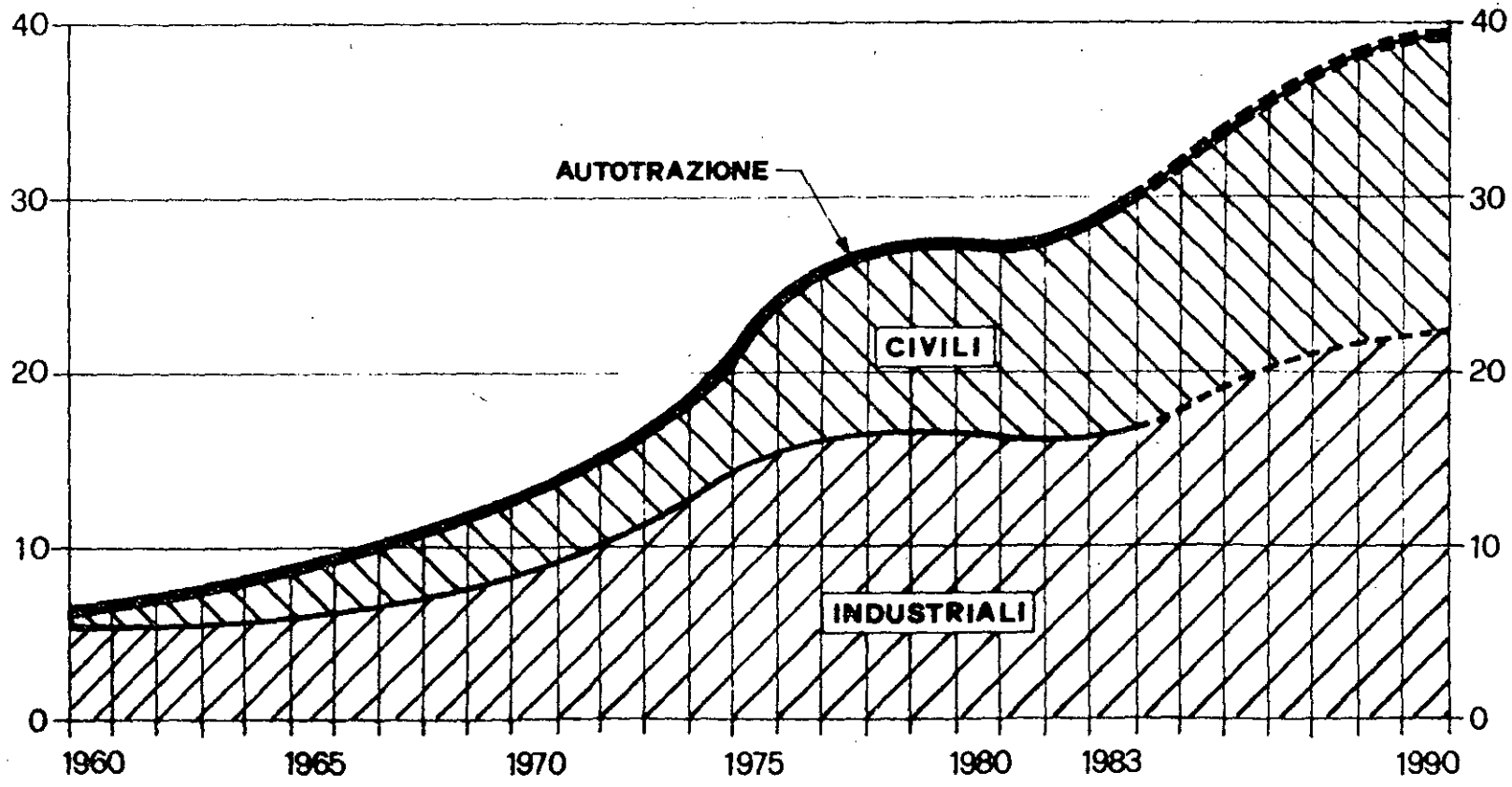


RIPARTIZIONE PERCENTUALE DEL MERCATO DEL GAS NATURALE PER USO CIVILE



UTILIZZAZIONE DEL GAS NATURALE IN ITALIA PER SETTORI DI IMPIEGO

miliardi di metri cubi



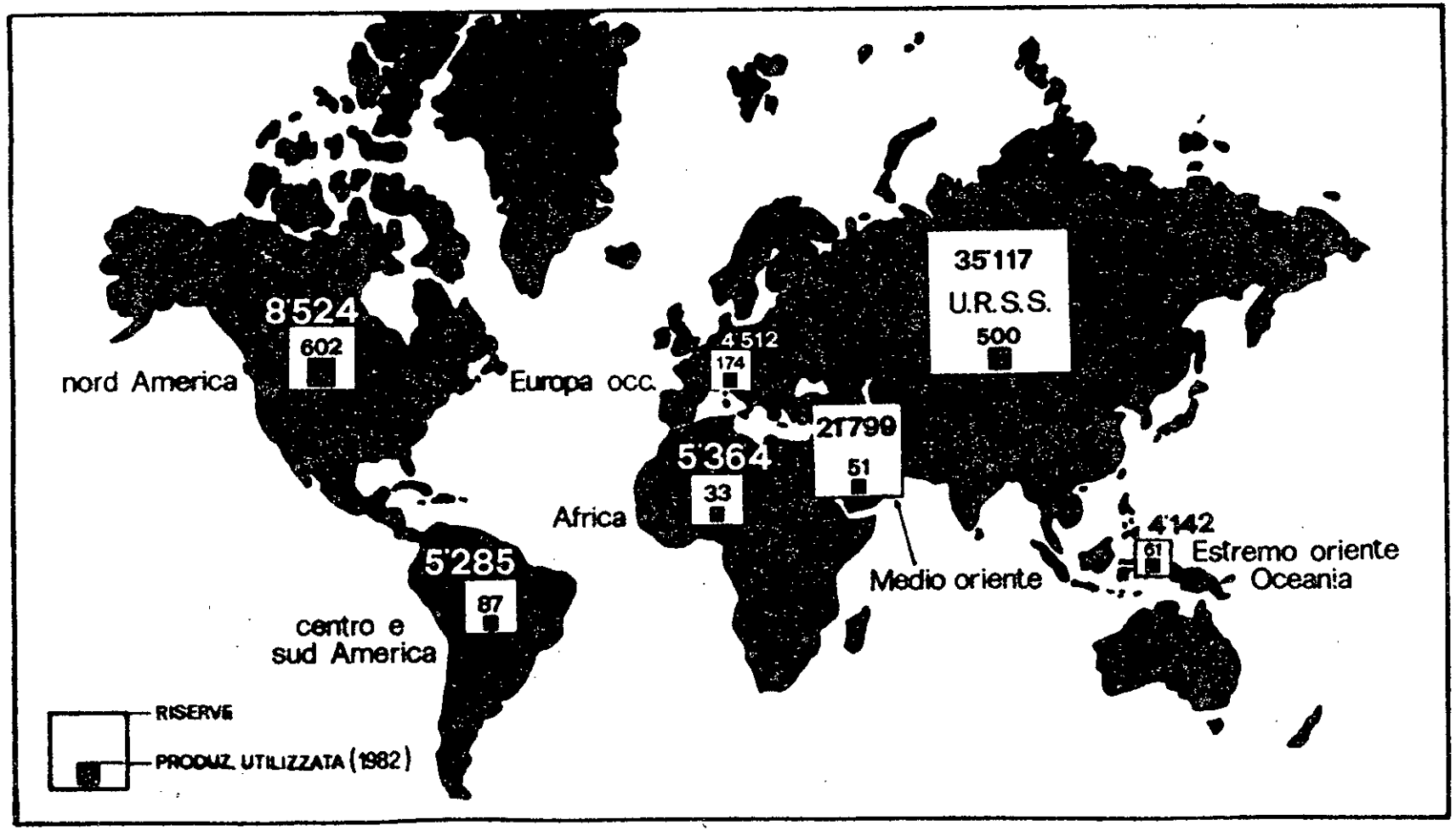
Riserve Gas
86'000 10^9 mc
Consumi
1420 · 10^9 mc
Durata 60 anni

RISERVE E PRODUZIONE UTILIZZATA DI GAS NATURALE PER GRANDI AREE

1-1-1983

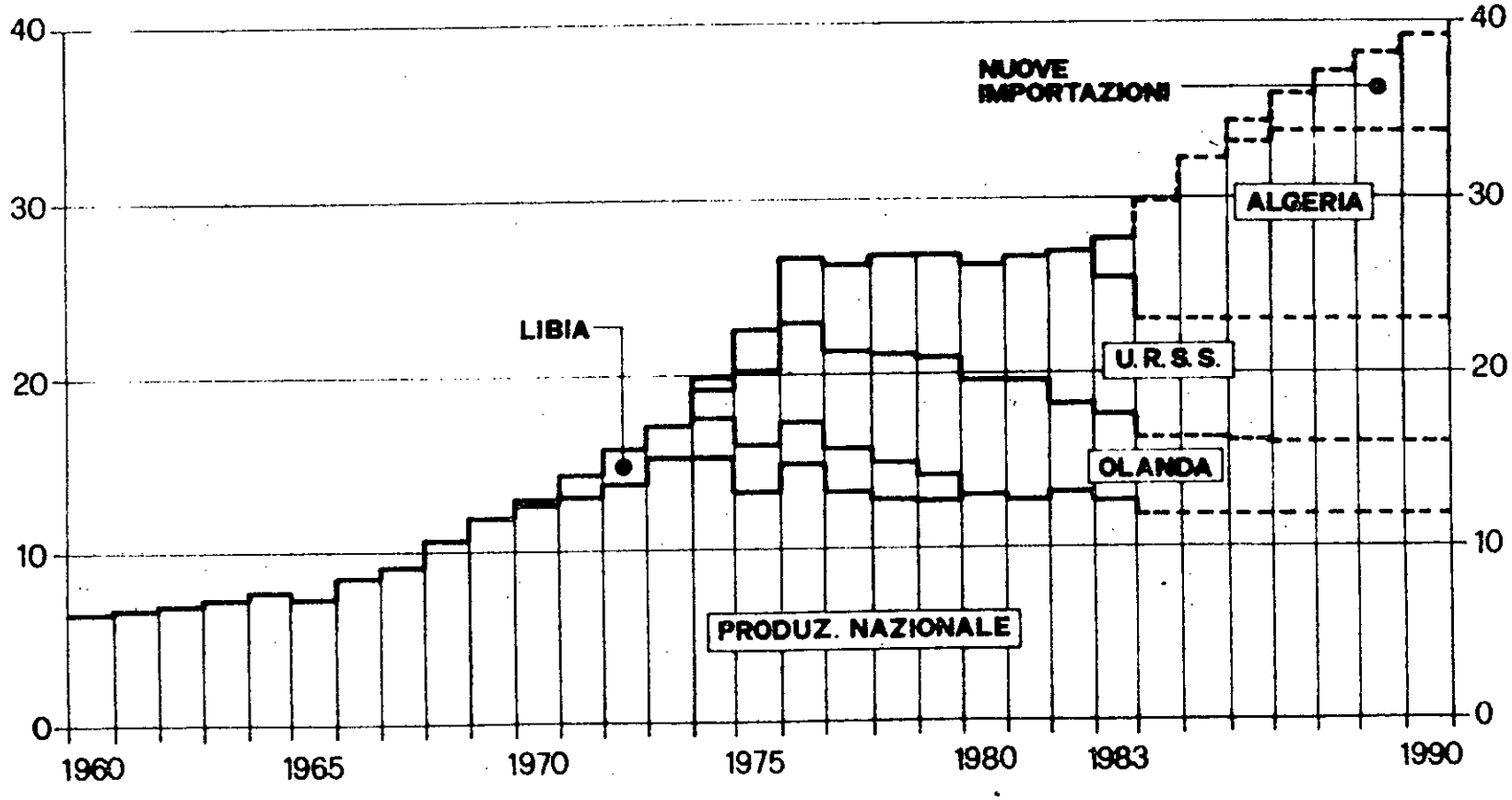
(miliardi di metri cubi)

Riserve Petrolio
92'000 10^6 ton
Consumi
2800 · 10^6 ton
Durata 33 anni



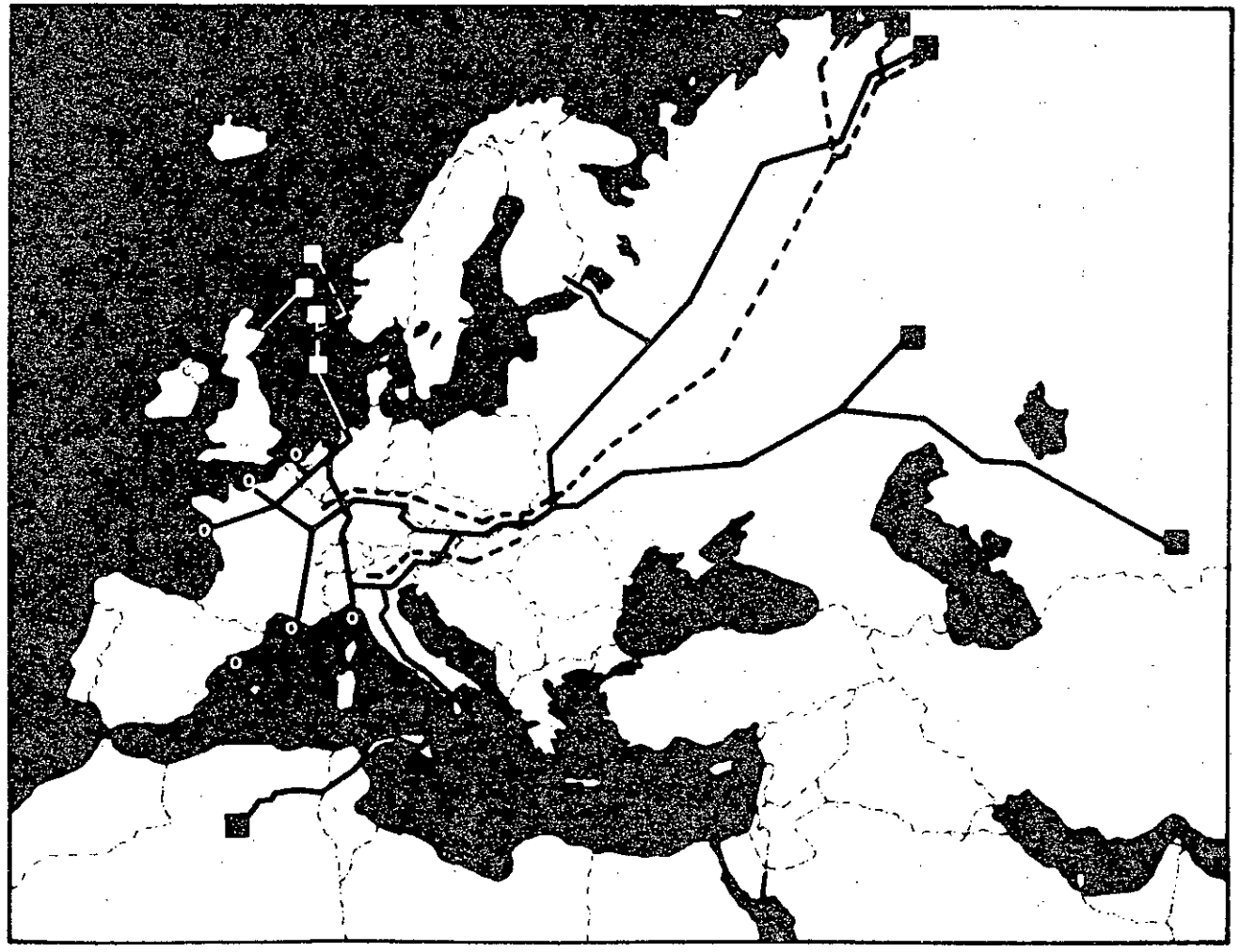
ITALIA
FONTI DI APPROVVIGIONAMENTO DI GAS NATURALE

miliardi di metri cubi



SISTEMA DEI GASDOTTI INTERNAZIONALI PER L'APPROVVIGIONAMENTO EUROPEO

1983

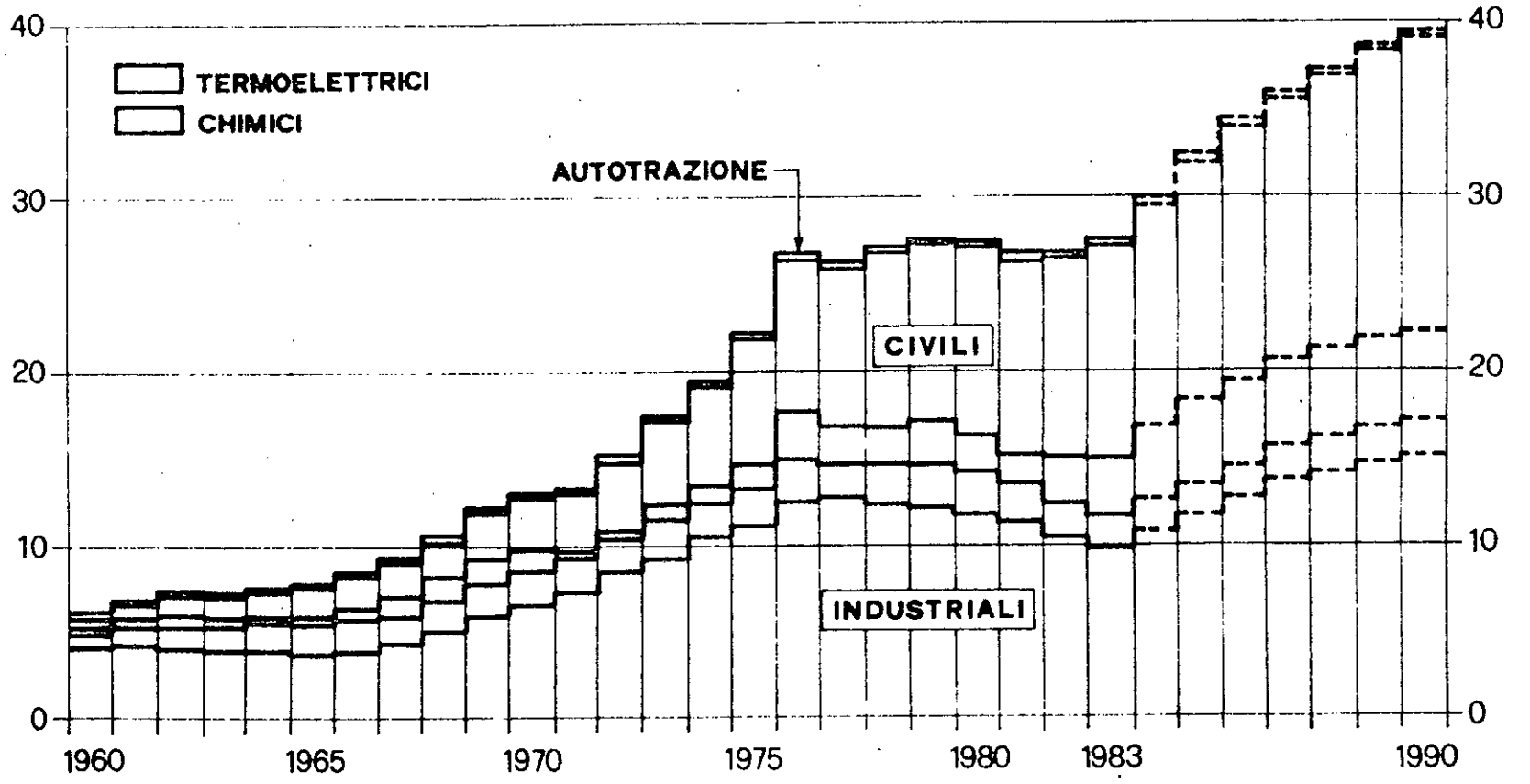


RIPARTIZIONE DEI CONSUMI DI GAS NATURALE PER GRANDI SETTORI DI UTILIZZAZIONE

	1970		1982	
	MILIARDI DI MC	%	MILIARDI DI MC	%
ITALIA				
CIVILI	3.0	23.4	11.5	43.1
INDUSTRIALI	6.1	47.7	10.5	39.3
CHIMICI	2.1	16.4	1.8	6.7
TERMOELETTRICI	1.6	12.5	2.9	10.9
TOTALE	12.8	100.0	26.7	100.0
TOTALE CEE A 9				
CIVILI	27.2	36.9	91.4	47.4
INDUSTRIALI	27.2	36.9	63.9	33.1
CHIMICI	5.9	8.1	12.6	6.6
TERMOELETTRICI	13.3	18.1	24.9	12.9
TOTALE	73.6	100.0	192.8	100.0

UTILIZZAZIONE DEL GAS NATURALE IN ITALIA PER SETTORI DI IMPIEGO

miliardi di metri cubi



PROGRAMMA DI SVILUPPO DELLE UTENZE CIVILI

(MILIONI DI FAMIGLIE)

	NORD		CENTRO		SUD		ITALIA	
	1982	1990	1982	1990	1982	1990	1982	1990
1) MERCATO POTENZIALE (1)	6.8	8.0	2.3	3.1	1.6	3.8	10.7	14.9
2) UTENZE SERVITE								
CUCINA	5.7	6.7	1.6	2.3	0.8	2.3	8.1	11.3
ACQUA CALDA	3.3	4.3	0.5	0.8	0.2	0.7	4.0	5.8
RISCALDAMENTO	3.2	5.0	0.8	1.4	0.2	0.9	4.2	7.3
DI CUI:								
CENTRALIZZATO	0.8	2.0	0.3	0.5	. .	0.2	1.1	2.7
AUTONOMO	1.6	2.1	0.4	0.7	0.1	0.4	2.1	3.2
STUFE	0.8	0.9	0.1	0.2	0.1	0.3	1.0	1.4

(1) FAMIGLIE RESIDENTI NEI COMUNI SERVITI DALLA RETE METANO.

PROGRAMMA DI VENDITA DI METANO IN ITALIA (MILIARDI DI MC)

	NORD		CENTRO		SUD	
	1982	1990	1982	1990	1982	1990
CIVILI	9,4	13,4	1,6	2,3	0,4	1,3
DI CUI:						
-CUCINA	0,6	0,7	0,2	0,3	0,1	0,3
-ACQUA CALDA	0,9	1,1	0,1	0,2	. .	0,2
-RISCALDAMENTO	6,2	8,7	1,0	1,4	0,3	0,7
-CENTRALIZZATO	1,7	4,0	0,3	0,5	0,1	0,2
-AUTONOMO	3,8	4,0	0,6	0,8	0,2	0,4
-STUFE	0,7	0,7	0,1	0,1	. .	0,1
-TOTALE RESIDENZ.	7,7	10,5	1,3	1,9	0,4	1,2
-TERZIARIO	1,7	2,9	0,3	0,4	. .	0,1
INDUSTRIALI	6,5	8,5	1,4	2,2	1,8	2,8
SINTESI CHIMICA	1,1	1,2	0,2	0,2	0,5	0,6
AUTOTRAZIONE	0,2	0,3	0,1	0,1	. .	0,1
TERMOELETTRICO	1,1	2,6	. .	. .	1,7	2,4
TOTALE VENDITE	18,3	26,0	3,3	4,8	4,4	7,1

PROGRAMMA DI VENDITA DI METANO IN ITALIA (MILIARDI DI MC)

	ITALIA	
	1982	1990
CIVILI	11,4	17,0
DI CUI:		
-CUCINA	0,9	1,3
-ACQUA CALDA	1,0	1,5
-RISCALDAMENTO	7,4	10,8
-CENTRALIZZATO	2,1	4,7
-AUTONOMO	4,6	5,2
-STUFE	0,8	0,9
-TOTALE RESIDENZ.	9,3	13,6
-TERZIARIO	2,0	3,4
INDUSTRIALI	9,7	13,5
SINTESI CHIMICA	1,8	2,0
AUTOTRAZIONE	0,3	0,5
TERMOELETTRICO	2,8	5,0
TOTALE VENDITE	26,0	38,0