FOR OFFICIAL USE ONLY

JPRS L/9685

23 April 1981

West Europe Report

(FOUO 22/81)

FBIS FOREIGN BROADCAST INFORMATION SERVICE

FOR OFFICIAL USE ONLY

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

JPRS L/9685

23 April 1981

WEST EUROPE REPORT

(FOUO 22/81)

CONTENTS

MODERNIZATION OF ALAT EQUIPMENT RELATED

Paris ARMEES D'AUJOURD'HUI in French Mar 81 pp 14-15

[Article by Colonel Bertrand de Lacroix de Vaubois: "ALAT Equipment Modernized To Meet Tactical Requirements"]

[Text] Upon graduating from Saint Cyr with the class designated "Ceux de [those of] Dien Bien Phu," the author, Colonel B. de Lacroix de Vaubois, elected to serve in the ABC [Armored Corps and Cavalry]. After commanding a helicopter flight and a hussar squadron, he attended the ESG [Army War College]. Upon graduating with the 86th ESG class, he was assigned to the 1st Army general staff. He later activated and commanded the 6th RHC [Combat Helicopter Regiment] in Compiegne. He was assigned to ALAT [Ground Forces Tactical Air Support] headquarters in 1978 and has been ALAT chief of staff since September 1980.

The first SA 342M/HOT [helicopter armed with HOT antitank missile] weapon system was issued to the 2d Combat Helicopter Regiment on 28 February 1980. The gradual assignment of this system to antitank squadrons is illustrative of the high command's desire to modernize ALAT's equipment.

This modernization program is prompted by the changing tactical requirements military helicopters have to meet. The opposing forces are predominantly armored, powerfully armed with surface-to-surface and surface-to-air weapons, and capable of conducting day and night operations. These forces are now adding helicopters armed with guns to their arsenal. These gunships pose a continuous and formidable threat not only within the European theater but overseas also, an area where this threat had heretofore been considered nonexistent.

To cope with this hostile environment, new technical solutions must continuously be sought.

Reduced Detectability and Vulnerability

The capabilities of battlefield detection systems are radically increasing. Initially limited solely to optical detection, the tracking and identification of helicopters is now being done with electromagnetic, thermal, and even acoustic sensors.

For these reasons, the SA 341 and SA 342 Gazelle helicopters have been so designed as to reduce their detection by the enemy. Their acoustic signature is one of the lowest of all the world's operational aircraft. Their thermal signature has been reduced by a special paint which lowers the level of infrared reflection, and also by the installation of jet deflectors (DDJ).

Their radar signature is reduced by using rounded shapes and composite materials which also have the advantage of lowering the helicopter's battlefield vulnerability while enhancing its reliability.

Two other factors contribute to heightening the survivability of our aircraft:

a. Improved engine performance enhancing tactical maneuverability;

b. Reduced size of our helicopters.

This deliberate choice of small special-purpose--and not multimission--aircraft is warranted for three reasons:

a. A cost and maintenance reason: purchase price and maintenance costs are proportional to the tonnage of the aircraft;

b. The direct relation between mass and the probability of detection, and also between volume and the probability of being hit;

c. A multimission aircraft implies increased mass and volume due to the weight of the ordnance and equipment carried. As a result, the helicopter's maneuverability is greatly reduced.

Increased and Diversified Firepower

ALAT's principal missions involve seeking, finding, and destroying enemy armored formations. These missions are conducted primarily by antitank helicopters supported by scout and reconnaissance helicopters, and possibly supplemented by special helicopter-borne infantry antitank warfare teams.

But the adversary conducts similar operations. Moreover, its equipment is becoming more powerful and its air defense weapons are more suitable. Its armored vehicles are armed with guns and missiles having greater range, and also greater accuracy thanks to an automatic fire control system. These increased capabilities, coupled with those of its helicopters that have now become formidable firing platforms, constitute a growing threat to the freedom of action and effectiveness of our units.

Consequently we must be able to "see sooner and farther" in order to employ our weapons with maximum accuracy while still remaining as undetectable as possible.

Seeing sooner and farther: this goal is achieved by employing the Athos sight mounted on top of the cockpit of the scout and reconnaissance SA 341's. With this sight, accurate detection and identification is possible out to a range of 4,000 meters.

Arming ourselves with more accurate weapons: the HOT missile has a reduced time of flight--17 seconds for 4,000 meters--and is practically sure to strike its target thanks to its infrared guidance system.

Furthermore, various items of equipment installed on the SA 342m/HOT, such as an autopilot and a self-contained navigation system, lighten the crew's workload, thus enabling it to devote more time and attention to its combat mission.

This employment of firepower is continuously evolving. For instance, in the next few years, target acquisition is expected to become more inconspicuous with the rotor mast-mounted optical sight--possibly coupled with a laser rangefinder--and the effectiveness of firepower should be improved with a homing "fire and forget" missile [words missing] that of the opposing helicopter with its flat-trajectory weapons and its future air-to-air missile. It has become urgent, therefore, to design a helicopter specifically for the protection of other helicopters and close air support. This aircraft, possibly derived from another helicopter, should have its own specific character so as to avoid a multimission capability detrimental to execution of its primary mission and to its tactical flight performance.

ALAT's Day-Night Combat Capability

Two constraints limit a helicopter's movement and fire support capabilities: night and poor weather conditions.

At a time when night operations are becoming more common and intensive in all of the world's armed forces, such a limitation on helicopter employment is no longer possible.

At the present time, ALAT already is capable of movement during a level 1 or 2 clear night, and by instrument flying, during a pitch-dark night except when there are icing conditions. ALAT is progressively increasing its capabilities by employing light-intensification binoculars that make low-altitude flights possible on much darker level 3 or 4 nights depending on the type of light-intensification scopes used.

Night firing from a helicopter will subsequently become possible with artificial illumination of targets by rocket flares. This capability is but a temporary stage pending availability of passive thermal-imagery devices which a few years hence are expected to make operational movement, vision, and firing possible at night even under unfavorable weather conditions.

Navigation, the major difficulty in night flying, is going to be greatly facilitated in coming years by installation of a self-contained navigation system independent of any infrastructure.

In conclusion, ALAT is endeavoring to meet the army's steadily mounting tactical requirements with new items of equipment coupled with new procedures.

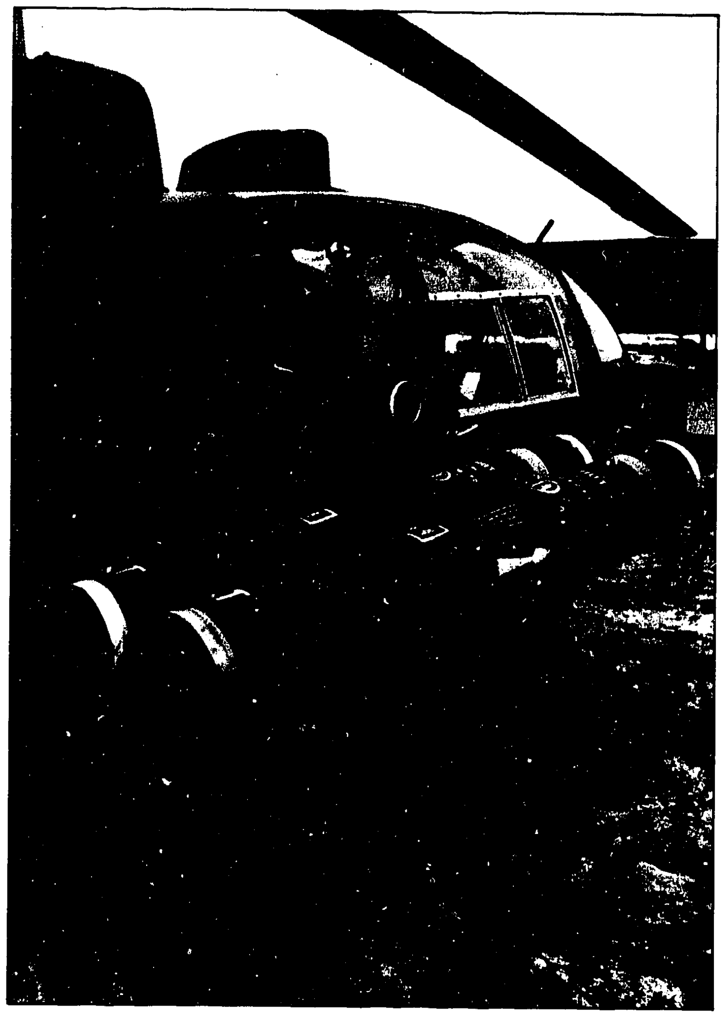
But such adaptation can be made only in successive stages, with each stage advantageously using the experience gained in the preceding stages. Such a method permits:

a. Quicker and more reliable development of necessary items of equipment;

b. Lower costs through better determination of design requirements;

c. Regard for the equipment's practical aspect, avoiding any inordinate sophistication. This aspect is verifiable from information obtained through use of preceding items of equipment.

Helicopter-mounted HOT antitank missiles



8041
CSO: 3100

ENERGY ECONOMICS ITALY

NATION'S ENERGY SCENARIO UP TO YEAR 2000

Rome ENERGIA E MATERIE PRIME in Italian Nov-Dec 80 pp 25-42

[Article by Giuseppe Centaro and Ettore Pont: "An Italian Energy Scenario to 2000"]

[Text] By using every energy source efficiently, it is possible, during the next 20 years, not only to increase the available per-capita energy but also to reduce the country's dependence on imported sources.

The second energy crisis in 1979 traumatically underscored the fundamental significance of the energy problem in the industrialized countries and particularly in the European countries where the heavy dependence on Middle Eastern petroleum decisively determines economic growth.

Inside Europe, the Italian position is therefore particularly critical since Italy --although it has one of the highest foreign energy dependence levels--has not yet managed to carry out a broadly-based energy program which would be capable of tackling the problems which must be resolved over the next several years in an organized fashion so as to guarantee the necessary energy supplies.

A contribution to the identification of a possible solution to meeting the country's energy needs and solving the pertinent problems was made in a study conducted by Fiat (1); starting with the idea of considering petroleum as a residual source, it analyzes the possible ways of meeting future Italian energy needs and indicates the lines along which Italian energy policy could move.

The study shows that, in spite of the great commitment demanded of the country in terms of energy savings and alternate source development, the share of requirements to be met with petroleum in the year 2000 likewise is still too high. It then points up the need for properly orienting petroleum consumption toward practically mandatory uses only.

Methodological Premise

To analyze the development of Italian energy needs we must take into account the characteristic aspects which distinguish the Italian energy system.

First of all we have the heavy dependence on imported energy sources (about 83 percent of our requirements) and particularly petroleum (99 percent); it plays a very significant role in the country's energy structure, covering 69 percent of the total energy requirements (Figure 1).

In second place, we have the low level of per-capita consumption in relation to that of the other advanced countries (Figure 2). Italy's per-capita energy consumption --though it does not reach the levels of the more advanced countries which reveal major phenomena of waste--should therefore tend to increase in line with the rise of the general living standards. This tendency toward a rise will however have to turn out to be compatible with the restrictive aspect represented by the heavy dependence on foreign energy. The lack of significant domestic energy resources availability as a matter of fact forces Italy to pursue an energy development aimed primarily at the objective of minimizing its energy dependence with particular reference to petroleum.

From that viewpoint, a reference scenario has been put together in which we evaluate the maximum availability levels for the various energy sources. These levels naturally were calculated taking into account the presumable availability and the international distribution of energy supplies as well as technical, structural, social, ecological, and institutional constraints which exist in relation to the various energy sources.

The assumption behind this scenario is that energy consumption generally will have to adjust to the supply not only regarding growth rates but also regarding the types of energy consumed. This adjustment can come about in a nontraumatic fashion through the entire economic system if, parallel to the efforts that must be made by all economic operators, we pursue the right kind of energy policies that--along the lines of what we have already achieved or launched--will allow us to reduce Italy's petroleum dependence to a minimum while at the same time guaranteeing the requirements necessary for the country's economic growth.

We therefore did not prepare estimates in the strict sense of the word but rather an analysis and an identification of the orders of magnitude and the types of problems that are going to have to be tackled in Italy to meet the country's presumable future energy needs.

The development of overall consumption has been calculated on the basis of the assumptions that the correlation between the growth rate of this variable and the growth rate of the gross domestic product (elasticity coefficient) will be reduced in time as a consequence of an improvement in the overall efficiency of energy use and a gradual reorganization of economic activities.

As students of this sector underscored many times, the choice of correlation between energy consumption and the PIL [Gross Domestic Product] entails numerous limitations.

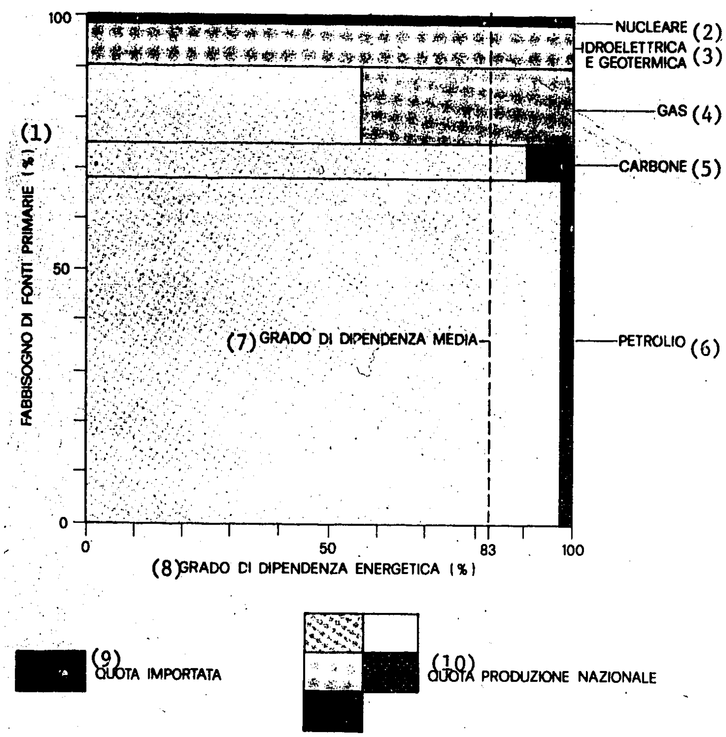


Figure 1. Degree of Italian energy dependence in 1978. The data pertain to an analysis as of March 1980. Key: 1--Need for primary energy sources (%); 2--Nuclear; 3--Hydroelectric and geothermal; 4--Gas; 5--Coal; 6--Petroleum; 7--Degree of average dependence; 8--Degree of energy dependence (%); 9--Imported share; 10--Domestic output share.

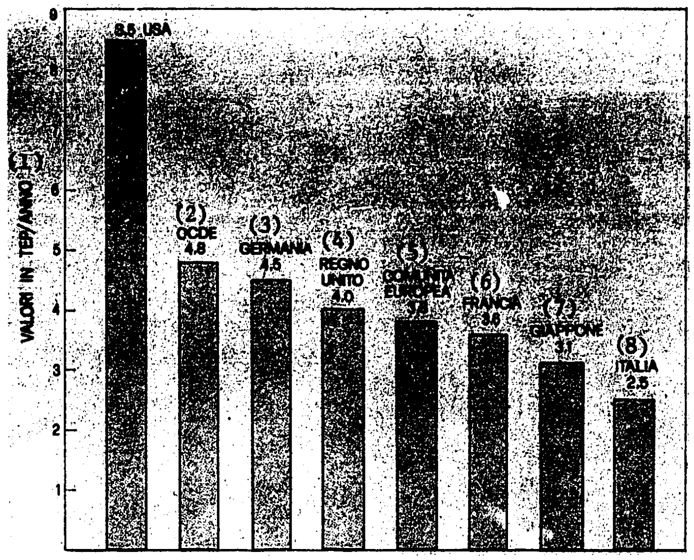


Figure 2. Per-capita energy consumption in 1978 (source: ENI [National Hydrocarbons Agency]). Key: 1--Values in tep [tons of petroleum equivalent] per year; 2--OECD; 3--Germany; 4--United Kingdom; 5--European Community; 6--France; 7--Japan; 8--Italy.

However, since the estimate of the development of energy consumption substantially serves only as an indicator of the consumption level which must be met through a responsible planning for the entire energy system, this type of approach appeared sufficiently acceptable for the purpose indicated.

The development of the energy supply was determined by calculating the maximum levels of domestic and imported nonpetroleum energy sources that could reasonably be available. The contribution from domestic sources, both mineral and renewable, was calculated by taking into account the maximum level which is technically attainable beyond the strictly economic limits.

The petroleum need which undoubtedly will be the need for which supply will turn out to be most critical both because of the available volumes and because of the prices, was obtained as the residual difference. The petroleum need level thus found therefore represents the share below which a sufficiently balanced and steady growth of the Italian economic system could be difficult to bring about.

Naturally, a development of nonpetroleum sources less than indicated would force higher petroleum requirements upon Italy which, in the light of the anticipated supply difficulties, woudl create problems for growth.

Development of Energy Consumption from Petroleum Crisis until Today

During the years after the first petroleum crisis, along with an increase in the income amounting to about 17 percent and a resident population growth of 2 millions (in other words, 3.6 percent), energy consumption developed much less dynamically; as a matter of fact, energy consumption went up only 6 percent during the period of time considered and that corresponds to an average annual increase of about 1 percent.

These small energy consumption growth rates, which are rather very low when compared to those prior to the 1973-1974 energy crisis (up 9 percent on annual average for the period 1960-1970 and up 5 percent during the period of 1970-1973), spring from the structural change which consumption itself experienced during the second part of the seventies in Italy. This change partly sprang from the logic of the development of the Italian economic system and was partly derived from the change in the development model which experienced a crisis due to the rise in prices caused by the Kippur War.

The behavior of the consumers and enterprises, influenced by the stiff relative rise in energy prices and the perception of the limits of available volumes, therefore was oriented toward more efficient energy use.

The dynamics of this improvement in the Italian energy system's efficiency can be provided roughly in the light of the development of the elasticity coefficient between the increase in energy consumption and the income; during the period of 1975-1979, it came to 0.7 as against figures of 1.6 during the period of 1960-1970 and 1.3 during the period of 1970-1973 (Table 1).

It must however be pointed out that the reliability or authenticity of the elasticity coefficient, especially during unsteady economic cycles, is not very great for two main reasons.

(1) Energy consumption can ideally be broken down into a variable part, tied to the income volume (for example, industrial consumption) and a fixed part, tied to needs that do not strictly depend on income development (for example, heating). This is why, theoretically, during periods of weak income dynamics (or negative income dynamics), the rate of fixed needs goes up and, hence, the elasticity coefficient tends to rise. This seems particularly true for electric energy where the fixed part has a major effect.

(2) A reduction in energy waste, even a modest one, will have an amplified effect on the elasticity coefficient because, while it has practically no effect on the growth of the PIL [GDP], it will on the other hand have a great effect on energy consumption increase. For example, looking at the 1973 statistics, covering a year not yet entirely influenced by the petroleum crisis (PIL up 7 percent, energy increase up 6.6 percent, elasticity: 0.94) and assuming an elimination of energy waste amounting to 1 percent (a figure which is not high since we were still in the era of cheap petroleum), the increase in consumption would have been only 5.6 percent, as compared to a PIL increase that remained practically constant (the 1 percent energy saved, hence not included here, has a negligible effect on the PIL).

On that assumption, the elasticity coefficient would have been 79, rather than 0.94, in other words, a reduction of almost 20 percent.

Table 1. Italian Energy Consumption Growth Rates

	4) Dati storici (1960-1979)						5) Previsioni (1980-2000)			
	60/70	70/73	73/75	75/78	75/79 (3)	78/79 (3)	80/85	86/90	91/95	96/2000
6) *Energia primaria*										
7) — Prodotto interno lordo (% medio annuo)	+5,53	+3,86	+0,17	+3,46	+3,83	+4,95	+2,9	+3,0	+3,0	+3,0
8) — Elasticità *(1)*	1,61	1,33	—	0,84	0,71	0,46	0,9	0,8	0,6	0,5
9) — Consumi energia (% medio annuo)	+8,93	+5,13	−2,46	+2,90	+2,74	+2,28	+2,6	+2,4	+1,8	+1,5
10) *Energia elettrica*										
8) — Elasticità *(2)*	1,40	1,56	—	1,65	1,43	1,00	1,35	1,25	1,15	1,00
11) — Consumi energia elettrica (% medio annuo)	+7,75	+6,04	+1,30	+5,70	+5,48	+4,90	+4,00	+3,75	+3,45	+3,00

(1) Si intende per coefficente di elasticità il rapporto tra il tasso di crescita dei consumi globali di energia e il tasso di sviluppo del Prodotto interno lordo.
(2) Si intende per coefficente di elasticità il rapporto tra il tasso di crescita dei consumi di elettricità e quello di sviluppo del Pil.
(3) I dati relativi al 1979 sono provvisori.

Key: 1--By elasticity coefficient we mean the ratio between the total energy consumption growth rate and the domestic gross product growth rate; 2--By elasticity coefficient we mean here the ratio between electricity consumption growth rate and the PIL [Gross Domestic Product] growth rate; 3--The data for 1979 are provisional; 4--Long-term data, 1960-1979; 5--Estimates, 1980-2000; 6--Primary energy; 7--Gross domestic product (% annual average); 8--Elasticity (1); 9--Energy consumption (average annual %); 10--Electric energy; 11--Electric energy consumption (average annual percent symbol).

Energy Demand

In the situation outlined above, the Italian energy demand was expected to grow over the next several years at reduced rates when compared to the past, in other words, at an average annual increase of 2.6 percent during the period of 1980-1985 and 1.9 percent during the period of 1985-2000 (Table 1). These figures, which are half of the figures for the time prior to the 1970-1973 petroleum crisis and which are one-third of the figures for the period of 1960-1970, derive from the interaction of two phenomena: slower economic growth when compared to the long-term figures and a reduction in the energy consumption elasticity as compared to the income.

Slower Economic Growth

Italy's economic growth over the next several years should turn out to be slower when compared to the long-term values. The PIL as a matter of fact will rise at average rates of 3 percent, in other words, equal to about half of the growth rates of the sixties and early seventies.

These low anticipated growth rates, which are considerably lower than the potential growth rate (5-6 percent), spring from a series of constraints already present in the Italian economic system and those constraints cannot be entirely overcome over the next several years. In particular, there is the difficulty in achieving significant productivity improvements in the entire economic system, the crisis in some industrial sectors, which are traditional moving forces for Italian growth, the rather shaky foreign account balance, and the continued existence of uncertain social and institutional conditions.

The restrictions on the improvement in productivity (low inclination toward manpower mobility, educational system's failure to supply adequate skill levels, high rate of labor conflicts, etc.) will not make it possible sufficiently to hold down the inflationary push, every time the demand tends to grow too fast. Taking into account the fact that the leeway for acting upon the other inflation factors is very narrow (the foreign inflationary push is difficult to control in Italy in view of our heavy dependence on raw materials and energy, while the cost of labor will continue to be quite rigid), the only way that can be pursued in Italy to keep the development of prices within acceptable limits will be to adopt restrictive policies whenever inflation exceeds certain safety levels.

The crisis in some traditional sectors, which are moving forces in the Italian economy (especially the big enterprises) already emerged in outline during the second half of the seventies; it will constitute a further restriction on growth since it cannot be totally overcome. As a matter of fact, the lack of growth in the primary sectors (steel, metallurgy, and petrochemistry will reveal a gradual shift toward the emerging countries which have basic resources) cannot be entirely compensated for by the development of traditional sectors or new activities with a high technological content. On the other hand, the traditional sectors (auto industry, machine-building, electrical household appliances, etc.) will not be able to maintain their long-term growth rates because of the (financial and institutional) difficulties which will obstruct the process of reorganization and conversion which is becoming necessary in order to improve the competitive capability on markets which will become ever more competitive. The third factor which will hinder the Italian economic system from achieving a high growth rate is represented by the rather shaky nature of Italy's foreign accounts. On the one hand, Italian exports, characterized by products that are highly sensitive to cyclic conditions in the world economy, are particularly exposed to international competition; on the other hand, the makeup of Italian imports (which, to the extent of 60 percent, consist of energy sources, raw materials, and semifinished products) means that any excessively fast domestic growth movement will create balance of trade problems.

As a final growth-limiting factor we finally have the uncertain social and institutional conditions which prevent investments from assuming the development-advancing role which they played during the fifties and sixties.

Table 2. Italy's Energy Dependence Degree (in Mtep)

3) Fonti primarie	1978			2000		
	4) Produzione nazionale	5) Importazione	6) Totale	7) Produzione nazionale	5) Importazione	6) Totale
7) Carbone	1,1	9,3	10,4	3,9	33,1	37,0
Gas	9,8	12,7	22,5	8,2	41,8	50,0
8) Petrolio	1,5	98,1	99,6	2,0	100,0	102,0
9) Idro + Geo *(1)*	11,4	—	11,4	15,0	—	15,0
10) Nucleare *(2)*	1,0	—	1,0	18,0	—	18,0
11) Solare + altre	—	—	—	8,0	—	8,0
12) Totali	24,8	120,1 (A)	144,9 (B)	55,1	174,9 (A)	230,0 (B)
13) Grado di dipendenza A/B%			83%			76%

(1) Nell'energia idroelettrica e geotermoelettrica non è stata considerata la quota di energia elettrica importata.

(2) La fonte nucleare è considerata nazionale dato che la maggior parte delle fasi di preparazione del combustibile nucleare (e quindi dei relativi costi), sarà effettuata in Italia o in impianti con partecipazione italiana.

Key: (1) The share of imported electric energy was not considered in hydroelectric and geothermoelectric energy; (2) the nuclear source is considered to be on the national level since the major portion of the nuclear fuel preparation phases (and hence the pertinent costs) will be handled in Italy or in plants with Italian participation; 3 -- primary source; 4 -- national output; 5 -- imports; -- total; 7 --coal; 8 -- petroleum; 9 -- hydroelectric plus geothermal (1); 10 -- nuclear (2); 11 -- solar and others; 12 -- totals; 13 -- degree of dependence A/B%.

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000300100048-5

Reduction of Energy Consumption Elasticity Compared to Income

The reduction of consumption elasticity compared to income, which emerged for the Italian economy starting in the early seventies, is destined to continue over the next several years.

This reduction will have a trend component and that is, also in the absence of external action, the elasticity should diminish spontaneously toward values close to one, as a consequence of the evolution of the development model. Taking this tendential reduction into account energy consumptions should rise from the current figure of 144.9 Mtep [millions of tons of petroleum equivalent) to 291 Mtep in 2000 (Figure 3).

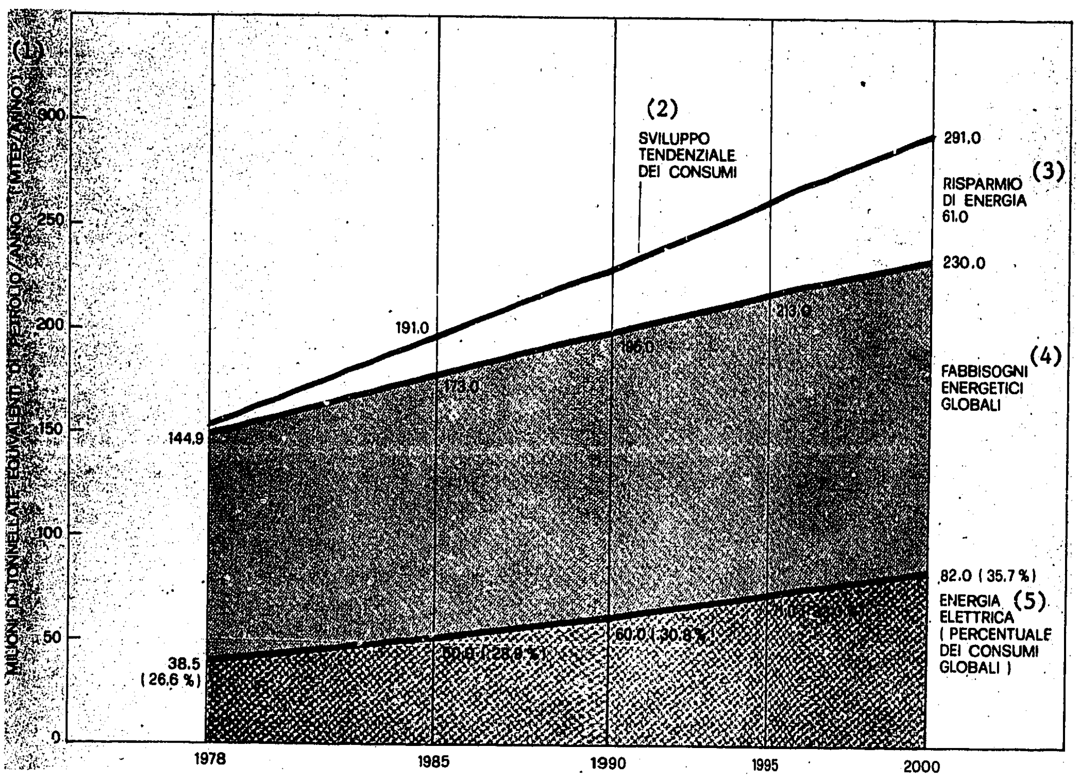


Figure 3. Overall energy consumption development scenarios in Italy and electric energy share, figured in millions of tons of petroleum equivalent. Key: 1--Millions of tons of petroleum equivalent per year (Mtep/year); 2--Consumption development trend; 3--Energy savings; 4--Total energy needs; 5--Electric energy (percentage of total consumption).

It is worth noting that the effect of this trend component--which takes into account the maturation of the Italian economic structure, which should approach the levels of the more advanced economies, characterized by lesser elasticity and economic growth rates--is rather revealing. Indeed, if energy consumption grows with an elasticity, compared to the income, similar to what it was during the sixties, then, by 2000, we would have an energy demand in excess of about 100 Mtep. In addition to the trend component involving a reduction in the elasticity coefficient, there should be another one necessitated for a series of reasons:

High energy price increases which, in real terms, will go up at average annual rates of 3-4 percent;

Repercussions of government policies providing an incentive for savings and efficient energy use;

Acceleration in the tendential process toward a structural change in the economy which will entail a reduced significance of the industrial sector (within which the high-energy compartments, such as steel, chemistry, etc., will lose importance) in favor of services;

Wide dissemination of energy-saving technological innovations in products and production processes;

Greater awareness of consumers and enterprises regarding the energy problems.

Overall, it was assumed that elasticity will decline from values of 0.9 during the early eighties to values of 0.5 toward the end of the century (Table 1).

Naturally, this further reduction in elasticity as compared to the trend figure will be possible only if all economic operators, both public and private, make a major effort to adjust the production structures and the energy utilization methods toward models featuring higher energy efficiency.

It must however be noted that, during the first half of the eighties, we assumed an elasticity higher than what we had in recent years (0.7 for the period of 1975-1979) since during that period of time it will be necessary to make investments for future energy savings. These investments involve greater use of energy the moment they are implemented. Furthermore, the savings margin following the elimination of the most obvious waste (in other words, waste that can be eliminated through management measures) has been reduced in recent years and therefore their effect on the elasticity coefficient will tend to diminish.

In absolute terms, the reduced annual need deriving from the mandatory component, that is, savings, will, in 2000, come to about 60 Mtep, that is, 21 percent of the total consumption which we would have had without that saving (Figure 3).

In summary: total energy consumption will rise from 145 Mtep in 1978 to 173 Mtep in 1985 and 230 Mtep in 2000 (Figure 3); the per-capital availability will register a good increase, reaching 3.9 tep [tons of petroleum equivalent] per year in 2000 (today it is 2.5 tep) while energy consumption per unit of added value will shrink to 17 percent, dropping from 0.8 kg of petroleum equivalent for every 1,000 lire produced down to 1.5 kg.

Electric Energy Demand

The demand for electric energy will also grow at lower rates compared to the long-term rates: up 4 percent for the average annual increase during the period of 1980-1985 and up 3.4 percent for the period of 1985-2000, against increases of 7 percent during the period of 1960-1973 (Table 1). However, the reduction will be much less accentuated with respect to total consumption which is why the electric energy share out of the total primary energy volume will rise from the current 27 percent to about 35 percent by 2000 (Figure 3). This percentage is in line with the share which electric energy has in the most advanced countries.

The increase in the electric energy consumption rate out of the total consumption volume, which already manifested itself clearly during the second half of the seventies (while electric energy grew at rates of 5.7 percent, total electric energy consumption grew at almost half that rate, in other words, 2.9 percent) is destined to be firmed up during coming years for a number of reasons:

Growing preference given to this form of energy because of its intrinsic qualities, such as "cleanliness," easy distribution, high employment flexibility, easily produced from nonpetroleum sources, etc.;

Highly limited share of nonobligatory uses which, as was confirmed in recent studies, only marginally involve uses for environmental and utility water heating;

Increase in needs of domestic and tertiary sectors due to the increase in the number of electrical household appliances used by families; in this connection it suffices to think of the fact that right now only 10-12 percent of the Italian families have dishwashers and freezers and that 20 percent of the family groups are still without laundry machines;

High efficiency of electrical energy uses which is why the rate of concentration measures is less than what can be achieved with other secondary energy sources.

The increase in the electric energy share does not rule out the possibility that there might be an improvement in the overall efficiency of electric energy consumption. It appears as a matter of fact possible for us to have a gradual reduction in the electrical consumption elasticity as compared to the income from current figure (1.4 for the period of 1975-1979) to values close to one by the end of the century.

The following factors will work in favor of a reduction in the elasticity:

The rise in electric power rates (particularly domestic rates) through an adaptation to the cost dynamics;

The foreseeable public support for the dissemination of environmental and utility water heating systems using solar energy;

The improvement in the yield of electrical appliances;

As a last factor we might mention a "mandatory restriction" deriving from the difficulty in increasing the electric energy supply at adequate rates in view of the current deadlock situation in the construction of new electric power plants; that constraint however could not be classified as a saving because--in view of the lack of available networks--it would lead to production bottlenecks and hence to a reduction in the PIL likewise in a very high proportion with respect to the value of energy that is missing here; furthermore, the "mandatory restriction" could lead to higher consumption of other energy sources.

Sector Development of Energy Consumption

Industrial Sector

The share of industrial consumption out of the total consumption volume will go down slightly during the next several years (Figure 4). This reduction is due to the smaller share which industry will get out of the total economy during the last part of the century but above all it is due to the reduction in specific consumption within the entire sector.

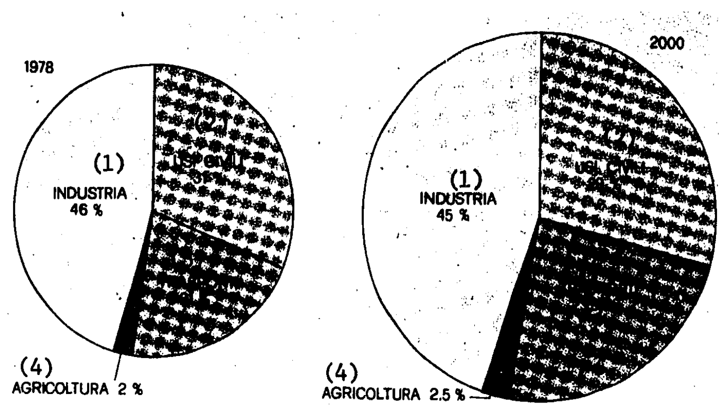


Figure 4. Distribution of final energy consumption in Italy by consumption sectors in 1978 and 2000. The higher consumption in transportation is due not only to the increase in trips but also the average number of cylinders per car. Key: 1--Industry; 2--Civilian uses; 3--Transportation; 4--Agriculture.

The reduction in specific consumption will be more evident than in other sectors and this will substantially contribute to the overall reduction in elasticity since industrial consumption represents the largest share of the total (46 percent). In particular, the rather weak development anticipated over the next several years in the energy-intensive department (steel, chemistry, petrochemistry, nonferrous metals and nonmetallic materials), which consume 70 percent of the entire sector's requirements, although they contribute only 8 percent to the formation of the total added value, obviously will have a significant effect on the entire reduction of total specific consumption.

This trend by the way already emerged in recent years; the reduction we have in per-unit energy consumption in the Italian industrial sector (during the period of 1972-1979 it dropped almost 15 percent) can as a matter of fact be traced back for the most part to the crisis in those sectors.

In the other industrial departments, growing energy costs and government actions to promote energy savings can bring about reductions on the order of 10-15 percent in per-unit consumption.

Domestic, Commercial, and Government Sector

Two opposing tendencies will be working on civilian uses of energy consumption which today amount to about 31 percent of the total consumption volume (Figure 4). On the one hand, we are going to have an increase in the per-capita electric energy consumption, due to the increase in the number and degree of utilization of electrical appliances, particularly electrical household appliances.

On the other hand, specific consumption for heating will shrink considerably due to a whole series of actions that should be undertaken, including the following: standards concerning environmental air conditioning, improvement of plant maintenance and handling, more rigid specifications for heat dispersion in new construction projects, incentives to improve insulation of existing buildings, development of solar plants, etc. Overall, we are going to have a reduction in specific consumption. This reduction will compensate for the greater weight which the services will have within the entire economy and the share out of total energy consumption will therefore go down.

Transportation Sector

Although per-unit consumption will be improved due to the effect of technological improvements and more efficient utilization of the various means of transportation, the transportation sector should increase its share out of the total consumption volume (Figure 4).

The energy consumption for public and private passenger transportation is destined to go up, although in the presence of the depressing effect caused by the heavy increase anticipated in fuel prices, with the subsequent foreseeable increase in the distances traveled (the current per-capita travel distances are rather low with 6,000 km/year as against 9,000 km/year in Germany) and the average number of cylinders in the Italian auto inventory (2).

Considering the current traffic congestion levels, the shortage of parking lots in the big cities, and the decline in population movements, urban traffic will on the other hand remain roughly lined up with current levels. The increase in the travel distances will mostly involve vacation and tourist traffic over long distances whereas--beyond the foreseeable increase in foreign tourism--we are going to have heavy increases in domestic travel by citizens. Per-capita spending for tourism as a matter of fact in Italy is still rather low; in 1977 it was 115,000 lire per year as against 205,000 lire among the Germans and 260,000 lire among the French.

The reduction in specific passenger transportation consumption therefore will to a great extent be tied to the improvement in automotive vehicle yield; this type of transportation as a matter of fact will continue to carry very significant weight out of the total (about 70 percent).

Freight transportation energy consumption will increase more markedly than passenger transportation due to the effect of the very sustained dynamics which freight transportation will experience following the process of industrial development in the South and the decentralization of industrial operations.

For freight transportation likewise, the reduction of specific consumption is essentially tied to the improvement in the yield of cars and commercial vehicles. These means of transportation as a matter of fact will carry significant weight in freight transportaion (about 50 percent) because of the difficulties involved in alternate transportation systems--when it comes to assuming a more important role and that particularly concerns the railroad and maritime-river transportation systems. These difficulties are essentially tied to the times and the dimensions of the financial commitment necessary to make these transportation systems efficient.

It is finally a good idea to recall here that a greater need for passenger and freight transportation will spring from the hoped-for tendency toward a more decentralized society which, by the way, is foreseeable. This tendency--also regarding passenger transportation--can partly be compensated by boosting the telecommunications system and will have a noteworthy effect on freight transportation.

Agricultural and Fishing Sector

The agricultural and fishing sector will slightly increase its share out of the total (Figure 4) above all because of greater energy needs tied to new industrial cultivation and cattle-raising systems. A large part of this need can be met with solar energy and by using vegetable and animal wastes.

Structure of Primary Energy Supply

The structure of energy supply, as we recalled earlier, was calculated by assuming the highest development which is realistically possible for domestic resources (in some cases refraining from any estimates as to the specific economy involved in those operations) and the maximum shares of nonpetroleum sources obtainable through imports; finally, we calculated the petroleum requirements as the residual difference of the anticipated consumption figures.

A substantial increase in coal, nuclear, and gas energy sources has been anticipated for the allocation of energy sources for various uses (Figure 5). These three sources--coal, nuclear, and gas--which today altogether cover 24 percent of our needs, will go up to 45 percent in 2000. This increase necessitates imports of gas and coal about 3 times greater than the current figures and the construction of at least 12 nuclear power plants of 1,000 Mw. Although renewable sources will more than double (that is, solar, hydroelectric, and geothermal), they will have the same effect as the current figures (as a matter of fact, we will go up from 8 percent to 10 percent here). On this assumption, petroleum's share out of the total requirements will go down considerably (from 69 percent down to 45 percent) but will still remain the most important energy source both in qualitative and in quantitative terms.

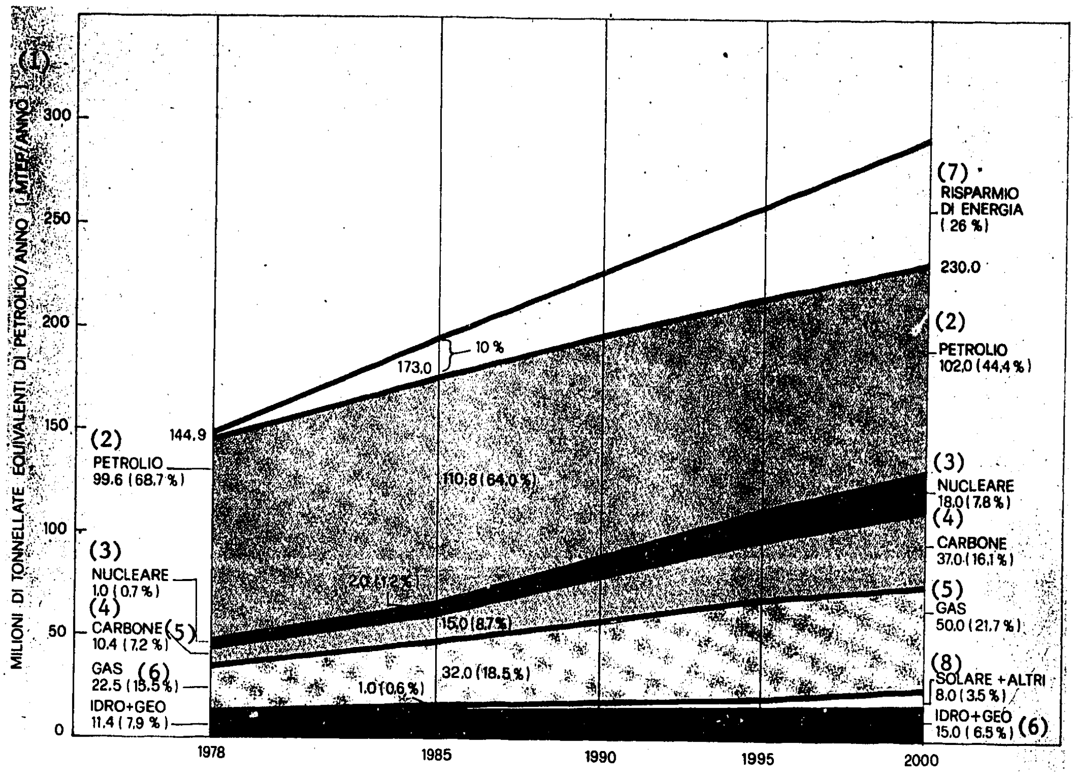


Figure 5. Overall Italian energy consumption development scenarios. The scenario is representative of the lower limits of the most probable development of the Italian economy and is based on a GNP growth rate (average annual percentage) of 2.9 percent in 1980-1985 and 3.0 percent in 1986-2000. As we can see, we assume a substantial increase here in the case of coal, nuclear energy, gas, and energy savings. Key: 1--Millions of tons of petroleum equivalent per year (Mtep/year); 2--Petroleum; 3--Nuclear; 4--Coal; 5--Gas; 6--Hydroelectric plus geothermal; 7--Energy savings; 8--Solar and miscellaneous.

It must be emphasized here that Italy's degree of energy self-sufficiency will not go up much; as a matter of fact, we will go up from the current 17 percent to 24 percent in 2000 (Table 2).

This evaluation of Italy's degree of self-sufficiency however does not take into account Italy's most important domestic energy source, that is, energy savings. According to estimates made earlier, this source, if properly stimulated, will be able to supply a virtual contribution of about 26 percent of the total anticipated consumption by 2000.

Energy Savings

Energy savings will play an important role in Italy's future energy situation. Its contribution has been estimated by assuming the implementation of strict and adequate policies and action measures in all final user sectors. In absolute terms it has been estimated possible for us to have a maximum contribution here amounting to about 60 Mtep in 2000 (Figure 5).

In industry we can achieve savings of 20-25 percent through the reorientation and conversion of the industrial machinery toward departments with less energy intensity (a process which in part will take place spontaneously), the introduction of energy-saving production processes, the organization of work and the maintenance of plants according to principles which will also take into account energy efficiency, etc.

Specifically, the most effective actions in the industrial sector look like this: recovery of residual heat, combined production of electric energy and heat, introduction of new production techniques (continuous casting and electric furnace in steel industry, development of production of aluminum through secondary methods, integration of processes which permit the joint utilization of energy sources, etc.).

In the area of civilian uses, savings can reach figures of 15 percent on short notice and 40 percent by the end of the century through an improvement in the heat insulation of buildings, greater efficiency of heating and electrical equipment (electric ranges, electrical household appliances, etc.), the development of centralized heating systems using the heat discharged by electric power plants, joint generation of electric energy and heat, introduction of systems for automatic temperature and energy flow control, etc.

In transportation we can achieve savings of 15 percent in the short run and 30 percent in the long run. These savings are attainable both through an improvement in the yield of transportation equipment (improvement of the weight/power ratio and the aerodynamic penetration coefficient, extension of direct injection, electronic control and switch to diesel engines, etc.) but also through a smoother traffic flow and combination of the various types of transportation.

In agriculture finally we can achieve savings of between 10 and 20 percent through better utilization of energy systems present in the agriculture system.

Hydroelectric Energy

According to recent estimates by the ENEL [National Electric Power Agency], the maximum additional hydroelectric contribution technically achievable--apart from considerations of economic convenience and practical implementation times--is about 12,300 GWh per year (2.8 Mtep), in other words, it is equal to about 27 percent of the current potential output.

This estimate of the added electric energy contribution takes the following into account:

(1) Plants already under construction, which will furnish a net natural production potential of 1,300 GWh per year (0.3 Mtep).

(2) All plants whose technical feasibility has already been ascertained by ENEL. Among those plants--which have an annual net output potential of 7,060 GWh (1.6 Mtep) and a gross efficient [effective] power of 3,484 Mw--60 percent reveal production costs comparable to those for thermoelectric production based on coal or nuclear energy. The other plants on the other hand reveal higher costs which in some cases turn out to be as much as 100 percent higher.

(3) Plants examined only in a general manner by the ENEL (whose complete feasibility has not yet been ascertained) and numerous small new or rebuildable power plants. These plants should have a total average annual output potential of 2,100 GWh (0.5 Mtep).

(4) Plants which could turn out to be technically feasible according to new studies by the ENEL or private or company proposals, as well as plants which use streams in the Po and Adige plains (the latter are important because they do raise problems of environmental change which are difficult to solve). The contribution from these plants would be about 2,000 GWh (0.5 Mtep).

Considering the constraints deriving from environmental protection and problems connected with the multiple use of water, we assumed that, by 2000, the added contribution would be only 10,300 GWh (2.4 Mtep) or in other words 85 percent of the entire attainable potential. In this way, the total average annual potential output would rise from 44.84 TWh to 55.20 TWh, in other words, 12.7 Mtep.

This kind of development of the hydroelectric source nevertheless means that we must resolve the previously mentioned difficulties of an environmental character and that we work out financial incentives and institutional efforts aimed at the construction of power plants which today are not economical (particularly those that must be built by private outfits). A very approximate estimate of the investments necessary to implement the entire program outlined (an additional 10,300 GWh) should be around something like 12 trillion lire (at current prices), including about 6 trillion for plants already under construction, with pumping plants included.

Geothermo-Electrical Energy

New contributions from geothermo-electrical plants, which use hydrothermal systems with a depth of no more than 3,000 m, should, according to ENEL, make it possible gradually to increase the current annual output by another 2,500 GWh (0.6 Mtep). This will make it possible by 2000 to double the current output with an installed capacity which would rise from the current 421 Mw to about 700 Mw.

The indicated availability could be further increased by drawing on hydrothermal systems at a depth of more than 3,000 m where the prospecting and exploration commitment is quite hefty. A further contribution can be derived from the use of some regions of low-enthalpy springs for civilian uses and agriculture.

For the moment however we cannot anticipate a contribution from dry hot rock systems.

The financial commitment for this program is difficult to estimate but we must figure that it would be around 500 billion lire (at 1979 prices).

Solar Energy

For solar energy we have assumed a contribution represented by a maximum ceiling attainable only if we have a massive and well-organized series of steps promoting the broadest possible dissemination of this sort. From that angle, the contribution of solar energy will come to 8 Mtep (3.5 percent of our needs) by 2000, including 7.5 Mtep from low-temperature and medium-temperature heat production and about 0.5 from electric energy production (Table 3).

Table 3. Estimated Direct Solar Energy Contribution (in Mtep) to Total Energy Output in Italy

	1985	1990	1995	2000	Installations by 2000
Civilian sector					
Environmental heating	0.23	0.46	0.81	1.26	Solar panels installed for environmental heat, about 40,000,000 m^2
Utility water heating	0.68	1.89	2.91	4.08	Housing units with hot utility water production from solar plants equal to 8,150,000 units (45% of inventory)
Industrial and Agricultural sector					
Water/air heating	0.09	0.58	1.14	2.09	
Total solar energy contribution for low-temperature thermal uses	1.00	2.93	4.86	7.43	
Electric energy generation	--	0.07	0.14	0.57	Plants for electric energy production: 200 Mw (solar, photovoltaic, wind) + 300 Mw (motor-generator groups supplied with biomass fuels)
Total solar energy contributions	1.00	3.00	5.00	8.00	

Concerning low-temperature heat generation, the department in which the solar energy penetration potential appears highest is the department of water heating for domestic, industrial, and agricultural uses. For these uses as a matter of fact we already have the technologies available and economic convenience has practically been achieved.

In particular, regarding the production of hot utility water for domestic uses, we can achieve a contribution of about 4 Mtep (Table 3) if about 50 percent of the housing units will, by 2000, be equipped with a solar plant for water heating.

This kind of penetration however cannot be achieved spontaneously. It will be necessary to remove the current procedural difficulties (housing construction permits) and launch a suitable policy providing incentives for the user, a policy of disseminating installation techniques and properly dimensioning those plants.

The financial commitment for such a program, on the basis of a unit cost of 1 million lire per plant, would be something like 10 trillion lire for the civilian sector only.

For uses different from the civilian sector (industry, agriculture, tertiary sector, etc.) we assumed a solar energy contribution for air and low-temperature hot water production of 2 Mtep.

The use of solar energy for environmental heating causes more complex technical problems especially in multifamily dwellings (difficulty in identifying areas for the placement of collectors, in transmitting the heat to the lower levels, etc.).

Economic estimates also turn out less favorable because of the higher installation costs and the fact that the need for environmental heating is present during the part of the year when insolation is least intensive.

The active contribution which can be furnished by solar energy for environmental heating--assuming a gradually growing penetration up to 80 percent for the new housing units built during the period of 1995-2000 and up to 35 percent for reconstruction of existing housing units--has been estimated at about 1.5 Mtep. To attain this objective it is necessary to have an output of about 1 million m^2 of solar collectors [panels] per year during the period of 1979-1985 which should gradually go up to 2.8 millions during the period of 1995-2000 (the 1978 output was 0.1 million m^2). By 2000, we would thus have installed about 40 million m^2 with an investment of something like 10 trillions at 1979 prices, without including investments for the "passive improvement" of buildings.

Overall, the active contribution from solar energy in the civilian sector could, in the light of our assumptions, come to 10 percent of the total requirements of that sector.

But the effect which solar energy (in all of its forms, such solar, wind, biomass, etc.) will have in the context of electric energy generation is very modest. The assumption that was made is that we would have 500 Mw installed by 2000 which could furnish us with 0.5 Mtep and 0.6 percent of the total primary needs to produce electric energy. Nevertheless, we must not underestimate the importance of its contribution for uses not connected with the electric power grid (where it is in many cases already a good thing today) and for the acquisition of the necessary experience to permit its broader development in long-range terms.

The modest contribution which has been anticipated for solar energy in electric energy generation essentially springs from the fact that, up to the end of the century, the contribution from this source will be furnished essentially by demonstration plants.

In the light of current studies and experimentation, this use of solar energy as a matter of fact appears far from the competitiveness threshold as compared to traditional sources, also in a situation where mineral fuel prices go up heavily. The use of solar energy for electric energy generation can grow rapidly only during the next century.

For a broader dissemination of those sources, it will be furthermore necessary to make major efforts in the development of methods of accumulation and storage or automatic insertion in the network; in this field very little has been done both on the international and domestic levels.

The assumptions for the development of the various forms of electric energy production through solar methods are as follows:

(1) Thermodynamic conversion of solar energy (for example, power plants with towers and distributed concentration systems): we assumed that, by 2000, we would have 90 Mw of power plants of this type installed (corresponding to 90 power plants of the Adrano type). Considering an average utilization of about 8 hours per day, they can furnish 240 GWh per year.

(2) Photovoltaic conversion: the generation of electric energy from the solar source by means of photovoltaic cells in long-range terms constitutes one of the most important alternate sources, although it is far from a competitive position today on a large scale and far from a sufficient energy yield (ratio between energy produced and energy spent on construction). Assuming that the costs of these systems can be considerably reduced also through demand incentives, we should be able to count on about 120 Mw of solar cells installed by 2000 essentially for widespread uses. Considering an average daily use of 8 hours, they can furnish about 260 GWh per year.

(3) Wind conversion: this source is closest, in terms of time, to the competitiveness threshold as compared to the traditional system.

We assumed that, by 2000, we will have about 10 Mw installed (corresponding to 20 power plants of the type currently under construction in Sardinia) with both small-sized and medium-sized (for widespread uses) and large-sized air motors. Considering an average annual utilization of 1,300 hours (15 percent of annual hours), the contribution from that source would be about 13 GWh. The relatively modest contribution from the wind source is also connected to the relative scarcity, in Italy, of places with particularly valid wind characteristics (only Sardinia as a matter of fact has good wind characteristics).

(4) Biomass conversion: the estimate of the energy contribution from the biomasses is rather difficult in the absence of an organization in Italy which would make a survey of these resources, as well as the lack of precise technical-economic estimates of the various possible destinations or ultimate uses (also as alternatives to energy sources), exploitation methods, etc. It has been considered in this connection that the contribution which one might get from the biomass would essentially be converted into biogass and alcohol and would be employed as fuel for motor-generator groups for small and medium users. We assumed that, by 2000, we would have installed 300 Mw of the small and medium motor generators which , with an average annual utilization of 75 percent, could furnish about 2000 GWh.

Table 4. Percentage of Electric Energy of Nuclear Origin (year 1978) in Principal Countries (1)

	Electric energy share of nuclear origin out of total electric energy output (%)	Nuclear electric energy share out of total thermal electric energy output (%)
Sweden	25.1	68.3
Belgium	24.5	24.8
Switzerland	18.4	81.7
France	13.3	19.5
U. S. A.	12.1	13.8
United Kingdom	12.1	12.3
Germany	10.2	10.8
Japan	9.9	11.5
Finland	9.1	12.8
Canada	8.8	29.1
Spain	7.6	13.3
Holland	6.5	6.5
Italy	2.6	2.8

(1) Up to date and complete statistics are not available for the USSR and the CEMA countries which however are heavily committed to the pursuit of nuclear programs. The heads of government of the CEMA countries signed a collaboration agreement for a nuclear energy development plan which will raise the installed capacity in the area of the CEMA to 150,000 Mw in 1990. Source: Statistical Institute of the European Communities, UN.

Table 5. Problems Pertaining to the Movement of Coal for Electric Power Plants in Italy

		For one 4x640 Mw power plant	For all power plants installed by 2000
Mw		2,560	23,300
Coal requirements (Mtec/year)		5 (1)	38 (1)
Corresponding petroleum needs (Mtep/year)		3.5 (1)	24 (2)
Number of port coal terminals (10 million t/year)		0.5	3.8
Number of ship trips per year (20,000 t/year)		250	1,900
Frequency of ships tieing up at terminals (ships per day)		2 every 3 days (0.7)	5/day (5)
Number of railroad trains per year (10,000 t/train)	coal	500	3,800
	ash	55	418
Frequency of railroad train runs (trains per week)	coal	10	73
	ash	1	8

(1) Lower calorific power of coal: 7,000 kcal/kg; (2) Lower calorific power of coal: 6,000 kcal/kg.

Natural Gas

We anticipate a very significant development of this sort. Indeed, immediately available resources, worldwide, are very abundant and the intrinsic characteristics (low pollution, easy distribution, high efficiency and flexibility of use, etc.) permit wide employment for civilian uses and high-efficiency uses (uses in industrial technology, joint generation, combined cycles, etc.); the possibility of supply contracts through the methane pipeline permit greater supply reliability as compared to petroleum supplies.

It must however be noted that natural gas does not always constitute a structural alternative to petroleum since its production is often tied to that of petroleum.

For 1985, the additional gas availability (about 12 billion m^3, equal to 40 percent of current consumption) will derive entirely from the increase in imports under current contracts. Libya, Holland, the USSR, Algeria, and Nigeria, as a matter of fact are to supply Italy with 28-30 billion m^3 of gas. No added contribution however can be expected from domestic production which will remain around current levels (12 billion m3).

For the following years, considering that domestic availability will decline slightly to 10.2 billion m^3 in 2000, it will be necessary to make a major effort to work out new import contracts also by virtue of the fact that the current contracts with Libya, Holland, and the USSR will run out before 1995 (Figure 6).

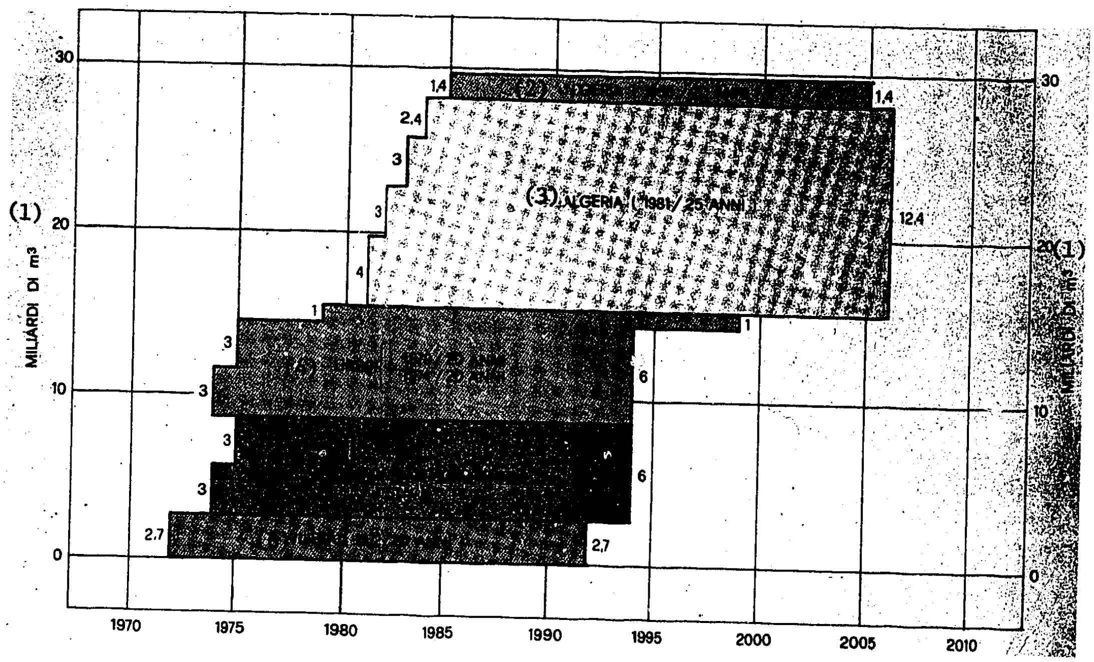


Figure 6. Current availability of imported natural gas in Italy. Key: 1--Billions of m^3; 2--Nigeria (1985/20 years); 3--Algeria (1981/25 years); 4--USSR (1979/20 years, 1974/20 years); 5--Holland (1974/20 years); 6--Libya (1972/20 years).

The maximum quantities that can reasonably be obtained through imports by 2000 are as follows: 12.4 billion m^3 from the contract already signed with Algeria; 1.4 billion m^3 from the contract with Nigeria; 5.6 billion m^3 which can derive from a further contract with Algeria which would make it possible to increase the transportation capacity of the current methane pipeline up to 18 billion m^3; 30-35 billion m^3 which, on the basis of current worldwide availability, can be gotten through new contracts; for example, we could get a share out of the possible doubling of the Algerian gas pipeline which might involve other European countries.

The gas will be used for the most part in the industrial sector and the civilian sector; however, a portion (about 10 percent) will continue to be used in electric energy generation in high-efficiency plants. Extensive use of gas however calls for a major effort to adjust the transportation and internal distribution structures.

We can get an idea of the financial commitment necessary to put up the transportation infrastructure from a comparison with the expenditures necessary for the construction of the Algerian gas pipeline from the Algerian-Tunisian border to Minerbio-Bologna and the accessory facilities. This project calls for investments totaling 3,625 billion lire over a span of 10 years.

We must furthermore consider that the gas quantities to be secured can make it necessary to import also from very remote localities so that, in addition to the methane pipelines, we will also have to have an adequate fleet of methane tankers and we are going to have to put up liquefaction and gasification plants.

Regarding domestic distribution, we are going to have to make a significant effort particularly in the south where adequate use of methane coming from Algeria is today not fully feasible if we realize that, as of 31 December 1975, out of 1,292 communities with a methane distribution network, only 44 were located in the South. It furthermore emerges from the "Indagine sulla situazione termica del riscaldamento degli edifici" [Survey on Thermal Situation in Building Heating] of the CNR [National Research Council] that only 5.8 percent of the housing units in the South use a gas heating system (city gas and methane) as against 32.1 percent in the North and 19.2 percent for the national average.

Nuclear Energy

Nuclear energy has already assumed an important dimension on the worldwide level. As of the end of 1979, nuclear electric power output exceeded the cumulative level of about 3.3 trillion kwh in the OECD countries with an operational power output of 125,000 Mw coming from more than 200 power plants. Power plants for another 300,000 Mw furthermore are under construction or have been ordered.

The contribution to the production of electric energy from nuclear sources in almost all countries has grown to a significant share: between 10 and 20 percent (Table 4) and destined to go up further.

Contrary to what happened in the majority of the other countries, nuclear energy in Italy, after the promising start during the early sixties, has been marking time (the nuclear source as a matter of fact in Italy only accounts for 0.7 percent of the total consumption and 2.6 percent of the electric energy needs); nevertheless, the need for using this source has been underscored in several quarters. From the National Energy Program, approved by the CIPE on 23 December 1925, to the recent Venice conference in January 1980, we have had a whole series of motions, position statements, expert reports, etc., which underscored the need for Italy also resorting to the use of nuclear energy.

On the international level likewise more and more emphasis has been placed on the need for promoting a vigorous revival of programs for the development of electric nuclear power plants and coal-fired power plants, along with an intensive policy aimed at the efficient use of energy and the development of renewable sources.

The nuclear option furthermore offers an undeniable economic advantage as compared to the other fuels. As a matter of fact, although the installation cost is rather high (for a nuclear power plant, the installation cost is about 1 million lire per kw, while it is 700,000 for coal-fired power plants and 500,000 for plants running on fuel oil), the cost of producing 1 kwh of nuclear origin (including also the fuel reprocessing costs and the power plant dismantling costs) is by far less. Recent studies--which compare nuclear power plants of 2,000 Mw with coal-fired or fuel-oil power plants of 2,560 Mw, used 6,000 hours per year--indicate production costs of 20 lire/kwh for nuclear power plants, 26 lire/kwh for coal (excluding special pollution control devices), and 50 lire/kwh for plants running on fuel oil.

Concerning the safety problem, the majority of speakers at the Venice Conference (including technicians, politicians, and representatives of the social forces) noted that the degree of risk entailed in nuclear power plants is be far less than what it is in other industrial plants. The zero risk degree required by nuclear option opponents is not possible in any human action and therefore not even in the nuclear field.

Rather than making reference to the maximum technical-economic implementation possibilities of Italian industry, estimates for nuclear energy are based on the program approved by parliament.

From that viewpoint it was assumed that 4,000 Mw would gradually go into operation for every 5-year interval during the period of 1985-2000; that would make it possible to have the 12 power plants of 1,000 Mw, each, as provided for by the 1977 PEN, in operation by 2000; those plants would make a primary energy contribution of 18 Mtep.

Considering that it takes about 7 years to get a power plant started (to which we must add the period of time for processing the authorization and permit, for initial start-up and for final inspections), we should, this year, start work on the 2,000-Mw plant at Montalto di Castro and during 1981 we should start work on another 2,000-Mw power plant already ordered although the specific site has not yet been picked for it. The other power plants, covering the remaining 8,000 Mw, should be contracted out during the following years.

In addition to the existing power plants (Trino, Garigliano, Latina, and Caorso), only the Cirene prototype will be available for 1985 plus the ENEL share of 400 Mw from the 1,200 Mw Superphenix reactor, built together with the French EDF [French Electric Power Company] and the German RWE [Rhine-Westphalian Electricity Works, Inc].

The financial commitment involved in the Italian nuclear program can, at current prices, be figured at about 12 trillion lire.

Coal

Coal will play a double role in the Italian energy structure: as a matter of fact, it will have to reduce Italy's dependence on petroleum and it will have to make up for delays in the implementation of the nuclear power plant program.

The timeliness of a return to the use of coal for energy uses is justified by the good prospects of coal imports at more convenient prices when compared to petroleum (the average current cost of crude as a matter of fact is about $30 per barrel, equal to $220/tep, while the average cost of coal is about $50/tec [tons of coal equivalent], in other words, about $80/tep) as well as the vast coal reserves available worldwide.

Major development of coal use in the generation of electric energy and for industrial purposes (cement plants, brick factories, etc.) has been anticipated.

Looking at the generation of electric energy, it has anticipated that, by 1985, the conversion to coal of an inventory of 6,800 Mw of existing thermoelectric power plants will be completed. For the succeeding years, it has been assumed that additional power plants will be built gradually for 16,500 Mw.

The coal-fired power plant inventory in the year 2000 will therefore be equal to 23,300 Mw with an annual coal consumption of 38 billion tons (24 Mtep) as against 3.2 consumped in 1979.

For non thermoelectric uses, we expect to increase from the 8.8 Mtep consumed in 1978 to 13 Mtep in the year 2000.

The total requirement for coal used in Italy thus will go up about 4 times by 2000, exceeding the current 15 million tons by more than 55 million tons, corresponding to about 37 Mtep (Figure 5).

Considering the potential of the Sulcis Basin (about 4 million tons per year) and the quantities of lignite or other fuels similar to coal (wood, solid urban and agricultural waste, etc.), maximum domestic supplies could come to about 4 Mtep by 2000 (today the figure is 1 Mtep). Regarding coal from the Sulcis Basin, considering the serious environmental problems due to the high sulfur content, its optimum use can come about only due to the development of advanced technologies, such, as for example, gasification tied in with plants having a combined cycle with high-temperature gas turbines or through its conversion into methanol.

The supplies to be obtained abroad assume significant dimensions in 2000 (about 33 Mtep as against the current 11) and it therefore seems necessary to draft a long-term supply policy which would spell out the roles of the agencies involved so as to coordinate their action on the various markets. It will furthermore be necessary to spell out a policy of collaboration with supplier countries, drawing up long-term contracts and if necessary participating in mining activities.

The most important problems to be tackled in order to increase the use of coal in the dimension indicated are those connected with transportation. As a matter of fact, we must remember that every 2,560-Mw power plant currently consumes 5 million t of coal and that it therefore takes 250 trips per year for ships of 20,000 t with almost daily tie-up frequency and pertinent unloading operations.

If that coal is to be transfered by train, we are going to have to have 500 trains of 10,000 t per year, in other words, 10 trains per week (Table 5). A partial solution to the problem of transportation can be provided through the proper development of the coal-oil system, that is, the transportation of a mixture of coal dust with heavy petroleum products.

Another problem is represented by the disposal of ash. As a matter of fact, for a 2,560-Mw power plant, we need 55 trains per year, in other words, one every week, merely to transport the ash, as well as adequate facilities for its sale and utilization.

It has therefore been estimated that, for the coal-fired power plant program indicated (23,300 Mw) we would have to have the following (Table 5): (1) four coal terminals of 10 million t/year by 2000; (2) a considerable increase in the transportation capacity of ships, railroad trains, etc.; this presupposes the immediate start of a rather impressive program for the adaptation of the collier fleet, the railroad rolling stock, the railroad net itself, etc.; (3) installation of dumps for ash and/or its utilization in the production of highway surfacing, floor tiles for housing construction, etc.

Finally, to be able to solve the serious environmental problems connected with the use of this source, we will have to step up the effort to develop new technologies of gasification and liquefaction which, in addition to making it possible to limit the impact upon the environment, will permit more efficient use of coal.

The financial commitment required for such a program is certainly considerable but it is difficult to estimate since action is required on several fronts, as we said before. For example, it has been calculated that, to develop 1 t of annual coal production capacity (mining activities, infrastructure facilities, transportation all the way to the consumer), it is currently necessary to invest between $100 and $150, that it, about 130-200 billion lire for every Mtep per year.

The investment for the new coal-fired thermoelectric power plants alone (16,500 Mw) should be on the order of 12 trillions.

Petroleum

The share of requirements covered by petroleum has been calculated as the residual difference between the level of the total energy demand and the maximum development share anticipated for the other sources.

The contribution from the petroleum (Figure 5) thus calculated will go up until 1985, rising from the current 100 Mtep to 111 Mtep; thereafter, its contribution will level off around those figures (109 Mtep in 1990) and it will then slowly decline in the last part of the century to level off by 2000 around the current figures (102 Mtep in 2000).

In spite of the resolute energy savings effort planned and the commitment indicated for the development of alternate sources, the share of requirements covered by petroleum, although declining (from 69 percent today to 45 percent in 2000) will continue to remain the biggest (Figure 7).

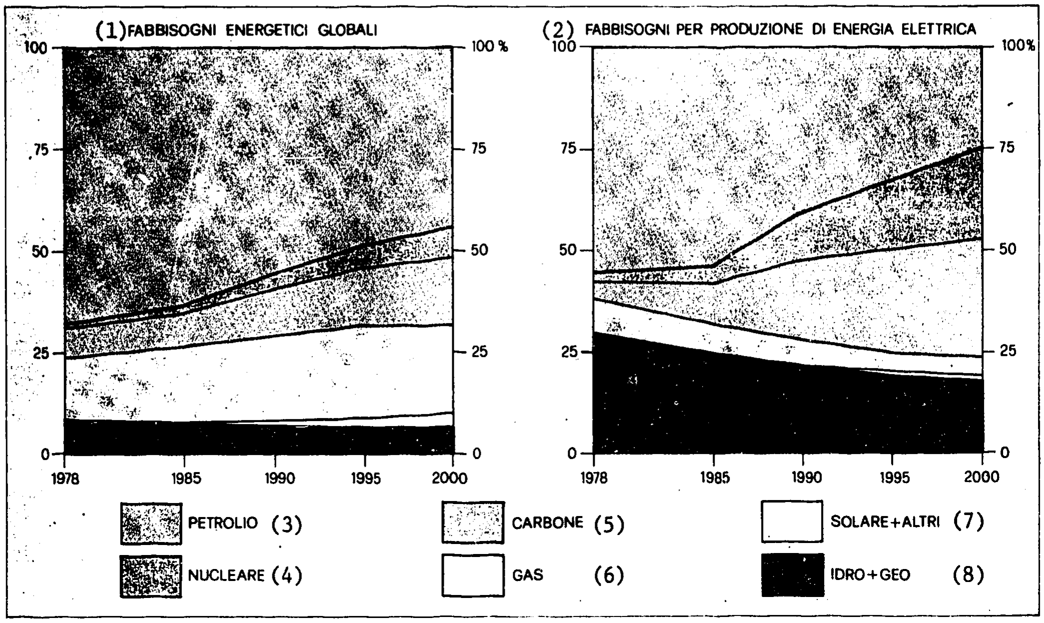


Figure 7. Percentage distribution of energy sources in Italy during the period of 1978-2000 to meet total energy needs and for the generation of electric energy. Key: 1--Total energy needs; 2--Requirements for electric energy generation; 3--Petroleum; 4--Nuclear; 5--Coal; 6--Gas; 7--Solar and miscellaneous; 8--Hydroelectric and geothermal.

Although these quantities of petroleum turn out to be below the imported quantities which were granted to Italy by the EEC (124 Mtep for the year 1985), the petroleum requirements, in absolute figures, remain very high in relation to the problems of instability concerning availability and prices anticipated on the international market.

The level of worldwide consumption is now very close to the maximum worldwide production capacity and, given the uncertainty of these estimates, we might, even on short notice, run into supply shortage situations. This particular situation, combined with the high cost of investments for the development of alternate sources, will bring about a heavy rise in petroleum prices.

In addition to the cyclic progress of the international economy, with the subsequent rise and decline in the petroleum demand, the policy of the producer countries increasingly oriented toward cutting down their own output in order to extend their petroleum resources as much as possible in terms of time, the social-political instability of the petroleum producing areas--these in the future will more and more frequently create cyclic imbalances between demand and supply.

The estimate of requirements for individual petroleum products, made in the study, evidences the major reduction, between today and 2000, in the mix, with a particularly noteworthy increase in medium distillates (gas-oil), a moderate increase of light distillates (gasoline), and a drop in fuel oil.

This therefore will introduce the need for converting Italian refineries, increasing the medium distillate production capacity, also taking into account the anticipated growth of the package of crude imported into Italy.

To look into the possibility of further reducing Italy's petroleum needs in case of emergency, we have finally attempted an estimate of the practically mandatory petroleum requirements (Figure 8).

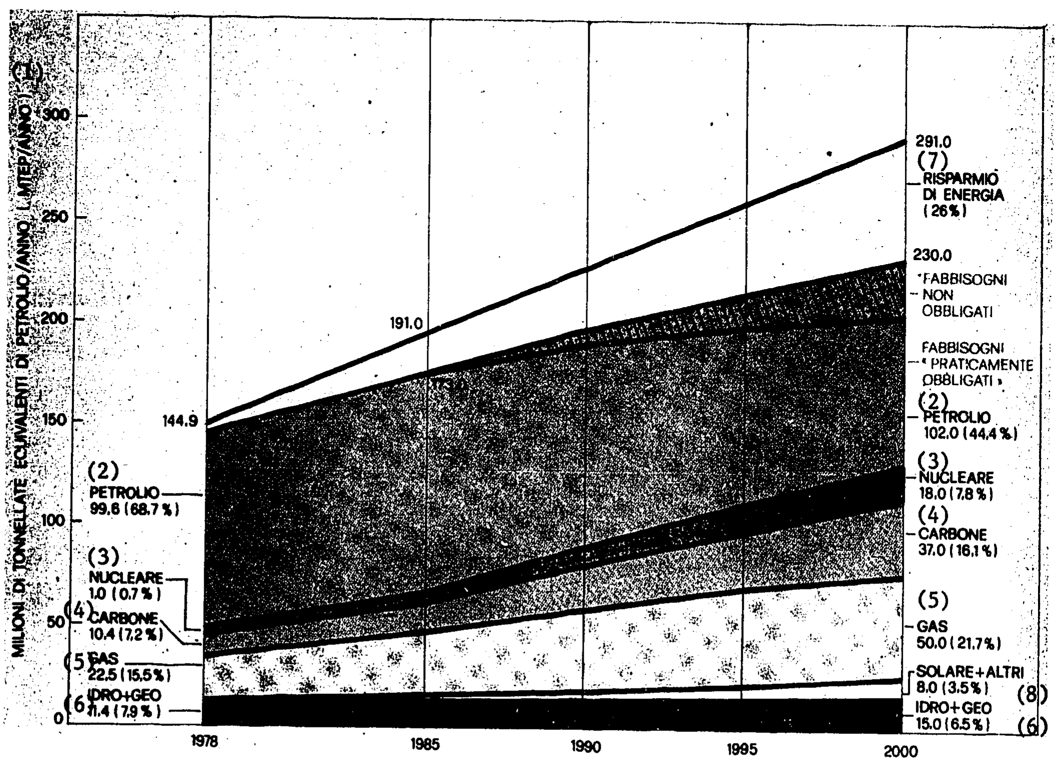


Figure 8. Scenarios for total energy consumption development in Italy. By "non-mandatory" needs we mean needs for petroleum products which are not strictly obligatory, that is to say, other sources can be used as replacements; they will experience a major percentage increase, although they will continue to be dangerously limited Key: 1--Millions of tons of petroleum equivalent per year; 2--Petroleum; 3--Nuclear; 4--Coal; 5--Gas; 6--Hydroelectric and geothermal; 7--Energy savings; 8--Solar and miscellaneous.

Fabbisogni non obbligati=Nonmandatory needs

Fabbisogni "praticamante obbligati" = "Practically mandatory" needs

This estimate indicates that the leeway of the Italian economic system in the case of a supply shortage is very limited since the share of petroleum consumption that cannot be replaced with other sources is very high, about three quarters of the total (Figure 9).

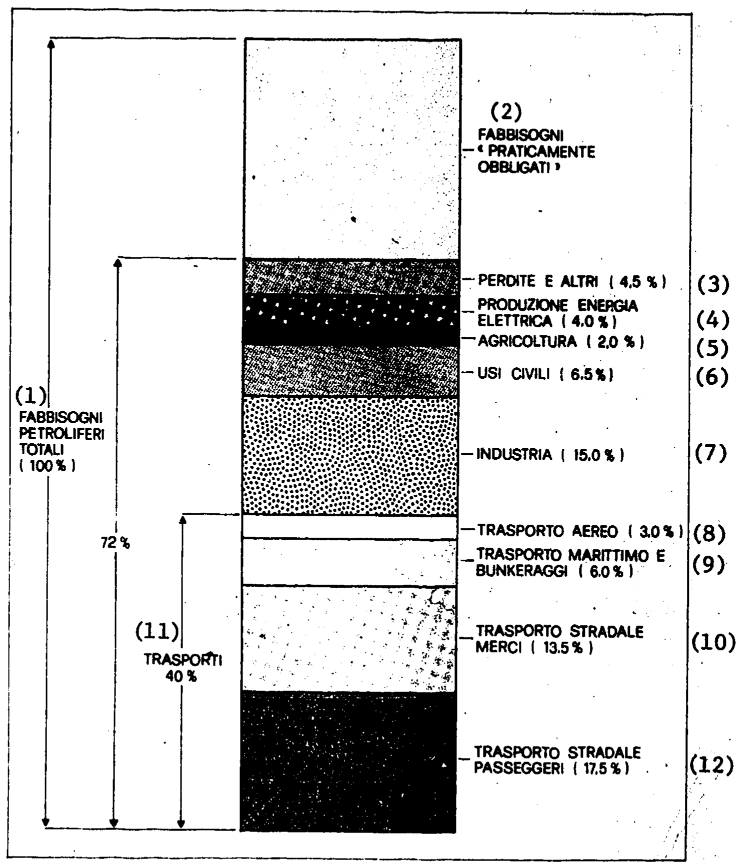


Figure 9. Assumptions of "practically mandatory" requirements for petroleum products for the year 2000 by utilization sectors. For the production of basic electric energy we assumed a substantial reduction in the use of petroleum. Key: 1--Total petroleum needs; 2--"Practically mandatory" needs; 3--Losses and miscellaneous; 4--Electric energy generation; 5--Agriculture; 6--Civilian uses; 7--Industry; 8--Air transport: 9--Maritime transport and bunker oil; 10--Highway freight transportation; 11--Transportation; 12--Highway passenger transportation.

The importance of petroleum in the Italian energy system which is not only quantitative but also qualitative since it will have to meet essentially mandatory needs, such as those pertaining to transportation, particularly highway and air, and petrochemistry, in addition to theoretically nonmandatory but practically difficult to substitute uses. For some theoretically nonmandatory uses however it does not seem realistically possible to achieve immediate substitution using other sources without taking into account the profound modifications that would have to be made in the energy system. To estimate the practically mandatory needs (Figure 9) we assumed a substantial reduction--gradually growing until the year 2000--of the use of petroleum for basic electric energy generation, therefore limiting its use essentially to modulation and peak services only. A marked reduction in petroleum needs was furthermore assumed for environmental heating and for industry. Naturally, these minor petroleum needs will have to be made up through a greater effort aimed at other sources (solar, coal, nuclear, gas, electric energy, etc.) which therefore should experience greater growth as compared to what we said in the earlier paragraphs.

In any case, it will therefore be necessary to guarantee the country a petroleum supply that will have to be made as secure as possible through the following:

(1) the extension of direct relationships with the producer countries (and/or coordinated relationships within the community complex) also through industrial cooperation relationships (development of energy source research activities abroad, exchange of goods and services in return for petroleum purchases, etc.);

(2) Development of exploration and prospecting on-off and off-shore on national territory;

(3) Suitable reorganization of transportation, storage, refining, and distribution systems;

(4) A system of prices and domestic rates which, on the one hand, will make it possible to attract supplies to Italy and, on the other hand, to control consumption.

Electric Energy Supply

As for the total energy supply, in looking at the electric energy supply, we also estimated the maximum development which can realistically be achieved for sources other than petroleum, leaving as remainder the share to be supplied with the help of petroleum (Figures 7 and 10).

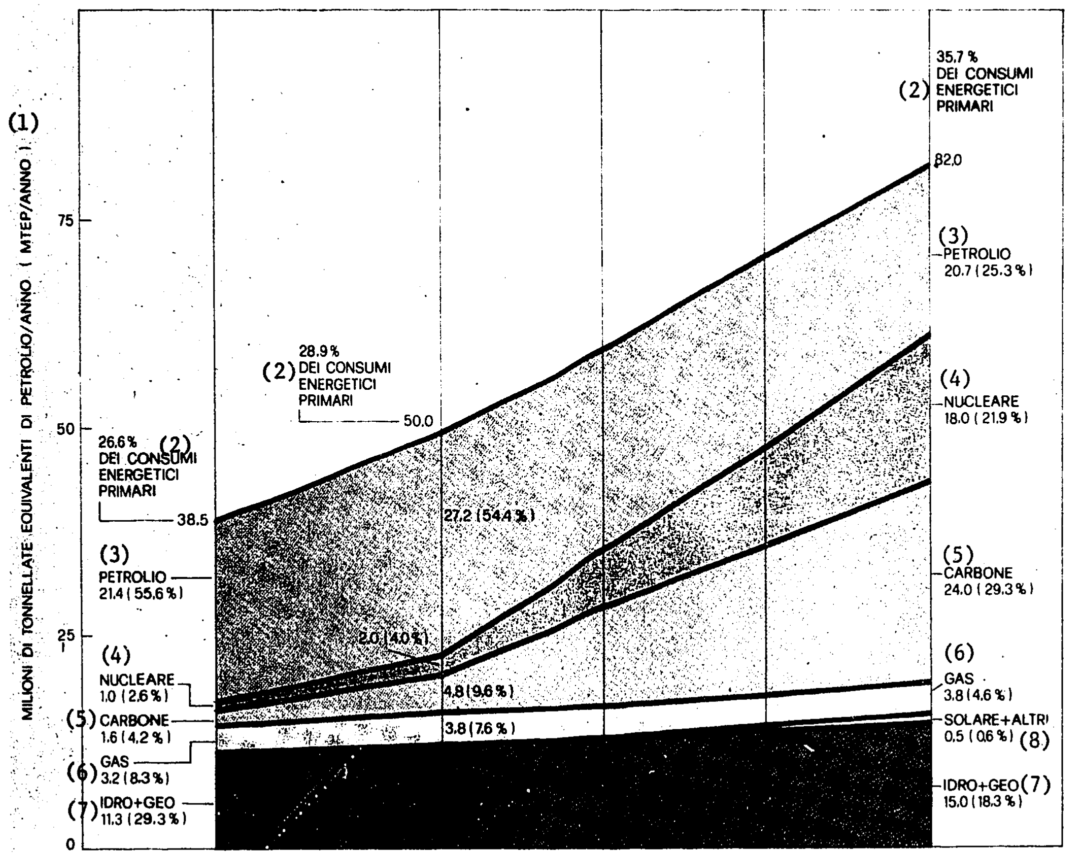


Figure 10. Scenarios for Italian electric energy supply expressed in primary energy. The scenario is representative of the lower limit of the most probable development of the Italian economy and is based on a GNP growth rate (average annual percentage) of 2.9 percent for the period of 1978-1985 and 3.0 percent for the period of 1986-2000. The electric energy has been estimated at a rate of 2,300 kcal/kwh with a conversion factor of 1 tep = 10^7 kcal. Key: 1--Millions of tons of petroleum equivalent per year; 2--Of primary energy consumption; 3--Petroleum; 4--Nuclear; 5--Coal; 6--Gas; 7--Hydroelectric and geothermal; 8--Solar and miscellaneous.

As we indicated earlier, the maximum contribution which the various nonpetroleum sources could supply would be as follows:

(1) Geothermal electric and hydroelectric energy would go up by 33 percent between 1978 and 2000, rising from 11.3 Mtep in 1978 to 15 Mtep (65 Twh). Nevertheless, the share of these sources out of the total primary energy requirement for electric energy generation will go down from 29 percent in 1978 to 18 percent in 2000;

(2) Nuclear energy with 12 power plants of 1,000 Mw operating in the year 2000 will increase contribution from 1 Mtep in 1978 to 18 Mtep (78.3 Twh) in 2000. The share of primary source requirements for electric energy generation supplied through nuclear energy will consequently rise from 2.6 percent in 1978 to 22 percent in 2000;

(3) With an inventory of 23,000 Mw, coal, by 2000, will increase its contribution from 1.6 Mtep in 1976 to 24 Mtep (10.3 Twh) in 2000. The contribution of coal to the total primary source requirement for electric energy generation therefore will rise from 4 percent in 1978 to 29 percent in 2000;

(4) The contribution from gaseous fuels should go up slightly from 3.2 Mtep in 1978 to 3.8 Mtep in 1985. This increase will take place above all through the use of Algerian gas in high-yield plants to be built in the South;

(5) Solar energy in all of its forms (solar, wind, biomass, etc.) with an installed capacity of 500 Mw can furnish about 0.5 Mtep and that would be 0.6 percent of the total primary needs for the generation of electric energy.

The contribution from petroleum sources (Figure 10) to meeting the primary source needs for the production of electric energy therefore, as the residual requirement, will go up until 1985 and will then go down in terms of absolute and percentage value up to the end of the century. By 2000, the petroleum share will go down to 25 percent whereas today it is equal to 56 percent.

If all of the alternate sources other than petroleum are developed to the maximum extent for the production of electric energy, we will during the last part of the century be able to start in Italy likewise that process of replacing petroleum for these uses (something which appears indispensable, considering the fact that the scant future supply of this source necessitates its use essentially for mandatory purposes). This process of substitution by the way is already going on in the other countries (Figure 11).

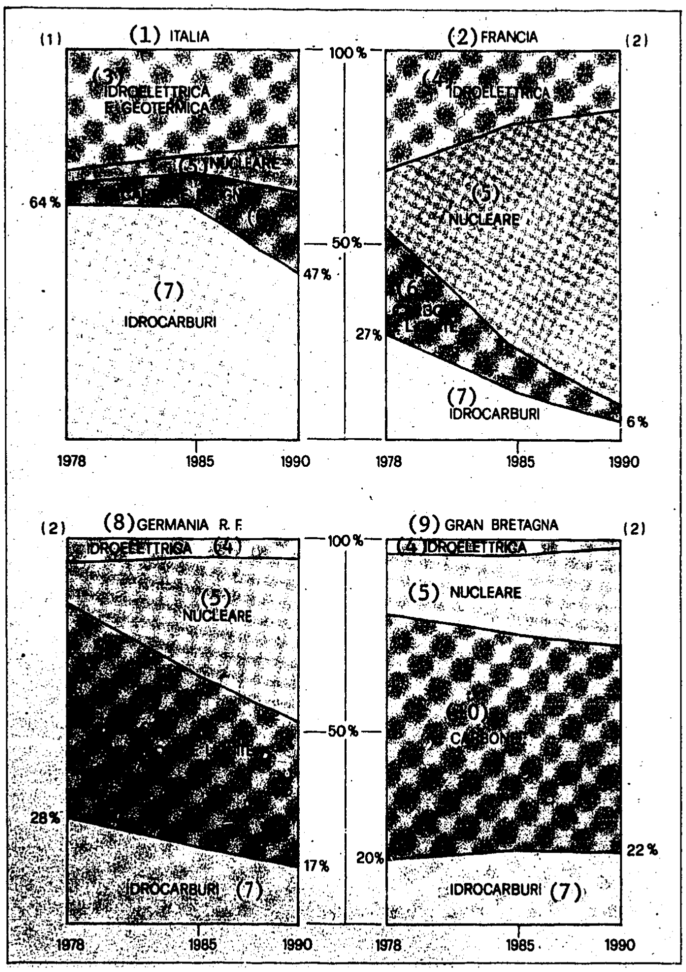


Figure 11. Percentage contributions of primary sources for electric energy generation. For France, the FRG, and Great Britain, the data were processed by the ENEL on the basis of a document put out by the EEC committee UNIPEDE [from August to September 1979] according to the operational programs indicated by the Community countries themselves: Key: 1--Italy; 2--France; 3--Hydroelectric and geothermal; 4--Hydroelectric; 5--Nuclear; 6--Coal and lignite; 7--Hydrocarbons; 8--West Germany; 9--Great Britain; 10--Coal.

We must however consider the fact that the development of electric energy in Italy is tied not only to the possibility of making ample use of sources other than petroleum but also to the possibility of overcoming the obstacle represented by the unavailability of sites and the bottleneck when it comes to authorizations for the establishment of new power plants. This problem exists not only in connection with the nuclear power plants but also the coal-fired, hydroelectric, and turbogas power plants.

As ENEL underscored several times, this can cause a serious shortage of electricity during the years to come and that will involve not only peak power use (something which is already happening today) but also base energy usage. The repercussions which this shortage will have on industrial production and employment is obviously significant. For example, ENEL has disclosed that the impossibility of supplying the medium and light industries with a quantity equal, for example, to the energy that can be furnished by a 2,000 Mw nuclear power plant (about 10 billion kwh per year), would cause a shortfall in income production of more than 13 trillion lire (at 1977 lire) and a shortage of jobs for at least 750,000 persons.

The possibility that there might be electric energy shortages during the next several years therefore calls for measures that must be adopted with extreme urgency.

Here are those measures which are possible on short notice: the planned reduction of loads in order to reduce the peak demand; the installation of new peak power plants; continued operation of older plants with special and repowering maintenance programs; boosting the electric power grid not only regarding domestic connections (particularly between the North and the South) but also concerning foreign connections; removing the bottleneck on permits for the construction of some plants already in an advanced construction phase where there is still a possibility of commissioning them soon.

These actions obviously will have to be carried out parallel to such other actions as:

(1) Development of power generating plants which, as recalled earlier, will make it possible to achieve a minimum reduction in the use of petroleum products for electric energy generation (nuclear, coal-fired power plants and plants using renewable sources);

(2) Modification of rate system permitting adaptation of rates to cost structure and extension of multi-hour rates from big power users to small power users. Among other things, the introduction of a correct rate system is an indispensable requirement for the development of alternate sources, particularly renewable ones;

(3) Substitution of electric energy for those final uses that are not strictly mandatory, although the leeway for this kind of effort in Italy is rather tight; in this area of action particular interest is devoted to initiatives by Italgas for the promotion of the widespread use of gas water heaters;

(4) The development of joint industrial and civilian generation which can significantly contribute to giving the country decentralized electric energy obtained with high thermal yields.

Role of Combined Electric Energy and Heat Generation

Noteworthy results in terms of primary energy source savings can be achieved through a development of total-energy systems for the combined production of electric energy and heat. For example, a joint 1,000 Mw electric generation plant (with an average yield of 75 percent and running 6,000 hours per year) can save about 0.7 Mtep per year when compared to traditional thermoelectric production. It therefore appears evident to push the development of this type of plant.

Regarding combined electric energy and heat generation in industrial plants, considerable development levels have already been achieved in Italy: in 1978, 17.3 percent of domestic thermoelectric production was as a matter of fact achieved through combined power plants, all of which belonged to the industrial sector; furthermore, these power plants produced 89 percent of the entire industrial thermoelectric in-house production volume. Further development can be promoted by steps which have already been adopted to provide incentives for joint generation (increase in contribution from the Equalization Fund for Electric Energy Generation, carried out in combined plants) are those which are being drafted or studied by ENEL or other agencies.

ENEL will play a primary role for the development of combined production both in the industrial sector and in the civilian sector since it will have to guarantee optimum management of electric energy surpluses generated by combined plants owned by third parties; it will also have to draw up agreements aimed at facilitating their operation.

Concerning joint generation in the civilian sector, in addition to the initiatives already under way (Brescia, Turin, Milan, Mantua, Verona, Reggio Emilia, and Pavia), it will be possible to achieve further development as a function of the solution of technical-economic problems for heat transportation and public incentive efforts which will be launched.

The development of small joint generation systems looks particularly valid from the economic viewpoint; these systems could indeed be developed above all for agricultural or decentralized rural users not far removed from the national power grid.

Conclusions

Energy development in Italy therefore will have to be accomplished by reconciling two opposing requirements: increasing the per-capita availability, which today is still very low compared to that of other countries, and reducing the degree of energy dependence on imported sources and particularly petroleum.

The second requirement is strictly tied to the possibility of Italy's economic growth and that means that it must assume a priority role which is why the development of energy consumption must generally be adapted to the growth rates and the types of consumption connected with this objective.

From that viewpoint, the action to be undertaken will have to move along the following lines:

(1) Attainment of maximum possible energy saving level which is compatible with steady economic growth in order to reduce the total energy demand growth rates as well as the petroleum import growth rates;

(2) Development of adequate mix of nonpetroleum energy sources to the maximum level compatible with the anticipated availability and international distribution of supplies and with technological, social, and ecological constraints;

(3) Efficient use of petroleum sources through efforts aimed at discouraging its use for nonmandatory purposes.

On the basis of these outlines, the study then lists a series of steps that could be adopted in the individual consumption sectors both regarding energy savings and the development of alternate sources. These steps should as a matter of fact be part of an energy program based on the following action methods and instruments:

A clear definition of action priorities so as to be able, very shortly, to launch steps that are most necessary (including the most urgent ones, such as the implementation of an organic savings policy and the elimination of the logjam holding up the nuclear program);

Smooth planning of objectives taking into account the changes that will take place in our development model;

A clear and precise definition of the roles and tasks of the individual public and private agencies operating in the energy area. The most precise definition of these roles will be all the more easily implemented if we identify a single responsibility center for energy policy; such a responsibility center will have to define the guidelines for energy policy, the subjects involved, the financial commitments, and the implementation procedures. The types of action and their practical implementation should however be handled by the most qualified (public or private) subjects in the country;

Coordinated action on several fronts (standards, legislation, rates, incentives, research and development, etc.) and involving several energy sources;

A link with the energy efforts and policies of the other industrialized countries and especially the EEC;

More intensive cooperation with energy raw material producing countries;

Adequate information and involvement of public opinion so as to increase the level of consensus on Italy's necessary energy choices.

Too much time has already lapsed since the Kippur war and no specific efforts have as yet been launched in Italy. "Doing nothing" in the end becomes a real political decision because it inevitably imposes upon Italy the need for emergency measures (rationing, bans, obligations and requirements) which will have a very serious effect on the country's economic and social life.

Instead of that, we must, without any further delay, seize the great development opportunity which the energy challenge presents to Italy.

Massive commitment toward energy savings and the development of alternate sources, other than petroleum, will on the one hand make it possible adequately to guide the development of energy consumption and to assure the country of the necessary quantities of energy for its development, while on the other hand it will make it possible to divide a tremendous impetus for domestic production activities, with increased employment opportunities for Italian labor.

The development of energy savings and alternate sources as a matter of fact do have a national content in terms of work and technological innovation. Here we might think of investments: to produce and consume energy in the most rational manner (for example, joint generation plants, heat pumps, building insulation, etc.), to develop solar energy, coal and the pertinent infrastructure facilities, natural gas, nuclear energy, and hydroelectric and geothermal sources.

The development of this program will involve not only the energy sector but all sectors of the economy (here we might think of the boosting and rationalization of transportation, new low-energy consumption and/or low-energy content goods, new production processes, etc.).

All of these activities will require manpower with new vocational skills likewise and they will give the country an enormous opportunity for renewal and technological advance, with positive effects upon Italy's future exporting capacity.

FOOTNOTES

1. This article is a synthesis of the study entitled "Uno scenario energetico italiano al 2000" [An Italian Energy Scenario up to 2000] drafted by the research agency and the energy sector of Fiat with the cooperation of experts from the Fiat Group and with the advice of docents C. Boffa and L. Gonella of the Turin Polytechnic and M. Deaglio of the University of Turin.

2. The low level of mileage figures and of the average number of cylinders in Italy is pointed up by statistics on average annual energy consumption per vehicle. Those figures are 35 percent below the European average; while in Italy every vehicle annually consumes 640 kg of petroleum products, the figure in France is 1,000 kg, Germany consumes 1,100 kg, and the EEC average is 990 kg.

5058
CSO:3104

ECONOMIC SWEDEN

INDUSTRY LEADERS SEE RECESSION BOTTOMING OUT IN SPRING

Stockholm VECKANS AFFARER in Swedish 5 Mar 81 pp 46-49

[Article by Hans-Olof Englund: "VA's Industry Survey: Improvement in Sight--Bottom to be Reached in the Spring"]

[Text] Swedish industrial activity will reach bottom in the spring. And then in the fall the utilization of capacity will increase. Factories, however, are somewhat later in the forecast. For them a bottom will be reached in the fall at the earliest. The situation on the export side is brightest. It is not equally bright for productivity and employment. These are some of the results of VECKANS AFFARER's industry survey.

VA's survey of steel companies, forestry companies, and factories gives a somewhat diffused picture of Swedish industry. While the forestry managers unexpectedly raised prices six months "too early," the medium-sized factories mainly tried to survive the decline by dieting back to good health. And the steel companies await the price effect of the EC's steel crisis program.

In a way the highly diversified pattern of the economy is explained by the political events in the country during the collection of answers to the survey: the LO-SAF [Trade Union Confederation - Employers' Confederation] agreement was reached, the government's energy bill was presented to the Riksdag, savings package II was presented, and the discount rate was raised to 12 percent.

Branch Chief Bengt Pettersson of the Institute of Economic Research said, "Industrial activity is like an airplane in bad weather--first a quick drop in a mighty air pocket, thereafter a leveling off at a lower altitude. That is what has happened now. Businesses have very quickly adjusted production to avoid inventory increases, which are expensive with today's interest rates.

Bengt Pettersson believes that Western Europe has already begun climbing toward higher altitudes during recent 1981.

"That optimism, however, does not include Sweden, where the combination of contraction and delayed stock cycles postpones the upturn," he said. "But in 1982 we can--we hope--harvest the fruits of labor peace and ability to compete in furtherance of the second year of the labor agreement."

Industrial activity declined markedly during the last quarter of last year. Orders continued to decline rapidly, much more than expected. Half of the export businesses experienced a reduction of orders. At the same time production was reduced.

Among the factories in VA's survey, 22 percent believe that the bottom of the curve of business activity will be reached in the spring, and 37 percent believe that it will be delayed until the second half of the year. Forty-one percent believe that the upswing will first come in one year or later.

Figure 1.

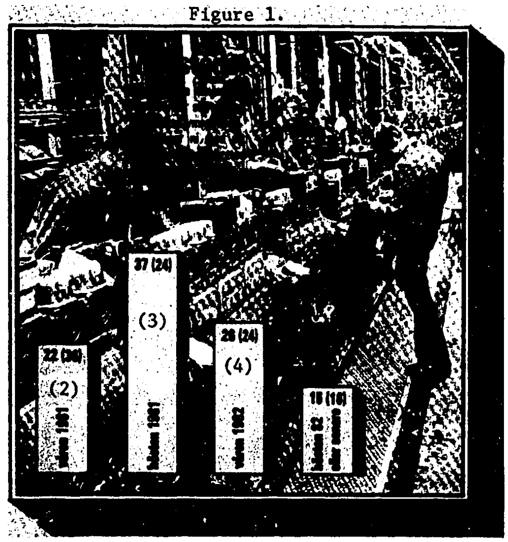


Figure 1. ...the factory industry comes, as usual, somewhat later in the cycle. Thirty-seven percent of the firms believe that the bottom will be reached in the fall.

Key: 1. Factories. Swedish business is now in a decline. When do you expect that the bottom will be reached in your branch?

2. Spring 1981
3. Fall 1981
4. Spring 1982
5. Fall 1982 or later

Among the steel companies optimism is greater. More than two companies out of three believe that the bottom will be passed during the nearest months--considerably more than in the previous survey in September 1980.

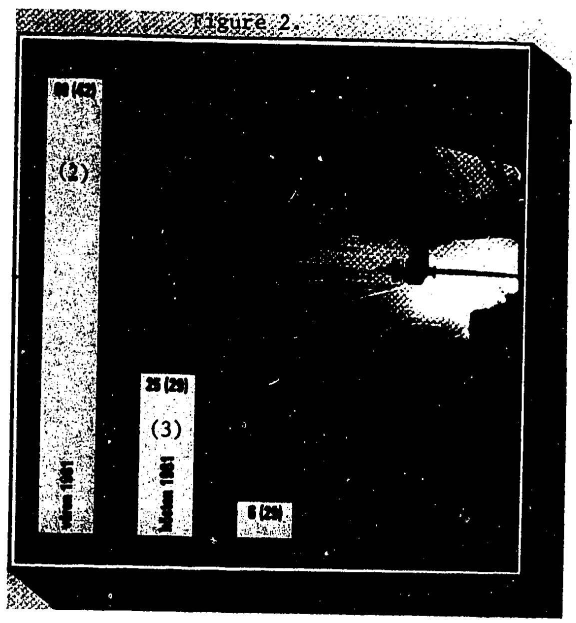


Figure 2. VA's industry survey indicates that the steel industry will reach bottom first. Almost 7 out of 10 companies expect the bottom to be reached in the spring.

Key: 1. Steel. Swedish business is now in a decline. When do you expect that the bottom will be reached in your branch?

2. Spring 1981

3. Fall 1981

4. Spring 1982

And among the forestry companies there are today twice as many who hope for a prompt upswing compared with six months ago, 60 percent.

Figure 3.

Figure 3. Forestry companies look forward to about the same situation as the steel industry. Sixty percent of the firms expect the bottom to come in the spring.

Key: 1. Forestry. Swedish business is now in a decline. When do you expect that the bottom will be reached in your branch?

2. Spring 1981

3. Fall 1981

4. Spring 1982

Within the same three branches a clear majority believes that prices will improve in the fall, but price increases still will not be enough to improve profits.

In the business barometer of December 1980 KI [National Institute of Economic Research] confirmed that forestry companies adjusted to a continued decline in domestic and export orders. This led to curtailment of production with the intention of limiting the growth of ready stocks, which were costing record amounts. Production plans for the first six months of 1981 had then also been thoroughly adjusted downward since September and the previous business barometer. Last year the forestry industry reduced its production of paper by 1.6 percent, of pulp by 4.2 percent.

Three months later the gloomy picture is reversed. Forty-three percent of the companies believe that orders will increase for the export markets, while every fifth forestry company also expects increased domestic orders. Not a single company dared to be so optimistic six months before.

And now the forestry companies are increasing prices. From 1 May Billerud's price for sack paper will increase by 300 kronor--12 percent--to 2,800 kronor per ton. MoDo's fine paper will be 10 percent more expensive from 1 April. And in a few weeks the pulp producers will announce prices from 1 April.

Gunnar Engman, managing director at Billerud said, "The North American producers have been forced to become less aggressive in Western Europe because of cost increases in the United States, but they have also found new customers, China among others.

"However we do not yet know where Ronald Reagan's economic policies for the United States and the dollar are going in the short run," said Gunnar Engman.

There are a number of fortunate circumstances which elevate the forestry business above its normal performance:

- The strong dollar.

- The North American pulp producers' raw materials have become uncertain since the supply of sawmill waste has declined with the decline in housing construction.

- In the spring Canada will also negotiate wages for 1981 and 1982 in negotiations which are expected to be very hard, since the forestry workers have lost four percent in real wages since 1977. Also, in the United States the strike risk is obvious.

- Swedish stocks are small, as are the buyers'.

- Energy price increases are larger for the American producers than for the Scandinavian--the relative competitive situations are reversed.

- Transport costs to Europe have increased.

While the pulp industry and the paper mills can now begin to see ahead to a profitable and almost as successful a year as 1980--if the question mark around the dollar and raw material supplies is straightened out--it is a much sadder tune in the sawmill industry. There the decline began during the labor conflict last May, and continued as the result of a weak building industry both at home and abroad. Now the bottom has fallen out of the export market for sawed lumber.

After the first 2 months of the year exports had shrunk to one-third compared with the corresponding period last year. The collapse of the orders can partly be explained by importers holding large inventories, reduced consumption, and rumors of Swedish devaluation.

With the increase in the forestry business (except for above) the raw materials problems of this branch were again emphasized. Price increases for wood of 20 percent and greater activity in the standing timber market did not solve the supply problem. Besides that, the forestry companies' raw material supplies were disturbed by the government's energy policies. The judgment of the companies that utilization of their capacity would soon be on the way to 95 percent should therefore be surrounded by a large question mark.

The energy bill which was presented to the Riksdag in mid-February contains, among other things, a proposal for greatly increased burning of chips until 1990. So supplies of raw material are threatened. In any case Gunnar Engman at Billerud fears it, as he said, "We can not compete for raw materials with a subsidized energy sector--I hope the government will understand that. But if the burning of chips reaches the volume recommended in the bill, pulp production in the country will be cut in half."

Timber cutting in the forest today is not as much as the annual growth--60 million cubic meters. In the paper mills there is only raw material for 2-4 weeks production. Now, according to the government's energy bill, energy from forest waste will be doubled until 1990--15 million cubic meters corresponding to 3 million tons of oil will be burned. Bo Wergens, managing director at Cellulosa and the Papermill Association said,"The risk is great that high quality wood raw material will go to heating plants--nothing can prevent the forest owners from selling to the highest bidder. And wood raw material will be further driven up in price. Subsidies for heating plants--1.7 billion in an oil substitution fund--will put the market economy out of kilter."

Bo Wergens also points out the national economic consequences of an uneven struggle for the forests: 1 million cubic meters of wood harvested to exported newsprint gives payments of 700 million kronor. To burn the same amount of wood gives an oil savings of 160 million kronor.

The year 1980 was a bad year for steel. World production declined by 4 percent--in the EC the decline was 9 percent.

In Sweden crude steel production declined by 10 percent--30 percent below the 1974 level.

The decline in production in Western Europe is caused by competition from underdeveloped countries and new steel producers, combined with decreased demand. Sweden is one of the countries which was hit the hardest--our domestic market, relatively, has shrunk more than other industrial countries.

Import from the EC continues to grow, and amounted last year for nearly three-fourths of Sweden's total imports. EC steel manufacturers now have a larger share of the Swedish market than domestic manufacturers. At the same time, however, the Swedish steel manufacturers have increased their share in Western Europe since the steel boom of 1973-74.

In VA's survey more than two of three steel companies now expect a continued decline in production. Only 6 percent of the companies questioned expect an improvement. New orders will, however, increase toward the end of the year, according to 60 percent of the companies--6 months ago the figure was 6 percent. Director Jan Beckeman of JARNKONTORET said, "By 1982 the bottom will be definitely passed."

Jan Beckeman bases this judgment on three factors:

- Investment in machinery and installations will get going toward the end of 1981 or the beginning of 1982.

- Sweden is 1 to 2 years behind the Western European economic cycle, and toward the end of this year will begin to move up out of the valley.

- Measures are being taken to improve efficiency in the producing firms.

In November 1980 the European Coal and Steel Community introduced production quotas for steel firms in the so-called crisis manifesto. A sought-after reduction in production of almost 20 percent was achieved after only a few months. On the other hand the expected price increases failed to appear. The steel trade has about 10 percent to regain from last year's price decline. And the prospects of price increases in the spring are very uncertain.

"The limits on production do not have their counterpart in agreements on limiting deliveries," said Jan Beckeman. "When the agreement has been in effect for 3-4 quarters, the effects will then first be noticed on prices."

Therefore when 63 percent of the steel companies hope for increased prices in the fall, their optimism is more readily explained by the increase starting from an unusually low level.

The factory industry as usual is late in the business cycle and must wait until 1982 before the more durable signs of an existing increase begin to appear. Only every fifth factory in VA's survey expects an increase as soon as the spring. The Metal Trades Employers' Association expects that production declines will continue at least until summer, and for the entire year the production level will be several percent lower than during 1980.

In that case the factories will try to minimize their stocks, and manpower will shrink by two percent, according to the Metal Trades Employers' Association. Only one of four factories in the survey will need to hire additional personnel this year.

On the other hand more than 40 percent of those businesses questioned thought that orders would increase in the fall, and only 16 percent thought they would decline. The overwhelming majority of factories, 44 percent, thought that domestic demand would be weak or would decline further. Every other factory expects to be able to increase prices in the fall. Only 31 percent of them, however, expect that it will be enough to improve profitability.

In an international business slump (possibly with the exception of an increase in the United States toward the end of the year), with lost markets and weakened demand here at home, the factory industries have no other choice than a hard austerity program.

Bulten-Kanthal is an example of that, as expressed in this commentary: The strategy is for us to squeeze our productivity rather than to try to fill too many unprofitable orders.

And Karlstads Mekaniska Werkstad is completing a reorganization program which will lead to a 20 percent reduction of personnel this summer. Managing Director Lars Hedenskogh said, "After last year's large losses, which we could predict relatively early in the year, the company began a crash program with the object of bringing it around to a positive direction in 2 years."

Factories last year reached profits on their own capital of 7.7 percent, a decline of 0.5 percent compared with the year before. This year the results will be worse according to the Metal Trades Employers' Association.

Managing Director Ake Nordlander: "One of three factories had a loss in 1980. Six thousand people worked in factories which lost money. This year total employment will go down by 9,000 to 10,000."

Atlas Copco's managing director, Tom Wachtmeister, said, "Industry has learned its lesson from its previous decline--not to maintain employment by artificial means.

"Next year--the second year of the wage settlement--production and employment can increase, provided that the firms can avoid other increases in costs and provided that the escalator clause of the settlement is not implemented."

Fifty-nine Firms Which Produce 111 Billion

The following firms participated in VA's industry survey:

Factories: AEG, Aga (engineering business less Pharos), Alfa-Laval, Asea, Atlas Copco, Bahco, Billman-Regulator, Bulten-Kanthal, Electrolux, LM Ericsson, Esab, Flygt, Hiab-Foco, Karlstads Mekaniska Werkstad, Linden-Alimak, Monark-Crescent, PLM, Saab-Scania, SKF, Sonessons, Standard Radio and Telefon, Assa-Stenman, Sunds Defibrator, Sundsvalls Verkstader, Svenska Philips, Volvo, Akermans. (Total production value in 1980: 66 billion kronor.)

Steel: Avesta Jernverk, Bofors, Boxholm, Fagersta, Garphytte Bruk, Hallstahammar, Halmstads Jarnverk, Hoganas, Kockums Jernverk, Kohlswa Jernverk, Lesjofors, Nyby Uddeholm, Qvarnshammars Jernbruk, Sandvik, SSAB, Surahammars Bruk, Wirsbo Bruk. (Total production value in 1980: 16 billion kronor.)

Forestry: Assi, Billerud, Fiskeby, Graningeverken, Holmens Bruk, Iggesund, Kopparfors, Mo och Domsjo, Munkedal, Munksjo, NCB, Papyrus, SCA, Sodra Skogsagarna, Vannerskog. (Total production value in 1980: 29 billion kronor.)

Figure 4.

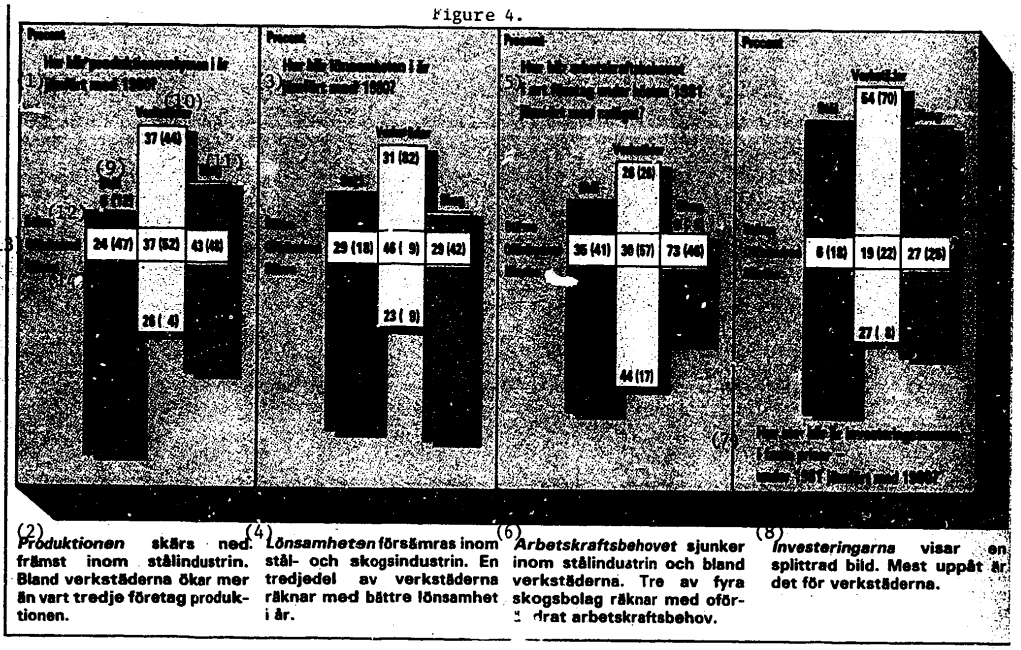
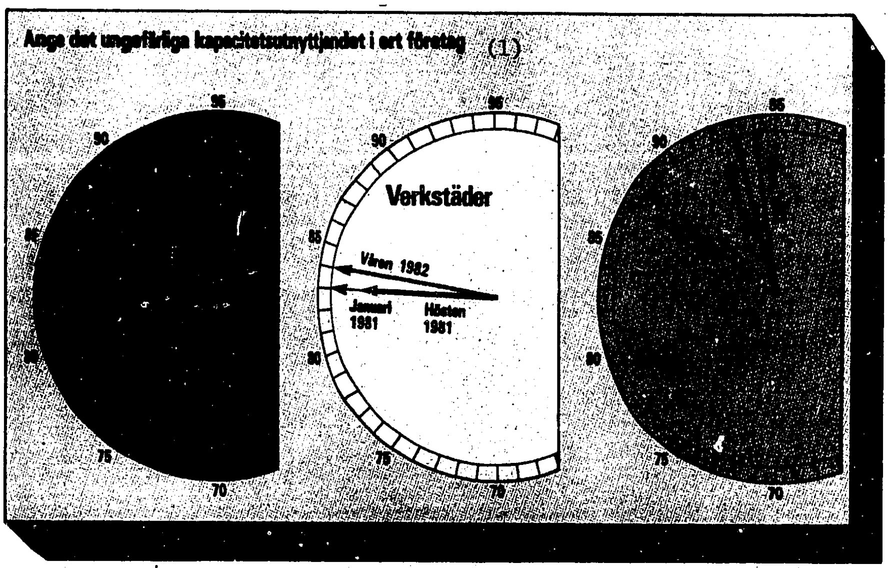


Figure 4.

Key:
1. What will be your production volume this year compared with 1980?
2. Production will be cut the most within the steel industry. Among factories more than every third firm will increase production.
3. How will your profits this year be compared with 1980?
4. Profits will decline in the steel and forestry industries. One-third of the factories expect better profits this year.
5. How about your employment in your firm in the fall of 1981 compared to now?
6. Employment will decline in the steel industry and factories. Three of four forestry firms expect unchanged employment.
7. How large will be your investments in fixed prices during 1981 compared with 1980?
8. Investments show a mixed picture. Factories show the most increase.
9. Steel
10. Factories
11. Forestry
12. Greater
13. Unchanged
14. Less



(2) *Stålindustrins* kapacitetsutnyttjande väntas öka stadigt för att våren 1982 göra ett rejält kliv till en 80-procentig nivå.

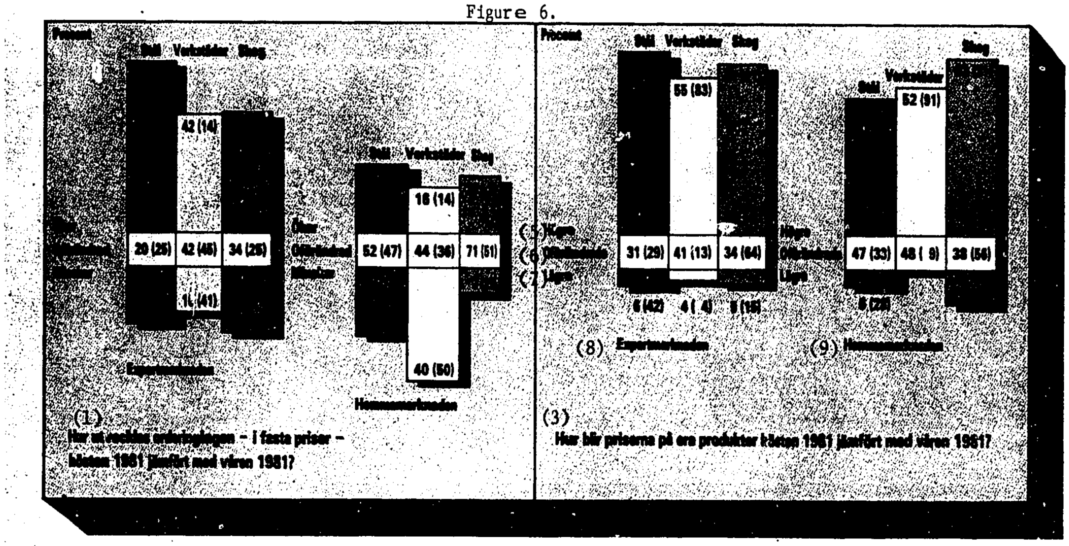
(3) *Verkstadsindustrin* tror att dess kapacitetsutnyttjande ligger stilla under 1981 för att endast öka obetydligt under nästa år.

(4) *Skogsindustrin* väntar sig ett allt bättre kapacitetsutnyttjande utifrån en redan hög nivå – och det redan under tiden fram till i höst.

Figure 5.

Key: 1. What is the approximate utilization of capacity in your business?
2. In the steel industry the utilization of capacity is expected to increase steadily so that by spring 1982 there will be a solid climb to 80 percent.
3. Factories believe that utilization of capacity will remain unchanged in 1981, and will only increase slightly in 1982.
4. Forestry industries expect an improvement in utilization of capacity from an already high level between now and the fall.
5. Spring
6. Fall

Figure 6.



(2) *Orderingången* ser betydligt ljusare ut på exportmarknaden än på hemmamarknaden. På exportsidan andas t o m stålindustrin optimism. Hemma ser det mörkast ut för verkstäderna.

(4) *Priserna* är något de flesta svenska företag nu slåss hårt för att hålla uppe. Och man ser ut att lyckas. En majoritet av företagen räknar med högre priser både hemma och på export.

Figure 6.

Key:
1. How will your orders develop--in fixed prices--from spring to fall 1981?
2. Orders look better on the export market than on the domestic. The steel industry is optimistic about exports. The domestic market looks poorest for factories.
3. How will the prices of your products develop from spring to fall 1981?
4. Prices are something that most Swedish firms are now fighting hard to maintain. And they appear to be succeeding. A majority of businesses expect higher prices both at home and abroad.
5. Increased
6. Unchanged
7. Less
8. Export market
9. Domestic market

9287
CSO: 3109

END