The Energy Revolution

1. The growth of electric power

Up to now we have traced the evolution of industry from the end of the war until 1979, the year of the second oil crisis. The chapters that follow will focus on Italy's industrial development in greater detail and examine individual aspects, problems and trends. A logical starting point is the fact that the energy requirements of Italy's postwar economic and industrial development were met primarily by two sources, electricity and oil products.

Electricity had also been the backbone of Italy's earlier industrialization and had enabled the country to slash its coal imports, thus relieving the trade balance and the balance of payments. The growth in electricity production slowed after 1936 as a result of Italy's involvement in combat in Spain and Ethiopia and the government's imposition of price controls and restrictions. The effects of this deceleration in generating capacity were compounded by wartime damage. Italy lost 23 per cent of its plant in the three years between 1943 and 1945; more capacity was subsequently lost through transfers to France and Yugoslavia under the terms of the peace treaty and the cession of some borderlands. Between 1946 and 1949 plant that had been damaged or destroyed was rebuilt without any contribution from the state budget.[1] The electric power companies could have accomplished even more if investment had not been held back by the government's policy of setting low electricity rates, ignoring the intervening increases in the cost of coal, fuel oil and wood. Bearing in mind that 90 per cent of Italian electricity was generated from water power, new plant construction was also checked by the scarcity of rainfall.[2]

Electricity output thus failed to keep pace with consumption, and for the fiscal year 1948-49 alone the shortfall was estimated at between 5 and 6 billion kwh. The situation worsened the following year, when the government abolished the restrictions on consumption.[3] But as Pietro Ferrerio, chairman of Edison, noted in an article in the *Review* in 1950, it took from two and a half to five years to build a hydroelectric or fossil-fuel plant and from two to three years for delivery of the necessary equipment. Given these long lead times, in August 1948 a wide-ranging, detailed four-year plan calling for annual generating capacity to be boosted from 22.5 billion kwh in 1948 to 32.8 billion by 1952-53 had been submitted to the OECE.[4] The OECE had found it inadequate and requested a new one. The revised plan,

[1] P. Ferrerio, "Situation and problems of the Italian power industry", *Review*, IX, 6 (November 1955), p. 526.
[2] Hydroelectric power accounted for some 50 per cent of total electricity production in France and only for between 2 and 3 per cent in Britain.
[3] P. Ferrerio, "The programmes and problems of the electricity industry in Italy", *Review*, IV, 1 (January 1959), p. 15.
[4] *Ibid.* pp. 11 *et seq.*

already under way in 1950, set a production goal of more than 35 billion kwh, the bulk of the increase to come from hydroelectric plants.[5] Gradually, fossil-fuel power-plant construction intensified, owing not only to the diminishing scope for building new hydroelectric stations but also to the growth of the fuel-oil and gas industry. As early as the turn of 1954 Enrico Mattei pointed out that some 18 per cent of the natural gas extracted in Italy was being used to generate electricity,[6] taking the place of coal and oil.[7] Between 1950 and 1954 the capacity of fossil-fuel power plants expanded by 1.1 million kw, more than doubling; since that of hydroelectric plants also increased, total installed generating power rose from 7.5 to 10.6 million kw, or by 41 per cent.[8] In short, electricity production in 1953 amounted to 32.5 billion kwh, more than double the prewar figure (15.5 billion kwh in 1938). In 1954 output jumped to 35.5 billion kwh, of which more than 31 billion was fully utilized, an accomplishment some countries could not boast of having matched.[9]

Despite significant progress, which was confirmed in 1954 by per capita consumption amounting to 612 kwh – double the 1946 figure – Italy was still below the level of the leading industrial countries. This was acknowledged by a special ministerial committee, which formulated a development plan based on a sizable increase in total demand by 1960. The objective was to boost output from 32.5 billion kwh in 1953 to around 50 billion kwh in 1960, or by an average of 6.3 per cent a year. Achieving this output growth of 17.4 billion kwh overall, or of 2.48 billion kwh a year, required capital spending of 806 billion lire on generating capacity plus an additional 977 billion for transmission and distribution networks. The forecast expenditure came to 255 billion lire a year, equal to 11.5 per cent of total capital investment in Italy in 1953.

Moreover, the Vanoni Plan, as the economy-wide planning framework was called, considered the electricity industry crucial for national economic development and envisaged its expansion through 1963. In all, therefore, capital expenditure in the sector was to amount to at least 3,200 billion lire in the ten years from 1955 to 1965.[10]

This objective was subject to two conditions. Firstly, it necessitated recourse to fossil-fuel power plants, as available water resources were insufficient for an expansion of this scale. Secondly, it assumed a revision of the government's electricity pricing policy: though an equalization fund had been created in 1953, a strong deterrent to investment in electric power was the freeze on electricity rates, which dated back to 1936. According to Ferrerio, the pricing system

[5] *Ibid.*, pp. 9-10.
[6] E. Mattei, "Natural gas and natural steam in the Italian economy", *Review*, VII, 1 (January 1954), p. 23.
[7] Thermoelectric energy's share of total electricity production rose from 5.1 per cent in 1946 to 8.1 per cent in 1948, 12.1 per cent in 1952 and 14.8 per cent in 1953. See Ferrerio, "Situation and problems of the Italian power industry", p. 529.
[8] *Ibid.*, pp. 525-26.
[9] *Ibid.*, p. 525.
[10] *Ibid.*, pp. 528-29.

constituted a practically insurmountable obstacle to the enormous investment that the power industry required,[11] especially since the international market did not appear willing to lend. The only financing received, $30 million from the World Bank to the Southern Italy Development Fund for the construction of 8 power stations in the South, had to be considered less as a loan for the electricity sector per se than as financing for backward areas. Despite these difficulties, in 1955 the Italian electricity industry completed the power line across the Strait of Messina, the longest (3,653 metres) ever built, and by the end of the year output came to well over 37 billion kwh, much of it privately generated in the North.[12] In the following years, by contrast, most of the growth in generation came in the South, thanks, not least, to the plants built with World Bank financing.[13] By the end of 1959 electricity supply was more than sufficient to cover mounting demand.[14]

2. The nationalization of the electricity industry

The power companies had come under widespread criticism for not charging uniform rates for connections and consumption. The companies were accused of making the poor parts of the country pay more than the affluent ones and thus being an obstacle to the lessening of disparities between regions and individual branches of industry.[15] They countered that the differences in rates reflected the costliness of bringing electricity to poor, low-consumption areas. In 1961 it was hoped that the problem would be redressed in part by a law that set up compensating mechanisms to achieve equality of treatment between North and South and among the various branches of industry, but the results were less than encouraging. In the meantime, a growing chorus maintained that the multiplicity of electricity generation and distribution companies precluded effective nationwide coordination of the sector. In addition to considering the public utility of the sector and the possibility of setting prices at a subsidized, low level for reasons of economic policy, the proponents of nationalization of the electricity industry, a step already taken in France and Britain, were convinced that merging the various companies into a single entity would bring appreciable cost savings, allowing more rational planning and distribution of facilities and a higher return on capital invested.[16]

The nationalization of the electric-power industry was not a new issue in Italian economic and industrial history. Francesco Saverio Nitti had championed it and had made the 1904 law for the industrialization of Naples a vehicle for the creation of a publicly-owned company (E.A. Volturno) that would build

[11] *Ibid.*, p. 531.
[12] "Output of electricity in 1955", *Review*, X, 3 (May 1956), pp. 260-61.
[13] See *Review*, IX, 5 (September 1955), pp. 480-81. [14] "Two months of economic activity in Italy", *Review*, XIV, *1* (January 1960), p. 22.
[15] F. Ventriglia, "Remarks on the nationalisation of the power industry", *Review*, XVII, 2 (March 1963), pp. 75-76.
[16] *Ibid.*, pp. 77 *et seq.*

power plants in Campania and distribute the electricity they generated at subsidized prices to nascent industry in the Naples area.

For the nationalization of the electric companies, however, Nitti had not envisaged a role of the state as sole purchaser and immediate payer, even in a takeover spread out over a number of years. His goal was the creation of an electricity regime that would gradually absorb the companies as their licences expired. In this way, nationalization would take longer but would not be a financial burden for the state, and would thus avoid injecting large and potentially disruptive amounts of liquid financial assets into the economy.

However this was not the path taken when the industry was nationalized under Law 1643 of 6 December 1962. It was decided that the new National Electricity Authority (ENEL) would pay the nationalized companies a cash consideration corresponding to their value, thus permitting them to invest in other activities. The purchase price was to be paid in ten annual instalments but could also be collected immediately through recourse to bank advances. The government's valuation of the companies was based on the average of their quoted share prices for the years 1959-61; unlisted companies were valued on the basis of their 1960 financial statements, adjusted by coefficients derived from stock market prices.

3. The birth of ENEL

Through ENEL the government gained almost total control over power sources, reserving its right to use administered prices with a view to stimulating or restraining particular sectors of the economy. ENEL was officially created by Presidential Decree 1670 of 15 December 1962, which defined its tasks and powers.

Its declared objectives included assisting the economic growth of the South.[17] However, heavy rainfall in the Centre and South in 1962-63 actually resulted in surplus local power-generation and transfers of electricity to the North.[18] The new agency began by setting up its central administrative structure, reorganizing or founding a series of research and experimental centres, strengthening contacts with the research agencies in the electricity sector of the European Community and with the United Kingdom (at the time not a member of the Community), and acquiring participating membership of the National Nuclear Energy Committee for the construction of the CIRENE reactor at Nebbia. ENEL then divided the nation's territory into 8 major divisions comprising, for electricity distribution, 29 districts and district centres, which grouped together 162 zones. At the same time ENEL also acted to increase capacity. Between 1963 and 1966 plants able to generate more than 25.6 billion kwh annually were built. With this expansion ENEL's generating structure consisted of 713 plants, of which 656

[17] *Ibid.*, pp. 79-82.

[18] V.A. Di Cagno, "ENEL - National electric power agency: Establishment, functions, results and programmes", *Review*, XXI, 5 (September 1967), p. 396.

were hydroelectric, 57 steam, 41 conventional fossil fuel, 13 geothermal and 3 nuclear.[19] In 1960 total generation amounted to 60.113 billion kwh, of which 57.519 billion went to consumption.

Productive activities (industry, commerce, farming, etc.) absorbed two thirds of total net output. Private use (home lighting and electric home appliances) and public lighting accounted for the rest. However, domestic demand verged on 61 billion kwh in 1966, more than ENEL's net output, and could be satisfied only through imports plus generation for own account by a few major industries.[20]

Considering that electricity consumption had grown by 6.2 per cent in 1965, 7.8 per cent in 1966 and a startling 14.4 per cent in the first few months of 1967, and forecasting that demand would grow at an annual average rate of 9-10 per cent,[21] ENEL drew up a consistent plant construction-plan for the years from 1967 to 1976.

Nuclear power plant-construction was not abandoned, however. In addition to participating in the construction of the CIRENE plant, ENEL commissioned the building of a fourth reactor whose capacity would be twice that of the three in operation. A fifth nuclear power plant was scheduled to be built by the end of 1970. In this regard, ENEL's president Vito Antonio Di Cagno affirmed that ENEL had "the greatest confidence in the contribution that this new source of energy can make to meeting growing demand also in the near future".[22]

4. Electrical engineering and electronics

The continuous, massive increase in electricity production favoured the growth of the electrical engineering and electronics industries.[23] These industries were divided into eight separate branches, each engaged in manufacturing fairly homogeneous groups of products. Under broad definitions, four of these branches produced investment goods[24] and four produced consumer goods.[25]

[19] *Ibid.*
[20] *Ibid.*, p. 392.
[21] *Ibid.*, p. 401.
[22] *Ibid.*, pp. 402-403.
[23] M. Latis, "The electrical engineering and electronic industries at the end of 1976", *Review*, XXX, 6 (November 1976), p. 499.
[24] Machinery and equipment for power generation and transmission: high-capacity generators, motors and transformers, high-voltage equipment and insulators, power transmission cables and very-high-voltage submarine cables, electrical transport equipment, telecommunications and electronics: telephone and telegraph systems, telegraph cables, professional radio and its components, and data-processing equipment. Industrial equipment: low-capacity generators, motors and distribution transformers, furnaces, rectifiers, measuring instruments, industrial batteries, cable for the distribution of electricity and industrial uses, carbon products, dielectrics and enamel-insulated wire.
[25] Domestic appliances: household appliances, domestic heating and cooking equipment, community kitchens, automatic distributors and electro-medical apparatus. Radio and television: radio and television sets and their components, and electro-acoustic equipment. Equipment for vehicles: electrical equipment for motor vehicles and planes, and starter batteries. Equipment for the building industry: electrical fittings, light fittings, lamps, lifts and electric cable for buildings.

As a whole, these industries grew in Italy at the same rate over the long term as in the other industrialized countries;[26] however, their growth was neither uniform nor continuous, in part because of the weakness of economic conditions in Italy beginning in 1972 and the sharp slump of 1975.

Comparing 1971 sales with those of 1976, Mario Latis found an increase for both groups of industries. Sales of capital goods grew two and a half times over;[27] more specifically, those of the telecommunication and electronics branches tripled and those of manufacturers of industrial equipment nearly doubled. As for consumer goods, the largest increases in sales were for domestic appliances, which nearly tripled, and radio and television sets, which more than doubled; sales of equipment for motor vehicles and the building industry rose by more than 55 per cent.[28]

The output performance of the two groups diverged markedly over the same period after adjustment is made for inflation. Overall, capital-good production fell by 6.5 per cent and consumer goods production rose by 12 per cent.

Among capital goods, the 6.4 per cent decline in the telecommunications and electronics sector reflected the fall in demand for telecommunication equipment and cables and in purchases by the armed forces, partly offset by an increase in demand for data-processing equipment. The modest 2.6 per cent increase recorded by manufacturers of electric power generation and transmission machinery and equipment reflected an earlier drop in the award of supply contracts.

ENEL had in fact cut back its investment plans, particularly in the field of nuclear energy. The electricity authority's decision had been due not only to disputes over the location of nuclear plants, but also to declining demand for electricity. In the event, ENEL had opted to freeze all new construction for at least two years and until the growth in electricity consumption accelerated and moved into line with the forecasts.[29] The state railways, which had allocated 2 trillion lire for purchases of electrical transport equipment under their five-year plan for 1974 to 1979, also trimmed orders and, what is more, had not even begun drafting a plan for the subsequent five years. SIP, the state telephone company and foremost customer in the field of telecommunications, also reduced its capital spending and award of supply contracts in 1975 and 1976. In sum, electrical engineering and electronics felt the consequences of the crisis that had hit the Italian economy beginning in 1973 and that turned perceptibly worse in 1975.

The effects of the crisis on the money supply fuelled a rather severe surge in inflation which, however, ultimately facilitated exports. The growth in exports of electrical engineering and electronics products[30] made up for the fall in

[26] *Ibid.*, p. 507.
[27] *Ibid.*, p. 508.
[28] *Ibid.*
[29] *Ibid.*, pp. 501-502.
[30] *Ibid.*, p. 502.

domestic demand and boosted the sector's trade surplus from 733.4 billion lire in 1975 to 1,163.3 billion in 1976.[31]

5. ENI

Oil began to play a larger role as an energy source in Italy following the discovery of natural gas deposits in the Po valley soon after the war.[32] There had been sporadic drilling in the area since the late 1800s but it had not given rise to much hope. The situation changed in 1946 with the discovery of natural gas, mixed with small quantities of oil, in the Caviaga field. A spate of discoveries ensued: in 1947 in the Ripalta field, in 1948 in the Cortemaggiore field, in 1950 at Cornegliano, in 1951 at Bordolano, in 1952 in the Correggio and Ravenna fields, and in 1952 in those of Imola, Cotignola and Alfonsine. These discoveries and the high yield of the wells launched the public-sector entities that dealt with oil and gas – AGIP and then, following its creation on 10 February 1953, ENI, the National Hydrocarbon Authority.

The state awarded ENI the exclusive rights of oil and gas prospecting, exploration, extraction and transport in the Po valley. As Enrico Mattei, chairman of ENI, explained, in 1953 the wells in production already supplied 13 million cubic metres of natural gas a day and would continue to produce that much for another twenty years, the energy equivalent of 7 million metric tons of coal a year.[33] But, at the end of 1954, Italian gas consumption was already estimated to exceed the equivalent of 42 million tons of coal a year. Gas production was thus far from covering the country's energy requirement.

The discoveries were nonetheless very beneficial. Coal consumption fell from 26 per cent of total energy inputs in 1953 to 24 per cent in 1954 and that of electricity declined from 37 to 31 per cent, while oil products' share rose from 28 to 32 per cent.[34] In the meantime ENI was building a gas pipeline to link the fields to the major markets, i.e. the districts of Milan, Turin, Bologna and Venice, followed by other cities in the North. Already 3,415 kilometres long and soon to reach 5,000 km, it was the longest gas pipeline in Europe and carried more than 20 million cubic metres a day. Natural gas production continued to mount: Mattei announced that output would total 5 billion cubic metres in 1954, compared with 950 million in 1951.

Exploration was proceeding in new areas and the prospects for development were encouraging. ENI had exclusive rights in the Po valley, but for other areas the government had granted oil and gas prospecting licences to major companies such as D'Arcy, Edison, Pacific Western, Macmillan and Snia. More than a few companies were founded specifically for the purpose of applying for prospecting rights.

[31] *Ibid.*, p. 501.
[32] Mattei, "Natural gas and natural steam in the Italian economy", pp. 21 *et seq.*
[33] See *Review*, IX, 2, March 1955, p. 160.
[34] *Ibid.*

Prospecting was carried out with good results in Ragusa, Sicily, by American International Fuel and Petroleum, an affiliate of Gulf Oil that was later renamed Gulf Italia Co. Petrosud, a company established by American International Fuel and Petroleum together with Montecatini, discovered an important field 26 kilometres from Pescara along the Adriatic coast; the field was named Alanno, after a nearby township.[35] Gulf Italia and ENI followed with discoveries in neighbouring areas.[36] The year 1955 was especially favourable from this point of view. While oil production was being stepped up in Ragusa, oil was also being extracted at Tramutola in the province of Potenza and at Ripi in the province of Frosinone.[37] In the years that followed other discoveries were made at Sergnano, Piadena, Spilimbergo, Selva, Minerbio, Bagnolo, Mella, San Pietro in Casale, Sabbioncello, and Leno, all located in the Po valley.[38] A large oil field was discovered at Gela, in southeast Sicily, in 1957 and another at Ferrandini, in Basilicata, in 1959.[39] As discovery followed discovery and the use of oil and gas grew, the variety and importance of the interests involved increased. Oil and gas extraction, refining and utilization gave rise to a host of ancillary activities, ranging from the manufacturing of drilling equipment and the like to refinery construction and post-refinery transport and distribution.

Each oil company was faced with the problem of how best to organize its activities. Given its importance as a natural gas producer and on the basis of its role in oil refining and petrol distribution, ENI grouped its operations homogeneously. As the holding company, it concentrated all exploration and production activities in AGIP-Mineraria, including the activities that AGIP Mineraria acquired in taking over Ente Nazionale Metano. SNAM, which had made great progress in building the gas pipeline in northern Italy, became the group company responsible for gas transport via pipeline and ship, including its own fleet of tankers (totalling 335,000 tons in 1961).[40] ANIC, which was involved in oil refining and also had an interest in chemicals, was assigned the petrochemical sector. AGIP was made the commercial and marketing arm.

While the state was reorganizing its role in oil and gas prospecting, production and distribution, Italian industry's consumption was growing at an accelerating rate. In 1929 liquid fuels had covered barely 6.4 per cent of Italy's energy requirement. Eight years later, in 1937, consumption of these fuels had grown two and a half times, an increase that accounted for two thirds of the total rise in energy consumption during the period in question.[41] Between 1929 and

[35] See *Review*, IX, 2 (March 1955), pp. 166-67; IX, 3 (May 1955), pp. 265-66; IX, 5 (September 1955), p. 481.
[36] *Review*, IX, 6 (November 1955), p. 584.
[37] D. Giarratana, "Production, processing and distribution of oil in Italy", *Review*, X, 4 (July 1956), p. 351.
[38] E. Mattei, "Ente nazionale idrocarburi", *Review*, XIV, 3 (May 1960), p. 251.
[39] *Ibid.*, p. 252.
[40] *Ibid.*, p. 255.
[41] V. Cazzaniga, "The private oil industry at the service of the Italian economy", *Review*, XV, 2 (May 1961), p. 106.

1958 Italian energy consumption doubled: coal, which had ranked first in 1929, fell to third place;[42] natural gas, which had not been used in 1929, ranked second; oil vaulted into first place.[43] In other words, Italy was surmounting one of the chief obstacles to its industrialization.

With little coal of its own and thus compelled to rely on imports from northern Europe, Italy had been at a disadvantage as long as coal represented the principal source of energy for industry. Now that Italy was using far more oil, natural gas and electricity (part of which was generated by burning oil), it was aligning itself with the other industrial countries of Europe, which were also obliged to import oil. Indeed, Italy's greater proximity to the major oil fields and refining centres meant lower transport costs than those borne by the others, and Italy's discoveries of oil and gas at home gave it a further edge.

Domestic oil production and oil imports fostered the development of oil refining. In 1938 Italian oil refineries had a capacity of 2,260,000 metric tons a year. These refineries were destroyed during the war and had to be almost completely rebuilt. By 1948 Italy had already surpassed the prewar level, with total capacity of 3 million tons.[44] This trend was reinforced in 1957, when the Government not only liberalized trade in oil products and crude oil but also facilitated the construction of new refineries by abolishing the requirement of special ministerial authorization. Refineries could now be built inland as well as along the coast. By 1960 Italy had 35 full-cycle refineries whose combined capacity of 38.5 million tons a year was sufficient to cover domestic needs, with room to spare for exports.

However, in a polemical essay, Vincenzo Cazzaniga, chairman of Esso Italiana, complained that the refining industry was penalized both by the failure to use its byproducts and by an excessive tax burden. This compromised its competitiveness and also had repercussions on the Italian shipping industry, whose tankers were not fully utilized.[45] Cazzaniga was even more critical of ENI's role. The fact that the privately-discovered and operated Ragusa wells accounted for no less than 1,420,000 of the 1,695,000 tons that Italy produced in 1960 was proof, he claimed, that the private oil companies were more efficient; Italy would achieve better results if AGIP's monopoly in the Po valley were abolished and a level playing field created for private enterprise.

[42] In absolute terms, coal consumption rose from 20.1 to 49.4 million metric tons. *Ibid.*, p. 107.
[43] The following percentage breakdown, calculated by Cazzaniga (p. 107), is enlightening:

	1929	1958
Solid fuel (coal)	73.7	21.8
Electricity	19.9	30.8
Oil	6.4	34.8
Natural gas	–	12.6
Total	100.0	100.0

[44] *Ibid.*, pp. 109 and 114.
[45] *Ibid.*

The conflict between the private oil companies and the state had in fact sharpened in 1957 when a law was passed augmenting ENI's prospecting and production rights in the Po valley and it grew more acute between 1966 and 1967, when a bill to enhance ENI's privileges was about to be approved. Behind the government's resolve to strengthen ENI was its understanding that the rosy forecasts of major oil and gas discoveries in the Centre and South, sparked by the finds in Ragusa and Gela, were altogether excessive. ENI itself had carried out prospecting in an area extending over 80,307 square kilometres and had given up 65,360 square kilometres after finding nothing at all. In ENI's view, it was absurd to keep hoping that the South had enough oil reserves to meet the nation's needs; it was preferable to continue prospecting, possibly sinking deeper wells, in areas that were already under production or likely to pay off, i.e. the Adriatic continental shelf. Of course, this could only draw criticism and protest from the private oil companies.

ENI's chairman, Marcello Boldrini, responded to the state oil company's critics in an article in the *Review*. According to Boldrini, the bill before Parliament, which essentially assigned ENI the task of carrying out preliminary exploration throughout the continental shelf, was appropriate, economically justified and in the general interest. Certain of the privileges which the bill appeared to grant ENI, e.g. assigning ENI offshore prospecting rights at depths of up to 50 metres and the private companies rights at depths beyond that, were actually less rigid than some imagined and left the private companies some leeway, Boldrini observed.[46] He especially emphasized the need for the government to know the geological structure beneath Italy's territorial waters within a reasonable period of time. Assigning exploration to a number of companies would delay this enormously. Since ENI was the only Italian enterprise capable of performing the task, which was in the general interest, Boldrini argued, it was only logical for the state to entrust the job to the public oil company.[47]

The determination displayed in defending ENI's absolute pre-eminence in prospecting and production was related to the fact that Italy's oil and gas output and reserves were increasingly insufficient to meet industry's needs. There was no reasonable choice but to ensure supply from abroad. Negotiations were accordingly begun with the Soviet Union, Algeria and other countries in order to diversify the sources of supply. An agreement was reached with Esso Standard Co. for imports of 3 billion cubic metres of natural gas from Libya for a period of 20 years beginning in 1969, and negotiations for an accord with the Soviet Union were at an advanced stage. The problem was transporting the gas to Italy, but this would be solved by liquefying the gas at the plants under construction on the Libyan coast and shipping it by tanker to the port of Panigaglia, where regasification plants would be built. Finally, the gas would be pumped into ENI's pipeline for distribution.[48]

[46] M. Boldrini, "ENI and natural gas exploration and import problems", *Review*, XXI, 3 (May 1967), p. 197.
[47] *Ibid.*, p. 198.
[48] *Ibid.*, pp. 200-201.

6. Nuclear energy

Nuclear power, whose development had been closely bound up with the war, widened the array of sources that an energy-hungry Italy could tap. In 1955, following the Geneva Conference's call for the application of atomic energy to electricity production and other peaceful uses, the major private electricity companies belonging to ANIDEL, their trade association, formed Società Elettro-Nucleare with a view to carrying out research and training managers and technicians.[49] One year later, in 1956, AGIP-Nucleare was set up for the task of using atomic energy to generate electricity,[50] a further sign that Italy was endeavouring to expand and diversify its energy sector.

At just about the same time Enrico Mattei, head of ENI, set up a uranium prospecting and mining company, Somiren. Shortly thereafter Mattei launched another new company, Simea, to build Italy's first nuclear power plant. The plant, built near Latina, was up and running under the management of AGIP-Nucleare in 1962. Upstream, Nuovo Pignone manufactured nuclear power plant equipment and AGIP-Mineraria conducted uranium prospecting and mining, mainly abroad.[51] This was a particularly sensitive task, since workable uranium deposits were to be found in a few industrial countries, including Canada, France and the United States, but also in such politically unstable countries as Niger, South Africa, Gabon and the Central African Republic.[52]

With AGIP-Nucleare taking the role of operating arm, the nuclear energy sector's structure was completed by the creation of the National Committee for Nuclear Energy, a coordinating research body led by Felice Ippolito.[53] Up to the early seventies plans for expanding the nuclear power sector were discouraged by the low price of oil. This changed radically after the oil shock of 1973. The three years following the shock saw Italy's balanceof-payments deficit and general economic conditions worsen. Seeking a remedy, the government formulated an energy plan in 1975, but barely a year later the plan already seemed inadequate. Energy demand was growing at an annual rate of 7.2 per cent, and although this was expected to slow to 6.3 per cent in the near future, the nation's energy requirements nonetheless remained very high. The bulk (74.5 per cent) of the energy consumed in Italy was obtained from oil, so that the leap in oil prices had placed a heavy burden on balance of payments. Giorgio Fogagnolo, deputy managing director of AGIPNucleare, wrote that the issue of energy demand and supply had to be tackled at the international level in forums such as the European Community, the International Energy Agency and the Conference

[49] "The Italian power industry", *Review*, X, 2 (March 1956), p. 146.
[50] E. Mattei, "Ente nazionale idrocarburi", pp. 250-51.
[51] G. Fogagnolo, "Contribution of Italian nuclear industry to the solution of the energy crisis", *Review*, XXIX, 3 (May 1975), pp. 217-18.
[52] *Ibid.*, 219.
[53] *Ibid.*, pp. 219-23.

on International Economic Cooperation, better known as the North-South Dialogue.[54] Aurelio Robotti, professor of jet propulsion at the Turin Polytechnic,[55] focused instead on the much-discussed problem of alternative energy sources. Starting out from the observation that only 3 per cent of Italy's electricity was generated by nuclear power,[56] Robotti went on to survey the prospects of the other potential alternatives, namely solar, wind and tidal power. In his view solar power development was feasible, as was shown by plants built in France, Mauritania and other countries, and was appropriate especially (but not exclusively) for home heating.[57]

The problem of alternative energy sources was of course not limited to Italy. Felice Ippolito quite rightly pointed out the imbalance that had been created between 16 industrial countries, with barely a quarter of the world's population, and the rest of the world: the inhabitants of the former consumed almost ten times more energy per capita than those of the rest of the world.[58] Ippolito also recalled that the enormous price increase decreed by the oil-producing countries was partly attributable to their concern over the possibility of a rapid depletion of their petroleum reserves and a consequent economic retrogression. These concerns were comprehensible: after all, had not many Italian fields run dry? Ippolito drew the conclusion that in the long term (35-50 years) both the 16 industrial countries and the rest of the world would have to convert to other energy sources, mainly renewable ones such as solar energy directly transformed into electricity, nuclear energy, geothermal energy, biomass, wind power and the tides.[59] Still other renewable sources could be found through an expanded research effort in the sector, Ippolito argued.

[54] It was produced by the three reactors that began operating between 1962 and 1964. Italy's fourth nuclear power station, at Caorso, was under construction at the time and would not enter into operation until 1976. Two additional plants had been ordered by ENEL, but were not scheduled to go live until 1979. *Ibid.*, p. 467.

[55] G. Fogagnolo, "The Italian energy problem: A world view", in *Review*, XXX, 5 (September 1976), p. 386.

[56] A. C. Robotti, "The outlook for solar energy exploitation in Italy", *Review*, XXIX, 6 (November 1975), p. 467.

[57] *Ibid.*, pp. 480-81.

[58] F. Ippolito, "Italy's position in the current world energy scenario", *Review*, XXXIV, 1 (February 1980), p. 9.

[59] *Ibid.*, pp. 30 and 38.