ITALY

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1. GENERAL INFORMATION

1.1. General Overview

A republic of Southern Europe, Italy is a peninsula set in the Mediterranean Sea. It extends from the Alps, its northern border, southward for 960 kilometres; it has a maximum width of 240 kilometres. To the east lays the Adriatic Sea, to the south the Ionian Sea and to the west the Tyrrhenian and Ligurian seas. Starting from northwest and moving to northeast, Italy is bounded by France, Switzerland, Austria and the Republic of Slovenia. The Apennines, a recent mountain chain, created by the collision of the African and European plates, subject to frequent earthquakes, extends the length of the peninsula. There are few large catchment basins and only the Po basin is suitable site for modern nuclear power plants.

The peninsula comprises much of Italy and includes the independent republic of San Marino as well as the Vatican City. In addition to the continental part there are two big islands, Sicily and Sardinia. The total area is 301,260 square kilometres.

Italy is located in the temperate zone, the mainland climate varies from the north to the south; summer temperatures are relatively uniform in most cities and range on average between 23°C and 28°C, while winter temperatures range between 12°C and 17°C. The annual average rainfall, generally, does not exceed 1,000 mm.

In 2000, the population of Italy was about 58 million with the density of 192 people per square kilometre. Table 1 gives the statistical data until 2000. The capital and largest city is Rome which had a population of 2,693,383 in 1991. The country is composed of 20 regions, which are subdivided into 104 provinces.

TABLE 1. POPULATION INFORMATION

	1960	1970	1980	1990	1996	1997	1998	1999	2000[2]	An. growth rate (%) 1980 to 2000
Population (millions) [1]	50.2	53.8	56.4	56.7	57.4	57.5	57.6	57.6	57.8	0.1
Population density (inhabitants/km^2)	166.6	178.6	187.3	188.2	190.5	190.9	191.1	191.3	191.7	0.1
Urban population as percent of total	59	64	67	67	67	67	67	67	NA	-
Area (1000 km^2)	301.3									

[1] Mid year
[2] Provisional

Source: ISTAT

1.2. Economic Indicators

Table 2 shows the historical GDP data.

1.3. Energy Situation

Italy is poor in natural resources and depends heavily on imported energy supply. In 2000, about 83% of Italy's energy was imported. Natural gas is Italy's largest domestic source of energy with proven reserves of 9.1 EJ in 1996 (Table 3).

Italy's total primary energy consumption was 184.8 Mtoe in 2000, of which solid fuels accounted for 12.8 Mtoe, oil 91.3 Mtoe, natural gas 58.1 Mtoe, renewable sources (hydro, geo, wind, solar, biomasses) 12.8 Mtoe, and electricity net imports 9.8 Mtoe. Historical data are given in Table 4.

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

									Growth rate (%/year)
	1970	1980	1990	1996	1997	1998	1999	2000 [4]	1980/2000
GDP [1]	107.7	448.8	1,102.4	1,232.8	1,166.8	1,196.5	1,180.2	1,077.1	4.5
GDP [2]	577.5	823.5	1,030.0	1,109.2	1,1317	1,152.2	1,170.7	1,204.9	1.9
GDP [3] per capita	2,001	7,953	19,437	21,480	20,288	20,777	20,473	18,646	4.4
GDP by sector (%):									
-Agriculture	5	4	3	3	3	3	3	3	-1.4
-Industry	33	31	29	28	28	28	27	27	-0.6
-Services	56	58	62	63	62	63	62	62	0.4
- (+)Ind. taxes (-)bank services	5	7	7	7	7	7	7	7	0.0

[1] Billions of current US$
[2] Billions of constant 1995 US$
[3] Current US$ per capita
[4] Provisional

TABLE 3. ESTIMATED ENERGY RESERVES

Exajoule

	Solid	Liquid	Gas	Uranium [1]	Hydro [2]	Total
Total amount in place	0.84	2.18	9.12	2.62	32.78	47.54

[1] This total represents essentially recoverable reserves.
[2] For comparison purposes a rough attempt is made to convert hydro capacity to energy by multiplying the gross theoretical annual capability (World Energy Council - 1998) by a factor of 10.
Source: IAEA Energy and Economic Data Base; Country Information.

TABLE 4. ENERGY STATISTICS

(Exajoule)

										Growth rate (%/year)	
	1960	1970	1980	1990	1996	1997	1998	1999	2000[2]	'60/'80	'80/'00
Energy consumption											
- Total	2.11	5.02	6.13	6.81	7.19	7.30	7.50	7.65	7.74	5.5	1.2
- Solids	0.45	0.46	0.53	0.66	0.53	0.55	0.58	0.59	0.62	0.8	0.8
- Liquids	1.00	3.65	4.14	3.87	3.95	3.97	3.97	3.87	3.82	7.4	-0.4
- Gases	0.22	0.45	0.95	1.64	1.94	2.00	2.16	2.34	2.43	7.6	4.8
- Primary electricity[1]	0.44	0.46	0.52	0.64	0.77	0.78	0.80	0.85	0.87	0.8	2.6
Energy production											
- Total	0.88	1.03	1.02	1.16	1.40	1.40	1.38	1.35	1.29	0.8	1.2
- Solids	0.13	0.08	0.05	0.05	0.06	0.06	0.07	0.08	0.08	-4.7	2.6
- Liquids	0.09	0.06	0.08	0.20	0.23	0.25	0.24	0.21	0.19	-0.6	4.6
- Gases	0.22	0.46	0.43	0.59	0.69	0.67	0.66	0.60	0.56	3.4	1.3
- Primary electricity[1]	0.44	0.43	0.46	0.32	0.42	0.42	0.42	0.46	0.46	0.2	-0.1
Net import (import-export)											
- Total	1.29	4.14	5.13	5.73	5.85	5.86	6.11	6.26	6.66	7.1	1.3
- Solids	0.32	0.39	0.48	0.58	0.49	0.46	0.50	0.51	0.56	2.0	0.8
- Liquids	0.97	3.72	4.10	3.77	3.73	3.69	3.76	3.66	3.70	7.5	-0.5
- Gases	0.00	0.00	0.50	1.06	1.28	1.35	1.47	1.71	1.98		7.2
- Electricity	0.00	0.03	0.06	0.32	0.34	0.36	0.38	0.39	0.41		10.5

(1) 2200 kcal/kW·h. Net of generation from hydro pumping plants
(2) Provisional
Source: Ministry of Industry, Italian National Energy Balances

1.4. Energy Policy

The last Energy Plan approved by the Government dates back to August 1998. It focused on a set of actions capable of yielding substantial results in terms of energy conservation, environmental protection, development of domestic energy sources, diversification of imported energy sources and their origins, and safeguarding the competitiveness of the production system. Since 1988, the Italian Government has issued no further comprehensive energy documents. A five-years nuclear moratorium, following a popular referendum, which took place in 1987, officially expired in December 1993, nevertheless the Government remains steadfast in excluding nuclear energy. Recently, a new State owned Company (SOGIN) got the assets constituted by the closed existing power stations (about 1,400 MW) and will take care of their decommissioning. A return to nuclear power, in Italy, is for the moment not foreseeable.

2. ELECTRICITY SECTOR

2.1. Structure of the Electricity Sector

In 1962, the electric sector was nationalized by Law 1643 of 6 December 1962. ENEL (Ente Nazionale per l'Energia Elettrica, Italian Electricity Generating Board) was established to be wholly responsible for electricity production and transmission, and partially responsible for distribution of electric energy.

Over the following three decades, the structure of the Italian electricity sector - in terms of production, transmission and distribution – was organized along the following model: a large, nation wide company: ENEL; a number of municipal utilities, namely in the large cities like Rome, Milan, Turin; and a large number of industrial autoproducers.

Starting from the early ‘90s, many changes have been developed in the Italian electricity sector and the consequences begin to appear.

By Decree No. 333 of 11 July 1992, the Government decided to privatize some state-owned industrial and commercial companies. The new companies issued shares for a total value equal to the net fixed assets given in the last balance sheet. The shares have been allocated to the Treasury and the revenue obtained by their sale will be used to reduce the national debt and to balance the Government’s books. Thus, in August 1992, ENEL became a joint-stock company (ENEL S.p.A.) with its shares in the hands of the Treasury. In November 1995 the law setting up the Independent regulatory Authority has been approved, and the Authority has been operational since the beginning of 1997. In December 1995 The Ministry of Industry issued the new concession to Enel SpA.

In March 1999, a legislative Decree (“Bersani” Decree) was issued, for the restructuring and liberalization of the Italian electricity sector: the purpose of the Decree is both to reach a sufficiently large liberalization and to guarantee such general economic interest as, for instance, a universal service, tariff equalization, the development of renewable sources.

According to the mentioned decree, Enel SpA begun a process of complete reorganization: now Enel is an holding, where five stock companies exist for generation, two for distribution (one for the captive market and one for the free market), and one owning the transmission grid. Many others stock companies exist in Enel group for other business such as engineering, telecommunications, lighting, water management, and other for different industrial services.

In November 1999, ENEL completed an initial public offering of shares representing about 32% of the company.

According to the “Bersani” Decree, two different markets should coexist in the future: the free and the captive market.

2.2. Decision Making Process

New generation capacity will be built according to the licensing procedure: producers wanting to operate on the free market will apply for the authorization. In order to encourage the use of renewable sources, operators producing more than 100 GW·h/year (coming from non renewable sources) will be obliged as of 2001 to insert a quota of energy into the grid produced with renewable sources equal to 2% of the amount exceeding 100 GW·h.

From January 2003, no producer or operator will be allowed to generate or import more than 50% of the total electric power generated and imported in Italy. By this date, Enel shall sell at least 15,000 MW of its generating capacity (three of the five companies have been created for this purpose). The sale process is already ongoing.

The management of the grid will be assured by the Independent System Operator (ISO): a joint stock company, owned by the Ministry of Treasure and totally independent from the electricity industry. ISO will have the task of dispatching energy and operating the national network, that mainly consists of the HV grid of Enel and HV lines of other operators.

2.3. Main Indicators

Italy’s total gross output capacity of electricity generating plants in 2000 amounted to 78,331 MW: thermal plants 56,700 MW, hydroelectric 20,600 MW, geothermal 631 MW and 400 MW renewable sources (Table 5). Total gross electricity production in 2000 was 275.94.7 TW·h., and renewables for 0.5 TW·h. High voltage transmission lines, connecting power plants with the distribution system, are mainly based on 380 kV lines and 220 kV lines.

In 2000, the electricity demand on the national grid was 297.7 TW·h with a per capita demand of 5,154 kWh. In 2000, electricity’s share in gross domestic energy demand was 35.4%. Energy related ratios are given in Table 6.

TABLE 5. ELECTRICITY PRODUCTION AND CAPACITY

								Growth rate (%/year)	
	1960	1970	1980	1990	1998	1999	2000[3]	'60/'80	'80/'00
Gross electricity production (TW·h)									
- Total	56.240	117.423	185.741	216.891	259.786	265.657	275.881	6.2	2.0
- Thermal [1]	8.030	70.222	133.350	178.590	207.970	209.068	219.800	15.1	2.5
- Hydro	46.106	41.300	47.511	35.079	47.365	51.777	50.925	0.2	0.3
- Nuclear	0.000	3.176	2.208	0.000	0.000	0.000	0.000		
- Geothermal	2.104	2.725	2.672	3.222	4.214	4.403	4.705	1.2	2.9
- Wind [2]	0.000	0.000	0.000	0.000	0.237	0.409	0.451		
Gross maximum output capacity (GW)									
- Total	16.311	31.331	48.469	58.596	74.955	76.230	78.331	5.6	2.4
- Thermal [1]	4.56	16.96	30.65	39.12	53.95	54.81	56.70	10.0	3.1
- Hydro	11.47	13.41	15.90	18.97	20.26	20.56	20.60	1.6	1.3
- Nuclear	0.00	0.58	1.47	0.00	0.00	0.00	0.00		
- Geothermal	0.29	0.39	0.44	0.51	0.58	0.62	0.63	2.2	1.8
- Wind [2]	0.00	0.00	0.00	0.00	0.17	0.24	0.40		

[1] Including biomass
[2] Including solar
[3] Provisional
Sources: ENEL, GRTN

TABLE 6. ENERGY RELATED RATIOS

	1960	1970	1980	1990	1996	1997	1998	1999	2000[3]
Energy consumption per capita (GJ/capita)	42	93	109	120	125	127	130	133	134
Electricity per capita (kWh/capita)	1091	2137	3181	4145	4580	4719	4850	4959	5154
Electricity penetration (%)	24.7	22.3	28.3	32.9	34.2	34.4	34.5	34.6	35.4
Nuclear/total electricity (%)	0	3	1	0	0	0	0	0	0
Dependence on imported energy sources (%)[1]	58.5	79.5	83.4	83.0	80.6	80.9	81.6	82.3	83.4
Load factor of electricity plants (%)[2]									
- Total	39	43	44	42	39	39	40	40	40
- Thermal	20	47	50	52	44	44	44	44	44
- Hydro	46	35	34	21	27	26	27	29	28
- Nuclear		63	17						

(1) 100 - (indigenous production/total demand)*100
(2) Rough evaluation referring to gross generation and gross maximum output capacity
(3) Provisional

3. NUCLEAR POWER SITUATION

3.1. Historical Development

Italy was among the first countries in the world to use nuclear technology for civil power generation purposes only. The Italian history of nuclear technology development can be split into three major periods:

i) pioneering period from 1946 to 1965 during which the private industry played a fundamental role;
ii) planning period from 1966 to 1987, during which the Government planned nuclear development;
iii) post referenda period from 1988 onward, which is characterized by the efforts to abandon nuclear energy production.

3.1.1. Pioneering Period

In November 1946, CISE (Centro Informazioni, Studi ed Esperienze) was founded, with the participation of the elite post-war Italian industries (Edison, Montecatini, FIAT) and some of the most prominent Italian nuclear scientists. Early on, the purpose of CISE was to lay down the foundations of civil nuclear engineering and, later on, to design a natural uranium fuelled, heavy water moderated test nuclear reactor.

In June 1952, the Government established CNRN (Comitato Nazionale per le Ricerche Nucleari), an agency in charge of developing and promoting nuclear technology. In August 1960, the agency was reorganized and renamed CNEN (Comitato Nazionale per I'Energia Nucleare).

In October 1958, the construction of the country's first nuclear power plant, Latina, began. This 200 MW(e) gas-graphite reactor (Magnox, from magnesium alloy used in the fuel cans) was connected to the electric grid in May 1963. It was ordered by SIMEA, an ENI[1] (Ente Nazionale Idrocarburi) subsidiary, and contracted from the Nuclear Power Plant Company (NPPC) of the UK. The United Kingdom's Atomic Energy Authority was to offer support for the safety aspects.

In November 1959, construction work for the Garigliano nuclear power plant began. A Boiling Water Reactor prototype was ordered by SENN (Societa Elettro Nucleare Nazionale) from the International General Electric. In January 1964, Garigliano 150 MW(e) reactor started operation.

The Trino Vercellese nuclear power plant, a Westinghouse PWR with two separate turbine systems, was ordered by SELNI (Societa Elettro Nucleare Italiana), a subsidiary of the Edison group.

[1] Italian Hydrocarbons Board

Construction for the 260 MW(e) Trino Vercellese began in August 1961. It entered commercial operation in October 1964.

A general rule, Law 1860, to regulate peaceful use of atomic energy was issued for the first time in December 1962. This law assigned CNEN the role of the nuclear Regulatory Body and foresaw the issuance of a subsequent law for radioactive protection of population and workers.

In February 1964, the Italian Government issued a complete set of Regulations (D.P.R. 230) to cover into details the different aspects of nuclear safety and radiation protection. CNEN was confirmed as the official Regulatory Body. However, this responsibility created an inherent conflict of interests between its role as a public promoter of nuclear technology and as a Regulator. The safety criteria during the period were adopted from countries exporting nuclear technology (mainly the UK and the USA).

In 1962, after a long political struggle, the electric sector was nationalized and ENEL was established as the sole utility. In 1964, the ownership of Latina nuclear power plant was transferred to ENEL, and, in 1966, also the Garigliano and Trino units were transferred to ENEL, hence closing the first period of the Italian nuclear history.

3.1.2. Planning Period

In December 1966, ENEL announced a huge nuclear programme forecasting 12,000 MW of nuclear power by 1980. A year later, in 1967, CIPE[2] (Comitato Interministeriale per la Programmazione Economica) - a Committee in charge of co-ordinating the activities of Ministries involved in the country's economic planning and of defining the nuclear programme of ENEL - reorganized the nuclear sector. Among the most important actors (all state-owned companies) were:

i) ENEL, which maintained its position as the sole utility;
ii) ENI, which was in charge of nuclear fuel;
iii) ANSALDO, which was in charge of collaborating with foreign supplier(s) and later became the Italian nuclear components supplier.

In 1967, an agreement was signed by CNEN and ENEL for developing an Italian version of the Canadian CANDU. This reactor type, called CIRENE, was designed to use heavy water as moderator and boiling water as coolant. In 1972, ANSALDO got an order to build a 40 MW(e) prototype close to the Latina nuclear power plant. CISE actively participated in the design and construction of the CIRENE reactor, which, however, never became operational due to technical problems and the lack of economic resources. Its construction was finalized only in 1988.

In 1969, ENEL decided to build a BWR (G.E. BWR 4, Mark 2) on the site of Caorso; one year later ANSALDO, in a joint venture with G.E., officially received the order. The Caorso site construction began in 1970. After several delays in implementing improvements in the suppression pool and bolstering thermal fuel performance, this 860 MW(e) unit finally started commercial operation in 1981.

In 1974, following the Yom Kippur War and the consequent oil crisis, the Ministry of Industry, Commerce and Crafts (hereafter referred to as Ministry of Industry) approved a National Energy Plan that foresaw the construction of 20 nuclear power plants in order to reduce the contribution of oil on the Italian energy balance. The main effort during that period was to achieve a certain level of technological independence from the American licenser(s). Political indecision led the industry to spread technical and economic resources over five different reactor types; namely, the BWR of General Electric, the PWR of Westinghouse and Babcock types, the CANDU of AECL, and the indigenous CIRENE.

[2] Interministerial Committee for Economic Planning

To attain the goals of the new energy plan, the Italian government in 1973, joined the EURODIF consortium. AGIP Nucleare, a subsidiary of ENI, and CNEN were in charge of providing the country with enriched uranium for fuel fabrication. Meanwhile, in 1972, ANSALDO -in a joint venture with G.E.- completed the Fabbricazioni Nucleari (Bosco Marengo) to manufacture the fuel elements for the future BWR's. The plant can produce 100 tons of fuel annually. It entered in operation in 1976 and has produced more than 500 tons of fuel for the Italian nuclear power stations and Leibstadt nuclear power station in Switzerland.

Later, in December 1973, three major European utilities signed an agreement to build a Superphenix, 1200 MW(e) fast breeder reactor in France. A second smaller station was planned in Federal Republic of Germany. The three original partners were Electricité de France (EdF), ENEL and Rheinisch Westfalisches Elektrizitätswerk (RWE). Subsequently RWE was substituted by Schnell-Bruter Kernkraftwerkgesellschaft (SBK), a joint enterprise of RWE, Belgian and Dutch utilities and, to a lesser extent, the British Central Electricity Generating Board (CEGB). Under the terms of this agreement the NERSA company was created in 1974 to undertake the construction of the Creys-Malville station. EdF's share of NERSA was 51%, ENEL had 33% and SBK 16%. Preliminary work on the Creys-Malville site started in December 1974. The fist concrete was laid in December 1976. The reactor began operation in January 1986. Earlier, in 1983, construction had began for PEC (Prova Elementi di Combustible) for testing fast breeder fuel elements. This was intended to strengthen Italy's participation in the Superphenix venture.

In 1976, Montalto di Castro was selected as the site for two new BWR's (G.E. BWR 4, Mark 3). The site permit was issued in 1979, exactly one month before the Three Mile Island incident. This along with the active opposition of the environmental movements, delayed the implementation of the energy plan. Moreover, ENEL faced increasing difficulties with its nuclear power stations and conventional power plants with the construction of transmission system. During the 1980's, the nuclear option became one of the major political issues, almost completely halting all nuclear activities, despite the commitments of several energy plans.

The new National Energy Plan of 1982 reflected mixed attitudes. It called for two nuclear units at Montalto di Castro and six other units on three different sites (Piemonte, Lombardia and Puglia). The plan also identified the development of the so-called PUN[3] (Progetto Unificato Nazionale), a Westinghouse pressurized water reactor as the final reactor type for the country. The most important characteristic of PUN design was to standardize nuclear plant design and construction. ENEA[4] (Ente Nazionale per la ricerca e lo sviluppo dell'energia nucleare e delle Energie Alternative), formerly CNEN, was split into two major branches: ENEA responsible for research and promotion of nuclear technology; and, ENEA/DISP[5], an independently acting nuclear Regulatory Body.

In 1986, a few months before the Chernobyl nuclear disaster, CIPE reaffirmed its commitment for the two BWR units at Montalto di Castro and for the six PUN type pressurized water reactors. However, the impact of the Chernobyl disaster on public opinion was enormous and a general debate on the implications of the use of nuclear energy inflamed the contest in the political arena. In November 1987, three referenda were passed essentially stopping any activity in the nuclear sector.

3.1.3. Disengagement Period

In December 1987, CIPE halted construction of the Montalto di Castro and Piemonte plants. These were the only two sites where construction work was effectively in progress. A nuclear moratorium period of five years became effective.

[3] Standard Nuclear Plant Project.
[4] Italian Commission for research and Development of Nuclear and Alternative Energy Resources, set up under Act No. 84 of 5 March 1982 to reorganise CNEN.
[5] Directorate for Nuclear Safety and Health Protection.

In June 1988, the Government, by Decree Nos. 230 and 324, ended all nuclear construction. The Caorso reactor, which was shut down in October 1986 for the annual refuelling remained in cold shut down for a complete safety review and assessment. In 1989, an OSART (Operational Safety Assessment Review Team, under the aegis of IAEA) inspection of the Caorso plant was conducted; but, despite of positive results of both reviews, CIPE decided, in July 1990, to close down the plant. At the same time Trino nuclear power plant was closed. The remaining units of Garigliano and Latina had already been closed down in August 1978 and November 1986, respectively.

At the same time ENEA decided to close down a number of facilities relevant to the fuel cycle: IFEC (Impianto di Fabbricazione Elementi di Combustibile), EUREX (Enriched Uranium Extraction), ITREC (Impianto di Trattamento e Rifabbricazione Elementi di Combustibile) and the plutonium plant at its Casaccia Centre. In effect, Italy is currently inactive in the nuclear energy sector.

In the context of the privatization and of the liberalization of the electric energy market, and accordingly to a legislative Decree (Decreto legislativo n° 79 , 16 March 1999) all Enel's liabilities and assets (and all capabilities and resources) connected to nuclear power have been assigned to a newly established company, named SO.G.I.N. (Società Gestione Impianti Nucleari, hereafter Sogin); Sogin is operational since November 1st, 1999; its shares have been transferred in 2000 to the Ministry of Treasure; nevertheless, Sogin will act accordingly to guidelines issued by the Ministry of Industry.

The mission of Sogin covers:

- the decommissioning of the NPPs in Italy: as it is well known, all nuclear generation plants in Italy have been definitely shutdown; furthermore, Sogin has been allowed to act with joint ventures or similar co-operative initiatives in order to dismantle any other nuclear related structure in Italy: for this reason on 12 December 2000, Sogin entered into a Consortium with ENEA and Fabbricazioni nucleari (FN). The aim of the Consortium is to dismantle all plants related to the fuel cycle (fabrication and research plants: no installation for the back end of the cycle exist in Italy), which are property of ENEA and FN;
- the management of the back end of the related fuel cycle;
- the valorization of the assets such as sites, components, resources;
- providing engineering and consultancy services in the nuclear field within the domestic and the international market.

3.2. Status and Trends of Nuclear Power

TABLE 7. STATUS OF NUCLEAR POWER PLANTS

Station	Type	Capacity	Operator	Status	Reactor Supplier
CAORSO	BWR	860	Sogin[1]	Shut Down	AMN/GETS
ENRICO FERMI (TRINO)	PWR	260	Sogin[1]	Shut Down	WEST
GARIGLIANO	BWR	150	Sogin[1]	Shut Down	GE
LATINA	GCR	153	Sogin[1]	Shut Down	TNPG

Station	Construction Date	Criticality Date	Grid Date	Commercial Date	Shutdown Date
CAORSO	01-Jan-70	31-Dec-77	23-May-78	01-Dec-81	01-Jul-90
ENRICO FERMI (TRINO)	01-Jul-61	21-Jun-64	22-Oct-64	01-Jan-65	01-Jul-90
GARIGLIANO	01-Nov-59	05-Jun-63	01-Jan-64	01-Jun-64	01-Mar-82
LATINA	01-Nov-58	27-Dec-62	12-May-63	01-Jan-64	01-Dec-87

[1]Sogin since November 1st, 1999; before, the operator was ENEL.
Source: IAEA Power Reactor Information System as of 31 December 2000; Sogin.

3.3. Current Policy Issues

At the present time, electric demand is being met with increased uses of gas-fired units and imported energy. The future of the nuclear sector remains uncertain pending development and acceptance of the new generation of enhanced safety reactors.

Main nuclear policy issues relate to the decommissioning and waste disposal facilities. The ultimate strategic goal, for the former, is unrestricted site release.

On 14 December 1999, the Italian Government, with an announcement of the Ministry of Industry, has outlined strategic choices and plans to manage the problems connected with the closure of all nuclear activities in the country. These guidelines have been submitted to the Parliament, even if a wide consensus both on political and technical bodies has raised and a high level of confidence about their confirmation should be considered.

The ministry statement outlines three main goals:

- treatment and conditioning, within a 10 year period, of all liquid and solid radwaste currently in on-site storage, mostly issued from the operation of the plants, with a view to subsequent transport to a national waste repository;
- Site selection and construction of a national repository for low and intermediate level wastes, also within 10 years; the same site would be used for temporary storage of high level long lived wastes, particularly spent fuel and wastes resulting from reprocessing: the final selection of a site for waste disposal facilities has not been made yet;
- Decommissioning of the nuclear plants in about 20 years, proceeding directly to the dismantling stage in order to reach the site release with no radiological constraints.

It is worth mentioning that this announcement brings a new approach for the decommissioning: in fact, also as a consequence of the National Conference on Energy and Environment in the autumn of 1998, the deferred decommissioning strategy (Safe Store) was up to this moment the adopted and agreed strategy by Enel with the Government.

Nevertheless, during 1999 also representatives of ANPA (the Safety National Authority) have asked for the possibility of an acceleration, considering “prompt decommissioning” option to be preferred, as well taking into account dose constraints as the need of taking advantage of the reactor operational staff still available on the nuclear sites.

Sogin is therefore now being reconsidering the planning of activities in view of the DECON (prompt dismantling) strategy, in order to meet the Ministry requirements; this also considering that an adequate financing procedure has been defined by the Government in order to face consequent additional costs: in fact, following the separation of Sogin from Enel, a funding mechanism has been defined to provide resources for additional costs deriving from the different economic conditions (new interest rates and taxes), from the management costs for the new company, and from the change in strategy (from Safe Store to DECON). A Decree of the Ministry of the Industry issued on 26 January 2000, states that above mentioned extra costs for Sogin shall be financed on a levy on the price of the sold kW·h. Every year, Sogin shall present the programme of future activities, with associated costs: on this basis, the national Authority for Electric Energy and Gas (the National body which defines tariff politics) shall re-evaluate the amount of the price of the kW·h due to Sogin for the next three years; this re-evaluation will take into account economic efficiency criteria.

The same procedure is foreseen by the Decree in the framework of the Consortium agreement in order to provide Sogin with additional funds for financing the dismantling of nuclear related installations now property of ENEA and FN.

4. NUCLEAR POWER INDUSTRY

4.1. Supply of Nuclear Power Plants

Due to the historical development of nuclear technology in Italy, it was not possible to develop separate organizations for the roles of architect engineer and nuclear steam systems supplier. For PUN, it was foreseen that ENEL would have covered the role of architect engineering, and ANSALDO would have been the nuclear supplier. For the other reactors, both activities were performed mainly by foreign companies. For example, for Caorso nuclear power plant the supplier was a joint venture of ANSALDO and G.E. (AMN/GETS), while the architect engineering services were provided by Gibbs & Hill of the U.S.

At present, ANSALDO participates in a joint venture with AECL for construction of five CANDU reactors in Cernovoda, Romania.

Sogin is also present in the international market offering mainly engineering and consultancy services for refurbishing of power plants, for on site assistance programmes and for decommissioning activities. At present, Sogin is participating in PHARE and TACIS programmes: it is since 1997 leader in the On Site Assistance project of the Medzamor plant (Armenia); as a partner of EDF it is operating for safety improvements of Aktau (Kazakistan) and Beloyarsk (Russia) fast breeder reactors; other services have been granted in other eastern countries and in the field of training.

4.2. Operation of Nuclear Power Plants

Since 1962, ENEL has been the only utility owning and operating nuclear power reactors. ENEL has also acted as a maintenance company with several other private or state-owned companies (ANSALDO, Carlo Gavazzi, Fochi, Belleli, FIAT, etc.). For instance, half of the outage services at Caorso NPP are performed by the plant personnel and other half by external contractors. For training nuclear operators, ENEL established, in the 1980’s, a training centre in Piacenza equipped with a full scale BWR simulator.

Now Sogin cares about post operation activities of NPPs to be decommissioned

4.3. Fuel Cycle and Waste Management Service Supply

4.3.1. Uranium enrichment and fuel fabrication

In Italy, there are no facilities for enriching Uranium. Several installations have the capability to manufacture fuel elements. However, at the present time all are closed.

4.3.2. Fuel transportation

Radioactive material can be transported only by authorized carriers. The authority responsible for issuing freight licences is the Ministry of Industry, after ANPA (Agenzia Nazionale per la Protezione dell’Ambiente, see section 5.1) has given its technical assessment. The rules regulating transport of radioactive material come from IAEA’s Safety Series No. 6, and are in accordance with international regulations enacted by ICAO, ADR, RID and IMO.

4.3.3. Spent fuel disposal and storage

Some irradiated fuel removed from ENEL power plants has been reprocessed in the United Kingdom. The remainder is stored at ENEL and at Avogadro (Saluggia- Fiat Avio)storage.

In the middle of the 90ties, Enel has decided to terminate nuclear fuel reprocessing, on the basis of an economical and technical evaluation, and to proceed with interim dry storage of the remaining

spent fuel of light water reactors. It was in fact recognized that, in the light of the Italian situation, reprocessing would not have brought important advantages in term of final disposal, since VHLW would have to be disposed anyway together with other reprocessing generated wastes; moreover, the waste form would not have implied specific advantages in term of final disposal, where only geological barriers could be credited.

For the temporary on site storage of irradiated fuel, among the various available technologies, the dry storage, inside dual-purpose metallic containers ("cask"), has been chosen.

Sogin is actively carrying on a project for an interim storage facility on the sites of Trino and Caorso NPPs where residual spent fuel of these plants can be kept safely for several decades pending the governmental decision on final disposal.

4.3.4. Waste management and disposal

The sources of radioactive waste in Italy include the power plants formerly operated by ENEL, the fuel cycle plants: operated by Fabbricazioni Nucleari S.p.A., ENEA research laboratories and experimental facilities, and non-energy applications (e.g., biomedical and other uses).

It is a governmental commitment the definition of guidelines and of a regulatory framework for the management of radioactive wastes: in this view a National Operator is to be created and appointed for the management of all existing and future wastes; in the meantime, a procedure has been initiated by the government in order to select the site for the final repository for the second category wastes (see below): the repository is at present scheduled to be operating early in 2009. A specific task force of ENEA is now working on the siting of the repository. Waiting for the constitution of the national operator, Sogin and ENEA have provided strategies for the temporary storage on their sites of the produced wastes; NUCLECO (an ENI and ENEA joint company, established in 1981) has the responsibility for non-energy applications produced wastes. ANPA is responsible for licensing aspects.

The criteria applicable to the classification, treatment and disposal of radioactive waste are set forth in ENEA/DISP's Technical Guide No. 26, issued in May 1988 and updated in 1997. These rules allow above ground disposal of treated low-level waste (Categories I and 11) and prescribe suitable final disposal solutions (such as deep disposal) for high-level waste (Category III).

As for categories I and II, solid low-level waste is to be super-compacted and cemented. Liquid low-level waste is to be cemented in containers suitable for above ground storage.

At the present time, high-level and most low-level waste is stored at production sites (ENEL power plants and ENEA facilities). The quantities of energy related waste currently stored in Italy are the follows:

- about 5,300 cubic meters solid and 40 cubic meters liquid low level waste (Categories I and II);
- cubic meters solid high-level waste (Category III). This figure includes alpha-emitting waste, 120 cubic meters liquid waste. About 290 tHM of spent fuel have to be added.

Vitrification and cementation treatments are under consideration for liquid high-level waste, and cementation for solid high-level waste in category III containers for deep storage.

4.4. Research and Development Activities

Nuclear research is conducted by several agencies, institutions and universities. Every three years two governmental bodies (Consiglio Nazionale della Scienza e della Tecnologia and CIPE) issue the "Triennial Research Plan" in order to co-ordinate the whole research sector. The leading agency for applied nuclear research is ENEA with its Energy Research Centre (CRE) at Casaccia,

near Rome. To a lesser extent, research activities are also performed by ENEL. Theoretical research in the nuclear field is performed mainly under the aegis of CNR[6] (Consiglio Nazionale delle Ricerche) and INFN[7] (Instituto Nazionale di Fisica Nucleare) in its four main laboratories - Laboratori Nazionali di Frascati, Laboratori Nazionali di Legnano, Laboratori Nazionali del Sud and the new Laboratori Nazionali del Gran Sasso.

In nuclear engineering, the universities with degree programmes are the Università di Roma (power plant engineering), the Università di Pisa (safety assessments), and the Politecnico di Milano (plant engineering and probabilistic safety studies).

Some research activities, experiments and studies, mainly in connection with the above universities and agencies, are still performed at the facilities equipped with research reactors as shown in Table 8.

TABLE 8. RESEARCH REACTOR FACILITIES

SITE	POWER	OPERATOR	STATUS
Bologna	100 We	ENEA/RB3	not operating
Palermo	20 We	University of Palermo	in operation
Roma	1 MW	ENEA/TRIGA	in operation
Roma	5 kW	ENEA/TAPIRO	not operating
Pavia	250 kW	University of Pavia	in operation

Source: Country Information.

4.5. International Co-operation in the Field of Nuclear Power Development and Implementation

Italy participates in several international co-operative projects developed under the aegis of the European Community, NEA/OECD and the International Atomic Energy Agency. In this setting two important research centres must be pointed out: the Joint Research Centre of Ispra[8] and the International Centre for Theoretical Physics in Trieste, a branch of IAEA. ANPA is participating in the PHARE and TACIS programmes of assistance to Central Europe and CIS countries. Sogin is also deeply involved in these programmes

In the area of nuclear safety and environmental protection, bilateral agreements have been signed with NRC (USA), NII (UK), CSN (Spain), N.N.S.A.(China), and D.S.I.N (France).

Some noteworthy activities in progress are: nuclear fuel research conducted with the Halden reactor; participation in the international EPRI-DOE programme on new generation reactors; and, in nuclear fusion field, participation in the Joint European Torus project.

5. REGULATORY FRAMEWORK

5.1. Safety Authority and the Licensing Process

In Italy, the general framework of nuclear activities is given by Basic Act No. 1860 of 31 December 1962, on the peaceful uses of nuclear energy (G.U. No. 27, 30 Gennaio 1963). Licensing and operation of nuclear installations are governed by recent Legislative Decree No. 230 of March 1995 (G.U. No. 136, 13 Giugno 1995) on the safety of nuclear plants and the protection of workers and the population against the risks of ionizing radiation, amended by Legislative Decree n 241 of May 25, 2000. These Decrees replace and update the previous Decree No. 230/1964, incorporating

[6] Italian National Research Council

[7] Italian National Institute for Nuclear Physics

[8] Reactor Safety, Fusion Technology (with the European Tritium Handling Laboratory) and Advanced Materials are only some of the activities performed in the Centre. Another European research centre, in which Italy has a quota of 28%, is CERN (Consiglio Europeo per la Ricerca Nucleare) in Switzerland.

several Directives of EURATOM (n. 80/836, 84/467, 84/466. 89/618, 90/641, 92/3) and introducing a specific licensing procedure for decommissioning nuclear plants (Art. 55, 56, 57). Both of these general Acts are complemented by several Decrees regulating specific aspects.

In accordance with Act No. 1860 and with Decree No. 230, the administrative authority responsible for licensing is the Minister for Industry, Commerce and Crafts. It grants the nuclear power plant construction permit and the operating license.

The National Agency for the Environmental Protection (ANPA), established by Act No. 61 of 21 January 1994, is entrusted with safety reviews, regulatory inspections and other technical tasks. Before the establishment of ANPA, these activities were performed by ENEA/DISP, a Directorate embodied in ENEA. In the main steps of the licensing procedure, ANPA makes use of consultative advice from the Advisory Committee (Commissione Tecnica) made up of experts appointed by the Ministries involved.

In addition to the provisions of Presidential Decree No. 230, ANPA publishes Technical Guides, which outline the safety criteria and license application formats. These guides are prepared for nuclear operators and are informational in nature. Their purpose is to provide a better understanding of the controls exercised by ANPA in matters of safety and health protection.

5.2. Main National Laws and Regulations

According to Article six of the Law 1860, any organization that intends to operate a nuclear installation has to be licensed by the Ministry of Industry, as advised by the Regulatory Body.

The Act No. 393 of 23 August 1975, outlines a construction licensing procedure, which is broken into two main stages: a study of the site in relation to the basic design principles of the power plant in question; and, a study of the preliminary project of the planned power plant. Act No. 393 on the NPP site selection instituted the co-operation of national authorities with regional and local authorities to take due account of the administrative decentralization implemented in legislation.

In accordance with the established procedure, CIPE authorizes the areas where nuclear power plants can be constructed. In order to facilitate this phase, the Regulatory Body drew up a "National Sites Map", which indicates the areas where the nuclear power plants can be built. The CIPE's decision is taken after a consultation with ENEA and in agreement with the Inter-regional Advisory Commission made up of the presidents of the regional governments. In the first phase, each region concerned has to indicate, within 150 days following the CIPE deliberations, at least two areas in its territory where nuclear power plants could be constructed.

Once the areas have been selected, the utility is given permission by the Ministry of Industry to proceed with all investigations that are needed to determine whether the areas selected are technically suitable and to decide which area it would propose for the installation. Within 12 months, the utility has to submit a detailed report on the proposed site to the Minister of Industry, to the regions concerned and to the Regulatory Body. The report contains a detailed analysis of nuclear safety and health protection issues in accordance with the procedures laid down in D.P.R. No. 230, as relates to the siting of the location. Under the terms of Act No. 393, ANPA has to consult all concerned, e.g., Ministries of Interior, Employment, Public Works, Health. The Ministries are required to reply within sixty days of being consulted. The outcome of the investigation is referred to the Advisory Committee by the Regulatory Body and ultimately forwarded to the Ministry of Industry.

This technical phase is followed by a decision making phase culminating in a final choice of the site by the region in agreement with the municipality concerned. The region’s decision must be communicated to the Ministry of Industry within two months.

Once the site has been approved, the Ministry of Industry authorizes the utility to begin preliminary site preparation under the control of the Regulatory Body. From this point on the licensing procedure continues along the lines set out in D.P.R. 230. This consists of the issuance of the construction permit and the operating license.

Before the final authorization is granted, nuclear power plants and facilities for the disposal of radioactive waste must undergo an environmental impact assessment, in accordance with Decree 377 of 1988.

Filing of application:

The utility submits the general design (site and plant) and the preliminary Safety Report to the Ministry of Industry and to the Regulatory Body. The documents supplied must also include a Preliminary Study on the treatment and disposal of radioactive waste.

The Regulatory Body draws up a technical report for nuclear safety and health protection evaluation of the installation. It also makes a critical appraisal of the preliminary safety report and the preliminary study on the treatment and disposal of radioactive waste determining whether these comply with the conditions laid down during site selection.

The Regulatory Body's technical report is forwarded to the Ministry of Industry, which then sends it to the Ministries of the Interior, Employment, Public Works, and Public Health for their comments. The comments should be forwarded to the Regulatory Body within sixty days. Having considered the assessment of the Advisory Committee, the Regulatory Body gives the Ministry of Industry its final evaluation. The construction license is granted by Decree from the Minister.

The Regulatory Body, on the advice of the Advisory Committee, establishes a list of the parts of the installation that involve nuclear safety and health protection. A detailed plan for each part of the installation included in the list has to be approved by the Regulatory Body, on the assessment of the Advisory Committee, prior to the construction. The study on treatment and disposal of radioactive waste must be handed to the Commission of the European Communities in accordance with section 37 of the EURATOM Treaty.

Two series of tests -non nuclear and nuclear- must be carried out and successfully performed before an operator can apply for a license to commission the installation. The results of non-nuclear tests are submitted to ANPA for approval The test can be carried out only with its permission and under its supervision. Depending on the reports produced by the operator and the results of the checks made during these tests, the Regulatory Body issues a certificate stating that from the safety viewpoint the installation is ready to be loaded with the nuclear fuel.

Nuclear tests may not be carried out until the operator has submitted the Final Safety Report (with Operating Rules, Operating Manual, Structure of Operating Organization, Proposal of Technical Specifications) and obtained the Regulatory Body's approval on the general test programme, after the Advisory Committee has given its assessment. The approval is subject to the Ministry of the Interior’s receipt of the emergency scheme for safety measures in case of an accident. Before beginning nuclear tests, the Regulatory Body also has to approve the maximum discharge levels for the radioactive effluents. The Operator must give the Regulatory Body a report on each nuclear test in order to get certified.

The operating license is granted in successive stages, depending on the results of the nuclear tests within the limits, conditions and technical specifications with which the operator must comply. A specific license is required for the reactor operators, reactor senior operators and plant supervisors. The operating license is granted by Decree of the Ministry of Industry and includes the technical

requirements specified by the Regulatory Body. As a rule, the operating license is granted indefinitely. However, a general review of the installation's safety condition is usually undertaken after ten years.

The period within which a safety review is carried out also depends on the operational life and on the status of the specific plant. Any modification to the initial design must be approved by the Ministry of Industry, which takes its decision after consulting the Regulatory Body.

5.3. International, Multilateral and Bilateral Agreements

AGREEMENTS WITH THE IAEA

• Amendments to Articles VI & XIV of the Agency statute	Not ratified	
• Agreement on privileges and immunities	Entry into force:	20 June 1985
• NPT related agreement INFCIRC/193	Entry into force:	21 February 1977
• Additional Protocol (GOV/1998/28)	Signature:	22 September 1998
• Supplementary agreement on provision of technical assistance by the IAEA	Not Applicable	
• EURATOM	Member	

MAIN INTERNATIONAL TREATIES etc.

• NPT	Entry into force:	2 May 1975
• Convention on physical protection of nuclear material	Entry into force:	6 October 1991
• Convention on early notification of a nuclear accident	Entry into force:	11 March 1990
• Convention on assistance in the case of a nuclear accident or radiological emergency	Entry into force:	25 November 1990
• Vienna convention on civil liability for nuclear damage	Not applicable	
• Paris convention on third party liability in the field of nuclear energy	Entry into force:	17 September 1975
• Joint protocol relating to the application of Vienna and Paris conventions	Entry into force:	27 April 1992
• Protocol to amend the Vienna convention on civil liability for	Signature:	26 January 1998

nuclear damage		
• Convention on supplementary compensation for nuclear damage	Not signed	
• Convention on nuclear safety	Entry into force:	14 July 1998
• Joint convention on the safety of spent fuel management and on the safety of radioactive waste management	Signature	26 January 1998

OTHER RELEVANT INTERNATIONAL TREATIES AND UNDERTAKINGS

• Improved procedures for designation of safeguards inspectors	Rejected but agreed to special procedures	
• ZANGGER Committee	Member	
• Nuclear Export Guidelines	Adopted	
• Acceptance of NUSS Codes	Summary: National regulations are in conformity with revised codes. Codes are sound international safety standards which should be made obligatory in all states operating NPPs. Letter:	27 December 1989
• Nuclear Suppliers Group	Member	
• Establishment of CERN with 12 other European Countries	Paris	July 1953
• Halden Boiling Water Reactor project Italian representative: ENEA		June 1958
• Joint European Torus Undertaking Italian representatives: ENEA and CNR	Brussels	May 1978

REFERENCES

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[2] Il Nucleare in Italia, special edition of Professione Ingegnere, Anno 5, N.19/20, Luglio-Dicembre, (1992).

[3] Energia, ambiente, innovazione dal CNRN all'ENEA, a cura di G. Paoloni, Laterza; Bari, (1992).

[4] La questione energetica: dieci anni perduti 1963-1973, F. Ippolito, F. Simen, Feltrinelli; Milano, (1974).

[5] Il ruolo dell'organizzazione industriale nello sviluppo nucleare, P. Berra, A. Ninni, S. Vaccà, Economia delle fonti di energia, XXXIII, N. 42, (1990).

[6] Data & Statistics, The World Bank, www.worldbank.org/data.

[7] IAEA Energy and Economic Data Base (EEDB).

[8] IAEA Power Reactor Information System (PRIS).

[9] IEA, Beyond 20/20.

Appendix

DIRECTORY OF THE MAIN ORGANIZATIONS, INSTITUTIONS AND COMPANIES INVOLVED IN NUCLEAR POWER RELATED ACTIVITIES

NATIONAL ATOMIC ENERGY AUTHORITY

Ministry for Industry, Commerce and Handicrafts (MICA)
Via Vittorio Veneto, 33
I-00187 Rome, Italy
Tel: +39 6 470 51
Fax: +39 6 470 528 44
Telex: 616315 MICA

Italian Agency for New Technology, Energy and the Environment (ENEA)
Lungotevere Thaon di Revel, 76
I-00196 Rome
Italy
Tel: +39 6 3627 1
Fax: +39 6 3627 2591/2214
Telex: 610183 ENEA
http://www.enea.it/

NATIONAL REGULATORY BODY

Italian Agency for Environmental Protection (ANPA)
Via Vitaliano Brancati, 48
I-00144 Rome, Italy
Tel: +39 6 500 71
Fax: +39 6 500 729 16/722 19
http://www.sinanet.anpa.it/

OTHER NUCLEAR ORGANIZATIONS

Italian Forum for Nuclear Energy (FIEN)
Via Flavia, 104
00187 Rome, Italy
Tel: +39 6 486415
Fax: +39 6 4744397

National Association for Nuclear Engineering (ANDIN)
Via Flavia, 104
00187 Rome, Italy
Tel: +39 6 486415
Fax: +39 6 4744397

NUCLEAR INDUSTRY

Supply of Nuclear Power Plants

ANSALDO S.p.A. Nuclear Division
Via Corso Perrone 25
16161 Genova.
Tel: +39 10 6551

Operation of Nuclear Power Plants

SO.G.I.N p.a.
Via Torino 6
00184 Roma
Tel: +39 06 85091

Fuel Fabrication

FN S.p.A. Nuove Tecnologie e Servizi Avanzati
S.S. 35 bis dei Giovi Km 15
15062 Bosco Marengo - Alessandria
Tel: +39 131 2971
Fax: +39 131 297250

Transport

Air carrier:	Alitalia Via della Magliana 806 Roma	 Tel: +39 6 65629133 http://www.alitalia.it
Land Carriers:	Borghi Nucleare V. le Liegi 33 Roma	 Tel: +39 6 8546104 Fax +39 6 8543798
	MIT Nucleare Via dell'Artigianato 12 Carugate (Mi)	 Tel: +39 2 921591 Fax +39 2 92150244
Rail Carrier:	Ferrovie dello Stato Piazza della Croce Rossa 1 Roma	 Tel: +39 6 47305700
Marine Carrier:	Lloyd Triestino S.p.A. Piazza Unità d'Italia 1 Trieste	 Tel: +39 40 3180111

Several other carriers are licensed for radioactive and fissile materials, their addresses are available from ANPA or from the Ministry of Industry.

Spent fuel	COMPES Via Cuneo 21 Torino	 Tel: +39 11 26001 Fax: +39 11 850642
Waste Management	NUCLECO Via Anguillarese 301 Roma	

NUCLEAR RESEARCH INSTITUTES

ENEA/CRE Via Anguillarese 301 S.M. di Galeria (RM)	Tel: +39 6 30481 Fax +39 6 30494203 http://www.casaccia.enea.it/
CNR le A. Moro 7 Roma	Tel: +39 6 49931 Fax +39 6 4461954 http://www.cnr.it/
National Institute for Research in Nuclear and Subnuclear Physics (INFN) Piazza dei Caprettari 70 Roma	 Fax: +39 6 68307924 http://www.infn.it/
Abdus Salam International Centre for Theoretical Physics (ICTP)	 http://www.ictp.trieste.it/
European Centre for Theoretical Studies in Nuclear Physics and Related Areas (ECT)	 http://www.ect.it/

HIGH ENERGY INSTITUTES

Elettra Synchrotron Light Source	http://www.elettra.trieste.it/
Frascati National Laboratory (LNF)	http://www.lnf.infn.it/
ENEA (Frascati, Italy)	http://www.frascati.enea.it/FTU/

OTHER ORGANIZATIONS

Ministry for University based Science and Technology	http://www.miur.it/
International Centre for Genetic Engineering and Biotechnology (ICGEB)	http://www.icgeb.trieste.it/
International School for Advanced Studies (SISSA)	http://www.sissa.it/
Department of Electrical and Automation Research	http://www.pea.enel.it/
The Journal of High Energy Physics (JHEP)	http://jhep.sissa.it/
Architecture and Engineering Virtual Library	http://www.uniroma1.it/cobai/bibvirt/start.htm