SLOVENIA

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1. ENERGY, ECONOMIC AND ELECTRICITY INFORMATION

1.1. General Overview

The Republic of Slovenia is a small European country bordering on the west to Italy and the Adriatic Sea, on the north to Austria, on the east to Hungary, and on the south to Croatia. Its capital is Ljubljana. Before 1918, Slovenia belonged to Austrian and Hungarian empire; from 1918 to 1991 it was part of Yugoslavia. It declared its independence on 25 June 1991 and on 22 May 1992 the country became member state of the United Nations.

Slovenia is a mountainous land. In the north are the Julian and Karavanke Alps, and in the south, the Dinaric Alps. The highest elevation, mount Triglav (2.864 m) is in the Julian range. The climate is moderate, with mean temperatures of 0 °C to 2 °C in January and 18 °C to 19 °C in July. Precipitation varies between 800 mm and 1,200 mm per year, although it can exceed 2,000 mm in some locations.

About 23 percent of the land is arable; about 28 percent consists of meadows and pastures and about 50 percent is forested. The principal rivers are the Sava and the Drava. Slovenia has both mountain glacial lakes – such as the popular tourist resort, Lake Bled – and Karst lakes. At the lower levels, forests consist mostly of beech and oak trees; at higher elevations, coniferous trees predominate. The Postojna Caves, in the Karst, are the third – largest caverns in the world.

Ethnic Slovenes, a South Slav people related to the Croats and Serbs, comprise about 88 percent of the population (see Table 1). About 2.8 percent is Croatian, 2.4 percent Serb, 0.4 percent Hungarian and 0.2 percent is Italian.

TABLE 1. POPULATION INFORMATION

							Growth rate (%/yr)
	1970	1980	1990	2000	2001	2002	1990 To 2002
Population (millions)				2.0	2.0	2.0	
Population density (inhabitants/km²)				98.2	98.1	98.0	

Predicted population growth rate (%) 2002 to 2010	-1.5
Area (1000 km²)	20.3
Urban population in 2002 as percent of total	49.1

Source: IAEA Energy and Economic Database.

1.1. Economic Indicators

The economic development of the county after the Second World War was significantly influenced by the centrally planned economy. After a relatively high economic decline, starting in late 70's, economic recession was accompanied with a rather high inflation rate that escalated at the end of 80's into a hyperinflation. After the independence, Slovenia lost the whole market of the rest of Yugoslavia, which contributed almost 35% to the total Slovenian export. The country undertook great efforts to overcome the economic decline. Its exports had to be reoriented to other markets, mostly western ones, which were much more demanding then the former Yugoslav ones. Production has been reorganized in many sectors to match the new standards and market requirements. Unemployment became a severe problem, reaching in 1997 a level of 14.5%. Nevertheless, the undertaken efforts

resulted in a stabilization of Gross Domestic Product (GDP) in 1993. In 1994, an economic swing upwards was registered. GDP grew 4.5% (Table 2) and the industrial production had an increase of 8%. In recent years the GDP growth stabilized at a level of 3.5% annually. Above average growth was seen in tourism, manufacturing, construction and transport. The recent economic expansion was mostly spurred by fast growth of exports, facilitated by a favourable situation on west European markets, and a revival of investment activity. Slovenia will become a full member of European Union (EU) in 2004.

As seen from the shown indicators, Slovenia is facing many challenges as it develops towards a market economy. Following the split from the former Yugoslavia, new infrastructure, including additional connections to neighbouring countries, may also be required. The Slovenian economy is heavily export oriented and as such very sensitive to any regional or world recession.

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

						Growth rate (%/yr)
	1980	1990	2000	2001	2002	1990 To 2002
GDP (millions of current US$)			18,124	18,948	19,808	
GDP (millions of constant 1990 US$)			20,920	21,526	22,215	
GDP per capita (current US$/capita)			9,109	9,533	9,974	

Source: IAEA Energy and Economic Database.

1.1.2. Energy Situation

Slovenia has rather limited energy reserves (Table 3). The proven and recoverable reserves of low quality brown coal and lignite amount to 190 million tons. Oil reserves are very scarce, 850,000 tons with annual exploitation of 2,500 tons. The estimated hydro reserves of Slovenia are up to 9 TWh per year, out which 3.5 TWh are already exploited. Oil and gas are imported entirely. The country is connected to two gas pipelines from Algeria and Russia respectively. In 2002, the energy dependency of the country was 57% (according to OECD-IEA methodology, nuclear fuel is treated as domestic fuel).

TABLE 3. ESTIMATED ENERGY RESERVES

	Estimated energy reserves in (Exajoule)					
	Solid	Liquid	Gas	Uranium (1)	Hydro (2)	Total
Total amount in place	3.83			1.20	1.25	6.28

(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 - 2002) by a factor of 10.

Source: IAEA Energy and Economic Database.

The severe economic recession that affected the country has also been reflected in the energy sector. The relatively high energy growth rate stabilized in the 80's. The final energy consumption grew during the early 80's with an average yearly growth rate of 2.1%. In 2002 it reached the value of 189 PJ. During the period 1977-2000 the primary energy consumption was decreasing by 0.7% annually. Table 4 shows the historical energy statistics.

A significant share of Slovenian industrial production is very energy intensive such as steel production, aluminium, chemicals, pulp and paper industry, building material and manufacturing. In

2002, energy demand of the industry sector accounted for 28% of the total final energy demand. The high energy consumption in industry is also reflected in high energy use per unit of Gross Domestic Product, compared to most West European Countries. Energy use per capita is lower than the average for EU countries. Primary energy consumption decrease had a positive impact on energy intensity, that has been decreasing by 4.2% annually (EU figure is 1.6% annually). Nevertheless is energy intensity in Slovenia is considerably higher compared to EU (Table 5). In 2000, this ratio was 309 toe/mio € for Slovenia compared to 194 toe/mio € for the EU.

TABLE 4. BASIC ENERGY SITUATION

							Average annual growth rate (%)	
	1970	1980	1990	2000	2001	2002	1970 To 1990	1990 To 2002
Energy consumption								
- Total (1)				0.28	0.28	0.29		
- Solids (2)				0.07	0.07	0.06		
- Liquids				0.10	0.10	0.11		
- Gases				0.04	0.04	0.04		
- Primary electricity (3)				0.07	0.07	0.08		
Energy production								
- Total				0.14	0.15	0.15		
- Solids				0.06	0.06	0.06		
- Liquids								
- Gases								
- Primary electricity (3)				0.08	0.09	0.09		
Net import (Import - Export)								
- Total				0.16	0.16	0.15		
- Solids				0.01	0.02	0.02		
- Liquids				0.10	0.10	0.09		
- Gases				0.04	0.04	0.04		

(1) Energy consumption = Primary energy consumption + Net import (Import - Export) of secondary energy.

(2) Solid fuels include coal, lignite and commercial wood.

(3) Primary electricity = Hydro + Geothermal + Nuclear + Wind.

(*) Energy values are in Exajoule except where indicated.

Source: IAEA Energy and Economic Data Base

TABLE 5. COMPARISON OF SOME INDICATORS WITH EU

Indicator	Region	Unit	2000	2001	2002
Energy Intensity	Slovenia	toe/mio €	309	312	310
Energy Intensity	EU	toe/mio €	194	n.a.	n.a.
Primary energy consumption per capita	Slovenia	toe/cap	3.2	3.3	3.9
Primary energy consumption per capita	EU	toe/cap	2.5	n.a	n.a

Source: Country Information.

1.2. Energy Policy

The Government of Slovenia laid down its energy policy objectives and main priorities for the development of energy system in its Resolution on the Strategy of Energy Use and Supply of Slovenia (adopted in January 1996) and with the new Energy Law (September 1999). In 2003 the Slovenian Government endorsed the National energy plan (NEP). The time horizon of NEP is 2000-2020. The adopted economic scenario foresees that beyond Slovenia's accession to EU, the GDP will grow 4% annually. After 2009 it will stabilize around 2.2% per annum until 2020.

According to economic scenario in NEP, as the main driving force for energy demand, total primary energy demand will grow in the period 2000-2020 by 1.1% annually. Electricity is foreseen to grow 1.5% annually.

NEP sets the guidelines for the energy policy of the country taking into account the three main objectives of the energy sector:

- security of energy supply,
- competitive energy prices,
- sustainable development and mitigation of environmental impacts of energy generation and consumption.

The main goals of the future energy policy could be summarized in the following activities:

- to maintain the present availability of energy sources,
- further improvements of technical reliability of energy networks and quality of supply,
- implementation of measures foe efficient use of energy,
- electricity at the level of final consumption should match the international standards,
- promoting the opening of electricity an natural gas market,
- promote the efficient use of energy,
- increase the share of renewable sources of energy in the primary energy demand,
- to maintain the long-term exploitation of lignite,
- to keep the nuclear option for electricity generation,
- to enable the 90 days reserves of liquid fuels.

1.3. The Electricity System

1.3.1. Structure of the Electricity Sector

The following services are carried out within the public service obligations scope: electricity transmission, transmission system operator (TSO), electricity distribution, distribution system operator (DSO), electricity supply to the tariff customers, and market operator. The transmission and distribution companies are required to ensure the access to the electricity network in a transparent and non-discriminatory manner following the principles of regulated third party access. The information on distribution and transmission networks traffic is public. The Energy Agency determines the prices for the use of energy networks in a manner that encourages the efficiency of providers and users separately for transmission and distribution networks, and individual ancillary services, except for those services for which a competitive market is organized.

Electricity is being traded via bilateral contracts and on the market organized by Borzen, the market organiser. When dispatching generating installations, priority is given to qualified producers using renewable energy sources or waste and cogeneration units, and generating installations using indigenous primary energy fuel sources, to an extent not exceeding in any calendar year 15 % of the overall primary energy necessary to produce the electricity consumed in Slovenia, as laid down in EU electricity directive.

Generating installations using renewable energy sources or waste and cogeneration units are eligible for qualified producer status. Producers have to meet environmental acceptability standards. Power plants are divided into four groups, depending on the installed power, as follows: micro power plants (up to and including 36 kW), small power plants (from 36 kW to including 1 MW), medium power plants (from 1 MW to 10 MW), and large power plants (above 10 MW).

The feed-in price for the produced electricity is set by the government. The assumption is, that the feed-in tariff for the qualified production will stimulate qualified production development, and it is projected that by the year 2010 the share of the qualified production will double compared to 2002. Electricity distribution companies are required to buy the electricity from qualified producers.

The Energy Agency was established by the Energy Act with the purpose of providing transparent and non-discriminatory operation of the electricity and natural gas markets for the benefit

of all participants. The Agency is an independent organisation that controls the functioning of the electricity and natural gas markets, having the following duties and authority:

- Setting the use of the system charges (The Agency's duties will be broadened by amendments of the Energy Act in accordance with the Directive 2003/54/EC concerning common rules for the internal market in electricity, the Directive 2003/55/EC concerning common rules for the internal market in natural gas and Regulation 2003/1228/EC on conditions for access to the network for cross-border exchanges in electricity). Taking decisions about the justification of costs and other elements of the price for use of system charges on the basis of data and criteria for the evaluation of cost justification.
- Taking decisions in case of disputes, originating from:
  - denial of access to electric or gas system,
  - to charge for the use of electric or gas system.
- Granting of licences for performing energy activities in accordance with the provisions of the Energy Act and the decree.

Beside the above listed tasks, the Agency also executes the following duties:

- cooperates with competent authorities and inspectorates,
- publishes annual reports and information for the public,
- performs other tasks connected with the control of functioning of the electricity and natural gas markets.

The founding of the Market Operator has been one of the obligatory elements introduced by the Energy Act, and at the same time one of the fundamental conditions for opening up the electricity market. The organized electricity market is the meeting point of supply and demand of electricity.

The operation of the organized electricity market and the rights and duties of the Market Operator have been set forth in detail in the *Rules on the Operation of the Electricity Market*. Borzen d.o.o. has been established in March 2001 as a daughter company of ELES and to assume the role of Market Operator.

The Market Operator is responsible for ensuring transparency of the organized electricity market by publishing special indices, price lists and quantities based on transactions concluded on the electricity market in different time periods. This provides market participants with the possibility to develop appropriate strategies for trading purposes and for forming their own bids. The Market Operator is also responsible for registering of all bilateral agreements and balancing groups settlement.

In 2002, Slovenia had 2,762 MW of total electricity production capacity, 670 MW of which was provided by the only nuclear power plant in Krško, and 830 MW and 1262 MW in hydro and thermal power plants, respectively. Total production in 2002 amounted to 13,012 GWh, of which 5,302 GWh were produced in the nuclear power plant, 2,991 GWh in hydro and 4,719 GWh in thermal power plants. As it can be seen from this data, Slovenia has a fairly diversified primary sources for electricity production.

There are eight generating companies, each with one main power station. In the case of hydro-power, a company operates a chain of power plants on a single river system. These companies are presented in the table below.

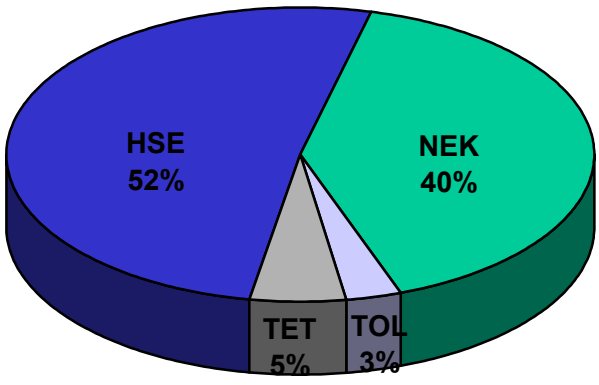
Production capacities

Power Plant's Location (abbreviation)	Type by fuel	Capacity [MW]	Annual Production in 2001 [GWh]
Šoštanj (TEŠ)	coal	755	3,336
Krško (NEK)	nuclear	676	5,030
Drava river (DEM)	hydro	584	2,697
Brestanica (TEB)	oil and gas	312	101
Soča river (SENG)	hydro	144	405
Trbovlje (TET)	coal	125	577
Sava river (SEL)	hydro	121	354
Ljubljana (TE-TOL)	coal CHP	103	400
TOTAL		**2,820**	**12,900**

Source: Yearbook of Slovenian electro-industry, 2002

Most of the major players in electricity production are connected under the parent company of Holding slovenske elektrarne (HSE). All the above mentioned power plants with the notable exception of NEK, and two smaller thermal power plants, TE-TOL and TET, are owned in majority by the HSE. HSE also has the majority of ownership in the lignite mine in Velenje. NEK, on the other hand, is owned in equal shares by Slovenian and Croatian legal successors of the founders of the power plant. On the Slovenian side, this is the company ELES GEN, 100% owned by ELES, a public company in full (100%) state ownership.

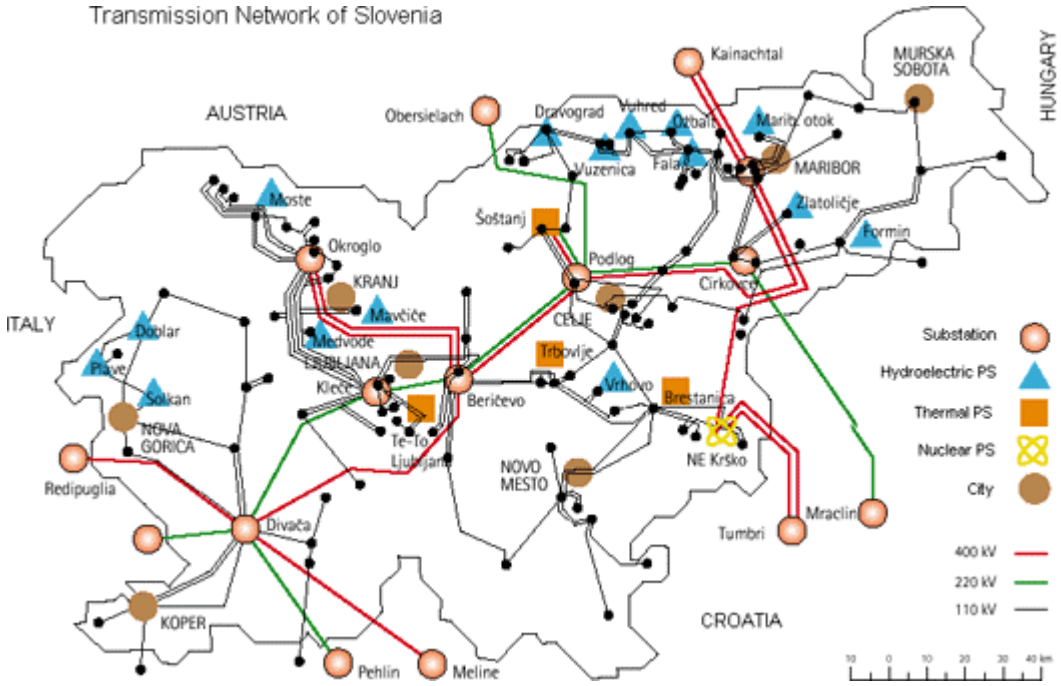
Distribution of electricity production in Slovenia in 2001



Source: MOPE

The transmission network of Slovenia is operated by Elektro Slovenia d.o.o. (ELES), whose main responsibility is to ensure the best possible and transparent use of the existing transmission grid management, operational reliability and security (defined in the Energy Act). The transmission system also makes it possible to buy, sell and transit electricity across borders. There are three voltage levels in the transmission grid – 400 kV, 220 kV and 110 kV, as well as corresponding transformer substations.

Transmission network of Slovenia is presented on the picture below, along with the above mentioned generating capacities.



Source: ELES

The consumption of electricity has increased in 2002 for significant 5.9% compared to 2001. In 2002, consumption amounted to almost 12 TWh, and the exports to 2.7 TWh. Production exceeded the consumption for 1 TWh, while the imports amounted to 1.6 TWh. Slovenia and Croatia have successfully solved their dispute over the NEK, which means that in 2003 half of the production from the Krško NPP will again belong the Croatian co-owner. This half amounts to approximately 2.6 TWh, which will make Slovenia a net electricity importer.

1.3.2. Decision Making Process

The Ministry of the Environment, Spatial Planning and Energy has a comparatively large scope of competence and a part of that extends to the energy sector. *The Energy Office* is responsible for the area of energy supplies, mainly electric power and natural gas, ensures the proper functioning of the market, plans reliable and economically viable supply of energy in normal and in extraordinary conditions, and supervises the sustainable development of energy systems. It is responsible for the development of energy legislation and for implementing procedures in the area of energy use and supply. It performs tasks in the area of management and privatisation of state assets in companies in the energy sector that are state owned. It also covers energy issues in the international relations of the country and co-ordinates the work of official bodies in the energy sphere: Agency for Efficient Use of Energy, and the Energy Inspectorate in the framework of the Inspectorate of Slovenia for the

Environment and Spatial Planning. The Energy Office actively cooperates with the Energy Agency and non-governmental organisations that are active in the energy sphere.

Every two years, transmission system operators and distribution system operators for electricity and natural gas networks must prepare and publish an overview that includes missing production, distribution and transmission capacities, interconnectors to neighbouring systems, and the projection of consumption of electricity and natural gas for the next 5 years. Based on these assessments, the Ministry competent for energy prepares framework plans and defines types and scopes of energy permits or concessions for energy undertakings.

The Energy Act also provides for the possible privatisation of public service companies for production and distribution of electricity. These public companies can be privatised in various manners: by selling the company to a strategic partner, by calling for tenders, or by issuing stocks. However, it is not possible to privatise transmission companies, transmission system operators, energy market operator and Nuclear Power Plant Krško.

Generating installations using renewable energy sources or waste and cogeneration units are eligible for qualified producer status. Producers have to meet environmental acceptability standards. Power plants are divided into four groups, depending on the installed power, as follows: micro power plants (up to and including 36 kW), small power plants (from 36 kW to including 1 MW), medium power plants (from 1 MW to 10 MW), and large power plants (above 10 MW).

The feed-in price for the produced electricity is set by the government. The assumption is, that the feed-in tariff for the qualified production will stimulate qualified production development, and it is projected that by the year 2010 the share of the qualified production will double compared to 2002. Electricity distribution companies are required to buy the electricity from qualified producers.

Transmission and operation of the natural gas network fall within the public service obligations scope, as well as the natural gas distribution.

TSO is required to enable the access to the network to all eligible customers based on a negotiated third party access principle. The information on available network capacities is public. TSO is also responsible for annually publishing terms, conditions and prices of network use that have to be approved ex-ante by the Ministry of the Environment, Spatial Planning and Energy.

Oil distributors and oil consumers not supplied by the distributors must hold stock equivalent to 90-days average consumption. Electricity and heat producers must hold a certain stock of fuel to ensure reliable supply of consumers. As Slovenia is wholly dependant on oil imports, this is a necessary step to ensure the security of supply and is in line with the EU requirements.

1.3.3. Main Indicators

In 2002, the Slovenian power system produced 13,012 GW·h. The generation breakdown by type of production was 23% by hydro, 36% by thermal and 41% by nuclear. Table 6 shows the electricity production data and installed capacities. The total installed capacity at the end of 2002 was 2,820 MW(e). The country is undertaking significant efforts to refurbish and upgrade the existing capacities. The largest chain of power plants on the Drava river is undergoing major refurbishment and upgrading, financed by an EBDR loan. Upgrading and refurbishment process has been accomplished at the Soča river hydro chain. Two new gas turbines, each 115 MW(e) were added to the Slovenian power system. The only nuclear power plant at Krško replaced steam generators replacement in 2001 together with an up rate of 6 percent regarding to existing installed capacity (632 MW(e)). Table 7 shows the energy related ratios.

TABLE 6. ELECTRICITY PRODUCTION AND INSTALLED CAPACITIES

	1970	1980	1990	2000	2001	2002	Average annual growth rate (%) 1970 To 1990	Average annual growth rate (%) 1990 To 2002
Electricity production (TW.h)								
- Total (1)				13.31	13.90	14.32		
- Thermal				4.93	4.98	5.01		
- Hydro				3.83	3.90	4.00		
- Nuclear				4.54	5.03	5.31		
- Geothermal								
Capacity of electrical plants (GWe)								
- Total				2.56	2.58	2.82		
- Thermal				1.12	1.12	1.30		
- Hydro				0.77	0.78	0.85		
- Nuclear				0.68	0.68	0.68		
- Geothermal								
- Wind								

(1) Electricity losses are not deducted.

(*) Energy values are in Exajoule except where indicated.

Source: IAEA Energy and Economic Database.

TABLE 7. ENERGY RELATED RATIOS

	1970	1980	1990	2000	2001	2002
Energy consumption per capita (GJ/capita)				140	141	147
Electricity per capita (kW.h/capita)				5,607	5,823	5,955
Electricity production/Energy production (%)				94	92	90
Nuclear/Total electricity (%)				34	36	37
Ratio of external dependency (%) (1)				57	55	51
Load factor of electricity plants						
- Total (%)				59	62	63
- Thermal				50	51	51
- Hydro				57	57	58
- Nuclear				77	85	90

(1) Net import / Total energy consumption.

Source: IAEA Energy and Economic Database.

Thermal generation has a large share in electricity generation. This has caused severe impacts on the environment, especially what concerns sulphur emissions. A large desulphurization device was accomplished in 1997 on the largest thermal block in TPP Šoštanj. With the new devices, the SO_2 emission is essentially reduced.

It is also foreseen to improve and enlarge the transmission and distribution network in the country. Within the long-term plan until 2010, 163 km of 110 kV lines are expected to come in line, 5100 km of 20 kV lines and 1100 km of 400 V lines are anticipated to come into operation with respective control centres.

2. NUCLEAR POWER SITUATION

2.1. Historical Development and current nuclear power organizational structure[1]

2.1.1 Overview

Slovenia has one nuclear power plant in commercial operation since 1983, the NPP Krško. The NPP Krško is a pressurized water reactor plant of 676 MW(e), delivered and constructed by Westinghouse, and is jointly owned with the Republic of Croatia. The operational and safety record of Krško NPP is good and complies with all international standards and highest safety requirements. The safety status of the plant has been supervised by the Slovenian Nuclear Safety Administration as well as by international expert missions organized by IAEA, EU, WANO, etc. Apart from power generation, Slovenia has a research reactor TRIGA Mark II used mainly for R&D and for training activities.

2.1.2 Current Organizational Chart(s)

The organizational structure of Nuklearna Elektrarna Krško (NEK) is shown in Figures 1 and 2 below.

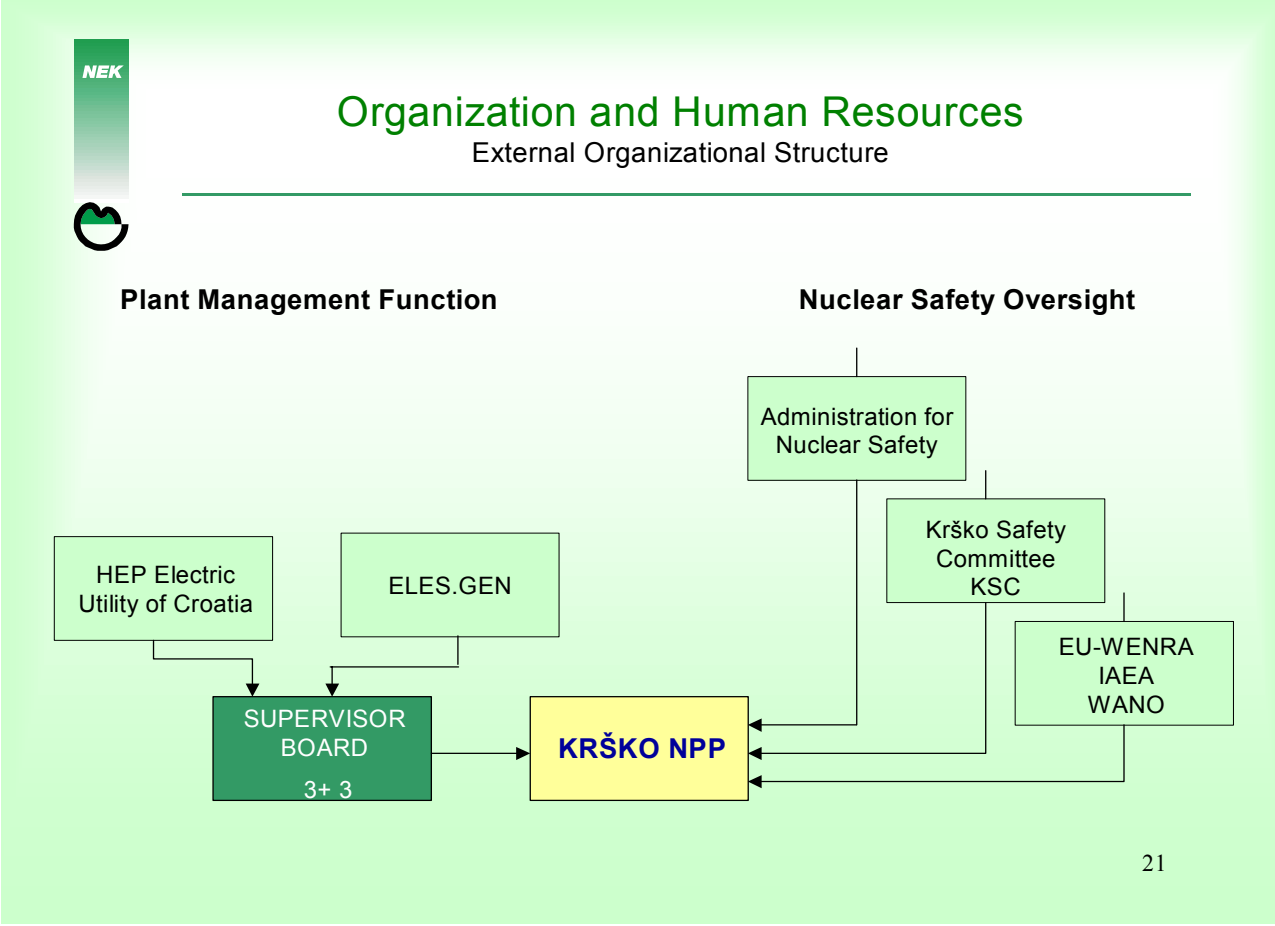


FIG. 1. External Organization Structure

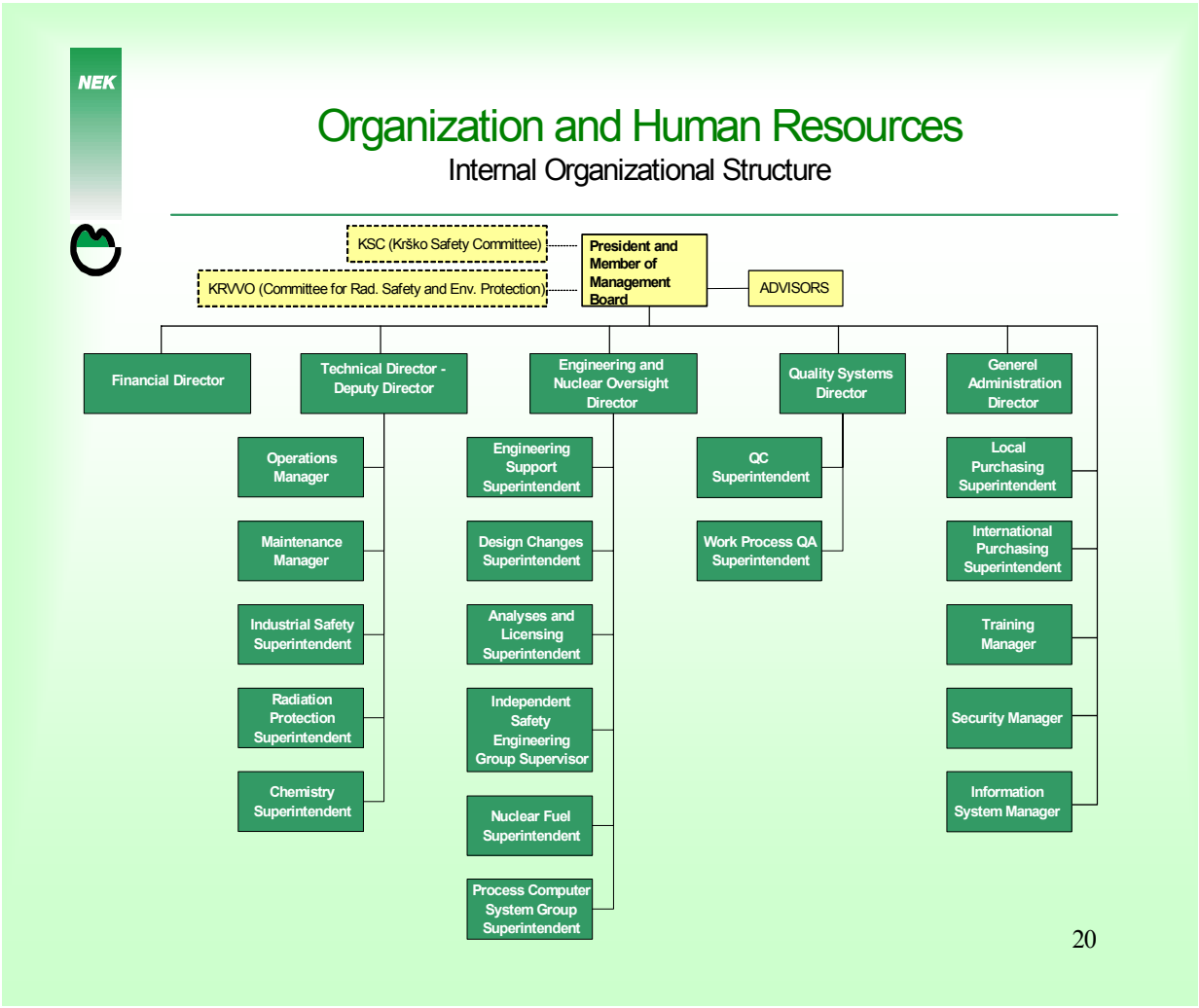


FIG. 2. Internal Organization Structure

2.2. Nuclear Power Plants: Status and Operations

In 2002, the NPP Krško produced 5,03 TW·h or about 39% of total electricity generation of the country. The load factor was 85%. Domestic and international institutions, including IAEA, were involved in safety missions to the NPP and they all rated the level of safety as good and the level is still improving. The designed lifetime is 40 years; Table 8 shows its current status.

TABLE 8. STATUS OF NUCLEAR POWER PLANTS

Station	Type	Capacity	Operator	Status	Reactor Supplier
KRSKO	PWR	676	NEK	Operational	WEST

Station	Construction Date	Criticality Date	Grid Date	Commercial Date	Shutdown Date
KRSKO	30-Mar-75	11-Sep-81	02-Oct-81	01-Jan-83	

Source: IAEA Power Reactor Information System as of 31 December 2002.

2.3. Supply of NPPs

There are no suppliers of NPPs in Slovenia. The only plant is the Krsko unit, which was imported from the USA.

2.4. Operation of NPPs

The Krško plant, the only NPP in Slovenia, has been in commercial operation since 1983. The unit is essential to electricity production in Slovenia. However, operation of Krško to the year 2023 is one of the long-range energy considerations.

2.5. Fuel Cycle and Waste Management

Waste production

The NPP Krško is the main producer of all waste categories in Slovenia. The contribution of other producers is relatively small. The amounts of different waste categories of radioactive waste in Slovenia at the end of 2002 are given in Table 1.

Table 1: Amounts of radioactive waste in Slovenia by types and producers, at the end of 2002.

Waste	Volume
Low and intermediate level	
From NPP	2200 m^3
Research, industry & medicine	70 m^3
Spent fuel	
From NPP	663 fuel assemblies
From TRIGA	-
Mining & milling	
Mining waste	$1.5 \cdot 10^6$ tons
Mill tailings	$0.6 \cdot 10^6$ tons

Storing of waste

The operational waste from the nuclear power plant is stored in LILW storage at the Krško site. It is operated by the plant operator. The LILW storage at NPP Krško is close to being filled to capacity. With the waste volume reduction and improvements in waste treatment and the reduction of waste production the storage still meets the requirements, but a long-term solution is needed.

Similarly to the low and intermediate level waste, storage for spent fuel is sited at the location of the NPP and managed by the plant operator. The spent fuel pool has recently been successfully re-racked to provide sufficient capacity for plant lifetime and even for possible lifetime extension. After re-racking the original 828 positions for spent fuel assemblies in the pool were increased to 1694 positions. At present 707 positions are occupied. The discharge rate is ~ 36 fuel assemblies per fuel cycle.

Current policies and practices

Long-term waste management

The disposal solutions for LILW or spent fuel are available neither in Slovenia nor in Croatia. In both countries the site selection processes for the LILW repositories were initiated in early nineties and developed to different stages but so far none of the countries succeeded in confirming the site.

Simultaneously with the site-selection process, the conceptual design of a repository for LILW is being prepared and the performance and safety assessment of the disposal facility is being developed.

On the other hand the final solution for spent fuel remains undefined. The debate is still being carried on at the strategic level. The only document treating the long-term management of spent fuel is "The Strategy for Long-term Spent Fuel Management", which was prepared by ARAO and adopted by the Slovenian government in 1996.

Strategy for long-term spent fuel management

Strategy for long-term spent fuel management analyses different possibilities of long-term management and possible final solutions for spent fuel. The preparation of the strategy was strongly influenced by the small quantities of spent fuel generated in Slovenia, the expected phase-out of nuclear energy and at that time still unresolved question of ownership of the NPP Krško.

Between the two options - reprocessing or direct disposal – the strategy proposes direct disposal. Since the nuclear power plant lifetime expires only in 2023 according to the strategy the decision on a final solution for spent fuel need not be taken before the end of operation of the NPP. The strategy recommends reaching the decision by 2020. In accordance with the requirements of the decommissioning plan for the NPP from 1996 the repository facility will be needed by 2050. Meanwhile the strategy recommends keeping all options open, including the export of spent fuel or multinational solution. Even the reprocessing of spent fuel may be reconsidered, if it turned appropriate.

Due to limited capacity of spent fuel pool at the time, estimated to expire in 2003, the strategy proposes also short-term solutions. In the first stage an increase of the existing capacity of spent fuel pool at Krško is proposed. If such an increase in pool capacity proves not to be sufficient, interim dry storage in casks is recommended as an additional option. In 2003 the pool capacity was already increased.

2.6. Research and Development

The Institute Jozef Stefan is the largest scientific and research institution in the country with over 740 staff, active in nuclear physics, solid state physics, chemistry, reactor physics and engineering, energy and process control. The facilities include a research reactor and a laboratory for nuclear spectroscopy based around a 2 MV Van de Graaff accelerator, which continues to receive assistance through the TC Programme. The Institute also operates a Nuclear Training Centre in premises completed in 1988. It provides training for NPP Krško personnel, organizes radiological protection courses and carries out public information activities. The Centre also regularly organizes and hosts training activities and workshops for the IAEA. The Institute plans to establish a multi-purpose irradiation facility with TC assistance.

The Institute Jozef Stefan has been operating a 250 kW(th) TRIGA Mark II research reactor since 1966. In 1992, the reactor was refurbished including the core, electronics and electrical systems and ventilation, and upgraded with 2 MW(th) pulsed mode capabilities. In August 1999, 219 spent fuel elements were returned to the USA which financed the operation. About 60 fuel elements remain in the core with about 20 fresh fuel elements in reserve. A new fuel element storage area is nevertheless available. At the end of the 1980s, the reactor was operating some 4,000 hours a year and producing isotopes for medical use. The decline of the research and the reduced cost effectiveness of producing isotopes for medical applications locally meant a substantial reduction in reactor use. Current applications are neutron activation analysis (NAA), operator training, neutron radiography, and research.

2.7. International Co-operation and Initiatives

Slovenia was admitted to full membership of the IAEA in 1992. Co-operation with the IAEA covers a wide range of activities, of which the most important are:

- Preparation of International Conventions;
- IAEA missions to Slovenia;
- Technical co-operation including attendance of Slovenian experts on Agency's sponsored seminars and training courses, scholarship, scientific visits, research contracts;

Slovenia furthermore co-operates with other international organizations, such as the Organisation for Economic Co-operation and Development (OECD/NEA – observers) and the European Union. The co-operation is also institutionalized through the membership in associations, such as the Western European Nuclear Regulators Association (WENRA), the Network for Regulators with Small Nuclear Programs (NERS) and International Nuclear Law Association (INLA).
The co-operation is also going on through multilateral and bilateral international agreements.
The NPP Krsko is a member of the World Association of Nuclear Operators (WANO). .

3. NATIONAL LAWS AND REGULATIONS

3.1. Safety Authority and the Licensing Process

Safety Authority and the Licensing Process

The Slovenian Nuclear Safety Administration (SNSA) performs specialised technical and developmental administrative tasks and tasks of inspection supervision related to:

- nuclear and radiation safety
- radioactive waste management
- carrying out practices involving radiation and use of radiation sources, except in medicine or veterinary medicine
- protection of people and environment against ionising radiation
- physical protection of nuclear materials and facilities
- non-proliferation of nuclear materials and safeguards
- import, export and transit of nuclear and radioactive materials and radioactive waste
- radiation monitoring
- liability for nuclear damage.

The SNSA is a part of the Ministry of Environment, Spatial Planning and Energy. In accordance with the recommendations of the International Atomic Energy Agency, the SNSA is not supposed to promote nuclear power therefore it is in licensing independent from the Energy Office within the Ministry of Environment, Spatial Planning and Energy, which is in charge of energy.

The major nuclear facility supervised by the SNSA is the NPP Krsko. Besides the NPP, the TRIGA Mark II research reactor of 250 kW thermal power operates within the Reactor Centre of the Jozef Stefan Institute. There is an interim storage of low and medium radioactive waste at the Reactor Centre site operated by the Agency for Radioactive Waste Management. Also the closed uranium mine Zirovski Vrh is supervised by the SNSA.

Activity of the Slovenian Nuclear Safety Administration

The activities of the SNSA cover five main areas:

- nuclear safety;

- radiological safety
- nuclear and radioactive materials;
- inspection control;

- legal and international co-operation.

Division of Nuclear Safety deals with licences and with analyses, which are used to support the licensing by performing and/or reviewing the safety analysis.

Division of Radiation Safety verifies radiation safety (except in medicine or veterinary medicine) and is responsible for radiation dosimetry control and radiation monitoring.

Division of Nuclear and Radioactive Materials deals with trade, transport and treatment of such materials. It shares responsibility in the field of physical protection of nuclear power plants and nuclear materials with the Ministry of the Interior. It also deals with the treatment, temporary storage and disposal of radioactive waste and participates in the selection of sites for nuclear facilities, especially those destined for radioactive waste. Finally, it is responsible for safeguards and illicit trafficking issues.

Legal and International Co-operation Division is involved with licensing procedures and the preparation of legislation on nuclear and radiation safety and on nuclear third party liability. The Division also co-ordinates the co-operation with international organisations (IAEA, OECD/NEA, EU, WENRA, NERS, INLA etc.) and with foreign regulatory authorities for nuclear and radiation safety within bilateral agreements.

Division of Inspection Control supervises licence-holders in fulfilling the safety requirements contained in the laws, regulations and in their licences. Inspections may be done one at a time, or may form part of an overall plan of inspections. To increase their efficiency, inspections may be unannounced. Regular inspections in NPP Krsko are carried out on a weekly basis.

3.2. Main National Laws and Regulations in Nuclear Power

The Act on Protection against Ionising Radiation and Nuclear Safety was adopted by the Parliament of the Republic of Slovenia in its session on 11 July 2002. The act was published in Off. Gaz. RS, Nr. 67/2002 and entered into force on 1 October 2002. The new act is adjusted to the EU legislation in the field of radiation and nuclear safety and to international agreements succeeded, ratified or signed by the Republic of Slovenia.

The act includes the main principles in the field of nuclear and radiation safety and the provisions on:

- practices involving ionising radiation (reporting an intention, a permit to carry out practices involving radiation, a permit to use a radiation source),
- protection of people against ionising radiation (principles, justification, dose limits, protection of exposed workers, medical exposure),
- radiation and nuclear safety (the classification of facilities, use of land, construction and carrying out of construction and mining activities, trial and actual operation of radiation and nuclear facilities, radioactive contamination, radioactive waste and spent fuel management, import, export and transit of nuclear and radioactive substances and radioactive waste, intervention measures),
- issue, renewal, modification, withdrawal or expiry of a licence,
- physical protection of nuclear facilities and nuclear substances,

- non-proliferation of nuclear weapons and safeguards,
- monitoring radioactivity in the environment,
- the removal of the consequences of an emergency event,
- report on protection against radiation and on nuclear safety, records containing information on radiation sources and practices involving radiation,
- financing of protection against ionising radiation and of nuclear safety (costs incurred by the users and public expenses) and compensation for the limited use of land due to a nuclear facility,
- inspection, penal provisions and transitional and final provisions.

In its transitional provisions the act provides for the issuing of several regulations of government and competent ministers. Until new regulations are issued the regulations issued on the basis of prior acts (Act on Radiation Protection and the safe Use of Nuclear energy, Off.Gaz. SFRY, Nr. 62/84 and Act on Implementing Protection Against Ionising Radiation and Measures on the Safety of Nuclear Facilities, Off.Gaz. SRS, Nr. 82/80) are still applicable**.**

REFERENCES

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[2] Operation of Nuclear Facilities in Slovenia, Annual Report 1993, Slovenian Nuclear Safety Administration, Ljubljana, (1994).

[3] Energy Act, Ministry of Environment, Spatial Planning and Energy, Ljubljana (1999).

[4] Energy Data Profile by World Energy Council, Slovenian National Committee, Ljubljana, (April 1993).

[5] Data & Statistics, the World Bank, www.worldbank.org/data.

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

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

Appendix 1

INTERNATIONAL, MULTILATERAL AND BILATERAL AGREEMENTS

The Republic of Slovenia is part of the following treaties:

AGREEMENTS WITH THE IAEA

• Amendments of Article VI &XIV.A of the IAEA Statute	Ratified:	3 April 2000
• NPT related agreement INFCIRC No:538	Entry into force:	1 August 1997
• Additional Protocol	Entry into force:	22 August 2000
• Improved procedures for designation of safeguards inspectors	Accepted	
• Supplementary agreement on provision of technical assistance by the IAEA	Not signed	
• Agreement on privileges and immunities	Succession:	21 September 1992

OTHER RELEVANT INTERNATIONAL TREATIES.

• NPT	Succession:	7 April 1992
• Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction on the Sea Bed and the Ocean Floor and in the Subsoil	Succession:	7 April 1992
• Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and under Water	Succession:	7 April 1992
• EURATOM	Non-Member	
• Convention on Physical Protection of Nuclear Material	Succession:	25 June 1991
• Convention on Early Notification of a Nuclear Accident	Succession:	25 June 1991
• Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	Succession:	25 June 1991
• Paris Convention on Third Party Liability in the Field of Nuclear Energy	Accession:	16 October 2001
• Brussels Supplementary Convention to the Paris Convention	Entry into force:	5 June 2003

• Joint protocol	Entry into force:	27 April 1995
• Protocol to amend the Vienna Convention on Civil Liability for Nuclear Damage	Not signed	
• Convention on Supplementary Compensation for Nuclear Damage	Not signed	
• Convention on Nuclear Safety	Entry into force:	18 February 1997
• Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	Entry into force:	18 June 2001
• ZANGGER Committee	Member	
• Nuclear Suppliers Group	Member	
• Nuclear Export Guidelines	Adopted	
• Acceptance of NUSS Codes	Accepted	
• Comprehensive Test-Ban Treaty	Ratified:	31 August 1999

Appendix 2

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

NATIONAL ATOMIC ENERGY AUTHORITY

Slovenian Nuclear Safety Administration Ministry of Environment, Spatial Planning and Energy Železna cesta 16, P.O.BOX 5759 SI- 1001 Ljubljana, Slovenia	Tel: +386-1-472 1100 Fax: +386-1-472 1199 http://www.intranet.sigov.si/ursjv
Agency for Radioactive Waste Management	http://intranet.sigov.si/arao/

NUCLEAR RESEARCH INSTITUTES

Jozef Stefan Institute Jamova 39 61000 Ljubljana, Slovenia	Tel: +386 1 2159 199 Fax: +386 1 2161 029 http://www.ijs.si/
Reactor Centre Podgorica	http://www-rcp.ijs.si/index-e.html

ENERGY RESEARCH INSTITUTE

Milan Vidmar Institute for Power Economy and Electrical Industry Hajdrihova 2 61000 Ljubljana, Slovenia	Tel: +386 1 474 3000 Fax: +386 1 474 3341

OTHER NUCLEAR ORGANIZATIONS

NPP Krsko Vrbina 12 68270 Krsko, Slovenia	Tel: +386 7 4208 410 Fax: +386 7 4921 528
Slovenian Electric Utilities - ELES Hajdrihova 2 61000 Ljubljana, Slovenia	Tel: +386 1 474 3000 Fax: +386 1 474 2502
Milan Copic Nuclear Training Centre Ljubljana	http://www2.ijs.si/~icjt/
Nuclear Society of Slovenia (NSS)	http://www.drustvo-js.si/index_eng.htm

OTHER ORGANIZATIONS

University of Ljubljana	http://www.uni-lj.si/
University of Maribor	http://www.uni-mb.si/
IJS Science Information Centre	http://libra.ijs.si/
Ljubljana Technology Park	http://www.tp-lj.si/documents/default.htm
Academic and Research Net Work of Slovenia	http://www.arnes.si/english/