REPUBLIC OF SLOVENIA

NATIONAL REPORT
ON
FULFILMENT OF THE OBLIGATIONS
OF THE CONVENTION ON NUCLEAR SAFETY

The Second Slovenian Report in Accordance with Article 5

September 2001

PREFACE

The National Report on Fulfilment of the Obligations of the Convention on Nuclear Safety is prepared in fulfilment of Slovenia's obligation as a Contracting Party to the Convention on Nuclear Safety.

This report has been prepared by the Slovenia Nuclear Safety Administration. Contributions to the report have been made by NPP Krško, the Administration for Civil Protection and Disaster Relief, the Jozef Stefan Institute, the Ministry of Health-Health Inspectorate, the Milan Copic Nuclear Training Center, the Agency for Radwaste Management and the Ministry of Environment and Spatial Planning.

The report was adopted by the Government of Slovenia on 6 September, 2001.

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INTRODUCTION

On 20th September 1994, Slovenia signed the Convention on Nuclear Safety (in the following text - Convention) and ratified it in October 1996 in the Parliament. The Convention entered into force for Slovenia in February 1997.

The fulfillment of the obligations in the period from 1998 to 2001 is evaluated in this second report.

Nuclear Program

Slovenia has one operating nuclear power plant, one research reactor, one central radioactive waste storage for LIL solid radioactive waste from non-power users of nuclear energy and one uranium mine and mill in a decommissioning stage.

The Krško Nuclear Power Plant is the only nuclear installation according to this Convention. It is situated on the left bank of the Sava river in the south-eastern part of Slovenia. It is a Westinghouse two-loop PWR with originally installed capacity of 632 MWe. After steam generator replacement the power was uprated to 676 MWe. The basic safety features of the plant are typical for a two-loop Westinghouse plant. The construction started in 1974; on the basis of a special permit, the first fuel loading was accomplished in May 1981 and the plant was synchronized to the grid in October of the same year. After an authorized trial operation, full power was reached in August 1982. A special permit for the beginning of commercial operation was granted to the Krško NPP in February 1984 by the Slovenian Committee of Energy, which was at that time competent for the licensing of nuclear facilities. Licensing was done on the basis of preliminary and final safety reports following vendor country regulations, with the assistance of several missions from the IAEA. The Krško NPP was built as a joint project of the electric utilities of Slovenia and those of the neighboring Croatia. The Krško NPP is one of the main pillars of the Slovenian power system, generating base load electricity. The total installed generating capacity in Slovenia during 2000 was 3359 MWe; the thermal share was 57%, with hydro at 23% and nuclear 20%. In terms of electricity generation, the nuclear contribution was 37% of the total electricity production in Slovenia.

The safety features of the Krško NPP design are based on the requirements of the US Atomic Energy Commission (AEC) of 1973. Westinghouse as the main contractor was responsible for the implementation of these requirements during the design, construction and testing phases. Krško NPP has been the subject of IAEA scrutiny from the very beginning of the project. The commitment of the plant and of the regulatory body - Slovenian Nuclear Safety Administration (SNSA) has been to follow international experience in the field of nuclear safety, and to fulfil western safety standards. Several software and hardware modifications and improvements of the plant have been implemented. These were based on the experience from the TMI accident, recommendations of the OSART, ASSET and ICISA missions, NRC requirements, experience of the nuclear industry (INPO, WANO, Westinghouse Owners Group), experience gained from the Phare - RAMG program of EC and from bilateral co-operation of the regulators.

As part of the technological process of electricity production, solid radioactive waste and spent nuclear fuel are stored within the plant area. Solid radioactive waste is treated and then packed into steel drums, which are then stored in the Solid Waste Storage. Spent nuclear fuel is stored under water in the Spent Fuel Pit.

The Research Reactor TRIGA Mark II of the Jožef Stefan Institute is situated in the vicinity of Ljubljana and has a 250 kWth General Atomic pool reactor. TRIGA was initially licensed in 1966 as an IAEA project and was re-licensed for steady state and pulse operation after refurbishment and reconstruction in 1992.

The Žirovski Vrh Uranium Mine and Mill was in operation in the period from 1985 to 1990. Its lifetime production was 607,700 tons of ore corresponding to 452.5 tons (U_3O_8 equivalent) of yellow cake. Both the mine and the mill are undergoing decommissioning and re-mediation of surface disposal of 1,548,000 tons of mine waste and red mud, and 593,000 tons of mill tailings respectively.

Central Radioactive Waste Storage at the Jožef Stefan Institute in Brinje. This facility is used for interim storage of LIL solid radioactive waste from the reactor center and other small waste producers, such as medical, research, and industrial applications of ionizing radiation. The responsibility for operation of the interim storage was in 1999 transferred from the Jožef Stefan Institute to the Agency for Radioactive Waste Management. The storage facility is a near-surface concrete building covered with earth. This building with an area of 26.7 m x 10.5 m and a height of 3 m is subdivided by concrete walls into nine storage sections and an entrance area.

Nuclear Legislation

Comprehensive nuclear legislation in Slovenia comprises international agreements, domestic laws and regulations.

Regulatory Body

SNSA is a regulatory body competent in the area of nuclear safety. It was established in 1987. Previously, the functions of the regulatory body were within the Committee of Energy.

Governmental Policies

The governmental energy policy for nuclear power is outlined in »A Strategy of Energy Use and Supply of Slovenia«, adopted by the Parliament in 1996. The highlights of the policy are:

- The long-term aim is to abandon electricity generation based on nuclear power in a safe, ecological, as well as economically acceptable way. Based on this it is not foreseen to construct any new nuclear power plants.
- The strategic objective is to maintain a high operational safety level at the Krško NPP during its planned operation until 2023, including a high level of safety after shutdown, as well as to gradually establish conditions for its safe decommissioning.

- Prior to deciding on shutting down the plant, energy supply reliability has to be ensured. This decision needs to be taken at least ten years in advance, accompanied by measures to replace its energy contribution. The implementation of these measures should be regularly monitored and in the case of changed circumstances, the date of shutdown should be adjusted accordingly.
- To ensure the highest level of nuclear safety and plant availability during the plant's operation, the projects recommended by international review missions need to be implemented.

In September 1996 the Government adopted »A Strategy for Long-Term Spent Fuel Management«. The preparation of a long-term spent fuel management program for the Krško NPP's fuel was strongly influenced by the specific situation in Slovenia:
- a small nuclear program (only one NPP),
- the planned phasing out of nuclear energy after 2023 (at the end of the scheduled lifetime of the Krško NPP),
- the issue of co-ownership with neighboring Croatia is being resolved.

On the basis of these facts it is clear that any final solution for the disposal spent fuel would be extremely expensive.

In the strategy of long-term spent fuel management, a deferred final decision is recommended as the only reasonable solution in the present situation. A deferred decision does not only delay the final solution but also gives negotiators sufficient time to reach an agreement between the co-owners without additional pressures. It also makes it possible to reconsider different options, including the possibility of reprocessing of spent fuel, as well as new technological developments. This provides the opportunity of responding to and joining the project of a regional repository, if this idea, which seems so attractive to countries with small nuclear programs, is implemented.

In this strategy, also short-term solutions for spent fuel storing are included. In the first stage, an increase of the existing capacity of the spent fuel pool at the Krško NPP is in progress and will allow plant operation for the designed plant lifetime.

»The Decommissioning Plan for the Krško NPP« was adopted by the Government in September 1996. Three decommissioning strategies for the Krško NPP were analyzed: immediate dismantling, later dismantling and entombment.

For the purpose of cost assessment and estimation of the contribution to the decommissioning fund, the above options were evaluated from radiological-safety, financial and political aspects. The results have shown that the option of immediate dismantling would be the most appropriate.

Due to the many variables in the Plan, the Government requested regular updating of the Plan every three years.

Peer review of the decommissioning plan by the IAEA experts was done in 1999 and 2000 upon the request of the SNSA and the first update will be done in 2001.

The Act on the Fund for Financing the Decommissioning of Nuclear Power Plant Krško and for the Disposal of Radioactive Waste from Nuclear Power Plant Krško (Off. Gaz. RS, 75/94), established a fund which is being filled from contributions of each kWh produced in NPP Krško in the amount of 0.61 Slovenian tolar/kWh.

Internet Resources

The following Internet sites are available for additional information:

- Slovenian Nuclear Safety Administration: http://www.gov.si/ursjv/,
- Krško NPP: http://www.ne-krsko.si/,
- Milan Èopiè Nuclear Training Center: http://www2.ijs.si/~icjt/,
- Agency for Radwaste Management: http://www.gov.si/arao/,
- Administration for Civil Protection and Disaster Relief: http://www.mo-rs.si/urszr/eng.

In the following section, the fulfillment of each of the articles 4 - 19 of the Convention is evaluated separately. Based on the evaluation it can be concluded that Slovenian regulations and practices are in compliance with the obligations of the Convention.

(A) GENERAL PROVISIONS

Article 4. Implementing Measures

Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures, and other steps necessary for

The legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under the Convention on Nuclear Safety are discussed in this report.

Article 5. Reporting

Each Contracting Party shall submit for review, prior to each meeting referred to in Article 20, a report on the measures it has taken to implement each of the obligations of this Convention.

This is the second report that the Republic of Slovenia has issued in accordance with Article 5 of the Convention.

Article 6. Existing Nuclear Installations

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonable practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.

The Krško NPP is the only nuclear installation in Slovenia as defined in Article 2 of the Convention. Technical Information about the plant is presented in Addendum of this report.

The Krško NPP operates with the operating license issued in 1984, new revisions of Technical Specifications and updates of Final Safety Analysis Report approved by the SNSA.

Plant policy on safety culture is referenced in a number of top tier documents with a clear statement of NPP Krško policy on safety, production and responsibilities. This policy is defined in various documents such as: Quality Assurance Plan, Plant Management Manual, NPP Krško Policies and Goals, Company General Employee

Training Handbook, Operating Experience Assessment Program, etc. Within these documents, clear statements are made about the policy on safety culture and developed into goals and objectives for each division within NPP Krško.

The Krško NPP has experienced in the last 10 years (1991-2000) a number of reviews and assessments of its safety. All these activities can be divided into six different categories:

1. International missions; six different missions have visited Krško since 1991 (ICISA, OSART, WANO, ASSET, IRRT and WENRA).
2. PSA analysis, which included Level 1, Level 2, External events and the PSA assessment of the shutdown modes.
3. Regulatory Conformance Program Compliance Review and the creation of a list of NRC regulatory requirements issued from 1975 to 1995, applicable to the Krško NPP.
4. A review of all modifications from the safety viewpoint, which were performed at the Krško NPP.
5. A detailed analysis of important safety issues.
6. Accident analysis, systems design analysis and mechanical analysis necessary for SG replacement and power uprate.

All six categories included, at different levels of detail, a safety review of all areas in design, operation and maintenance. All these activities in the last 9 years resulted in different lists of corrective actions, which were implemented by the year 2000. All these activities integrated into one systematic and comprehensive effort could represent an important element of the periodic safety review.

The principal objectives of these safety assessments were the following:

a. To confirm that the plant is at least as safe as originally designed, i.e. that no degradation of safety has taken place, and to re-assess the plant status by referring to its operating experience, with emphasis on those structures, systems and components which are susceptible to aging or wear.

b. To justify the current levels of safety of the plant by comparing it with current safety standards and practices, and to identify areas where improvements would be beneficial and the risks reduced at a justifiable expense. One further factor was to ensure a balanced approach to safety across the whole plant.

c. To perform detailed probabilistic safety assessment. The assessment includes the core melt frequency determination (Level 1), containment performance (Level 2), evaluation of external events, the risk assessment/reduction for shutdown modes and accident management database development.

d. To demonstrate acceptability of, and to obtain a license for operation of the Krško NPP with replacement steam generators - RSG at an increased thermal power of 2000 MWt, with reactor coolant average temperature within an operating window, with up to 5% SG tube plugging and cycles duration of 12 to 18 months.

International Missions

ICISA - International Commission for Independent Safety Analysis of the Krško NPP.

In April 1992, the Slovenian Government established an international commission for the Krško NPP review and invited Governments of neighboring countries to participate in its work. The Austrian and Italian Governments responded positively.

The work of the ICISA, to which many professional experts from Europe and the USA contributed, concentrated on the safety aspects related to the site, the design and the operation of the plant and its impact to the environment. The objective was to asses the adequacy of plant safety from the beginning of its operation taking into account all its back fitting. This was compared with the current USA applicable rules.

The institutional and organizational structures of the utility which operates the Krško NPP and the SNSA were also studied.

During the 18-months of the ICISA mandate, experts made visits to the plant, reviewed the documentation, made interviews and performed safety assessments.

The ICISA mission issued its recommendations in 15 main areas. The most important areas were: geology and seismology, external events important to plant safety, plant safety systems, electrical systems, instrumentation and control, containment systems, fire protection, plant modifications, emergency preparedness and spent fuel and radiological waste management. A total of 74 recommendations were addressed to the Krško NPP and 3 to the SNSA.

The most demanding recommendations - establishing a training center with a full scope (plant specific) simulator and steam generator replacements - were implemented. The full scope simulator has been in operation since May 2000 and steam generators were replaced during the refueling outage in the year 2000.

The process of properly responding to the recommendations has required considerable effort on the side of the Krško NPP.

SNSA followed up this carefully and reviewed all mission findings and recommendations with the Krško NPP personnel. After the last review at the end of 2000 it was concluded that the findings and recommendations were resolved.

The IAEA OSART Mission

At the request of the Slovenian government, the IAEA Operational Safety Review Team (OSART) mission visited the Krško NPP in July 1993.

The OSART mission team was composed of twelve experts from seven different countries and IAEA staff with three observers. The mission performed the review and assessment of all power plant areas essential to operational safety:
- management, organization and administration,
- training and qualification,
- operations,
- maintenance,
- technical support,
- radiation protection,
- chemistry,
- emergency planning and preparedness.

The OSART mission report presents assessments of these activity areas and includes recommendations and suggestions for further enhancement of operational safety. In this report, the OSART mission also presented examples of good experience in terms of good performance and good practices.

The most demanding recommendation was establishing a training center with a full scope (plant specific) simulator.

The IAEA OSART follow-up visit was carried out in October 1994. The purpose of the visit was to discuss the action taken in response to the recommendations and suggestions of the OSART mission, to comment on the appropriateness of actions and to make judgements on the degree of progress.

Status of requirements and recommendations of ICISA and OSART missions.

Mission	Required	Resolved	Under implementation	Continuous process	N/A
ICISA 92	74	69	0	0	5
OSART 93	167	167	0	0	0

IAEA ASSET Mission

The Krško NPP Operating Organization requested an ASSET mission first in 1986 and the second to be held at the nuclear power plant during September 1996. This was the 114th mission of the IAEA ASSET services which took place, coincidentally, ten years after the first ever ASSET mission, which was also held at the Krško NPP.

The mission reviewed the events reflecting operational safety performance over the period January 1991 to December 1995. The Krško plant management seeks to benefit from the international perspective regarding its self-assessment of safety performance and regarding the possible ways of further enhancing incident prevention. An additional incentive is the compliance with the ratified Nuclear Safety Convention applicable from October 1996.

The Krško NPP is exhibiting a steadily increasing ratio of events resulting from deficiencies discovered by routine surveillance to those resulting from failures during operation. This positive trend in prevention of operational failures is confirmed by the low safety significance of the few incidents that have occurred, highlighting the current dedication of plant management to the enhancement of the Krško NPP operational safety performance.

Status of requirements and recommendations of the ASSET mission:
All recommendations were addressed and most of them concluded. A few long-term requirements are under implementation.

WANO Peer Review

A WANO team, comprised of experienced nuclear professionals from all four WANO regions, conducted a peer review at the Krško Nuclear Power Plant in 1993 and in 1995. The purpose of the review was to determine strengths and areas in which improvements could be made in the operation, maintenance and support of the nuclear unit at the Krško Nuclear Power Plant. Information was assembled from a review of documentation, discussions, interviews and from observations of station activities.

As a basis for the review, the team used the Performance Objectives and Criteria for WANO Peer reviews. These were applied and reviewed against station performance in light of the experience of the team members, the team's observations and good practices within the industry.

The goal of peer reviews is to assist stations in achieving the highest standards of excellence in nuclear plant operation. The areas for improvement are based on best practices, rather than minimum acceptable standards or requirements, and are not necessarily indicative of unsatisfactory performance.

The status of requirements and recommendations of WANO Peer Review missions:
an on-going process.

IRRT (International Regulatory Review Team) mission

The IRRT mission was in Slovenia in December 1999. It was a two-week full scope mission (only the issue of transport was not included since it was covered by a separate TranSAS mission conducted in the same year).

The final report represents 32 recommendations, 25 suggestions and 7 good practices. The action plan, prepared by the Slovenian Nuclear Safety Administration on the basis and as a respond to the report, identified that a significant number of the mission’s recommendations and suggestions are related to issues which can only be dealt within the scope of the new Act on Nuclear and Radiation Safety which is under preparation, as for example: clear assignment of responsibilities, authority and functions of governmental bodies; effective and independent assessment in the licensing process; demand for a Periodic Safety Review; financing system; long-term policy and the role of the technical support organization and enforcement policy.

In some other areas the recommendations and suggestions have already been taken into account, as for example: the emergency preparedness and response plan of the SNSA has been revised and completed; the National Protection and Rescue Plan in the event of radiological emergency is under revision; the SNSA policy statement has been prepared; the decision was issued to the Krško NPP on the "Periodic Safety Review"; the clearance level (for NPP Krško) has been prepared and approved by the Expert Commission on Nuclear Safety; the Strategy on LILW is under revision in order to evaluate the time schedule for the siting and completion of the LILW repository.

Generally, the IRRT mission provided an invaluable insight in the work of the SNSA and gave the orientation on the priorities. A clear vision of what needs to be improved first is very important for a relatively small regulatory body which has to use its resources in the most efficient way.

WENRA mission

In the WENRA report, which was issued in October 2000, the following conclusions were reached for Slovenia:

- Status of the regulatory regime and regulatory body:
  In order to be fully in line with Western practice, the nuclear legislation needs to be revised, addressing the identified deficiencies. The regulatory body acts in general accordance with Western practice and methodologies; however, the budget and the financial situation need to be improved in order to increase independent safety assessment capability.

- The Krško NPP safety status:
  The Krško NPP safety level is comparable with that of nuclear power plants in operation in Western European countries. A large modernization program including the replacement of steam generators and a full scope simulator has recently been completed. The site organization and the operational safety practice are similar to those in Western Europe.

In the future, the following issues need to be addressed:
- implications concerning the safety of the ownership for the long term and the upcoming privatization process of the energy sector need to be assessed,
- efforts to strengthen the engineering capability of the utility need to be continued, including resources to ensure the necessary technical support from foreign organizations,
- closer contacts with Western European utilities would also be beneficial,
- evaluation of the seismic characterization of the site and the onsite storage of the spent fuel need to be finalized and further attention is deemed necessary to the performance of a periodic safety review.

AQG / WPNS (Atomic Question Group / Working Party on Nuclear Safety) report

The report on nuclear safety in the context of EU enlargement evaluates the legislation in the nuclear sector, the organization and management of regulatory authorities and the level of safety of the installation in each of the EU Candidate States with a view to defining the European Union's position on "a high level of nuclear safety" to be requested in those countries. For Slovenia, the following recommendations are to be read in conjunction with the general recommendations that are applicable to all Candidate States with nuclear power reactors:

- nuclear legislation (short term priority): to complete the on-going revision of the 1984 Act,
- resources of the Regulator: to develop and implement the action plan to ensure that the SNSA has adequate resources to carry out all its duties and responsibilities and resources to obtain the necessary independent technical support,
- seismic qualification of Krško NPP: to complete the regulatory review, approval process and follow-up of the Krško seismic case and the associated monitoring program,
- National Emergency Response Plan: to develop an integrated national emergency plan.

PSA Study of Nuclear Power Plant Krško

In response to a licensing amendment issued by SNSA in 1991, Nuclear Power Plant Krško (NEK) performed a Probabilistic Safety Analysis (PSA) study within the frame of an IPE/IPEEE project, which took place between 1993 and 1997. The NEK PSA study includes detailed event tree/fault tree models of internal initiating events, internal fire events, internal flooding events and seismic events, as well as a bounding estimate of risk due to other external events. Additionally, it includes shutdown modes PSA, based on EPRI-ORAM methodology.

The NEK PSA is an exhaustive and comprehensive study which has contributed to an improved understanding of the likely response of the NEK plant to a spectrum of accident initiators and of the accident sequences which dominate the risk profile. It was reviewed by the SNSA with the assistance of technical support (TSO's) organizations and IAEA peer review missions.

Upon completion of all IPE/IPEEE studies, all the models (internal and external events) were transferred and integrated on a RiskSpectrum program platform. By 1999 a major update of the integrated NEK PSA model was done in order to accord it with the changes that took place in the plant since the IPE/IPEEE “freeze date” (i.e. beginning of 1993). A living PSA concept was established for future periodical updates, which would ensure that the PSA model is up-to-date with the status of the plant.

Listed in the table below are contributions of various initiator categories to power operation core damage frequency (CDF) of NEK plant, as calculated by the latest up-to-date version of the NEK Baseline PSA Model.

Initiator category	CDF (per Rx crit. Year)	% of total
Internal events	3.09×10^{-5}	26.5

Initiator category	CDF (per Rx crit. Year)	% of total
Seismic events	5.62×10^{-5}	48.3
Internal fire	1.25×10^{-5}	10.7
Internal flooding	4.36×10^{-6}	3.7
Other external events	1.26×10^{-5}	10.8
Total	**1.17×10^{-4}**	**100**

The CDF due to shutdown modes varies with a particular outage schedule and it can be estimated, depending on a particular outage, to be approximately 3×10^{-5} to 4×10^{-5} per calendar year. The power operation CDF, when recalculated per calendar year, assumes a value which is slightly below 1×10^{-4}. Thus the overall CDF that would include both contribution of power operation and contribution of shutdown modes could be assessed to be approximately in the range of 1.3×10^{-4} to 1.4×10^{-4} events per calendar year.

As it can be seen from the table, the highest contribution to CDF comes from the seismic and internal events (app. 74%). The remaining level of CDF is shared mostly by other external events and internal fire events.

The improvements carried out in the past years changed the risk profile in such a manner that the most significant contributors to the risk are decreased, such as fire induced risk and risk due to internal events. Consequently, the risk due to seismic events, in spite of extremely robust SSC's, becomes the leading contributor. The additional improvements for a significant seismic risk decrease are those which are related to the Station Blackout (SBO). These improvements should make it possible to increase the reliability of AC power supply in case of seismic events. The Krško NPP improvements program already takes this into account.

The NEK PSA Level 2 results show that around 95 % of core damage events due to internal initiators lead to a fission product release which can be described as very small or small. The remaining 5 % of core damage events due to internal initiators map into release category described by the IPE study as "large release". Large releases include early containment failures, containment isolation failures and containment bypass events. Early containment failure contributes a negligible 0.03% of internal initiators CDF, so that the large release category is strongly dominated by containment isolation failure events and bypass events. As for the seismically-induced CDF, as well as CDF due to internal fire events, the fraction of large releases is even smaller than in the case of internal initiators.

The NEK PSA model has been used in a number of various risk-informed applications. Among the major applications were the development of the Fire Protection Action Plan (FPAP) and Integrated Safety Evaluation (ISA) of the plant modernization program (which included SG replacement and power uprate). The FPAP was developed with the purpose of elimination of the design weaknesses underlying the fire risk at NEK. Prior to the implementation of FPAP, fire-induced events were dominating contributors to the overall CDF. The IPEEE study estimated internal-fire-induced CDF at approximately 1.17×10^{-4} per reactor critical year. Thus, by the implementation of FPAP the fire-induced CDF was reduced by almost one order of magnitude and the total power operation CDF by almost 40%. As demonstrated by the ISA study, the plant modernization program contributed to the reduction of CDF due to internal initiators and large release fraction. This was largely the result of the reduction of risk from Steam Generator Tube Rupture (SGTR) scenarios, as well as transient scenarios, which came as the result of SG replacement and re-configurations of secondary side systems that accompanied it. An additional benefit at level 2 results was achieved by the change from dry to wet cavity design modification.

The NEK PSA model was also employed in numerous other risk-informed assessments, covering the overall spectrum of typical PSA applications: evaluations of design modifications from the long term risk impact perspective, risk ranking of components and system configuration risk evaluations. As for the near future, extensive use of PSA in NEK is further anticipated. Among the broader forthcoming applications there is the NEK Periodic Safety Review where PSA is expected to be used as one of the tools for ranking of safety issues and prioritization of corrective measures.

Seismic Safety of the Krško NPP

During the construction, the seismic safety of the Krško NPP was assured by solutions which took into account the earthquake acceleration (horizontal and vertical) of 0.3 gravitational accelerations (g). The seismic PSA study considered a wider spectrum of accelerations, i.e. from 0.15 g up to 1.1 g, divided into 6 acceleration ranges. As the 7th range, acceleration higher than 1.1 g was also taken into account. Risk contributions from all ranges were quantified and summed up. The performed design solutions were also examined by many domestic and foreign expert organizations, including an ICISA international group of experts. In the framework of this group a special survey was financed by the Austrian Government in 1995 entitled “Evaluation of Seismic Risk of the Site, Components and Structures at the Krško NPP”. The survey demonstrated that the Krško NPP could withstand earthquake accelerations up to 0.6 g, which proves that the Krško NPP was built with a conservative design basis. In regard of this evaluation the designed and achieved seismic safety of the Krško NPP was not questionable. However, doubts were expressed that the potential faults in the immediate surrounding of the site could represent a hazard for the Krško NPP. In order to respond to these doubts the Slovenian Nuclear Safety Administration elaborated a program of extensive seismic and geological research, which was concluded in the year 2000.

The fundamental objective of the research was to obtain, using modern methods, accurate and quality data on the geological and tectonic structure. The research paid special attention to the detection of possible surface faults, intercepting through the bedrock into the Tertiary sediments. The program, which began in 1992, included a geological and geophysical research with fieldwork and interpretation, a survey of Quaternary sediments of the Krško basin, geodetic measurements of surface deformations and hydro-geological investigations. Extensive geophysical and geological investigations of this area have been going on since the year 1993.

Based on the recommendations given by the IAEA mission, taking place in 1996, an additional reflection seismic investigation was performed between 1999 and 2000. The European Commission, through PHARE assistance, supported the beneficiary, NPP Krško, and financed this investigation. Through this project additional 51 km of regional reflection seismic profiles and 4 km of high resolution reflection seismic profiles were carried out by the EPTISA Consortium from Spain, the OGS from Italy and the University of Leoben from Austria. In order to make the investigation as thorough as possible, the SNSA financed 10% of this project.

The final report was issued in November 2000 and the presentation of the results was held on 25 November in Ljubljana. Foreign and domestic experts presented the findings to numerous participants from Slovenia, neighboring countries, France, Czech Republic, Slovakia and Spain.

The network of seismic profiles recorded in this investigation revealed structural elements of the Krško basin in very fine detail never seen before. This wealth of new information has implications well beyond the central targets of the project.

The results of geophysical investigations reject the original hypothesis that the Krško basin is a tectonic area delineated by faults on the northern and southern flanks. Recent results prove that the Krško basin is a syncline with only minor faults which do not penetrate into younger beds.

The interpretation of structural elements in the surrounding of the Krško NPP down to a depth of 2 km showed that no major seismogenic feature intersects the site of the plant. Two lineaments were identified that are of sufficient size to warrant further inspection. No fault traces were found close to or at the surface, indicating undisturbed recent sediments.

It was recommended to improve the seismological network and to include a high-quality station in this area, so that detection of small tremors and local earthquakes and determination of their hypocenters would be possible.

The geological and geophysical investigations carried out on the Krško NPP site and in its immediate surroundings therefore did not find seismically active faults, which might have, as an important input in the process of seismic hazard evaluation, a major impact on the calculation of design seismic parameters of the Krško NPP. In the light of recent investigations, the design seismic parameters are therefore not questionable. However, the findings of seismic studies, together with all other geological studies performed since the approval of the Final Safety Analysis Report, are included in the new revision.

In order to improve seismic monitoring of the whole territory of Slovenia, the Government adopted in the year 1999 a three-year plan to upgrade the state seismic network to 25 seismic stations and to install local seismic networks in Ljubljana and at Krško. The current seismic network consists of seven stations. In order to follow the recommendations from PHARE studies, one or two seismic stations of the local seismic network at Krško will be installed already in the year 2001. It is believed that these two stations, together with the two existing ones and one at the NPP Krško site, will facilitate the seismic studies of this area as recommended.

Regulatory Conformance Program

The Krško NPP established an internal Regulatory Conformance Program as a process by which it can demonstrate continuous compliance with USA regulatory requirements. These requirements have evolved over a period of more than twenty years. It is intended to be a living document and updated annually.

Each of the requirements identified in the first phase has been reviewed against the current as-built and as-operated the Krško NPP. Following this review a compliance conclusion was reached for each item. As a result of the compliance review more than 80 % of the overall items evaluated are resolved, and additional items of more than 10 % are under implementation.

Review/Evaluation of Previously Implemented Plant Design Modifications

The purpose and scope of the project conducted by the Krško NPP included the following activities:

1. Identifying all Design Modification packages issued prior October 1, 1992 (approximately 250),
2. Performing the reviews and evaluations necessary to determine if the plant design bases have been met and plant configuration control maintained,
3. Specifically identifying follow-up actions required to meet the plant design bases and to restore plant configuration control as necessary,
4. Tracking the completion of the assigned action items.

There were approximately 1300 action items identified from the review. About 1200 items are associated with the revision and issuance of design drawings, about 40 are design criteria documents and about 50 items required further engineering evaluations. The implementation of these action items started in June 1994 and is largely completed.

Detailed Analysis of Important Safety Issues

Detailed investigations, analyses and assessments were conducted for some important safety issues requested by the regulatory body. The following ones are the most important and comprehensive:

1. Fire Hazard and Appendix R to 10 CFR 50 analysis and assessments in 1991,
2. Station Blackout analysis in 1991,
3. Seismological and geological investigations and evaluations from 1993 onwards,
4. Plant physical security analysis and evaluations in 1991,
5. Control Room Design Review in 1996,
6. Anticipated Transient Without Scram (ATWS) analysis (1993),
7. Post TMI (Three Mile Island) requirements, recommendations and action plan

evaluation including a periodical survey of action plan implementation (1985-1997),
8. Pressurized Thermal Shock (PTS) analysis (1991),
9. Analysis of 18% steam generator tube plugging criteria (1989),
10. Integrated safety assessment of all plant changes (PSA) (1995-2001),
11. Analysis for a Krško modernization project (1997-2000), etc.

All these analyses, assessments and evaluations resulted in a number of findings and were followed by detailed action plans, where the findings were prioritized and accordingly implemented.

There was no significant safety issue discovered which would require plant shutdown. Some of the action plans have been continuously updated and when necessary new provisions for safety improvements have been put into place.

The conclusions of the safety assessments at the Krško NPP are the following:
- many of these reviews and analyses were requested or initiated by the regulatory body,
- most of the results were directly or indirectly reviewed by the regulatory body and the comments were incorporated,
- all recommendations are evaluated and based on their regulatory importance, risk significance and cost benefit analysis.

In conclusion, it should be pointed out that Slovenian regulations and practices are in compliance with the obligations of Article 6.

(B) LEGISLATION AND REGULATION

Article 7. Legislative and Regulatory Framework

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.

2. The legislative and regulatory framework shall provide for:

(I) the establishment of applicable national safety requirements and regulations;

(II) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a license;

(III) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licenses;

(IV) the enforcement of applicable regulations and of the terms of licenses, including suspension, modification or revocation.

7.1 Description of the Legislative and Regulatory Framework

For historical reasons, the legislation currently in place in Slovenia evolved from the federal legislation of the former Yugoslavia, and the legislation of Slovenia as a former member of that Federation. Since 1991 the Republic of Slovenia has been an independent sovereign state and legislation at the time of its independence ensured a continuity of the legal system by adopting all federal laws in so far as they could be said to apply to Slovenia.

The Constitutional Act on Enforcement of the Basic Constitutional Charter on the Autonomy and Independence of the Republic of Slovenia, adopted on 23 June 1991 (Off. Gaz. RS 1/91), provides that all the laws adopted by the Yugoslav (federal) authorities in the past which are not incompatible with the Slovenian legal system, will remain in force in the Republic of Slovenia pending the adoption of appropriate legislation by its Parliament.

Accordingly, legislation on nuclear energy (and safety) in Slovenia is made up of the following laws and regulations:

Nuclear and Radiological Safety, Physical Protection, Safeguards, Quality Assurance

- Act on Radiation Protection and the Safe Use of Nuclear Energy (Off. Gaz. SFRY, 62/84), 1984 Act;
- Act on Implementing Protection Against Ionizing Radiation and Measures for the Safety of Nuclear Facilities (Off. Gaz. SRS, 28/80 and 32/80), 1980 Act;
- Act on Health Inspection (Off. Gaz. RS, 99/99).

On the basis of the 1984 Act, several important regulations for carrying into effect the radiation protection and nuclear safety provisions are in force:

- On siting, construction, commissioning, startup and exploitation of nuclear facilities (with appendix on quality assurance), (Off. Gaz. SFRY, 52/88), Regulation E-1;
- On preparation and content of safety analysis report and other documentation relevant for the assessment of safety, (Off. Gaz. SFRY, 68/88), Regulation E-2;
- On education, experience, examination and certification of personnel conducting specific work at the nuclear installation (Off. Gaz. SFRY, 86/87), Regulation E-3;
- On material balance areas and the mode of keeping records accounting for nuclear raw materials and nuclear materials as well as to the submission of data contained in such records (Off. Gaz. SFRY, 9/88), Regulation E-4;
- On places, methods and frequencies of monitoring of contamination with radioactive materials (Off. Gaz. SFRY, 40/86), Regulation Z-1;
- On the mode, extent, and frequencies of monitoring of radioactive contamination in the surroundings of nuclear facilities (Off. Gaz. SFRY, 51/86), Regulation Z-2;
- On the mode of collecting, accounting, processing, storing, final disposal and release of radioactive waste into the environment (Off. Gaz. SFRY, 40/86), Regulation Z-3;
- On trading and utilization of radioactive materials exceeding certain limits, X-ray machines and other apparatus producing ionizing radiation as well as measures for the protection from radiation of such sources (Off. Gaz. SFRY, 40/86 and 45/89), Regulation Z-4;
- On education, health condition and medical examination for the personnel working with ionizing radiation sources (Off. Gaz. SFRY, 40/86), Regulation Z-5;
- On dose limits for members of the public and for occupational exposure, on measurements of occupational exposure and on monitoring of the working environment (Off. Gaz. SFRY, 31 /89 and 63/89), Regulation Z-6;
- On conditions for the application of sources of ionizing radiation for medical purposes (Off. Gaz. SFRY, 40/86 and 10/87), Regulation Z-7;
- On terms under which drinking water, foodstuffs and articles in common use may be traded if they contain radioactive materials exceeding the prescribed limits of activity (Off. Gaz. SFRY, 23/86), Regulation Z-8;
- On maximum established limits for radioactive contamination of the environment and on decontamination (Off. Gaz. SFRY, 8/87 and 27/90), Regulation Z-9;
- On the mode of keeping records accounting for sources of ionizing radiation and irradiation of the population and workers (Off. Gaz. SFRY, 40/86), Regulation Z-10;
- On trade of fodder (Off Gaz. SFRY, 6/88).

Based on the 1980 Act these regulations are in force:

- On the mode and frequencies for keeping records and for reporting to the regulatory body by the authorized TSOs and by the organizations operating nuclear facilities (Off. Gaz. SRS, 12/81);
- On education, experience and compulsory qualification and training of personnel working with ionizing radiation sources or in radiation protection services and on the procedure of verifying their qualification (Off. Gaz. SRS, 9/81).

There are several other regulations related to a broad nuclear area.

Third Party Nuclear Liability

- Act on Third Party Liability for Nuclear Damage (Off. Gaz. SFRY, 22/78 and 34/79),
- Act on Insurance of Liability for Nuclear Damage (Off. Gaz. SRS, 12/80),
- Decree on Establishment of the Amount of Limited Operator's Liability for Nuclear Damage and on Establishment of the Amount of Insurance for Liability for Nuclear Damage (Off. Gaz. RS, 84/98).

Decommissioning of Nuclear Power Plant Krško

- Act on the Fund for Financing Decommissioning of the Krško NPP and Disposal of Radioactive Waste from the Krško NPP (Off. Gaz. RS, 75/94).

Radioactive Waste

- Act on Cessation of Exploration of the Uranium Mine (Off. Gaz. RS, 36/92, 28/00),
- Act on Mining (Off.Gaz. RS, 56/99),
- Decree on Establishment of Public Agency for Radwaste Management (Off. Gaz. RS, 5/91, 45/96, 32/99, 38/01).

Civil Protection and Disaster Relief

- Act on Protection against Natural and Other Disasters (Off. Gaz. RS, 64/94),
- Ordinance on Writing the Civil Protection and Disaster Relief Plans (Off. Gaz. RS, 48/93).

Administrative

- Act on Organization and Field of Activities of the Ministries (Off. Gaz. RS, 71/9, 47/97, 60/99 and 30/01),
- Act on Administration (Off. Gaz. RS, 67/94),
- Act on Administrative Procedures (Off. Gaz. RS, 80/99 and 70/00),
- Act on Administrative Matter Dispute (Off. Gaz. RS, 50/97 and 70/00),
- Act on Posts for which the Pension Insurance is Benefited (Off. Gaz. SFRY, 17/68; 20/69; 29/71),
- Act on Local Autonomy (Off. Gaz. RS, 72/93, 57/94, 14/95, 26/97, 70/97, 10/98, 74/98 and 70/00),
- Act on Standardization (Off. Gaz. RS, 59/99).

Energy

- Energy Act (Off. Gaz. RS, 79/99,8/00),
- Act on the Postponement of Construction of Nuclear Power Plants until the Year 2000 (Off. Gaz. SRS, 45/87). This Act ceased to be valid at the end of 2000,
- Decree on the Transformation of NPP Krško, p.o. into the Public Company NPP Krško, d.o.o. (Off. Gaz. RS, 54/98, 57/98).

General

- Act on Environmental Protection (Off. Gaz. RS, 32/93,1/96);
- Decree on Environmental Interventions that Require Environmental Impact Assessment (Off. Gaz. RS, 66/96),
- Guideline on Preparation of the Environmental Impact Assessment (Off. Gaz. RS, 70/96),
- Penal Code (Off. Gaz. RS, 63/94, 70/94 and 23/99),
- Act on Minor Offences (Off. Gaz. RS, 87/97, 73/98, 31/00, 24/01),
- Act on Transport of Dangerous Goods (Off. Gaz. RS, 79/99),
- Act on Export of Dual Use Goods (Off. Gaz. RS, 31/00),
- Decision on Determination of Dual Use Goods (Off. Gaz. RS, 45/00),
- Decree on Export and Import Regime of Specific Goods (Off. Gaz. RS, 17/99, 1/00, 45/00, 69/00, 121/00, 4/01 and 15/01),
- Maritime Code (Off. Gaz. RS, 26/01).

Based on the Slovenian Constitution all announced and ratified international treaties also constitute an integral part of the Slovenian legislation and can be applied directly. The following international instruments, to which Slovenia is a party, should be mentioned:

- Statute of the International Atomic Energy Agency (including its Amendment of Article VI and XIV),

- Agreement on the Privileges and Immunities of the International Atomic Energy Agency,
- Vienna Convention on Civil Liability for Nuclear Damage,
- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention,
- Convention on the Physical Protection of Nuclear Material,
- Convention on Early Notification of a Nuclear Accident,
- Convention on Assistance in the Case of a Nuclear Accident of Radiological Emergency,
- Convention on Nuclear Safety,
- Treaty Banning Nuclear Weapon Tests in the Atmosphere in Outer Space and Under Water,
- Treaty on the Non-Proliferation of Nuclear Weapons,
- Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction in the Sea-Bed and the Ocean Floor,
- European Agreement Concerning the International Carriage of Dangerous goods by Road (ADR),
- Convention on International Railway Carriage (COTIF) including Appendix B (RID),
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management,
- Comprehensive Nuclear-Test-Ban Treaty,
- Convention on Third Party Liability in the Field of Nuclear Energy of 29th July 1960, as Amended by the Additional Protocol of 28th January 1964 and by the Protocol of 16th November 1982,
- Convention of 31st January 1963 Supplementary to the Paris Convention of 29th July 1960, as Amended by the Additional Protocol of 28th January 1964 and by the Protocol of 16th November 1982.

Bilateral agreements concluded since the independence of the Republic of Slovenia are:

- Agreement with IAEA for the Application of Safeguards in Connection with the Treaty on the Non-proliferation of Nuclear Weapons,
- Protocol Additional to the Agreement between the Republic of Slovenia and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-proliferation of Nuclear Weapons,
- Agreement between the US NRC and the SNSA on Exchange of Technical Information and Co-operation in the Nuclear Safety Matters,
- Agreement between the Government of the Republic of Slovenia and the Government of Canada on Co-operation in the Peaceful Uses of Nuclear Energy with an Arrangement between SNSA and AECB,
- Agreement between the Governments of the Republic of Slovenia and the Republic of Hungary on Early Exchange of Information in the Event of a Radiological Emergency,

- Agreement between the Governments of the Republic of Slovenia and the Republic of Austria on Early Exchange of Information in the Event of a Radiological Emergency and on Questions of Mutual Interest in the Field of Nuclear Safety and Radiation Protection,
- Agreement between the Governments of the Republic of Slovenia and the Republic of Croatia on Early Exchange of Information in the Event of a Radiological Emergency,
- Agreement between the Government of the Republic of Slovenia and the Government of the Slovak Republic for the Exchange of Information in the Field of Nuclear Safety,
- Arrangement between the Nuclear Safety Administration of the Republic of Slovenia and the Council for Nuclear Safety of South Africa for the Exchange of Technical Information and Co-Operation in the Regulation of Nuclear Safety,
- Arrangement between the Nuclear Safety Administration of the Republic of Slovenia and the Ministry of Science and Technology of the Republic of Korea for the Exchange of Information and Cooperation in the Field of Nuclear Safety,
- Arrangement between the Nuclear Safety Administration of the Republic of Slovenia and the Nuclear Installations Safety Directorate of the Republic of France for the Exchange of Technical Information and Co-Operation in the Regulation of Nuclear Safety,
- Arrangement between the State Office for Nuclear Safety in the Czech Republic and the Slovenian Nuclear Safety Administration for the Exchange of Information.

It should also be mentioned that based on our legislation during specific licensing activities for the Krško NPP, because of the non-existence of domestic codes and standards, those of the United States of America (as the vendor country) are used.

Preparation of new nuclear and radiation legislation

A New Nuclear and Radiation Safety Act is under preparation in the Republic of Slovenia. The Act covers all aspects of:

- nuclear non-proliferation, safeguards, physical protection,
- nuclear radiation and radioactive waste safety,
- emergency preparedness on site,
- liability and insurance for nuclear damage,
- safe transport of radioactive and nuclear materials,
- research and development for maintenance and improvement of national competence,
- establishing a clear licensing system with prior authorizations, reporting and exemptions,
- authorizing of Technical Support Organizations,
- establishment of a new Public Regulatory Agency,
- establishing clear prime responsibility for nuclear and radiation safety of the licensees,
- establishing licensing fees for licensees.

The inputs to the draft New Nuclear and Radiation Safety Act are:
- existing nuclear and radiation laws in Slovenia,
- Conventions, Treaties and Agreements that bind the Republic of Slovenia,
- Fundamentals / Safety Series of the IAEA,
- Basic Safety Standards for protection against ionizing radiation,
- EU legislation within Acquis Communautaire, coming from Euratom Treaty,
- recommendations of different missions (IRRT, Phare-RAMG, WENRA, AQG/WPNS),
- similar legislation abroad.

Parallel to the law, new second level regulations are under preparation (in the area of: basic safety standards for radiation protection, including outside workers and exemption levels; protection of medical patients; radioactive waste management; state system for accountancy and control/safeguards; physical protection of nuclear materials and facilities; contamination levels of foodstuffs and feedingstuffs; basic conditions for nuclear and radiation facilities; content of safety reports; requirements for selected personnel dealing with nuclear or radiation practices; requirements for quality systems in nuclear and radiation practices; emergency planning and preparedness; monitoring of the environment for radiation or contamination; requirements for irradiating facilities; contamination levels for commodities etc.).

Inputs for regulations are existing regulations, IAEA Safety Standards, EU Regulations, Directives and Recommendations and Similar Regulations abroad**.**

7.2 Summary of Laws, Regulations and Requirements

NUCLEAR AND RADIATION SAFETY LEGISLATION

Concerning nuclear safety, the 1984 Act is the most important, stipulating the protection requirements from the effects of ionizing radiation and nuclear safety measures.

The definition of "safety of nuclear installation" is given in Section 5 of the 1984 Act:

"Safety of the nuclear facility, for the purposes of this Act, means all technical and organizational measures anticipated by the project design, implemented in the course of construction, tested during commissioning and applied in operation as well as upon decommissioning which, in all circumstances, provide for the environment protection from contamination by radioactive materials and prevent irradiation of the population and persons employed in such facilities in excess of the prescribed limits."

The 1984 Act addresses a number of areas:
- Introductory provisions including definitions,
- General measures for protection against ionizing radiation,
- Special safety measures applied to nuclear facilities and nuclear materials,

- Surveillance and competent authorities,
- Inspection provisions, penalties, transitional and final provisions.

The 1984 Act includes specific provisions related to:
- Function, assignment and responsibilities of different regulatory bodies,
- Requirement to posses license,
- The responsibility of the license holder,
- Quality assurance,
- Assessment and verification of safety (during site selection, constructing, commissioning and throughout the life of the nuclear installation),
- Emergency preparedness plans,
- Physical protection and safeguards,
- Operator licensing,
- Radwaste,
- Decommissioning,
- Dose limits, etc.

Generally speaking, the license holder is responsible for nuclear and radiological safety. SNSA is responsible for the preparation of legislative measures and their implementation on nuclear facilities concerning nuclear and radiological safety.

Some specific responsibilities in this field are also given to the Ministry of Health (Health Inspectorate), Ministry of Defense (Administration for Civil Protection and Disaster Relief) and Ministry of the Interior.

LICENSING SYSTEM

The licensing system is generally defined in the 1984 Act. The system can be divided into four steps:

- application for the site license – the competent body is the Ministry of Environment and Spatial Planning,
- application for the construction license – the competent body is the Ministry of Environment and Spatial Planning,
- application for the license for commissioning – the competent body is SNSA at the Ministry of Environment and Spatial Planning,
- application for the start of operation – the competent body is the SNSA at the Ministry of Environment and Spatial Planning.

The following sections of the 1984 Act are relevant:

Section 28:
"A nuclear facility may be constructed only at a site covered by a physical and urban plan of the competent body of the Republic of Slovenia or by a decree in substitution of such plan."

Section 29:
"The technical and other requirements for the siting and construction of a nuclear facility shall be evaluated on the basis of an analysis of all data relevant for an assessment of the potential impact of the planned nuclear facility to the environment and possible effects of events occurring in the environment upon such a facility, as well as on evidence that all requirements related to the country's security and nation-wide defense system have been met."

Section 30:
"The analysis referred to in Section 29 of this Act, as a special document of the applicant, shall in particular establish: dangerous natural and artificial phenomena which exist or may occur in the area of the anticipated site (earthquake, flood, landslide, explosion, fire, etc.), critical path of irradiation of the population by radioactive materials, the danger emanating from the consequences of certain phenomena and the design bases required for the prevention of both such dangers and consequences thereof."

Section 31:
"The application for a site license shall be accompanied by the evidence and analysis referred to in Section 29 of this Act, as well as by other prescribed documentation, which can be used to establish that the prescribed safety of the nuclear facility at a particular site has been secured."

Section 32:
"The application for the construction license for a nuclear facility shall have the following attachments: the site license, the technical documentation for construction, the safety report including relevant evaluations, as well as other prescribed documentation which can be used to establish that the prescribed safety has been secured."

The safety report shall contain information on the nuclear facility and its impact on the environment, the project description, an analysis of the possible accidents and measures required to eliminate or reduce the risk for the population and personnel of the nuclear facility, arrangements for the disposal and safety of radioactive waste as well as other prescribed data.

The safety report shall be amended in accordance with the changes which arise in the project design during the construction, commissioning, start of operation, operation and decommissioning of the nuclear facility.

Section 33:
"Once constructed, the nuclear facility cannot be operated until the commissioning has proved that the measures anticipated by the Act and regulations passed on the basis of the Act have been complied with. The investor of the nuclear facility shall, together with the application for the commissioning license, supply the following documentation:

1. the safety report, including information on modifications and amendments made at the stage of construction of the nuclear facility,

2. the results of successfully performed pre-operational tests,
3. evidence of the quality of the installed equipment and materials,
4. the results of the meteorological measurements completed at the site and of measurements of radiation emitted by natural and artificial sources in the vicinity of the nuclear facility,
5. the commissioning schedule,
6. information on professional qualifications, capabilities and operating experience, as well as health conditions of the operating personnel managing the production process in the nuclear facility and licensed for such operation, pursuant to the provisions of this Act,
7. information on the organizational structure of the department and devices for protection from ionizing radiation,
8. plans and measures for prevention of possible nuclear accidents, as well as procedures to be applied in the event of such accidents,
9. the operational limits and conditions at the commissioning stage,
10. information on the ensured physical protection of nuclear facilities and nuclear materials. "

Section 34:
"The license for commissioning of the nuclear facility shall be issued on the basis of the quality control of the works performed, of the pre-operational testing and of the documentation referred to in previous Sections of this Act, after assessing that the conditions prescribed for the safety of nuclear facility have been met."

Section 35:
"The license for the start of operation of the nuclear facility may be issued if the operator of the nuclear facility supplies documentation which proves that the prescribed conditions have been met, and if it is, due to the commissioning stage and the technical take-over, established that the nuclear facility conforms to the prescribed safety conditions."

The body competent to issue the license for the start of operation of the nuclear facility determines the operational limits and conditions for the nuclear facility.

Licensing requirements are more precisely defined in Regulation E-1 in Parts:

- Conditions for the siting of a nuclear facility,
- Conditions for the construction of a nuclear facility,
- Conditions for the commissioning of a nuclear facility,
- Conditions for the commencement of operation and operation of a nuclear facility,
- Methodology for the preparation of Quality Assurance Program (Appendix 1 in Regulation E-1).

In the licensing procedure, the SNSA has overall control over nuclear safety in all stages. This task, however, is implemented in two main forms:
1. The form of a prior consent; the site license and the construction license are granted by the Ministry of Environment and Spatial Planning; the SNSA in these two

stages reviews and evaluates only questions related to nuclear safety. Accordingly, it issues a prior consent to the license of the originally authorized body.
2. The form of a license; the licenses for commissioning, operation and decommissioning are granted by the SNSA itself.

CONTROL OF MODIFICATIONS

All modifications which impact the current licensing basis in a nuclear facility during construction or operation require a license amendment issued by the SNSA. The operator may file a complaint against the license amendment. In this case the Ministry of Environment and Spatial Planning makes the decision based on an outside expert opinion. This decision may be challenged at the Supreme Court by the operator or by the Attorney General.

According to the Slovenian legislation, nuclear facilities are obliged to notify the SNSA on modifications and changes of the Update Safety Analysis Report (USAR). In the legislation, the criteria and procedures for each type of modifications are not defined but NRC rule 50.59 is followed as a guideline.

With regard to the licensing of NPP design modifications and consequently the SAR changes, the following laws and regulations are applicable:

1. 1984 Act:
   The law requires Preliminary SAR for a construction permit and final SAR for an operating permit. The law provides general statements on the safe operation of the plant. More specifically it states that national regulations must be applied and, when not available, regulations of the country of origin can be applied, subject to the approval of the regulatory body.

2. Regulation E-2:
   This regulation provides detailed statements that the SAR is the basic licensing document for the nuclear installation with respect to nuclear safety. The SAR shall be supplemented during the plant life with data and analysis on all changes which were done at the nuclear plant. This regulation establishes 3 categories of changes to the SAR. The first category requires a notification to the SNSA after the completion of modifications. The second category requires a notification to the SNSA before implementation. The third category requires an approval by the SNSA before implementation.

3. Regulation E-1:
   This regulation requires that the licensee monitors and analyses the level of nuclear safety, whereby he must take into account the experience of other nuclear facilities and new technological developments. This regulation establishes, besides other matters, that for Technical Specification (TS) changes a third party independent evaluation, performed by organizations

authorized by the SNSA, is mandatory. The arrangements to perform this independent evaluation are implicitly under the responsibility of the licensee.

4. Act on Administrative Procedures (Off. Gaz. RS, 80/99 and 70/2000):
This Act establishes the general licensing procedure adopted in Slovenia and it also establishes the procedure to manage complaints of the licensee against the SNSA decisions.

At present the operating license in Slovenia is not explicitly limited in time. The life-time of the Krško NPP is, however, implicitly limited by the design life-time of the reactor vessel as 32 effective full power years (USAR). There are no formal requirements for the Periodic Safety Review (PSR) in law. However, based on SNSA decision, PSR has started in 2001. The Krško NPP prepared a program for the "Periodic Safety Review of NPP Krško", which is in accordance with the IAEA safety guide "Periodic Safety Review of Operational Nuclear Power Plants" No-50-SG-012 and in accordance with the EU practice. A requirement on PSR shall be inserted into the new nuclear legislation. Details on PSR are in Article 10, Priority to Safety.

7.3 Inspection and Enforcement

The legal basis is represented by the Act on Administration (Off. Gaz. RS, 67/94) which has a part on Inspection and Enforcement. In the law, requirements for formal education, additional skills and experience and for keeping proprietary information are given, and duties and competencies of the inspectors (in general) are determined. The 1984 Act also has a part on Inspection and Competencies. This Act gives specific competence to the nuclear and radiation safety inspectors; they can enter a nuclear facility at any time, they can order the operator of the plant to remedy the deficiencies found, they can also stop the construction or operation of the NPP if all legal pre-requisites were not met. If in the course of their supervision they establish non-compliance with regulations which are sanctioned according to the provisions of this law and other regulations, the inspector has to submit a request for legal action against the licensee.

The Criminal Code

In the case of more serious unlawful activities, omissions or negligence, the SNSA is bound (by the Code of Criminal Procedure as well as by the 1984 Act) to report the criminal offence to a public prosecutor. Penal Code qualifies as a criminal offence:-

- causing public danger (also by means of ionizing radiation),
- causing danger through nuclear materials,
- bringing of dangerous substances (also radioactive) into the country,
- unlawful dumping of dangerous substances (also radioactive),
- terrorism (also by means of nuclear materials).

If a person is found responsible, he can be sentenced to a fine or imprisonment from 6 months up to 15 years.

In conclusion, Slovenian regulations and practices are in compliance with the obligations of Article 7.

Article 8. Regulatory Body

1. *Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.*
2. *Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.*

8.1 Slovenian Nuclear Safety Administration (SNSA)

The SNSA was established at the end of 1987 by the Act on Changes and Supplements of the Act on Organization and Field of Activities of the Republic's Regulatory Bodies, Organizations and Services within the Executive Council of the Republic of Slovenia (Off. Gaz. SRS, 37/87). Before 1988 the Energy Inspectorate, which was part of the Committee of Energy and Industry, had the main regulatory and inspection functions, relying heavily on the opinion of the Expert Commission on Nuclear Safety. Just like many other countries, Slovenia also recognized the need for separating the "promotion" of nuclear energy from "regulation". That was also in accordance with the IAEA Safety Standards. So the SNSA was established as an independent, functionally autonomous body dealing with all matters concerning nuclear safety. It had two organizational divisions, the Safety Analysis and Legislative Division and the Division of Inspections. The SNSA was directly responsible to the Government and to the Parliament of the Republic of Slovenia. In 1991 a new Act on Organization in the Working Field of the Ministries was adopted. According to this act, the SNSA came under the Ministry of Environment and Spatial Planning and lost some of its independence and autonomy. It is also no longer responsible directly to the Government and to the Parliament but to the Ministry of Environment and Spatial Planning. SNSA's decrees can be appealed to the same Ministry. Based on the last amendment of the Organization and Competence of Ministries Act, the energy section of the Ministry of Economy now passed over to the Ministry of Environment and Spatial Planning the covering of both the promotion of energy production (also nuclear) and nuclear safety.

The Director of the SNSA is the head of the body and also represents the SNSA. On the Governmental and Parliamentary level, the SNSA is represented by the Minister. The Director is responsible to the Minister for his work and for the work carried out by the SNSA. He is appointed and discharged by the Government on the motion of the Minister. The organization of the SNSA is prepared by the Director and approved by the Government on the motion of the Minister.

Senior civil servants are also appointed by the Government on the motion of the Director, with the consent of the Minister, while others are appointed by the Director himself.

Competencies

The legal framework of the SNSA is defined in the Organization and Competence of Ministries Act. The SNSA deals with regulatory, inspection and technical tasks related to:

- nuclear and radiation safety of nuclear facilities,
- trade, transport and handling of nuclear and radioactive materials,
- accounting for and control of all nuclear facilities and materials (safeguards),
- physical protection of nuclear facilities and materials,
- liability for nuclear damage,
- qualification of NPP's personnel,
- quality assurance,
- radiation monitoring,
- early exchange of information in case of nuclear or radiation emergencies,
- international co-operation in the field of nuclear safety,
- other tasks defined in "nuclear" and other legislation.

In case of nuclear emergency, the Ministry of Defense - Administration for Civil Protection and Disaster Relief, has certain responsibility. However, for the physical protection of nuclear material the responsibilities are divided between the SNSA and the Ministry of Interior.

Organization

The SNSA is organized into five divisions. These are:

- Division of Inspection Control,
- Division of Nuclear Safety,
- Division of Radiation Safety,
- Division of Nuclear and Radioactive Materials,
- Division of Legal Affairs and International Co-operation.

According to the current organizational chart approved by the Government in 1998, 48 permanent staff positions and six interns are foreseen. In December 2000 there were 41 positions occupied, among them six inspectors.

As one can see from the scheme, the number of employees is increasing from year to year. In the year 2001 there is a plan for 6 new employees in the SNSA.

An overview of the SNAS’s Manpower Development

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
No. of Employees	5	7	9	11	16	18	20	26	30	32	33	37	41

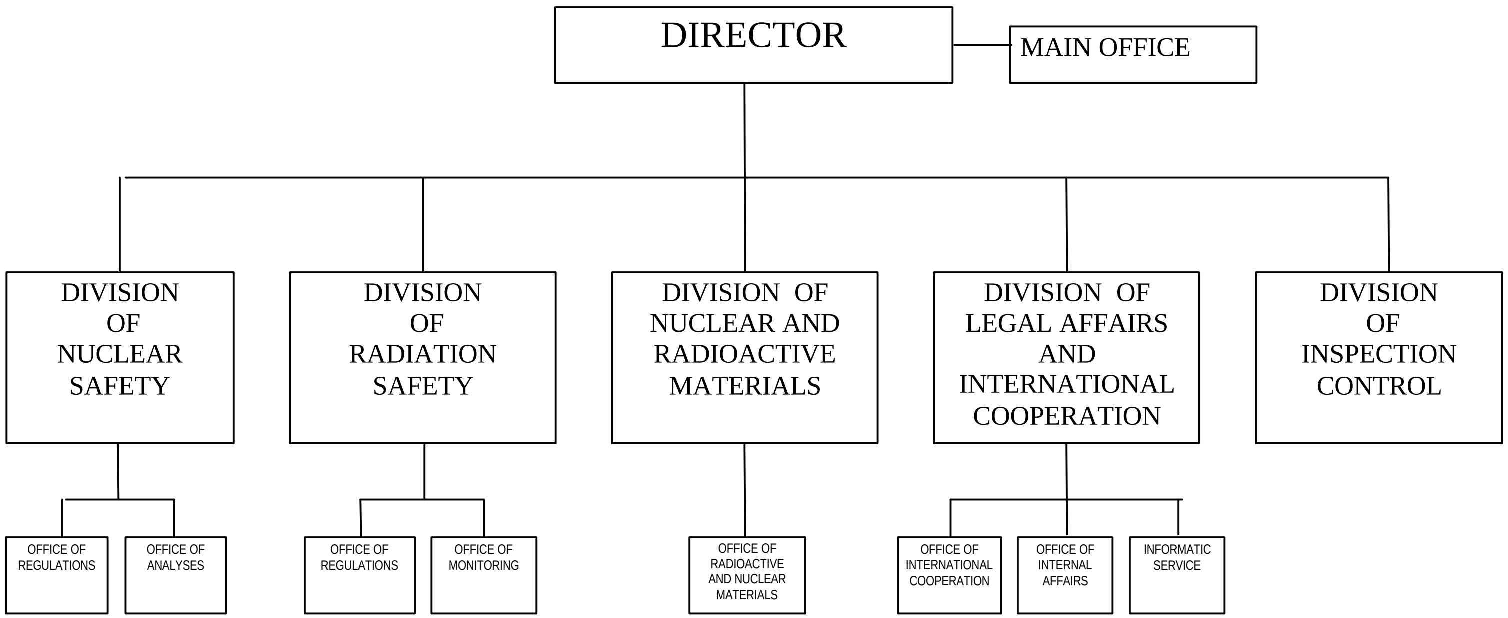
The staff of the SNSA is interdisciplinary, consisting of employees with different educational backgrounds; physicists, mechanical, electrical, chemistry and mining engineers, metallurgists, geologists, biologist, lawyers, sociologists, librarian and administration workers.

The SNSA has 3 doctors of science, 13 masters of science, 20 university graduates, 2 employees with college education and 3 employees with high school education. Out of 41 employees, 12 are women.

The Slovenian Nuclear Safety Administration invests a lot of time and money in the training of its staff. Training courses, seminars and workshops have been organized by the IAEA, EU through PHARE RAMG, OECD/NEA, US NRC and by other professional organizations and institutions. The following is a list of those which are of special importance for the SNSA staff. In the last few years many employees have participated in these courses and seminars:

- a nine-month nuclear technology training - 3 employees,
- a nine-week nuclear technology training - 22 employees,
- Westinghouse Technology Course Including PWR Simulator Course, a nine-week training - 10 employees,
- IAEA Regional Basic Professional Training Course on Radiation Protection, a five-week training - 2 employees,
- NPRB (advanced) Radiation Protection course, a four-week training - 2 employees,
- IAEA Nuclear Safety course, a five/nine-week training - 7 employees,
- Emergency Planning, a one-week training - 6 employees,
- IAEA PSA courses – 7 employees.
- Radiation Protection Course for NPP employees and contractors, level 3 (two days) – 22 employees and level 2 (two-week course) – 8 employees.

SLOVENIAN NUCLEAR SAFETY ADMINISTRATION



In the last twelve years, 15 mostly young technical professionals of the nuclear and radiological safety left the SNSA. The reason can be found in the uncertain career promotion in the state administration, uncertainty of the nuclear field in future and others.

The main task of the Division of Inspection Control is to perform inspection of nuclear facilities for their compliance with regulations and to determine the scope and depth of the inspection. Inspections can be organized separately or as a planned series of inspections, and they can be planned or unplanned (e.g. inspections which cover reactor trips, abnormal events, etc.). Planned inspections can be announced or unannounced.

The inspections are planned in accordance with the annual program of inspections, which is divided into four three-month periods. More detailed plans are prepared at the beginning of each three-month period, and after the end of each period the inspection reports are reviewed, and the compliance of the scope of the inspections with the objectives of the annual program is assessed. The new three-month plan is then reviewed and amended in accordance with the findings of the review of the inspection reports.

There are no resident inspectors who have an office on site, but continuous monitoring of the nuclear power plant's performance is performed through planned inspections twice a week by two inspectors (there are about 100 such inspections per year). The report about the inspection findings is written on the spot on each visit and a copy of this report is handed over to the plant staff.

Exceptionally only during the annual outage of the Krško NPP in the year 2000 and 2001, an inspector was assigned with an on-site office. This inspector co-ordinated SNSA inspection activities and co-operated with TSO's performing surveillance of the outage.

In 2000, the inspectors of the SNSA carried out 102 regular inspections of the Krško NPP and 4 joint inspections with the TSO's.

The Division of Nuclear Safety has three main functions:

- Preparation and issuance of decisions related to nuclear safety. In the framework of decision-making, an Integrated Safety Evaluation is performed. The prevailing tasks are those related to the licensing of plant changes and improvements, including the review of the corresponding licensing documents (FSAR, TS), programs (ISI, FPP) and safety assessments which support these license applications.
- Evaluation of plant operational safety, which encompasses gathering and analysis of plant operating experience, plant safety indicators, event analysis, testing and maintenance, etc. An additional important task is the collection and evaluation of the relevant international regulatory initiatives and practices.
- The safety analysis capability is used to support the licensing by performing and/or reviewing the safety analyses. The priority is the development of the following areas of safety analysis expertise: Severe accident analysis, Fracture mechanics and stress analysis, DBA analysis, and PSA analysis. Since the

manpower of the division is limited, many analyses and reviews are performed by the Technical Support Organizations (TSO).

The Division of Radiation Safety covers all matters related to radiation safety in nuclear facilities, i.e. radiation protection at workplaces, including dosimetry for the personnel and outside workers, on-site and off-site radiation monitoring and emergency preparedness. In some areas the responsibilities overlap with those of the Ministry of Health. The division co-ordinates the licensing of the environment radiation monitoring program, and licensing of the TS changes related to the radiation protection area. The exchange of radiological data with IAEA, EU and within the countries with bilateral agreements is the responsibility of the monitoring unit of the division.

The emergency preparedness unit is responsible for developing and maintaining the emergency plan of the SNSA, reviewing of the radiological emergency plan of the Krško NPP and the associated emergency implementation procedures, organization of emergency exercises with other institutions, organization of training and drills in the field of emergency preparedness, and co-ordination of international activities in harmonizing the emergency preparedness (bilateral meetings, IAEA projects, EU projects).

The Division of Nuclear and Radioactive Materials has regulatory responsibilities regarding trade, transport and handling of nuclear and radioactive materials. It issues permits for import, export and transport of radioactive and nuclear materials and approves the packages for storage and transport. This division is responsible for accounting for and control of nuclear materials (safeguards) and nuclear non-proliferation matters. In its mandate is also the approval of export of dual use materials equipment and technology. It is further responsible for the physical protection of nuclear facilities and materials. One of the main tasks of the division is supervision of the radioactive waste management (LILW and HLW) and decommissioning of nuclear facilities. Besides this, the division also deals with the siting of nuclear installations.

The Division of Legal Affairs and International Co-operation has the duties and responsibilities which are not always necessarily related to the nuclear field but which are in close connection with organizational matters, for example linkage with other ministries, servicing of the Government and Parliament, budget, employment policy, etc. This division is also engaged in the licensing process and preparation of new legislation in the field of nuclear and radiological safety and third party liability. Its responsibility is also the licensing of NPP’s shift personnel. Regarding international co-operation, the SNSA fosters and implements international relations for the purpose of gathering information on the state-of-the-art nuclear technology world-wide and of exchanging experience. The division also handles contacts established by bilateral agreements. The SNSA has been appointed as a contact liaison office with the IAEA (for technical questions). Good relations have been established with the OECD/NEA and the European Commission regarding the PHARE program (RAMG assistance).

There are also two expert commissions attached to the SNSA:

- the Nuclear Safety Expert Commission, which has an advisory role for different questions (for example, the yearly report of the SNSA, important licenses issued to the nuclear facilities, drafts of laws and regulations, draft measures for the physical protection of nuclear materials and facilities, etc.),
- the Expert Commission for Operators Exams sets the exams and proposes the SNSA to grant (or extend) the licenses to shift personnel.

Budget

The budget of the SNSA is determined on the basis of the realization of the previous year, taking into account new needs which have to be well justified. The budget is the only source for financing the SNSA's basic activities.

SNSA's salaries, material and other expenses, projects and investments are financed only through the national budget. There are very limited extra budgetary sources, i. e. within the licensing process for some direct costs.

Although the SNSA is a part of the Ministry of Environment and Spatial Planning, it still has it’s own share in the Ministry’s budget and is relatively free in the execution of its share. The composition of the SNSA’s budget for 2001 and SNSA’s budget for the period from 1993 to 2001 (and its share within the Ministry’s budget) is shown below.

	Year 2001 (in US $*)	**Year 2001 (in million SIT)**
Salaries	892,000	228.8
Material and other expenses (material expenses, publications and informing of the public, library, expert commission for nuclear safety and operators exams, maintenance of preparedness, safeguards, monitoring for early exchange of information, legislation, foreign cooperation)	304,000	77.6

Projects (geotectonic researches, IAEA membership fee, co-operation with US NRC in research programs, donation for the Chernobyl shelter fund	323,000	83.1
Investments	74,000	19.6
Total	1,593,000	409.1

* US $ exchange rate as per June 2001

Year	Budget (in US $*)	Budget (in million SIT)	% within the Ministry
1993	1,033,000	102	2.06
1994	955,000	126	2.18
1995	1,194,000	151	1.31
1996	1,325,000	167	1.45
1997	1,329,000	188	1.53
1998	1,182,000	200	1.41
1999**	1,689,000	272	1.70
2000	1,708,000	336	2.07
2001	1,799,000	409	1.87

* exchange rate as per January 1 of each year
** increase due to inclusion of IAEA membership fee into the budget of the SNSA

8.2 Other Relevant Organizations

The Ministry of Health - Health Inspectorate

The Health Inspectorate of the Ministry of Health has competencies based on three laws: the 1984 Act, the Act on Health Inspection (Off. Gaz. RS, No. 99/99) and the Act on Transport of Dangerous Goods (Off. Gaz. RS 79/99), and several regulations concerning radiation safety in Slovenia (Regulation Z-2, Z-3, Z-4, Z-5, Z-6, Z-9 and Z-10). The work of the Health Inspectorate is strongly connected to the TSO's which perform the expert and technical support to the Inspectorate. The Institute of Occupational Safety and the Jožef Stefan Institute were appointed by decrees from the Ministry of Health in 1981 for performing the support related to protection against ionizing radiation and for the safety of radiation sources.

The Health Inspectorate inspects the Krško NPP regularly in order to assure safe use, transport and storing of radioactive sources and materials.

The Health Inspectorate examines the fulfillment of medical conditions and the requirements related to the education of personnel working with ionizing radiation in Krško NPP. Special emphasis is given to the education of the people who are involved in the radiation protection program at the Krško NPP. The inspectors of the Health Inspectorate regularly examine the doses received by the workers at the NPP and the dosimetry quality assurance program. The inspections are also dedicated to the on-site and off-site radiation monitoring program, to the hygienic conditions at the Krško NPP and to the emergency medical facility. The inspections are usually announced in advance.

According to its competencies, the Health Inspectorate co-operates with the SNSA and takes part in the work of the Nuclear Safety Expert Commission. Besides these activities, the Inspectorate plays an active role in programs related to the preparedness for nuclear and radiation accidents in Slovenia, which were prepared by the Administration for Civil Protection and Disaster Relief.

The Administration for Civil Protection and Disaster Relief

Administrative and professional duties relating to protection against natural and other disasters are performed by the Administration for Civil Protection and Disaster Relief of the Republic of Slovenia (ACPDR). The ACPDR competencies include:
- planning and development of projects and research activities,
- risk assessment and national plans of protection and rescue,
- organization and equipment of national forces for protection, rescue and relief,
- organization and management of protection, rescue and relief in the event of major disasters,
- organization and implementation of a unified system of observation, notification and warning in the country,
- assessment of damage caused by disasters,
- assistance to local communities in mitigation of the consequences of disasters,
- preparation of programs and organization of education and training,
- planning and sustaining state reserves of materials and equipment for emergencies.

According to the Act on Local Autonomy, some of the responsibilities have been transferred to local communities.

For the coordination of planning and the maintenance of the national Protection and Rescue Plan in the event of Nuclear Accident, the Government has appointed a special Working Group consisting of representatives of the entities responsible for formulating plans, and ministries, as well as independent experts.

National Notification Center

The National Notification Center (CORS), which performs its duties in the framework of ACPDR, is responsible for notification procedures in the event of a radiological emergency, in accordance with the National Plan for Protection and Disaster Relief in the Case of a Nuclear Accident at the Krško NPP. The notification procedure depends on the level of emergency, but in all cases the CORS should notify the SNSA and the Administration for Civil Protection and Disaster Relief.

The Milan Èopiè Nuclear Training Center

The Milan Èopiè Nuclear Training Center, ICJT in short, is part of the Jožef Stefan Institute (IJS), the leading research institution in Slovenia. The main objective of the Nuclear Training Center is promotion of knowledge on the use of nuclear energy.

Since ICJT is the biggest and the best equipped center of its kind in Slovenia, it covers all aspects of the human use of nuclear power and ionizing radiation.

The activities of the ICJT can be divided into the following four areas:
- training of the Krško NPP personnel,
- public information about nuclear technologies and safety,
- organization of international training courses,
- training in the area of radiation protection.

Training of the Krško NPP personnel is the main activity of ICJT. It is performed in close co-operation with the Training Department of the Krško NPP. The three main courses are:
- Basics of the Power Reactor Technology (209 hours of lectures intended for NPP general personnel),
- Power Reactor Technology (520 hours of lectures, which is the initial training for the future main control room operators) and
- Refresher course (for the operators before licensing exam and before the re-licensing exam).

ICJT keeps in close contact with the development of nuclear technology in the world, and transfers that knowledge to nuclear experts in Slovenia. With assistance of the International Atomic Energy Agency, regional training courses are organized with lectures by experts from the most developed nuclear countries. The typical length of each course is one week. The subject is usually very specialized, presenting the latest news and achievements in the field of nuclear technology and safety. In 2000, a total of 31 training courses lasting from 1 day to 12 weeks were organized.

The Agency for Radwaste Management

The Agency for Radwaste Management (ARAO) was established in 1991 by the Slovenian Government with the basic intention of ensuring permanent and safe disposal of radioactive waste in Slovenia. The Agency's mandate was extended by the Government in 1996 to include, inter alia, operating the interim storage of radioactive waste from medicine, industry and other small users.

The Agency is fully owned by the Republic of Slovenia, and is financed by the state budget and decommissioning fund. In the future, further sources of finance are also foreseen, i.e. payments by users of the storage and repository of radioactive waste.

Third party liability

With regard to third party nuclear insurance liability, Slovenian insurers established in March 1994 the Nuclear Insurance and Reinsurance Pool. This consists of specialized insurance and reinsurance companies. The Pool, which is located in Ljubljana, is based on the fundamental principles common to all nuclear pools.

Fund for decommissioning of NPP Krško

The decommissioning of NPP Krško is regulated through the Act on the Fund for Financing the Decommissioning of the Krško NPP and on Radioactive Waste Disposal from the Krško NPP (Off. Gaz. RS 75/94) (Act). Based on this Act, the Fund for Decommissioning of NPP Krško was established. The Fund is a legal entity with its headquarters in Krško. It has the mandate to collect financial resources, to invest them on the financial market and to ensure rational and earmarked use of financial resources.

In order to assess the needed financial resources, the Government prepared the “Development of a Site Specific Decommissioning Plan for the Krško NPP”, in April 1996. Based on this Plan, the Krško NPP is currently contributing to the Decommissioning Fund a levy of 0.61 SIT per every kWh produced.

The Plan considers several possible methods for its implementation as well as the financing and scheduling. The Decommissioning Plan will be updated on a regular basis. The first revision is currently being carried out.

Financial status of the Fund from 1996 until the end of 2000.

Year	in US $*	in SIT
1996	766,052	103,697
1997	5,433,016	911,175
1998	17,712,919	2,855,342
1999	27,009,780	5,314,728
2000	45,804,547	10,414,905

* exchange rate as per December 31 of each year

Technical Support Organizations

The 1980 Act empowers in Section 14 the appointment of organizations by the Regulatory Body to be its technical support organizations. The qualification criteria are defined as having a qualified staff, appropriate technical means, an adequate QA program, etc. On the basis of this Section, the Regulatory Body for Nuclear Safety can appoint organizations for:

- reviewing the Safety Reports and other documentation connected with nuclear safety,
- performing expert surveillance of nuclear facilities during the construction and operation,
- permanent follow-up status and development of nuclear safety in Slovenia and in the world,
- preparation measures and participation in emergency planning with the consent of a regulatory body responsible for national defense,
- education and training of workers performing safety related activities, and of civil defense teams operating organizations and surrounding communities,
- other necessary activities, based on experience and actual findings.

By decree, the following organizations were appointed:

Jožef Stefan Institute, Ljubljana, Slovenia, for:
- analysis of events in nuclear facilities,
- reviewing the results of siting investigations for nuclear facilities,
- analysis of abnormal events in nuclear facilities,
- verification of operational status of the safety systems in a nuclear facility and of physical security,
- testing and verification of operability of nuclear, in-core and radiation instrumentation, as well as the reactor control system,
- verification of design documentation and review of the safety report,
- verification of test results of the safety systems during trial operation,
- preparation and execution of emergency measures during an accident related to radiation protection, the labeling of radioactive contamination and decontamination, and risk assessment to the environment,
- training of workers in basics of reactor technology, nuclear power plant systems descriptions, and radiation protection.

Electric Power Institute "Milan Vidmar", Ljubljana, Slovenia, for:
- quality assurance, performance of measurements and the quality control of electrical equipment during construction, trial operation and the operation of nuclear power plants,
- verification of operability, reliability and quality of the systems for control and automation of nuclear installations,
- training of technical staff in the area of expertise of the Institute,
- performance of acceptance tests on electrical equipment.

IBE Consulting Engineers, Ljubljana, Slovenia, for:
- preparation of investment and technical documentation for nuclear facilities,
- organizing the construction of nuclear facilities, installations and surveillance during construction, pre-operational tests and trial operation, including the organization of quality assurance in nuclear facilities and installations during construction,
- control of investment and technical documentation for nuclear facilities and installations,
- preparation of physical plans and siting documentation.

Institute for Metal Constructions, Ljubljana, Slovenia, for:
- quality assurance activities, carrying out measurements and control of quality and functioning, including non-destructive testing and quality assurance for metal structures and metal parts of the equipment, pressure piping and vessels during construction, trial operation and the operation of nuclear facilities and installations,
- training of technical staff in the area of expertise of the Institute.

Faculty of Mechanical Engineering, University of Ljubljana, Slovenia, for:

- \- quality assurance and control of mechanical equipment in nuclear facilities and installations during production, installation, pre-operational tests, trial operation and the operation of a nuclear facility,
- testing, measures and assessment of system functionalism,
- measures, regulations and running of equipment in nuclear facility,
- measures, quality assurance and assessment of functionalism of ventilation system, heating system, cooling system and air-conditioning in nuclear facility,
- measures, testing and assessment of functionalism of engines and systems for charging a nuclear facility in emergency,
- performing of guarantee measures of engines,
- training of technical staff in the area of expertise of the Institute.

Welding Institute, Ljubljana, Slovenia, for:

- quality assurance activities related to welding,
- quality control of welding,
- evaluation of welding procedures, base metal and filler material,
- verification of welders qualification, suitability of welding equipment and instruments,
- verification of welding-engineering concepts for welded constructions, design and statistics,
- inspection of welds, including non-destructive testing, consulting in the use of welding technology at new installations and in maintenance.

High Voltage and Energy Department, Faculty of Electrical Engineering, University of Zagreb, Zagreb, Croatia, for:

- safety analysis of installations, components and systems of nuclear facilities,
- safety analysis for qualification of safety class electrical equipment.

EKONERG, Zagreb, Croatia, for:

- quality assurance and quality control of mechanical equipment in nuclear facilities during production, installation, pre-operational tests, trial operation and operation,
- performance of acceptance and functional tests of mechanical equipment in nuclear facilities,
- verification of base line condition of the mechanical equipment which is especially important for the safety of a nuclear facility, in-service inspection and the impact of aging on its availability.

Energy Institute Ltd., Zagreb, Croatia, for:

- quality assurance and quality control of measuring and control systems and verification of operability of a nuclear facility and its reliability during construction; pre-operational tests, trial operation and operation of a nuclear facility.

Institute of Metals and Technologies, Ljubljana, Slovenia, for:

- quality assurance and control of metals based on investigations of their chemical, mechanical, micro structural and corrosion properties,
- assurance of quality and adequacy of metals used for metal constructions, piping and pressure vessels.

ENCONET Consulting Ges.m.b.H., Vienna, Austria, for:

- verification and review of safety reports and other documentation connected with nuclear safety,
- performance of safety analyses as a support to the Regulatory Body's decisions in the licensing process.

IZOLIRKA Fire Engineering, d.o.o, Radovljica, Slovenia, for:

- Fire hazard for nuclear facility,
- Fire safety concepts for nuclear facility,
- Fire hazard analyses for nuclear facility.

Beside those listed above, the Ministry of Health appointed on the basis of the same Act, also the Institute of Occupational Safety and the Jožef Stefan Institute for the tasks related to protection against ionizing radiation and for safety of radiation sources.

In conclusion, Slovenian regulations and practices are in compliance with the obligations of Article 8.

Article 9. Responsibility of the License Holder

Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.

There is no explicit provision in the 1980 Act and in the 1984 Act giving prime responsibility for the safety of a nuclear installation to the holder of the relevant license, except for the liability for nuclear damage. Specific provision can be found in paragraph 2 of Article 11 of the Governmental “Decree on the Transformation of NPP Krško, p.o. into the Public Company NPP Krško, d.o.o.”:
“The director (of NPP Krško) is responsible for the organization and operation of the public company, operational safety, and in particular for the nuclear safety”.

The relationships among the authorities, expert commissions and operators, as well as their duties and competencies, are regulated by the 1980 Act.

The system of licenses is set up to assure that the facility has been designed, constructed, commissioned and prepared for operation in accordance with the national or international codes, standards and experience.

The license holder is responsible for operating the facility, analyzed in the Safety Analysis Report, within the limits and conditions spelled out in the Technical Specifications and Operating License. He also has to perform all the activities based on the existing written procedures, instructions and manuals. The license holder is also responsible for the physical protection of the facility and radioactive materials, emergency preparedness, environmental monitoring, the training of personnel, radioactive waste treatment and storage. All these requirements are specifically detailed in the regulations. Furthermore, the license holder is responsible for the adequate and safe storage of radioactive waste, as well as for the storage of spent fuel.

A very clear requirement is set also in Section 36 of Regulation E-1, where it is stated that during the operation of the nuclear facility the operating organization shall permanently survey and analyze its safety status, taking into consideration the experience gained from other nuclear facilities, as well as technological development.

Section 43 of the 1984 Act requires that the operation of a nuclear facility must be carried out in accordance with operating and other technical instructions. When listing the required activities to be covered by the instructions, a special mention is given to the "Quality Assurance program for services and the equipment required for the safe operation of the nuclear facility".

The license holder is obliged to assure that the funds for the decommissioning and final disposal of radioactive waste and spent nuclear fuel are in accordance with the Act on Fund for Financing the Decommissioning of the Nuclear Power Plant Krško and for the Disposal of Radioactive Waste from the Nuclear Power Plant Krško.

It is the regulatory body's responsibility to ensure that the licensee fulfils the requirements of the legislation. The SNSA executes continuous surveillance (inspection, reporting, licensing, audits - see more under Article 8 of this report) in order to assess the effectiveness of the activities of the license holders needed for the safe operation of the facility.

In the new Nuclear and Radiation Safety Act it is foreseen, however, to incorporate provisions on prime responsibility of the license holder for the safety of a nuclear installation, as one of the main principles of the new act.

In conclusion, Slovenian regulations and practices are in compliance with the obligations of Article 9.

(C) GENERAL SAFETY CONSIDERATIONS

Article 10. Priority to Safety

Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.

Priority to safety is defined and impacted on several levels and by different ways. Below are described the main influencing categories in the framework of providing nuclear safety impacts on setting safety priority and what is the practice in Slovenia.

The National Policy

The basic requirements when addressing priority to nuclear safety are given in Section 10 of the 1984 Act, by which a nuclear installation can only be used under such technical and other conditions which would ensure the safety of human lives, and the health and protection of the environment against ionizing radiation.

In the Strategy of Energy Use and Supply of Slovenia adopted by the Parliament it is outlined that a strategic objective of Slovenia is to maintain a high operational safety level at the Krško NPP during its operation.

The Government which was appointed this year transferred the energy sector from the Ministry of Economy to the Ministry of Environment and Spatial Planning. This change has created a situation in which the regulatory authority line is not fully separate from the energy production line. A precondition for proper separation of safety from other interests is now jeopardized.

SNSA Practice

Although the SNSA has no specific written safety policy statement, the "priority to safety" philosophy can be seen in:

- transparency of nuclear safety issues towards national/international professionals and the general public, as well as national/international organizations (two OSART missions, two ASSET missions, ICISA mission, WAMAP mission, several IPERS and IPSART missions for PSA review, IPPAS mission, WENRA mission),
- priorities given between different (re)licensing procedures and other regulatory activities,
- allocation of available funds,
- regulatory request for safety improvements,
- periodic top management (SNSA and Krško NPP) meetings,
- striving to achieve and maintain compliance with high international safety standards,
- enforcing nuclear safety also by ordering plant shut-down or prohibited re-start if and when all safety measures requested by the SNSA are not met or if nuclear safety is otherwise endangered,
- event investigations review of the licensees to check the quality of the

investigations and follow up on the implementation of corrective measures,
- review of safety analyses and a follow up on the measures taken as a result of the analyses,
- regular inspections and assessments of the planning for and the conduct of refueling outages, including the work of contractors.

Measures taken by the Krško NPP

The Krško NPP policy is that all individuals concerned shall constantly be alert to opportunities to reduce the risks to the lowest practicable level and to achieve excellence in plant safety. One of the most important objectives is to protect individuals, the society and the environment by establishing and maintaining an effective defense in the nuclear power plant against radiological hazard. Accident prevention is the first safety priority at the Krško NPP. It is achieved through the use of reliable structures, components, systems, procedures and plant personnel, who are committed to safety culture.

The management commitment to safety is referenced to in a number of top tier documents with a clear statement of the Krško NPP policy on safety, production and responsibilities. This policy is defined in various documents, including the Quality Assurance Program, the Plant Management Manual, the Krško NPP Policies and Goals, the Company General Employee Training Handbook, the Operating Experience Assessment Program, etc. Within these documents clear statements are made about the Krško NPP objectives, mission statement, fitness for duty policies, nuclear and industry safety, personal protective equipment, safe working practices, training, operating experience, resources and finance. Each of the objectives in the previously mentioned documents are developed into goals and objectives for the separate divisions within the Krško NPP and a monitoring system is established.

Monitoring of the routine plant operation is achieved by the line management through daily meetings. A nuclear safety overview is achieved through the function of different committees and departments, such as the Krško Operating Committee (KOC), the Krško Safety Committee (KSC) and the Independent Safety Engineering Group (ISEG). The ISEG performs an extensive indicator program which is based on WANO performance indicators and IAEA INSAG Safety Culture Indicators. Trend and pattern analyses are performed on the key-field basis.

Independent reviews of outage activities and surveillance tests are performed by TSO`s. The TSO’s are engaged for inspection, witnessing and safety evaluation of refueling, surveillance and modifications activities. The safety analysis and the safety assessment of plant changes which impact Technical Specification are also reviewed by TSO’s. Besides TSO, also IAEA missions are invited to independently review different aspects of nuclear safety.

The plant operation is carefully controlled by trained personnel who operate in accordance with approved procedures. A maintenance, test or modification requirement is processed through detailed planning and a scheduling system. Throughout this process all nuclear safety activities receive careful consideration based on Standard Technical Specification parameters, supported by PSA and

Outage Risk Assessment Management (ORAM).

According to the requirements stated in the legislation, Technical Specifications and the internal procedure Guidance for Reporting the documents on safety issues are prepared and submitted to the SNSA in a prescribed time period in the form of a Licensee Event Report.

In order to achieve the necessary safety, which is the primary prerequisite for preventing accidents, high quality in the design, construction, tests, start-up and operation is required at the Krško NPP. Systems and components were conservatively designed, constructed and tested to the quality standards that were in accordance with the safety objectives. The safety assessment and verification were made before the construction and beginning of operation and were documented in the form of a Preliminary Safety Analysis Report (PSAR). This report was followed by the Final Safety Analysis Report (FSAR) and at the present time by the Updated Safety Analysis Report (USAR).

The FSAR as a minimum complies with Revision 1 to the "Standard Format and Content of Safety Analysis Report for Nuclear Power Plants", issued by the Atomic Energy Commission in October 1972 and designated as Regulatory Guide 1.70. FSAR, Chapter 15.0 has been upgraded according to the Revision 3 of Regulatory Guide 1.70.

Additional to the existing safety assessments, the Periodic Safety Review (PSR) is being introduced. The PSR, which has started this year, based on SNSA's decision, will make it possible to re-evaluate the plant’s safety according to the newest standards, considering the cumulative effect of plant changes through the plant life. Having in mind that the plant has been following the USA regulation and Safety review approach, the PSR represents an additional, complementary measure for assuring the plant’s safety. The Krško NPP prepared a program and determined a schedule for its implementation together with all relevant explanations and submitted it for approval to the SNSA. The program is in accordance with the IAEA safety guide “Periodic Safety Review of Operational Nuclear Power Plants” No. 50-SG-012 and with the EU practice.

The final PSR report will also include actions to improve nuclear safety and the suggested schedule for the implementation of improvements. The PSR will be completed by the end of 2003.

In the area of Severe Accident, important steps are taken in the direction of mitigation of severe accidents. Plant-specific Severe Accident Management Guidelines (SAMG’s) are being prepared, based on WOG’s SAMG and a plant- specific PSA Level 2 study. Implementation of SAMG is under consideration at SNSA. By the adoption of the SAMG’s, the defense against accident progression in the area of Beyond Design Bases Accident (BDBA) is strengthened.

Voluntary activities and good practices related to safety are achieved by self-assessments (ASSET), international missions (WANO, INPO, IAEA, ICISA) and operating experience exchange programs through international organizations. This allows to apply experiences relating to nuclear safety for the Krško NPP benefit.

Permanent safety improvements are made by a number of modifications. If opportunities for advancement or improvement over the existing practices are available and seem appropriate, such changes are applied cautiously. All changes are evaluated for licensing applicability in accordance with 10 CFR 50.59. For that purpose an administrative procedure, the Authorization of Changes, Tests and Experiments, was developed.

The role of training in contributing to plant safety has been fully accepted by the Krško NPP management and is reflected by the number of training programs. The Systematic Approach to Training (SAT) is accepted as the best currently available method. From similar power plants in the United States, the Job and Task Analysis (JTA) is being used as a basis to determine many of the training requirements for the personnel at the Krško NPP. A plant specific JTA is being prepared as part of modifications of training requirements in the framework of plant-specific full-scope simulator implementation.

In conclusion, the Slovenian regulations and practices are in compliance with the obligations of Article 10.

Article 11. Financial and Human Resources

1. *Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.*
2. *Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.*

The licensee has the prime responsibility for the safety of their nuclear power plant. This responsibility includes providing both adequate financial and human resources to support the safety of the power plant throughout its life.

11.1 Financial Resources

Based on a Decree adopted on 31st July 1998, Nuklearna elektrarna Krško p.o. was transformed into a public company Nuklearna elektrarna Krško, d.o.o. NEK is a limited liability company. The founder of the NEK public company is the Republic of Slovenia. Until an appropriate international agreement is concluded between the Republic of Slovenia and the Republic of Croatia, the founding rights of the NEK public company shall be enforced by the Government of the Republic of Slovenia.

The Republic of Croatia or Hrvatska elektroprivreda d.d., Zagreb, which is the bearer of the rights and obligations under the Decree, shall be acknowledged as a co-investor on the basis of their funds invested (joint investment).

NEK is liable for its obligations with its entire assets, with the exception of the assets which are in the form of infrastructure facilities, devices and networks, and are intended for the activities performed as a commercial public service.

The earnings from the sale of electricity are sufficient for the expenses of operation. NEK invests in continuous adjustment of the safety level of its installation, to account for the development of the state of the art in science and technology during the entire operating life, including decommissioning and dismantling.

Over the past years a great number of measures have been implemented in the nuclear power plant, with which its components, systems and structures have continuously been adapted to the increasing safety requirements. Special care and effort have been given to the implementation of recommendations from international missions, such as ICISA, OSART, WANO (for details, see Article 6, International missions and Annexes H and I). For example, in the year 2000 a new full scope simulator was acquired by NEK.

NEK has purposefully earmarked part of the earnings for the investments into additional nuclear safety related improvements. NEK is also obliged to assure the funds for the decommissioning and the final disposal of radioactive waste and spent nuclear fuel.

The Act on the Fund for Financing the Decommissioning of the Nuclear Power Plant Krško and for the Disposal of Radioactive Waste from the Nuclear Power Plant Krško, provides detailed provisions for the financial arrangements when taking care of decommissioning and nuclear waste management (see also Chapter 8.2, Fund for decommissioning of NPP Krško).

In the case of a nuclear accident financial resources to compensate the claim are provided through the Slovenian third party liability legislation, taking into account that Slovenia is a party to the Vienna Convention (see also Chapter 8.2, Third party liability).

The budget is the only source for financing the regulatory body's basic activities (see also Chapter 8.1, Budget).

In conclusion, the Slovenian regulations and practices are in compliance with Article 11, paragraph 1.

11.2. Human resources, training and qualification

The total number of the staff at the Krško NPP in March 2001 was 605, adequately covering all necessary functions for the operation, including QA, training and engineering. There are 7 shifts of licensed operators with a minimum shift composition of 5 licensed operators per shift, including an on-duty shift engineer. Shift supervisors typically have a university engineering degree.

Training and qualification activities at the Krško NPP are governed by the 1984 Act, Regulation E-3, the plant Safety Analysis Report, plant procedures and a yearly training program approved by the SNSA .

Krško NPP Guides

The education and training requirements are outlined in FSAR, Chapter 13.2. The process is further detailed in the administrative procedure Training and Qualification of the Krško NPP Personnel. Further administrative procedures cover specific areas, such as the Licensed Operator Training Program, the Non-licensed Operator training Program, the Health Physics Training Program, etc.

In addition to this, the Krško NPP personnel are trained and examined using other relevant standard industry guides in areas like welding, specific equipment and machinery operation, safety at work.

Facilities

NPP Krško installed a full scope simulator at the end of 1999 and started using it for training in 2000. The new maintenance training facility was also put in operation in 2000.

Training Programs

In general, training programs are divided into initial and continuous training. In addition to the training of the Krško NPP personnel, specific training is conducted for subcontractors, specifically in the area of site access and radiation protection.

The Licensed Operator Training consists of initial training and continuous training (retraining).

The licensed operator initial training consists of classroom training covering engineering fundamentals (phase 1), plant systems and on-the-job training on field operator positions (phase 2), plant procedures and simulator training (phase 3), and on-the-job training in the main control room (phase 4). The entire program takes approximately 2 years. After the completion of the training program an examination is conducted by the SNSA's Expert Commission for Operators Exams. The license is issued to the candidates who successfully pass the exam for the duration of 4 years, except for the initial license, which is valid for only one year.

The continuing training for licensed personnel consists of multiple weekly training segments (typically 4 per year), which comprise a two-year cycle of requalification training. Each day of training consists of classroom lecture topics and practical simulator exercises. The simulator retraining is conducted continuously through the year, when shifts are not on duty. Renewal of licenses is obtained based on examination conducted by the SNSA's Expert Commission for Operators Exams.

There are other types of training for specific needs:
- Refueling Operations Training,
- Maintenance and Engineering Training,
- General Employee Training,
- Radiation Protection and Chemistry Training,
- Security Training,
- Emergency Preparedness Training.

Future Development

The Krško NPP will continuously improve full-scope simulator (model improvements) and training programs in compliance with international practice, regulation and trends, as well as plant specific needs and situations.

In conclusion, the Slovenian regulations and practices are in compliance with the obligations of Article 11, paragraph 2.

Article 12. Human Factors

Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.

Slovenian legislation covers a human factor issue with respect to fitness for duty in the 1984 Act, requiring in section 41 adequate physical and psychological abilities for the licensed operator, and for other important positions in nuclear installations. Regulation E-3 further elaborates the same requirements.

The personnel engaged in activities related to nuclear power plant safety are trained and qualified to perform their duties. The possibility of human error is taken into account in the training program by facilitating the correct decision by operators and by inhibiting the wrong ones, and by providing a means for detecting and correcting, or compensating for the error.

Although the NPP Krško personnel are strongly aware of the responsibilities they have regarding nuclear safety, a number of different minor abnormal events were recognized as caused by the human error. Because of that fact, the methods for preventing, detecting and correcting human errors, were introduced through the Operating Experience Assessment Program (OEAP), based on the analysis, operational aspects and experience feedback. Both "in-house" and "industry" events are covered by this program.

The Operating Experience Assessment Program, is supported by other procedures, such as the Deviation Report, Root Cause Analysis etc. Program and associate procedures encourage personnel to report all "in-house" deviations from normal operation, and the condition of the equipment, and systems, as well as deviations from optimal human performance, no matter how low in importance these deviations could seem to be at first sight. According to the program, the personnel are encouraged also to report potential problems as well as ideas for improvement, primarily in human performance.

Once the Root Cause is defined, actions are taken to prevent the recurrence of such events or to improve human reliability. Actions are approved by the Krško Operating Committee and are assigned to responsible superintendents for implementation.

The OEAP Program is of great help for the management of the NPP defining goals for safety improvement. The information gained from both, on-site events as well as the operating experience of other nuclear power plants, is used as the source of lessons applicable at the Krško NPP. Therefore, good co-operation between the management and the OEAP Program personnel supports effective management practices and policies. They are implemented, monitored for effectiveness and continually improved. Issues such as communication between different levels of the personnel structure demonstrate that the OEAP Program is well supported by the plant management.

The on-going human factor evaluation is performed by ISEG (Independent Safety Engineering Group) in accordance with the Operating Experience Assessment Program. ISEG is responsible for maintaining surveillance of unit activities in order to provide independent verification that these activities are performed correctly and that human errors are reduced as much as possible.

The shutdown PSA was performed by the use of the EPRI-s ORAM method. Based on the results, procedures were developed for refueling and maintenance activities during shutdown planning for lower risk and controlling and avoiding the high risk contributions. The plant introduced the computer code based on ORAM approach, which more effectively supports the risk management in shutdown states.

The PSA model is used for system configuration management during preventive maintenance activities. Risk evaluation due to proposed SSC (System Structure Components) unavailability is performed on a weekly basis before preventive maintenance takes place.

Man-machine interface improvement is applied on the basis of the administrative procedure Human factors engineering design guidelines. This procedure provides a design guidance for the incorporation of human factor engineering principles into the design changes. All engineering and design disciplines during design change development are followed according to this procedure. The procedure basically refers to the American National Standard for Human Factors Engineering of Visual Display Terminal Workstations, ANSI/HFS 100-1988, Guidelines for Control Room Design Reviews, NUREG 0700, as well as numerous other documents.

The modifications and activities related to man-machine interface (MMI) are:

- Installation of Process Information Systems (PISs);
  PISs incorporate 12 desktop monitors and four Main Control Board panel mount monitors, a screen for monitoring process variables, application programs, system parameter trends with history, status of equipment, etc.,
- Review and correction of labeling of all components, instruments and controls which are available in the MCR (Main Control Room) and in the field,
- Modification in MCR to implement annunciator free environment,
- Upgrading of MCR engineering and environment (air conditioning, lighting, furniture, carpeting, coloring scheme),
- Digital displays for Radiation Monitoring Systems and trend recorders,
- Installation of Inadequate Core Cooling Monitoring System (ICCMC).

Managerial and organizational issues regarding human performance improvement are provided by the management and supervisors indoctrination down through the organization. The role of training in contributing to plant safety is fully accepted by the Krško NPP management and is reflected by the number of training programs.

The plant policy on safety culture is referenced in a number of top tier documents with a clear statement of NPP Krško policy on safety, production and responsibilities. This policy is defined in various documents, such as: Quality

Assurance Plan, Plant Management Manual, NPP Krško Policies and Goals, Company General Employee Training Handbook, Operating Experience Assessment Program, etc.

Training activities are conducted in a manner that supports safe and reliable plant operation, by preventing human errors due to insufficient training. Station engineers attend two system training courses to improve the overall knowledge of station operation.

In addition, important contribution to human factor improvement is also represented by three different analyses which have recently been carried out:

- Analysis of typical working conditions for all jobs which might impact nuclear safety.
- Control room design review, the results of which have already been implemented by changing the control room alarm displays, lighting and air conditioning.
- As part of the PSA analysis, extensive error assessment has been performed. The PSA analysis pinpointed the most critical human actions. The personnel training has taken this into account by modifying the training programs or the way they are performed, giving priority to the critical actions.

The use of the new full scope plant specific simulator will essentially improve the quality of the plant operators' training process in the area of accident management.

In conclusion, the Slovenian regulations and practices are in compliance with the obligations of Article 12.

Article 13. Quality Assurance

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programs are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.

The 1984 Act requires explicitly quality assurance measures to be taken for all activities related to nuclear facilities, from the design stage to operation and then to the decommissioning stage (Section 33 and 43). The required measures are specified and detailed in sections 5, 6 and 7 of the Regulation E-1 and Appendix 1 to this regulation.

SNSA Quality Assurance Management System

Based on the program of the Government on Management for Excellence in State Administration, supported by IAEA NUSS QA Standards and ISO 9001: 2000 and IAEA-TECDOC-1090 "Quality assurance within regulatory body", the SNSA QA Management system is in preparation. The system includes a Quality Manual clearly defining organization, responsibilities, resource management and processes within the regulatory body, and the Implementing Procedures. Some implementing procedures related to organizational matters and to external auditing of TSO's already exist and have been used. In its Mission Statement, SNSA clearly states its goal as aiming to "prevent or restrict any harmful effects of ionizing radiation to the public and the environment and to ensure only peaceful use of nuclear energy" and the policy to reach the goal as "by using clearly defined rules, giving an overriding priority to safety, being friendly towards the customers and open to the public, SNSA shall function, regulate and supervise".

The organization structure of SNSA has also been adjusted by adding the function of a QA Co-ordinator who reports directly to the Director.

The NPP Krško Quality Assurance Management System

The Krško NPP, as the license holder, is responsible for the overall quality of design, construction, operation, maintenance and modification of the nuclear power plant.

The plant was designed, built and tested in accordance with US AEC design and safety criteria in effect since October 1973.

The Westinghouse Electric Corporation was contracted for the design and construction of the nuclear steam supply system, and the balance of the plant systems. Westinghouse had the primary responsibility for the Quality Assurance of the Krško Nuclear Power Plant during the design and construction phases. The quality assurance program was implemented in full compliance with: US AEC Appendix B to 10CFR50 Quality Assurance Criteria for NPP and Fuel

Reprocessing Plant and QA guidance provided in WASH 12833 Guidance on QA Requirements During Design and Procurement Phase of Nuclear Power Plants and in WASH 1309 Guidance on QA Requirements During the Construction Phase of Nuclear Power Plants, both issued in 1974.

Krško NPP QA policies

The Statement of Policy and Authority, which is a part of the Krško NPP QA plan, includes the following statements: "It is a policy of the Krško NPP to operate the Krško NPP in a manner which ensures the safety and health of the public, and the personnel on site". It is also the policy of the Krško NPP to comply with the requirements of Appendix B to 10CFR50 of the United States Code of Federal Regulations; the operating license (OL); applicable codes, standards and guides.

Krško NPP QA program

The Quality Assurance Program includes all planned and systematic actions taken by the Krško NPP, including the suppliers, contractors and consultants, which provides adequate confidence that the structures, systems and components shall perform the intended safety function satisfactorily in service. The program consists of the Quality Assurance Program and applicable procedures, and is mandatory for all activities affecting the safety related functions of the nuclear power plant structures, systems and equipment. This can also be applied to non-safety-related items as deemed appropriate by the plant management.

The QA Program includes in its Appendices the List of NPP Krško Structures, Systems and Components.

The Krško NPP Quality Assurance Program is implemented and maintained to comply with the following codes and standards:
- 10CFR50, Appendix B,
- ANSI N 18.7-1976,
- ASME B&PV Code, Section III, NCA-4000;
- ANSI/ASME NQA-1,
- IAEA 50 C QA and
- Regulation E-1.

The QA Program has 18 chapters and addresses all criteria of Appendix B to 10CFR50. Each chapter defines: its purpose and references, the requirements of the relating criterion, authority and responsibilities of persons and organizations, procedures for implementation of quality assurance functions and performing functions of attaining quality objectives.

The QA Program is a top-level quality document for operational phase activities. The requirements identified by the QA Program are implemented according to management directives, programs, plans, procedures or instructions, grouped in plant level manuals, division level manuals and department level manuals and programs.

The Quality Systems Division is responsible for executing and reporting on the effectiveness of the QA Program implementation to the Director General.

Changes to the description of the QA Program in section 17 of FSAR and the QA program which represents the changes in commitment, are subject to notification of the SNSA, and the review and approval by SNSA prior to implementation.

Regulatory control of QA is reflected through the following activities:
- Inspection of QA program implementation in the Plant,
- Joint QA audits of third parties (plant supplies, TSO's, etc.).

The Krško NPP Quality Assurance Program is basically composed of three functional levels:

Level One - Quality Control and Inspection

Equipment manufacturers, suppliers and contractors are responsible for providing appropriate quality control procedures, systems and inspections for assuring and demonstrating that the end product has the specified degree of quality as defined in the specifications, drawings, and/or purchase documents.

The actual quality control is executed by the equipment manufacturers, suppliers and contractors. This is supplemented with Receiving Inspection activities performed by the QC department of the Krško NPP Quality Systems Division.

The Quality Control and Inspection of maintenance and modification activities performed by the Krško NPP personnel are executed by the QC department of the Krško NPP Quality Systems Division.

Level Two - Surveillance

The Krško NPP Quality Assurance department has the responsibility for surveying and monitoring the quality systems and activities of equipment manufacturers, suppliers and contractors. Two major Quality Assurance functions are accomplished at this level. The first one takes place during the design phase where the various drawings, specifications and procurement documents are reviewed for the proper inclusion of applicable codes and standards, and the quality requirements including acceptance criteria. The second function occurs during the actual fabrication and services performance. During this phase, the component manufacture and the construction quality control procedures, programs and practices are reviewed to conform to the requirements of the specifications and procurement documents. A physical surveillance action is performed to ensure that the quality requirements are in fact being met.

The Quality System Division surveys the plant's personnel activities regarding the periodical testing of safety related systems and components.

All work orders of plant activities that are related to the components identified in the Appendix to the QA Program are reviewed by Quality Assurance, and requirements for Inspection points are specified. The QA performs surveillance on a sample of those activities to verify that the quality requirements are in fact being met.

Level Three - Audits

To ensure that the overall Quality Assurance Program is functioning as planned, periodic audits are performed. The Audit Program includes internal audits of activities at the Krško NPP, and external audits of manufacturers, suppliers and contractors. The Quality Assurance System of suppliers, manufacturers and subcontractors is audited to verify conformance to requirements and proper implementation on activities within the contractual scope. Since most of the suppliers are from the US, the Krško NPP participates with other licensed US utilities in the Nuclear Procurement Issues Committee (NUPIC) joint audit program of suppliers. Supplier audits are reviewed during a review and approval of suppliers for placement on the Approved Supplier List (ASL). The Krško NPP purchases items and services from the suppliers on the ASL.

In conclusion, the Slovenian regulations and practices are in compliance with the obligations of Article 13.

Article 14. Assessment and Verification of Safety

Each Contracting Party shall take the appropriate steps to ensure that:
(I) comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;
(II) verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

14.1 Safety Assessment

Section 32 of the 1984 Act requires the following:

"The application for the construction license for a nuclear facility shall have the following attachments: the site license, the technical documentation for construction, the safety report including relevant evaluations, as well as other prescribed documentation which can be used to establish that prescribed safety has been secured.

The safety report shall contain: information on the nuclear facility and its impact on the environment, the project description, an analysis of the possible accidents and measures required to eliminate or reduce risk for the population and personnel of the nuclear facility, arrangements for the disposal and safety of radioactive waste as well as other prescribed data.

The safety report shall be amended in accordance with the changes which arise in the project design during construction, commissioning, start of operation, operation and decommissioning of the nuclear facility".

The licensing process and licensing requirements are defined in the nuclear legislation (Regulations E-1 and E-2) covering the aspects of siting, design, construction and operation. There are no national codes and standards in nuclear energy/safety, therefore the codes and standards of the country of supply are allowed to be used.

Section 36 of Regulation E-1 requires the following:

"During the operational phase the licensee has to review and analyze the safety of the nuclear power plant and has to take into account the operational experience of other nuclear facilities and technology development.

According to regulation during the design and construction phase the licensee shall prepare and submit to the authority the Preliminary Safety Analysis Report (PSAR). The Final Safety Analysis Report (FSAR) is necessary to get and maintain an operational license. During the operation phase the safety analyses are performed to support plant changes, plant specific resolution of generic issues or as a result of new knowledge, approaches or information. NEK, together with the subcontractor Westinghouse, have completely updated and re-analyzed all FSAR Chapters for the modernization project in the year 2000.

Additionally, continuous development work in the areas of severe accident (using MAAP, CONTAIN and MELCOR codes) and DBA analyses (RELAP code) is in progress.

Slovenia participates in international research programs related to nuclear safety. Jožef Stefan Institute from Slovenia is a member of the thermal-hydraulic Code Applications and Maintenance Program (CAMP) coordinated by US NRC. In June 2000, SNSA signed the Implementing Agreement with US NRC, which enabled Slovenia to become a member of the Cooperative Probabilistic Risk Assessment Program (COOPRA) and the Cooperative Severe Accident Research Program (CSARP). The licensee, SNSA and TSO's use the above mentioned memberships to actively participate in them and increase knowledge in the area of nuclear safety. The memberships also give access to up-to-date software programs used in nuclear safety. For example, Nuclear Plant Analyzer is used to simulate normal and accidental situations in the nuclear power plant for SNSA internal use, RELAP is used for DBA analysis, CONTAIN and MELCOR for the simulation of severe accident conditions and SAMG verification at NPP Krško.

Structural and mechanical simulations and analyses are performed within research and development programs supported by SNSA, such as additional analysis in support decision making of the leak-before-break (LBB) concept.

14.2 Verification

The 1984 Act includes several requirements which concern the verification of the physical state of a nuclear power plant. For instance, Section 43 of the 1984 Act sets forth as follows:

"The operation of a nuclear facility must be carried out according to operating and other technical instructions related to: all operating regimes, treatment of nuclear materials, transportation of such materials, maintenance and surveillance of the systems, internal control and procedures in the event of a nuclear accident".

The main programs used for the verification of the state of a nuclear power plant are:

- periodical testing according to Technical Specifications,
- preventive maintenance program,
- in-service inspection (ISI) program,
- periodical inspections of pressure vessels and piping,
- surveillance program of reactor pressure vessel material,
- specific programs due to accident analyses and PSA analyses.

Activities for verifying the physical state of a power plant are carried out in connection with normal daily routines and with scheduled inspections, testing, preventive maintenance, etc. Activities are performed by the licensee personnel and in the case of certain inspections by subcontractors separately approved.

Detailed programs and procedures are established and approved by the licensee and reviewed, and to some extent approved, by the SNSA. The operational limits and conditions are provided in the Technical Specifications, which are subject to approval by the SNSA. In general, the role of the SNSA is to ensure that the licensees follow the obligations imposed on them, and carry out all activities scheduled in the verification programs.

Inspections are performed regularly by inspectors, both on power and during refueling modes of operation. During the refueling period, TSO's are engaged to cover (inspect and evaluate) different but quite substantial parts of plant maintenance and testing. All activities and findings are described in TSO's and inspection reports.

The verification and monitoring programs such as ISI and radiation protection take place on periodic basis which is defined in the corresponding programs and procedures.

NPP Krško has started the activities to perform The Periodic Safety Review (PSR) in the years 2001 to 2003. There will be a complete review based on international standards and practices (IAEA guidelines and other Western European and USA standards).

In conclusion, the Slovenian regulations and practices are in compliance with the obligations of Article 14.

Article 15. Radiation Protection

Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

15.1. Regulations and requirements related to radiation protection that apply to Nuclear Installations

Radiation protection as applied to Nuclear Installations is regulated by the 1984 Act and Regulations Z-2 to Z-6, Z-9, Z-10 and E-1(see report under Article 7).

In section 10 of the 1984 Act it is stated:
"A nuclear facility may be constructed and operated only on the site and according to such technical and other conditions that provide protection for the lives and health of the population as well as environmental protection from ionizing radiation above the prescribed limits. The prescribed exposure limits in paragraph 1 of this Section are the limits established in such a way that the share of exposure produced by a nuclear facility, together with exposure originating from other sources of ionizing radiation to which the population of the same area is exposed, does not exceed the limits prescribed in the regulations based on this Act".

15.2. Implementation of national laws, regulations and requirements related to radiation protection

Dose Limits

Regulation Z-6 sets the system of the dose limits which is based on ICRP Publication No. 26 and IAEA SS No. 9, Basic Safety Standards for Radiation Protection, 1982 Edition. The exposure limits provided with this Regulation are the basis for planning and implementing of all organizational, technical, medical and other measures, which are necessary for the radiation protection of occupationally exposed persons and the general public. The exposure of workers and members of the general public due to a single radiation source, or to all radiation sources together, are restricted primarily by a system of dose limitation and by justification of the practice and optimization of radiation protection measures.

According to this, the design, planning and subsequent use and operation of sources and practices are performed in a way to ensure the exposure as low as reasonably achievable (ALARA), taking into account economic and social factors.

The prescribed annual effective dose limit for workers is 50 mSv, the annual equivalent dose limit for individual organs and tissue of workers is 500 mSv except in the case of eye lenses and blood-forming organs, where the limit is 150 mSv. In general practice, it has been found only in a few cases of exposure that the recommended level of 20 mSv per year was exceeded.

The operative dose limit for the personnel of the Krško NPP is more restrictive than the one set in the regulations - i.e. the annual limit of effective dose for the Krško NPP personnel is 20 mSv.

Exposures incurred in the course of intervention in emergency situation only shall not exceed twice the relevant annual limit in any single event (100 mSv) and, in a lifetime, five times this limit (250 mSv).

The limit for the annual effective dose for a member of the public is 1 mSv. The annual equivalent dose limit for individual organs and tissue of members of the public is 50 mSv. For a limited period of a few years the limit for the annual effective dose equivalent for a member of the public can be 5 mSv, if the average life time effective dose equivalent does not exceed 1 mSv per year.

In 1999 the SNSA started to develop a computerized registration system of occupational radiation exposure for workers in a nuclear fuel cycle in Slovenia, including outside workers. In total, about 5000 workers in a nuclear fuel cycle have been monitored, with an average of 1000 workers being assessed each calendar year. Four dosimetric services regularly perform personal monitoring of occupational exposure. The computerized dose register at the SNSA was regularly put into operation in December 1999.

In Regulation Z-2 the basis for an environmental monitoring program in the surroundings of nuclear installations is prescribed. The monitoring of emissions (at the source) is carried out and the environmental (off-site) monitoring as well. According to the operating license, the radioactive material in effluents to be released to the environment outside a 0.5 km radius during normal operation at the Krško NPP shall not result in exposure to members of the general public in an annual effective equivalent in excess of 50 microSv, taking into account all pathways of exposure.

In Regulation Z-9 the limits of radioactive contamination in the living environment are defined through annual limits on intakes and derived concentrations of radionuclides in water and air, as well as with activity concentrations of natural radionuclides in building materials used for housing.

Radioactive Materials Storage and Release

In Regulation Z-3 conditions for storage, disposal and release of radioactive waste material into human environment are prescribed.

Steps taken to ensure that exposure is kept ALARA

The Krško NPP uses procedures and engineering controls based upon sound radiation protection principles, in order to achieve occupational doses and doses to members of the public that are as low as reasonably achievable (ALARA). This procedure is also applied in planning the annual outage works and in steam generator replacement.

The Krško NPP has its own dosimetric service. The procedure for its approval by the Ministry of Health is in progress. The Radiation Protection Service of the NPP actively participates in the OECD/ISOE dose reporting system.

Environmental Surveillance

The regular radiation monitoring program in the surroundings of the Krško Nuclear Power Plant (mainly within a radius of 12 km around the installation) comprises complex radioactivity measurements of surface and ground water, sediments and water biota, precipitation, air particulate and iodine, soil, crops and vegetation. It is performed by four independent technical support organizations, two from Slovenia and two from Croatia. Monitoring of the environmental activity is performed also in the surroundings of the research reactor site and of the former uranium mine and mill at Žirovski vrh.

The automatic radiation monitoring system in Slovenia has been developing since the Chernobyl accident. All the data from different networks are currently collected at the SNSA. At the moment the whole system (named CROSS) comprises on-line data of dose-rate measurements (43 stations), aerosol radioactivity measurements (3 stations) and radioactive deposition (1 station). The control of airborne activity was realized through the IAEA TC project and also by support of the Austrian Government. The station for radioactive deposition was developed and installed by the SNSA.

15.3. Regulatory Control Activities

The SNSA and the Health Inspectorate of the Republic of Slovenia are the competent regulatory bodies which carry out their inspection functions of radiation protection through periodical inspections and ad hoc inspections. The objectives of inspections are to verify if the Krško NPP operates in compliance with the legislative obligations related mainly to the following radiation protection areas: control of gaseous and liquid releases from the plant, radioactivity monitoring of the nearby environment and dose assessment of the public, occupational exposures of the plant personnel and outside workers, review of ALARA procedures, etc.

SNSA annually reviews and approves programs of radiation and meteorological monitoring in the surroundings of the Krško NPP, and also for the other nuclear installations (research reactor site with low and intermediate-level radioactive waste storage near Ljubljana).

In conclusion, the Slovenian regulations and practices are in compliance with Article 15 of the Convention on Nuclear Safety.

Article 16. Emergency Preparedness

1. *Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.*
   For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.
2. *Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.*
3. *Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.*

16.1 Regulatory Requirements

According to the Act on Organization and Field of Activities of the Ministries there are two authorities with responsibilities and competencies to regulate and supervise the Krško NPP emergency preparedness: the Administration for Civil Protection and Disaster Relief is responsible for population protection during a nuclear accident and for the organization of civil protection units in nuclear installations, and the SNSA is responsible for on-site procedures and measures related to the on-site emergency plan.

The national concept of civil protection and disaster relief is regulated by the Act on Protection against Natural and Other Disasters. The law requires that the enterprises, institutions and other organizations (including nuclear power plants), which in their working process use, produce, transport and store dangerous materials or perform activities which pose some danger to the public and the environment, provide the basis for emergency planning and have an emergency response plan. The law also requires that also the state and the municipalities provide the basis for emergency planning and have an emergency response plan.

Concerning nuclear safety, the most important laws are the 1980 Act and the 1984 Act, which stipulate that every applicant must submit a request for trial operation of a nuclear facility, and the procedures and protection measures in the event of a nuclear accident. During operation the utility must adopt and use appropriate instructions, including an emergency plan and a program of measures in the event of nuclear accidents and other emergencies in a nuclear facility. The information from the on-site Radiological Emergency Response Plan (RERP) must be included in the FSAR. According to the Act on Protection against Natural and Other Disasters, order for evacuation can be given by the government, the mayor, or in emergency cases a commander of Civil Protection on duty.

16.2 Implementation of Emergency Preparedness Measures

16.2.1 Classification of Emergency Situations and Emergency Planning Zones (EPZ's)

For the purpose of emergency planning, and to assure that prompt and effective actions can be taken to protect the public in the event of a nuclear accident at the Krško NPP, three EPZ's are defined around the nuclear power plant. The first EPZ is the area within a three kilometer radius around the plant (the so-called Precautionary Action Zone - PAZ). In this zone, urgent protective actions have been planned in advance and will be implemented immediately upon the declaration of a general emergency. The second one - the EPZ for immediate protective measures (UPZ – Urgent Protective Action Zone), includes the two municipalities within a 10 kilometer radius around the plant. Protective measures in this zone will be implemented immediately after the decision is taken. This decision will be based on projected doses or measurements in the environment. The third one - the EPZ for the ingestion pathway protective measures (LPZ – Long Term Protective Action Zone), includes the area of the local communities within a 25 kilometer radius around the plant. Also for the purpose of general emergency planning, the general emergency preparedness zone is specified. The general emergency preparedness zone includes the whole territory of the Republic of Slovenia. The area within a 500 meter radius around the reactor is the exclusion area. This area is under the control of the nuclear power plant. The area within a 1500 m radius around the reactor is the limited population zone, where no new residential building development is allowed.

The nuclear emergency classification system is based on four levels of emergency (abnormal event, alert, site area emergency and general emergency), ranging from events where the effect on the plant to the environment is negligible, to the highly unlikely severe accidents, which could seriously affect the environment. The classification system is based on site- specific action levels for each class of emergency, according to the recommendations given in NUREG-0654 "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", App.1. The classification system enables gradual activation of the on-site and off-site emergency response organization. In an unusual event the emergency is controlled by an on-site normal shift organization. In an alert the emergency is controlled by a full on-site emergency response organization, and in the case of a site or general emergency the full on-site and off-site emergency response organizations are activated.

Accident classification is the responsibility of the Krško NPP. The four emergency classes are:

- abnormal event (class 0): there is no release of radioactive material requiring off-site response unless further degradation of safety systems occurs.
- alert (class 1): events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety. There is a possibility of a minor discharge of radioactive substances, or a minor discharge of radioactive substances has already occurred.

- site emergency (class 2): there is a threat of breakdown of a larger number of safety functions at the nuclear power plant and a potential danger of discharge of radioactive substances.
- general emergency (class 3): events are in process or have occurred which involve actual or imminent substantial core degradation or melting with a potential loss of containment integrity.

16.2.2 Overall National Emergency Preparedness Scheme and Off-Site Emergency Plans

The responsibilities and competencies for emergency planning and maintaining emergency preparedness for an accident at the Krško NPP are specified on three levels: plant, local and state level. The state is responsible for the regional and state radiological emergency response planning, and the maintaining of both RERPs. In April 1999, the updated National Protection and Rescue Plan in the Event of a Nuclear Accident (henceforth referred to as the Plan) was adopted by the Slovenian Government. In the Plan, the emergency organization response scheme is determined for all four emergency classes. The Plan comprises: notification, activation of state civil protection units, responsibilities of state administration and support organizations, radioactivity measurements, protective actions, rescuing activities, recovery operations, training and exercises. The interfaces with the regional and local radiological emergency plans are given in the Plan as well. The main objective of the regional emergency response planning is to co-ordinate the activities between the state level and the local level, and to support and co-ordinate the emergency managing efforts between municipalities. The on-site, local, regional and state emergency response plans must be harmonized with each other. The regional emergency plan comprises the emergency response in the three municipalities (Krško, Brežice and Sevnica). Potentially the most affected municipalities, Krško and Brežice, developed their own (local) emergency response plans. The regional emergency plan comprises the implementation of immediate protective actions (sheltering and evacuation of the area within 10 km around the Krško NPP, distribution of KI), support in the radiological monitoring of the environment, foodstuff and feedingstuff in the area within 25 km around the Krško NPP, decontamination and informing the potentially affected population before and during an accident. The local radiological emergency plans provide manpower and decontamination equipment to support the medical, police and fire fighting teams in implementing their tasks in the UPZ.

The two most important institutions in nuclear emergency preparedness at the national level are the Administration of the Republic of Slovenia for Civil Protection and Disaster Relief (ACPDR) at the Ministry of Defense, and the Slovenian Nuclear Safety Administration (SNSA) at the Ministry of Environment and Spatial Planning. During an accident, both institutions provide support to the Republic of Slovenia Civil Protection Commander. The SNSA director co-ordinates the work of the SNSA emergency organization and is responsible for maintaining contacts with the RS Civil Protection Commander who, on the basis of the decisions adopted by the Slovenian Government and together with the State Civil Protection Headquarters, is responsible for the operational management of protection and rescue activities. The State Civil Protection Headquarters consist of representatives of ministries and government services, therefore all aspects of co-ordinated operation are ensured. In case of accident, not only Civil Protection units but all protection, rescue and relief units are subordinated to the RS Civil Protection Commander.

In May 1999, the Expert Commission on Nuclear Safety issued the document Response Criteria in Case of a Nuclear Accident, which comprises generic intervention levels and operational intervention levels. This document became an integral part of the Plan in its Appendices. The generic intervention levels and operational intervention levels are consistent with the recommendations given in the IAEA publication of the Safety Series No. 109.

In April 2000, a working group appointed by the Government began its work in the revision and finalization of the Plan. The group had members from the ministries which would support the activities in the nuclear and radiological emergency management, the regional and local civil protection, and from the Krško NPP and the Jožef Stefan Institute. The main task of the working group was co-ordination of emergency planning on all levels.

16.2.3 On-site Emergency Plan

The Krško NPP is responsible for on-site emergency planning and maintaining the on-site RERP (Radiological Emergency Response Plan). The contents of the RERP are given in Annex D. On the request of SNSA in 1992, the Krško NPP updated and upgraded its on-site emergency plan. Because of the lack of domestic regulations specific for nuclear emergency planning, the Krško NPP decided to follow international recommendations (the IAEA guides and standards) and foreign practice - especially the US NRC regulations and guides as much as it was applicable, suitable and appropriate to the off-site interface in the overall organizational concept of the civil protection and disaster relief in the Republic of Slovenia. The Krško NPP radiological emergency response plan was revised to a new format and new adequate emergency implementing procedures (EIP) were written.

From 1992 to 2001, the implementation of the new concept of emergency preparedness in the Krško NPP was reflected in 6 revisions of the Krško NPP RERP.

The Krško NPP has the following important responsibilities regarding the off-site emergency control:

- classification and declaration of emergency;
- notification of the off-site authorities about the declaration and status of the on-site emergency;
- recommendation of protective actions for the public to the off-site authorities.

The Krško NPP notifies the regional and state notification centers about the emergency. The notifications must be performed in 15 minutes after the declaration of the emergency level, or after the recommendation of the new protective actions for the public. For this reason a special notification form is used. The notification is done by facsimile or by alternate communications (notification radio system) if a facsimile is not available. The regional and state notification centers perform further local and state notifications.

According to Sections 26 and 44 of the 1984 Act, the Krško NPP also notifies the SNSA. This notification is performed with a special notification form, immediately and no later than 1 hour after the announcement of the level of emergency. For immediate notification a dedicated phone line was established between the Krško NPP control room, SNSA and CORS.

Regardless of the level of emergency, the adequate state and local authorities, and the forces responsible for disaster relief and protection are notified. In the case of an unusual event they are notified for their attention, in an alert they are notified for their readiness and in a site or general emergency they are activated in accordance with the state and local emergency response plan.

In the Krško NPP RERP, the following protective actions are pre-planned for recommendation:

Emergency Class	**Protective Action**
Unusual Event	None
Alert	None
Site Emergency	Alarming of the population in the vicinity. Sheltering in the vicinity of the NPP. Grazing animals should be placed inside and fed by stored food-stuff in a radius of 3 km from the NPP.

Emergency Class	**Protective Action**
General Emergency	Alarming of the population. Sheltering in a 3 km radius from the NPP and in the sector of wind direction up to 8 km. Iodine profilaxis. Grazing animals should be placed inside and fed by stored food-stuff in a radius of 10 km from the NPP.

	Evacuation in a radius of 3 km and more if the projected whole body dose at 500 m is 10 mSv in one hour, or 50 mSv to the thyroid in one hour. If the activity in the reactor building is more than the activity in the gap of the fuel elements; evacuation in a radius of 3 km and 8 km in the downwind sector; sheltering for the rest of the area of a 8 km radius and 10 km downwind. In the case of a core melt: evacuation in a radius of 8 km And 10 km in the downwind sector.

During 1999 the Krško NPP completely refurbished the premises of the Technical Support Center. One of the major changes in the emergency preparedness scheme was introduction of the Emergency Off-site Facility, which is located in Ljubljana. The facility was tested during the exercises in the years 1999 and 2000. After the activation of the Emergency Off-Site Facility, the following tasks are taken over from the Technical Support Center:

- overall management and co-ordination of the emergency response in the nuclear power plant,
- providing engineering and technical support,
- co-ordination with the State Civil Protection Headquarters, the SNSA and other off-site support organizations,
- classification of the event and notifying the competent authorities,
- radiological assessment of the event and recommendations of the protective actions for the population in the affected area,
- informing the public about the status of the nuclear power plant.

The severe accident management procedures for the Krško NPP, based on generic SAMG's (Severe Accident Management Guidelines) developed by the WOG (Westinghouse Owners Group), were introduced in 2001. These procedures are used by the Technical Support Center to handle the situation in the case of a severe accident. The procedures were validated during the year 2000.

In October 2000 the SNSA issued a partial decision to the Krško NPP in which it was required that the Krško NPP should forward to the SNSA an updated version of Chapter 13.3 of the final safety analysis report “Emergency Planning” for approval. This chapter should meet the criteria set in the NUREG-0654 to the largest extent possible. The Krško NPP handed over to the SNSA the updated Chapter 13.3 of the final safety analysis report (FSAR) in June 2001. The FSAR Chapter 13.3 “Emergency Planning” was approved, with some modifications to be made until the end of October 2001.

16.2.4 SNSA Emergency Plan

The SNSA Emergency Plan (SEP) contains information which is needed to support the SNSA staff when performing specific activities which are required during an emergency at a nuclear facility.

The SEP covers the following:

- Responsibilities of the SNSA in an emergency, and relations to other governmental institutions,
- Organization,
- Activation and notification of the SNSA,
- Assessment of the emergency and the emergency classification,
- Emergency facilities and equipment,
- Training and maintaining emergency preparedness.

In the case of an emergency, the SNSA acts as an independent expert governmental organization whose main activities are related to:

a) Civil Protection Commander of the Republic of Slovenia (CPC):
   The Civil Protection Commander is responsible for the decision-making in the case of an emergency. The CPC is supported by the State Civil Protection Headquarters. The SNSA supports the work of the State Civil Protection Headquarters with the necessary data which is important for the State Civil Protection Headquarters and the CPC as well.
b) Nuclear Facility:

The SNSA communicates with the nuclear facility via on-line systems (e.g. meteorological and radiological data transfer system, ERDS-Emergency Response Data System), facsimile, telex or telephone messages from the control room (or the Technical Support Center), and with the SNSA representatives on the site to obtain information on the status of the emergency. All this information is provided to the expert group for the plant status, whose duty is to project the progress of the emergency from the information provided by the nuclear facility (e.g. core status, safety systems status, planned actions, safety parameter values). The projection of the emergency, along with the meteorological data, is provided to the dose assessment group to calculate the projected doses. The results of both expert groups are a valuable source of information for the National Civilian Protection Headquarters (NCPH).

c) The SNSA provides the neighboring countries and the IAEA with information on the emergency, according to the Convention on Early Notification in Case of a Nuclear or Radiological Accident. From November 2000, SNSA has been sending data from the CROSS to the Emercom system EURDEP on a daily basis.
d) The SNSA assists the NCPH in the preparation of information for the public.

The SNSA emergency plan is considered an integral part of the National Radiological Emergency Response Plan.

It is important that the interfaces between the Radiological Emergency Response Plan of the nuclear facility (the Krško NPP RERP) and SEP (SNSA Emergency Plan) are identified:

a) notification about the emergency and emergency classification,
b) communication lines to transfer information from the nuclear facility to the SNSA.

The knowledge of the Krško NPP RERP by the SNSA management is essential in order to co-ordinate the activities going on at the Krško NPP and the SNSA Emergency Center (SEC).

The organization of the SNSA during an emergency consists of the SEC Director, two expert groups, an information/support group and SNSA representatives at the nuclear facility.

Responsibilities and Duties of the SNSA Staff.

Position	**Responsibility**
SEC Director	Responsible for all activities of the SEC, co-ordinates the work in the SEC and reports to the NCPH.
Head of the group for the forecast of accident progression	Responsible for the group performance, regularly reports to the SEC Director and provides the information to the dose assessment group.
Head of dose assessment group	Responsible for the group's performance, provides weather forecast, projected doses and protective actions for the population, regularly reports to the SEC Director.
Head of Information/Support group	Responsible for dissemination of information to the neighboring countries and the IAEA, for the preparation of information for the public, for supporting the SNSA information (computer) system and for assuring undisturbed operation of communications.
Group members	Perform the work assigned by the group leaders or according to procedure.
Inspectors	Independent observers at the nuclear facility, provide the information if necessary to the SNSA.

The Director of the SNSA appoints the expert group leaders and expert group members.

In 1999, a SNSA officer on duty was introduced around-the-clock, equipped with a mobile phone. In case of an event, his primary duty is verification if the message is true and activation of the SNSA staff. In 2000, a radiological monitoring officer on duty took over his responsibilities. He daily checks the operation of the automatic radiological monitoring system and writes a report. In case of elevated levels detected by the automatic monitoring system, he receives an automatic message to his wireless communicator.

16.2.5 Informing the Public

General information about the accident is communicated via the national media, while information important for protection and rescue operations in the most threatened zone (within a radius of 25 km from the nuclear power plant) is also provided by the local media, particularly radio stations. Upon the announcement of a general emergency, which calls for an immediate implementation of measures, sirens transmitting the immediate danger sign are sounded in the UPZ. At the same time, the public is provided with instructions on the implementation of protective measures via radio and television broadcasts.

The preparation of messages on the local level is the responsibility of local communities. In addition, outside the contaminated region, local communities are also responsible for organizing information centers and publishing the telephone numbers of the advisory service which the affected population can contact for the purpose of obtaining additional information on the implementation of protective measures, the whereabouts of their relatives, and so on. All the information that local communities cannot collect themselves (weather forecasts, results of radioactivity control) are submitted to them by national bodies. Until the activation of the RS Civil Protection Headquarters, information is prepared by the SNSA and the Krško NPP, while subsequent activities are run via the State Civil Protection Headquarters. The Government Public Relations and Media Office, which has its own representative at the RS Civil Protection Headquarters, also participates in this process.

The new Nuclear and Radiation Safety Act, which is under preparation, envisages the provision of the Council Directive 89/618 EURATOM on informing the general public about the health protection measures to be incorporated directly in the Act, while details about the contents and scope of the information to be provided and procedures for circulating shall be covered in the appropriate regulation, dealing with emergency preparedness.

16.3 Training and Exercises

The first emergency preparedness exercise was conducted at the Krško NPP in 1982, with the participation of observes from IAEA, who positively assessed the actions taken by the Krško NPP, as well as the actions taken by local authorities and the population.

The adequacy of the new concept of emergency preparedness was tested by exercises in 1993 (national exercise), 1994, 1995,1997 (table-top exercise), 1998, 1999 and 2000, and evaluated by the IAEA OSART mission in 1993. Exercises are conducted annually.

In October 1995 Slovenia was invited to take part in the second cycle of the four INEX-2 exercises, which were promoted by the OECD/NEA. Slovenia participated in all four exercises. It was three times a far-field country (Swiss /1996/, Finnish /1997/ and Canadian /1999/ exercise) and once a near-field country (Hungarian /1998/ exercise). The SNSA also participated in the joint IAEA/WMO exercise, which was held on 26th June, 2000. Slovenia also took part in the JINEX-2000 exercise in May 2001.

The training of protection, rescue and relief forces is conducted by the Republic of Slovenia Protection and Rescue Training Center, under the jurisdiction of the ACPDR. The training covers introductory, basic and supplementary training courses.

16.4 International Agreements and International Projects

Slovenia is a party to the Convention on the Early Notification of a Nuclear Accident and to the Convention on the Assistance in the Case of a Nuclear Accident or Radiological Emergency. Slovenia has a bilateral agreement with Hungary on the early exchange of information in the event of a radiological emergency. This was signed in 1995 and ratified by the Slovenian Parliament in the same year. Bilateral agreements similar to that with Hungary were also signed with Austria and Croatia. All three bilateral agreements have been ratified and there are regular meetings between the parties. There have been meetings between Austria and Slovenia (in Ljubljana on 5 July 1999, in Vienna on 16 October 2000), between Croatia and Slovenia (in Zagreb on 3 March 2000), between Hungary and Slovenia (in Ljubljana 24-25 May 2000, in Budapest 5-6 April 2001). The negotiations to sign a bilateral agreement on the early notification in the case of a nuclear accident are under way with Italy.

Slovenia concluded bilateral agreements on the protection against natural and other disasters with Austria, Croatia, Hungary and Slovakia. The agreements specify certain forms and methods of co-operation between the countries in the event of natural and man-made disasters:

- mutual assistance in protection, rescue and disaster relief,
- identification of threats,
- co-operation in the monitoring, forecasting and prediction of hazards and disasters,
- exchange of scientific and technical information important in protection against disasters,
- education and training for protection, rescue and relief,
- co-operation in the development and production of protection and rescue equipment.

The international projects related to emergency preparedness, in which Slovenia decided to take part, are:

- in 1995 the ECHO (European Commission Humanitarian Organization) started a project to provide assistance in Off-Site Emergency Preparedness (OSEP project) for East and Central European countries. The first phase of this project, which was finished by the end of 1995, was to perform a study to assess the level of off-site emergency preparedness in the countries which expressed readiness to accept the assistance. Some of the countries received the assistance in equipment, but for most of the participating countries, training of personnel responsible for emergency preparedness is foreseen. In 1999 the kick-off meeting of the project “Training on the Off-site Emergency Preparedness” was held in Trnava, Slovakia. The training was sponsored by the Phare Program,

- Slovenia took part in the IAEA project RER/9/050 "Harmonization of Emergency Preparedness in Countries of Central and Eastern Europe", which was set up as an extensive program to improve and to harmonize the emergency preparedness. The project expired at the end of 2000. Slovenia was an active member in the project and met most of the project goals. The activities relating to the project which are still in progress are: review and revision of procedures for environmental monitoring and a coherent approach to public information. During the project Slovenia put more emphasis on training; operational intervention levels were developed, generic intervention levels were revised, and more co-operation in the framework of bilateral agreements was established (e.g. radiation monitoring data exchange). The notification procedures and the classification scheme had been established before the project started,
- in 1999, the EU put Slovenia on the list to receive the RODOS system for 2000. Until June 2001 this task was still under way, but in the meantime Slovenia started to participate in the ex-RODOS User’s Group, which later evolved into the DSSNET (Decision Support System Network). The Terms of Reference for the project of installation of RODOS in Slovenia were finalized in the first quarter of 2001,
- Slovenia is in the process of installation of the ECURIE system.

In conclusion, the Slovenian regulations and practices are in compliance with the obligations of Article 16.

(D) SAFETY OF INSTALLATIONS

Article 17. Siting

Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:
(I) for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;
(II) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;
(III) for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (I) and (II) so as to ensure the continued safety acceptability of the nuclear installation;
(IV) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.

Particularities regarding environmental assessment and public participation/review of new sites in the licensing procedure for nuclear installation can be found in the 1984 Act, Regulation E-1, Act on Environmental Protection (Off. Gaz. RS, 32/93, 1/96) and in its subsidiary regulation, in the Decree on Environmental Interventions that Require the Environmental Impact Assessment (Off. Gaz. RS 66/96) and in the Guideline on Preparation on the Environmental Impact Assessment (Off. Gaz. RS 70/96).

According to Section 28 of the 1984 Act, a nuclear facility may be constructed only on a site for which a regional and urban plan was prepared by the competent authority. Section 8 of the Regulation E-1 gives a list of data which an applicant for a site license has to provide in order to incorporate a nuclear facility into the regional and urban plan:

- the natural characteristics of the region which could have an impact on the safety of the nuclear facility;
- the characteristics of industrial and other facilities in the region which could have an impact on the safety of the nuclear facility;
- the characteristics of the nuclear facility which are of relevance for the assessment of its impact on regional planning and environmental protection.

Such a plan must be revealed for public comments and remain disclosed for a certain period of time (at least 14 days). After receiving comments, proposals and suggestions, it is revised and these are incorporated (as appropriate) in the final regional and urban plan.

According to Section 29 of the 1984 Act, technical and other requirements for the siting and construction of a nuclear facility must be evaluated, on the basis of an analysis of all data relevant for an assessment of the potential impact of the planned nuclear facility to the environment, and the possible effects of events occurring in the environment upon such a facility. The analysis shall address:

- dangerous natural and artificial phenomena which exist or may occur in the area of the anticipated site (earthquake, flood, landslide, explosion, fire, etc.),

- critical paths of irradiation of the population by radioactive material and
- the design bases required for the prevention of both such dangers and consequences thereof.

The application for a site license shall be accompanied by the evidence and analysis mentioned in Section 29 of the 1984 Act as well as other prescribed documentation which can be used in the evaluation process. Other prescribed documentation includes reports such as meteorology, hydrology, population, use of land, etc.

Chapter II. of the Regulation E-1 "Conditions for the Siting of a Nuclear Facility" determines in more detail the investigations and analyses of the site and of the impact of the nuclear facility on the environment, required for the application for the site license.

A law banning the construction of an NPP until the year of 2000, prevented the design and construction of any new NPPs in the Republic of Slovenia and excludes any kind of participation in similar activities.

In conclusion, the Slovenian regulations and practices are in compliance with the obligations of Article 17.

Article 18. Design and Construction

Each Contracting Party shall take the appropriate steps to ensure that:
(I) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defense in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;
(II) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;
(III) the design of a nuclear installation allows for a reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

According to Section 32 of the 1984 Act, the application for a construction license for a nuclear facility shall have the following attachments:

- site license,
- technical documentation for construction,
- safety report including relevant evaluations and
- other prescribed documentation which can be used to establish that the prescribed safety has been secured.

The safety report shall be amended in accordance with the changes which arise in the design of the facility during construction, commissioning, start of operation, operation and decommissioning of the nuclear facility.

Chapter III. of the Regulation E-1 "Conditions for the Construction of a Nuclear Facility" sets requirements for:

- analyses and input data for the preparation of the design documentation,
- equipment and facilities necessary for the physical protection of the nuclear facility and materials,
- the design of process, safety, protection, containment and other systems,
- radiation protection criteria.

Once constructed, a nuclear facility cannot operate until the commissioning has proved that the measures anticipated by the 1984 Act, and the regulations passed on the basis of the Act have been complied with.

As per Section 37, paragraphs 2 and 3 of the 1984 Act, in the case that a particular product, process or service have not been regulated by domestic standards, technical criteria or quality norms, rules established by international or foreign technical regulations or international and foreign standards may be applied. Slovenia has not developed specific codes and standards for the design and construction of nuclear facilities. In the case of the Krško NPP, US codes and standards (10CFR50 codes and US NRC requirements, standards ASME, ANS/ANSI, IEEE, NFPA) were applied.

In conclusion, the Slovenian regulations and practices are in compliance with the obligations of Article 18.

Article 19. Operation

Each Contracting Party shall take the appropriate steps to ensure that:
(I) the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning program demonstrating that the installation, as constructed, is consistent with design and safety requirements;
(II) operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;
(III) operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;
(IV) procedures are established for responding to anticipated operational occurrences and to accidents;
(V) necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;
(VI) incidents significant to safety are reported in a timely manner by the holder of the relevant license to the regulatory body;
(VII) programs to collect and analyze operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;
(VIII) the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.

19.1 Initial Authorization for Operation

In Section 33 of the 1984 Act, the requirements for the commissioning are defined:

"Once constructed, a nuclear facility cannot be operated until the commissioning has proved that the measures anticipated by the Act and regulation passed on the basis of the Act have been complied with."

The documentation which the applicant has to present to the regulatory body together with the application for the commissioning license, consists of:

- the safety report, including information on modifications and amendments made at the stage of construction,
- the results of successfully performed pre-operational tests,
- evidence of the quality of the installed equipment and materials,
- the results of meteorological measurements completed at the site, and of measurements of radiation emitted by natural and artificial sources in the vicinity of the nuclear facility,
- the commissioning schedule,
- information on professional qualifications, capabilities and operating experience, as well as health conditions of the operating personnel controlling the production process in the nuclear facility and licensed for such operation, pursuant to the provision of this Act,

- information on the organizational structure of the health physics department and its equipment for protection from ionizing radiation,
- plan and measures for protection against possible nuclear accidents as well as procedures to be applied in the event of such accident,
- the operational limits and conditions at the commissioning stage,
- information on the physical protection of the nuclear facility and nuclear materials.

If on the basis of this documentation (quality control of the works performed and pre-operational testing) it is assessed that the conditions prescribed for the safety of nuclear facilities have been met, the license for commissioning shall be issued (Section 34).

The operating license shall be issued only if the applicant supplies documentation which proves that the prescribed conditions have been met, and if during the commissioning stage the acceptance tests proved that the nuclear facility conforms to the prescribed conditions concerning safety.

Chapter V. of the Regulation E-1 "Conditions for the Commencement of Operation and Operation of a Nuclear Facility" sets more detailed requirements for the documentation which shall be submitted as an attachment to the application for the operating license, in order to prove that the required safety has been met.

19.2 Operational Limits and Conditions

In accordance with Section 33 of the 1984 Act and Section 34 of the Regulation E-1, the proposed operational limits and conditions (Technical Specifications) have to be submitted to the regulatory body as a part of license application for the commissioning operation, and for the start-up and normal operation.

Section 35 of the Regulation E-1 and Appendix 1 of the Regulation E-2 define the contents of the Technical Specifications (TS). Operational limits and conditions for the operation of a nuclear facility include:

1. safety limits,
2. limiting settings for safety systems,
3. limiting conditions for normal operations,
4. surveillance requirements,
5. requirements for the operator of a nuclear facility related to the reporting.

There is also a requirement that the operating staff should be familiar with the contents and objectives of the TS.

Section 43 of the 1984 Act defines that the Operating License shall include the operational limits and conditions.

Section 36 of the Regulation E-1 and Section 7 of the Regulation E-2 outline the procedure for making changes to the USAR. The procedure defines three categories of changes depending on the safety relevance:

1. changes which may be implemented without prior approval of the regulatory body;
2. changes which require prior notification of the regulatory body;
3. changes which require application to the regulatory body and the licensing process.

Technical specifications, as part of the USAR, are changed in accordance with the above described category 3.

Any change of the USAR has to be supplemented by an analysis of the impact of the change on the plant design bases, and on the analyses described in other chapters of the USAR. There is no written specific criteria in the existing Slovenian regulation for plant modifications categorization, therefore the Krško NPP is implementing the 10 CFR 50.59 rule. For that purpose, the internal procedure ESP-2.303 "Authorization of Changes, Tests and Experiments" (10 CFR 50.59 reviews) and ESP-2.302 "Administration of Changes to the Updated Safety Report" are in use. Nevertheless, all documentation of plant modifications safety assessments are sent to the SNSA for approval, in order to choose those modifications which require a formal application and a licensing change.

19.3 Operating Procedures

In accordance with Section 43 of the 1984 Act the operation of a nuclear facility must be carried out according to operating and other technical procedures relating to: all operating regimes, treatment of nuclear materials, transportation of such materials, maintenance and surveillance of the systems, internal controls and the procedures in the event of a nuclear accident.

The operating organization has to, pursuant to the provisions of this Act, prepare and apply procedures and other acts related to the operation of the nuclear facility. These procedures and other acts have to be periodically reviewed and updated, at least once per two years, in accordance with written procedures.

In accordance with Section 34 of the Regulation E-1, part of the documentation submitted with the operating license application is a list of prepared operating procedures and rules together with the plant start-up report, the QA program report, the technical specifications, the FSAR, etc. In the process of reviewing the USAR for licensing purposes, operating procedures are used as additional referenced documentation (Section 16 of the Regulation E-2).

The Krško NPP has issued two procedures which cover the issuance of new and revised procedures. A list of the Krško NPP Plant Procedure Categories is given in Annex E.

19.4 Anticipated operational occurrences and accidents

In accordance with Section 38 of the Regulation E-1, the organization operating the nuclear facility has to prepare procedures for all operational modes and accident conditions.

The Krško NPP has developed and applied a full set of Abnormal Operating Procedures (AOP), Emergency Operating Procedures (EOP) and Severe Accident Management Guidelines (SAMG). These sets of procedures have been verified during the operator's simulator training.

Preparedness for accidents is covered by a response to Article 16 of this report.

19.5 Engineering and technical support

The Krško NPP has organized its own basic engineering and technical support. It is performed within the Engineering Services Division and partially within the Technical Operation Division.

In-house capabilities have been developed to perform deterministic (MAAP, RELAP) as well as probabilistic (Risk Spectrum) analyses, PSA applications, shut-down risk assessment, reactor core design verification, an analysis of reportable events, an erosion and corrosion program, an in-service inspection program (partly), mechanical analyses and a radiation shielding assessment. The Krško NPP is capable of processing minor design changes in-house. A capability of preparing purchase specification, reviewing the bids and bidder selection, QA, QC and engineering follow-up of the projects and review and/or acceptance testing of the product are available in the plant.

The Krško NPP engineering and technical support has support in Slovenian research and engineering organizations. However, major projects require an open bid invitation.

The Ministry of Education, Science and Sport financially supports research and development projects in the field of nuclear safety in Slovenia through a research fund, with the participation of nuclear industry and the SNSA.

19.6 Incident reports

In accordance with Section 44 of the 1984 Act, the operating organization of the nuclear facility has to submit reports on incidents significant for safety to the competent regulatory body. Regulation on the mode and frequencies for keeping records, for reporting to the regulatory body by the authorized TSO's and by the organizations operating nuclear facilities (Off. Gaz. SRS, 12/81), prescribes detailed requirements for reporting and for the notification of the regulatory body by the operator of a nuclear facility. The regulation distinguishes between routine reporting and notification, and reporting in the case of an abnormal event. It specifies the time period for each report. Reporting criteria are also given and abnormal events are specified.

Reporting at the Krško NPP is organized in accordance with the internal procedure Reporting guidelines. Also Technical Specifications, Chapter 5.9 Reporting Requirements define the reporting criteria and requirements for different types of reports.

19.7 Incident Analysis

In accordance with Section 36 of the Regulation E-1, the operator of a nuclear facility has to continuously follow and analyze the safety status of the nuclear facility, and has to take into account the operating experiences of other nuclear facilities and technological development.

The Assessment of Operation Experience is covered by the plant program Operating Experience Assessment Program as well as by the procedure Operating Experience Assessment Program, and provides detailed requirements and procedures for a systematic analysis of operating experience. The additional procedures which have been developed, are the Deviation Report, the Post-Trip Review and the Root Cause Analysis.

Experience gained from the Krško NPP operation is shared with other utilities through WOG, WANO and INPO organizations.

19.8 Radioactive waste

Regulation Z-3 defines the solid, liquid and gaseous radioactive wastes based on type of radiation, specific activity and/or concentration of radionuclides. Wastes are also categorized into high, intermediate and low-level wastes. Based on this regulation the licensees are responsible for collecting and classifying the wastes, keeping records and accounting for the wastes and for processing, transporting and storing them. All activities should be performed in such a manner that the lowest possible quantities of radioactive wastes are generated.

There is no specific regulation in Slovenia addressing the release of very low contaminated materials generated inside the radiologically controlled area of the nuclear power plant.

In order to address this problem, a working group was established to support the safety authority in definition of clearance levels and to peer review the procedure for controlling unconditional release proposed by the Krško NPP.

The final decision of the working group and the authority was to interpret the existing national regulation, implementing similar levels as already specified in the European [*Definition of Clearance Levels for the Release of Radioactively Contaminated Buildings and Building Rubble, Final Report, BS-Nr. 9707-5, EC Contract C1/ETU/970040, Brenk Systemplanung, Aachen, May 1999*] and German [*Clearance of Materials, Buildings and Sites with Negligible Radioactivity from Practices subject to Reporting or Authorization, Recommendation by the German Commission on Radiological Protection (SSK), February 1998*] referenced recommendations.

The Krško NPP has implemented regulatory requirements in the following plant documents: Radioactive Waste Management Program, Fuel Integrity Program and procedures for Radioactive Waste Management and Interim Storage.

In the plant Technical Specifications, the limitations for fuel damages are specified through the specific activity of the reactor coolant.

In conclusion, the Slovenian regulations and practices are in compliance with the obligations of Article 19.

TOPICS RECOMMENDED BY THE FIRST REVIEW MEETING - Steps Taken and Progress Achieved

Based on the general objective of the Convention, i.e. to achieve and maintain a high level of nuclear safety world-wide through the enhancement of national measures and international co-operation, and based on the objective of the review process which is (among others) to observe and encourage successive improvements in the implementation of convention obligations, Slovenia understands the connection between the review process and its National Report as a lesson learned and a self-assessment exercise rather than purely as a reporting obligation towards the Contracting Parties.

The topics specific for Slovenia's, recognized during the first review meeting within the country group, concern general observations on external factors, which could have a significant impact on nuclear safety, i.e. deregulation of electricity markets, maintaining competencies, and a lack of sufficient economic resources.

The group recommended three specific topics to be included in the national report for the second review meeting, namely the progress made with respect to human and financial resources, information on the implementation of the safety culture enhancement program and criteria applied for prioritization of safety improvements. All three topics are elaborated bellow.

Regulatory Body

As underlined in the Summary Report of the First Review Meeting regarding observations on the regulatory body, additional information is incorporated into this second report under "Article 8".

Since the new Nuclear and Radiation Safety Act is still under preparation, the report on the status of the regulatory body, its independence and human and financial resources is based on the provisions of the draft Act.

Through its provisions the new Act will, among other issues, establish methods and means:

- to ensure the performance of an effective independent assessment in the licensing process (together with the authority and the resources to contract external organizations);
- to ensure and further develop technical capabilities of the regulatory body, in order to be able to improve independent decisions in the area of nuclear and radiation safety;
- to develop a long-term policy on the role of the “authorized” organizations (TSO) in the framework of an independent regulatory safety assessment process;
- to strengthen the regulatory process by developing an enforcement policy which will establish criteria for the identification and processing of major non-compliance with legal and license requirements.

Special attention will be given to the financial resources for scientific and research work in the area of nuclear and radiation safety and to the financing of the technical support organizations, which support the activities of the regulatory body.

Three types of financial sources are envisaged based on the draft act; namely, one part would be covered through the state budget, one part through the annual fee of the license holder and one through the taxes within the licensing process.

In the period after the first review meeting, the SNSA staff increased slightly (from 35 to 40) and it is expected that six additional posts will be occupied by the end of 2001, based on the action plan of the government within the overall concept of strengthening administrative capacity under the EU accession process.

On the other hand, the financial situation of the SNSA has not changed, neither in terms of salaries nor with respect to the budget for nuclear and radiation safety projects. As a part of the state administration financed through the state budget, the SNSA shares financial and employment restrictions with other ministries and governmental bodies.

Implementation of the safety culture enhancement program

Enhancement of the safety culture within NPP Krško is one of the fundamental management principles contributing to safe operation of the plant. The safety culture is the shared attitudes, values, goals, and practices that characterize an organization as demonstrated through an integrated pattern of behaviors. There are some basic elements of the culture, such as norms, beliefs, attitudes, symbols, leader actions and rewards. There are also many attributes of a strong safety culture: policies that are clear and understood, leaders' actions which establish and reinforce expected behaviors, learning from in-house and industry mistakes, open communication among levels in the organization, and plant staff awareness and sensitivity to safety culture issues.

The assessment of individual and organizational performance is not a straightforward process such as the assessment of technical performance. There is not a single indicator of the safety culture. NPP Krško established a set of indicators of effectiveness of the management processes: policies, practices and attitudes towards the safety culture. In addition, the World Association of Nuclear Operators (WANO) Plant Performance Indicators program is used, broadly demonstrating nuclear power plant operation in aspects of safety, reliability and providing measures which are important for the safe operation of nuclear facilities.

The following set of rules which enhance safety culture are adopted and implemented through different levels of our organization:

- safety and quality have a clear priority over production, schedule and cost,
- every evolution, event, meeting and report is used as an opportunity to teach, learn and reinforce principles,
- teamwork and collaboration are the norm,
- no-fault approach to problem reporting,
- management monitoring for expected results,

- conservative decision-making is expected and is consistently supported by the management,
- the management expects each job to be done properly the first time,
- all activities are conducted under control,
- regular critical reviews of activities are conducted,
- full accountability for the success of all activities.

In our key program document, entitled NEK Directions and Goals, the management expectations are well-defined. The plant policy on safety culture is additionally supported by some other top tier documents, such as: Quality Assurance Plan, Plant Management Manual, NPP Krško General Employee Training Handbook, Operating Experience Assessment Program, etc. In these documents statements are made about the policy on safety culture and goals and objectives for each division are well-defined.

Special care is devoted to the Operating Experience area. The Operating Experience Assessment Program is primarily administrated by the Independent Safety Engineering Group (ISEG). According to the Operating Experience Assessment Program we follow in-house and industry experience from various sources (US NRC, INPO, WANO, WOG, vendors, etc.). All these pieces of information are screened for applicability and significance for the plant. The Krško Operating Committee approves the evaluation with proposed corrective actions. Implementations of corrective actions are further followed until their completion by the ISEG.

The Operating Experience Program and the associated procedures encourage the personnel to report on all "in-house" deviations from normal operation and on the condition of equipment, system or plant, as well as deviations from optimal human performance, regardless of how low the importance of these deviations might seem at first sight. According to the program, the personnel are encouraged to report on potential problems as well as offer ideas for improvement, primarily of human performance.

Collection of information about in-house events and potential problems, as well as suggestions for improvement, are defined in the Deviation Report Procedure. These processes allow us to collect information about human failure and individuals' behavior. The human performance evaluating system is applied whenever a human error is detected as a possible Root Cause. Once a Root Cause is defined, actions are taken to prevent the recurring of an event or to improve human reliability and/or safety culture.

The ISEG performs plant safety evaluation using elements from the IAEA report on Safety Culture. In addition, the ISEG performs a trend and pattern analysis using the Operating Experience Tracking System (OETS) database. The trend and pattern analysis is performed on a key-field basis, for example: the system involved in the event, the component involved in the event, the root cause, the deviation reports attributed to various human performance casual factors, the fault category (mechanical, electrical, I&C, environmental, human factors, etc.), frequency of recurring events, etc.

NPP Krško also has a Self-assessment Program. The three levels of the program, have already been implemented. The first level is self-assessment of an organizational unit done by the staff of the unit themselves. The second level of self-assessment, which has been introduced this year, is self-assessment of organizational units done by a group of peers from our organization. The third level of self-assessment is assessment done by international peers. We have hosted a number missions form different organizations in the last ten years (for example IAEA – OSART (x2), OSART Follow-up (x2), IAEA – ASSET (x2), WANO Peer Review (x2), INPO - Technical Assistance Missions (x14), ICISA, etc.) More than twenty experts from our staff participated in these missions at different sites around the world, returning with good-practice experience. All these missions have provided valuable information and different approaches to certain problems and individuals' behavior allowing us to constantly improve the safety culture at the Krško NPP.

The role of training in contributing to safety culture and to the overall plant safety is fully accepted by the Krško management and is reflected by the number of training programs. The Systematic Approach to Training (SAT) is accepted as the best currently available method. Job and Task Analyses (JTAs) from similar power plants in the United States are being used as a basis for determining training requirements for the Krško personnel. In addition to that we started to use our new maintenance training center and a plant-specific full-scope simulator.

NPP Krško has established a reward program, the purpose of which is to reward the staff members whose approach to work and whose working results show a high level of safety culture and significantly contribute to plant safety and reliability. The rewards are announced every year on the company day in front of the company staff.

Criteria Applied for Prioritization of Safety Improvements

When assessing the adequacy and the safety impact of modifications to plant design or operational practice at NEK, comprehensive engineering safety evaluations are performed. The main point of these safety evaluations is, ultimately, to demonstrate that the fundamental principles are not compromised. These include high-level safety objectives of the safety philosophy for the operation and design of the NPP, such as:

- The collective effective dose to operators and to the general public as a result of operation of the plant shall be kept as low as reasonably achievable;
- All reasonably achievable steps shall be taken to prevent accidents;
- All reasonably achievable steps shall be taken to minimize the radiological consequences of any accident.

These safety objectives are consistent with the fundamental safety principles defined in the international safety guides and practice, most notably IAEA (e.g. Safety Series No. 50-C-D "Code on the Safety of Nuclear Power Plants: Design"), INSAG (e.g. 75-INSAG-12 "Basic Safety Principles for Nuclear Power Plants") and US NRC (Policy Statement 51 FR 30028 "Safety Goals for the Operation of Nuclear Power Plants").

The process of safety evaluation has been established in order to ensure an adequate level of design and operation control and to preclude any negative safety impact of the modifications taking place at the plant. There is a number of issues that are addressed in engineering safety evaluation, which are generally based on the defense-in-depth principle and related aspects. The safety evaluation process relies on the existing practice in the USA for authorization of changes (10CFR50.59). The proposed modifications that have passed the safety screening and the safety evaluation procedure are subjected to the prioritization process and they generally enter the implementation plan.

In the decision-making process a risk-informed evaluation, based on the plant-specific PSA, is generally performed complementary to engineering safety evaluation. Risk informed evaluations are used to support the defense-in-depth and safety-margin philosophy. The use of PSA and risk-informed evaluation in general at NEK is aimed to be compliant with the current world practices and criteria in the area of plant-specific, risk-informed decision-making. Among the most notable examples are US NRC (e.g. SRP Chapter 19, Regulatory Guide 1.174, NUREG/BR-0184) and IAEA guides (e.g. SS No. 106 "The Role of Probabilistic Safety Assessment and Probabilistic Safety Criteria in Nuclear Power Plant Safety").

Thus, generally speaking, the prioritization of safety improvements at NEK relies both on qualitative and quantitative methods. Two major approaches are employed in a complementary manner: the traditional engineering deterministic approach and the probabilistic approach. Technical details and the criteria applied are to some degree dependent on the specific application, i.e. the plant program or the project of concern.

One example is the Fire Protection Action Plan (FPAP), the purpose of which was to prioritize the proposed fire protection modifications contained in the NPP Krško Fire Hazards Analysis, the ICISA and the OSART reports, using a risk-informed approach which provided for a timely reduction of the significant contributors to fire-induced core damage frequency (CDF). A cost benefit analysis (based on references such as NUREG/CR-3568 "A Handbook for Value/Impact Assessment") has been performed for the proposed modifications in fire areas, which were found to have fire-induced CDF exceeding 1.00E-6/ry. The evaluations in this action plan utilized event sequences and system models from the Krško IPE/IPEEE PSA Level 1 and 2 reports. The method ranked the proposed modifications for a fire area into the following three categories:

1. Category 1 - CDF > 1.00E-6/ry and the proposed modification(s) meet(s) the cost benefit ratio criteria of < U.S. $1,000/person-rem reduction to implement.
2. Category 2 - CDF > 1.00E-6/ry and the proposed modification(s) exceed(s) the cost benefit ratio criteria of < U.S. $1,000/person-rem reduction to implement.
3. Category 3 - CDF < 1.00E-6/ry.

The implementation of FPAP modifications reduced fire-induced CDF by, roughly, an order of magnitude.

Another example of a plant program with included prioritization of safety improvements is the Periodic Safety Review (PSR), which has been initiated at NEK. This program would specifically include the ranking of safety issues identified and prioritization of the proposed compensatory measures. As a single method that would alone suffice for this kind of ranking prioritization does not exist, two different and complementary approaches would be applied. The first one would rely on deterministic considerations, while the second one would be probabilistic and would make use of the plant-specific PSA. In addition to the deterministic approach, a probabilistic method would be employed for the purpose of corrective measures prioritization. A general framework for the use of probabilistic safety criteria would be adopted from the available widely recognized sources from the world's practice (IAEA, US NRC, UK NII, nuclear industry). The impact of each potential corrective measure will be assessed using the plant PSA in terms of its risk reduction capability (the greater the risk reduction, the grater the relative worth of the measure). The risk reduction worth will be a relevant parameter to assess whether a particular corrective measure is worth implementing. The level of risk will be considered in terms of appropriate risk measures such as the frequency of particular off-site doses, large and early off-site releases and plant damages (significant core degradations). The comparison of alternative measures will be based on a systematic analysis, which considers both the beneficial aspects (values) and the costs (impacts) anticipated from a proposed measure.

ANNEX A. Glossary

ACPDR	Administration for Civil Protection and Disaster Relief of the Republic of Slovenia
ADP	Administrative Procedure
ALARA	As Low as Reasonably Achievable
AOP	Abnormal Operating Procedure
ASME	American Society of Mechanical Engineers
ASL	Approved Supplier List
ASSET	Assessment of Safety Significant Event Team
ATWS	Anticipated Transient Without Scram
CDF	Core Damage Frequency
CFR	US Code of Federal Regulations
CPC	Civil Protection Commander
CRDM	Control Rod Drive Mechanism
DBA	Design Basis Accident
ECHO	European Commission Humanitarian Organization
EIP	Emergency Implementing Procedures
EOP	Emergency Operating Procedure
EPRI	Electric Power Research Institute
EPZ	Emergency Planning Zone
ERDS	Emergency Response Data System
FSAR	Final Safety Analysis Report
IAEA	International Atomic Energy Agency
ICCM	Inadequate Core Cooling Monitor
ICISA	International Commission for Independent Safety Analysis of the Krško NPP
ICRP	International Commission on Radiation Protection
INPO	Institute of Nuclear Power Operations
IPPAS	International Physical Protection Advisory Service
ISEG	Independent Safety Engineering Group
ISI	In-Service Inspections
KFSS	Krško Full Scope Simulator
KOC	Krško Operating Committee
KSC	Krško Safety Committee
LCO	Limiting Conditions for Operation
LILW	Low and Intermediate Level Waste
NCPH	National Civilian Protection Headquarters
RCO	National Notification Center
NPP	Nuclear Power Plant
NUPIC	Nuclear Procurement Issues Committee
NUSS	Nuclear Safety Standards
OEAP	Operating Experience Assessment Program
OECD/NEA	OECD - Nuclear Energy Agency
OL	Operating License
ORAM	Outage Risk Assessment Management
OSART	IAEA Operational Safety Review Team
PAZ	Precautionary Action Zone
PHARE	European Community Program

PSA	Probabilistic Safety Assessment
PSAR	Preliminary Safety Analysis Report
PSR	Periodic Safety Review
PWR	Pressurized Water Reactor
RCS	Reactor Cooling System
SEP	SNSA Emergency Plan
QA	Quality Assurance
QC	Quality Control
RAMG	Regulatory Assistance Management Group
RERP	Radiological Emergency Response Plan
RG	Regulatory Guide
RVLIS	Reactor Vessel Level Indication System
SAMG	Severe Accident Management Guideline
SEC	SNSA Emergency Center
SG	Steam Generators
SLD	Strategy of Later Dismantling
SNSA	Slovenian Nuclear Safety Administration
SS	Safety Series
SSC	System Structure Components
TMI	Three Mile Island
TS	Technical Specifications
TSO	Technical Support Organization
USAEC	US Atomic Energy Commission
US NRC	US Nuclear Regulatory Commission
WAMAP	Waste Management Advisory Programme
WANO	World Association of Nuclear Operators
WOG	Westinghouse Owner's Group

ANNEX B. Contents of the Krško NPP Updated Safety Analysis Report (USAR)

ANNEX C. Contents of the Krško NPP Technical Specifications

LCO 3.6.1 Primary Containment
LCO 3.6.2 Depressurization and Cooling Systems
LCO 3.6.3 Iodine Cleanup System
LCO 3.6.4 Containment Isolation Valves
LCO 3.6.5 Combustible Gas Control
LCO 3.6.6 Penetration Room Exhaust Air Cleanup System
LCO 3.6.7 Vacuum Relief Valves
LCO 3.6.8 Secondary Containment

3.7 PLANT SYSTEMS

LCO 3.7.1 Turbine Cycle
LCO 3.7.2 Steam Generator Pressure/Temperature Limitation
LCO 3.7.3 Component Cooling Water System
LCO 3.7.4 Essential Service Water System
LCO 3.7.5 Ultimate Heat Sink
LCO 3.7.6 Flood Protection
LCO 3.7.7 Main Control Room Charcoal Cleanup System
LCO 3.7.8 Main Control Room Air Conditioning System
LCO 3.7.9 Snubbers
LCO 3.7.10 Sealed Source Contamination
LCO 3.7.11 Fire Suppression Systems
LCO 3.7.12 Fire Rated Assemblies
LCO 3.7.13 Area Temperature Monitoring

3.8 ELECTRICAL POWER SYSTEMS

LCO 3.8.1 A.C. Sources
LCO 3.8.2 D.C. Sources
LCO 3.8.3 Onsite Power Distribution
LCO 3.8.4 Electrical Equipment Protective Devices

3.9 REFUELLING OPERATIONS

LCO 3.9.1 Boron Concentration
LCO 3.9.2 Instrumentation
LCO 3.9.3 Decay Time
LCO 3.9.4 Containment Building Penetrations
LCO 3.9.5 Communications
LCO 3.9.6 Manipulator Crane
LCO 3.9.7 Crane Travel - Spent Fuel Storage Areas
LCO 3.9.8 Residual Heat Removal and Coolant Circulation
LCO 3.9.9 Containment Ventilation Isolation System
LCO 3.9.10 Water Level - Reactor Vessel
LCO 3.9.11 Water Level - Storage Pool
LCO 3.9.12 Spent Fuel Pit Area Air Cleaning Exhaust System

3.10 SPECIAL TEST EXCEPTIONS

LCO 3.10.1 Shutdown Margin
LCO 3.10.2 Group Height, Insertion, and Power Distribution Limits
LCO 3.10.3 Physics Tests
LCO 3.10.4 Reactor Coolant Loops
LCO 3.10.5 Position Indication System - Shutdown

3.11 RADIOACTIVE EFFLUENTS

LCO 3.11.1 Liquid Holdup Tanks
LCO 3.11.2 Explosive Gas Mixture
LCO 3.11.3 Gas Storage Tanks

4. DESIGN FEATURES SECTION

5. ADMINISTRATIVE CONTROLS

BASES

ANNEX D. Contents of the Krško NPP Radiological Emergency Response Plan

LIST OF THE KRŠKO NPP's EMERGENCY IMPLEMENTING PROCEDURES

EIP - NO.	TITLE
EIP-17.001	Emergency class determination
EIP-17.011	Emergency director's actions in the case of emergency
EIP-17.012	Actions of the off site-support center director during emergency
EIP-17.013	Emergency shift engineer actions during emergency
EIP-17.020	Activation of site area emergency
EIP-17.021	Information system of general emergency
EIP-17.022	Technical support center - activation
EIP-17.023	Operational support center - activation
EIP-17.024	Technical support center - support functions
EIP-17.025	Operations support center - support functions
EIP-17.026	Off-site support center - activation
EIP-17.027	Off-site support center - support functions
EIP-17.031	Protective action recommendation guidelines
EIP-17.041	Evacuation
EIP-17.042	Personnel accountability
EIP-17.043	Search and rescue
EIP-17.044	Medical emergencies
EIP-17.047	Recovery
EIP-17.048	Chlorine release emergencies
EIP-17.049	Public information during emergencies
EIP-17.050	Instructions for using Cl 503 measurer
EIP-17.061	Off-site dose calculation
EIP-17.062	Radiation exposure controls
EIP-17.064	Off site radiological monitoring
EIP-17.065	Post-accident sampling operation
EIP-17.066	The system for iodine and particulate samplings after emergency
EIP-17.500	Periodical review of the RERP
EIP-17.501	Emergency communications testing
EIP-17.502	Emergency preparedness training
EIP-17.503	Emergency facilities and equipment inventory control

EIP-17.504	Maintenance of emergency telephone book
EIP-17.505	Periodic pager response check
EIP-17.506	Information program
EIP-17.001	Severe accident management guidelines (SAMG)

ANNEX E. List of the Krško NPP Plant Procedure Categories

1.0 Plant Administrative Procedures

2.0 Engineering Services Procedures

3.0 Operations Procedures

4.0 Maintenance Procedures

5.0 Nuclear Fuel and Reactor Engineering

6.0 Chemistry/Radiochemistry Procedures

7.0 Radiological Control Procedures

8.0 Security Plan and Implementation Procedures

9.0 Quality Systems Procedures

10.0 Procurement/Commercial Procedures

11.0 Financial Procedures

12.0 Information Systems Procedures

13.0 Training Procedures

14.0 Industrial Safety Procedures

15.0 General Administration Procedures

16.0 Start Up

20.0 Decommissioning Procedures

ANNEX F. Contents of the Krško NPP PSA Study

PSA (Probabilistic Safety Assessment of Nuclear Power Plant Krško), Level 1:		
Analysis [name]	**Document**	**Year**
Probabilistic Safety Assessment at Nuclear Power Plant Krško Level 1 Report	1. 1.0 Plant Definition – Part 1, Volume 1 IPE Krsko Study	Jan 94
	2. 1.0 Plant Definition – Part 2, Volume 2 IPE Krsko Study	
	3. 2.0 Initiating Event Analysis, 3.0 Accident Sequence (Event Tree) Model; Volume 3, IPE Krsko Study	
	4. 4.0 Success Criteria, 5.0 Fault Tree Guidelines; Volume 4, IPE Krsko Study	
	5. 6.0 Data Analysis; Volume 5, IPE Krsko Study	
	6. 7.0 Systems (Fault Tree Analysis), Volume 6, IPE Krsko Study	
	7. 8.0 Common Cause Analysis; 9.0 Human Reliability Analysis; Volume 7, IPE Krsko Study	
	8. 10.0 Other Event Tree Nodes Probability; 11.0 Special Initiating Events Frequency; 12.0 Master Data Bank; Volume 8, IPE Krsko Study	
	9. 13.0 Quantification of Fault Trees – Part 1, Volume 9, IPE Krsko Study	
	10. 13.0 Quantification of Fault Trees – Part 2, Volume 10, IPE Krsko Study	
	11. 13.0 Quantification of Fault Trees – Part 3, Volume 11, IPE Krsko Study	
	12. 13.0 Quantification of Fault Trees – Part 4, Volume 12, IPE Krsko Study	
	13. 13.0 Quantification of Fault Trees – Part 5, Volume 13, IPE Krsko Study	
	14. 14.0 Core Melt Quantification, Volume 14, IPE Krsko Study	
	15. Resolution of Issues from IAEA IPERS Mission, IPE Krsko Study June-July 1994	
Nuclear Power Plant Krško Shutdown Safety Assessment	16. Work Package Volume 1	May 94
	17. Work Package Volume 2	
	18. Final Report	
Probabilistic Safety Assessment at Nuclear Power Plant Krško Level 1 Report	19. 15.0 Plant Damage State Analysis and Quantification 15.1 to 15.12, Volume 15, IPE Krsko Study	July 95
	20. 15.0 Plant Damage State Analysis and Quantification 15.13, Part 1, Volume 16, IPE Krsko Study	
	21. 15.0 Plant Damage State Analysis and Quantification 15.13, Part 2, Volume 17, IPE Krsko Study	
	22. 15.0 Plant Damage State Analysis and Quantification 15.14, Part 1, Volume 18, IPE Krsko Study	
	23. 15.0 Plant Damage State Analysis and Quantification 15.14, Part 2, Volume 19, IPE Krsko Study	

Probabilistic Safety Assessment of Nuclear Power Plant Krško, Level 2:		
Analysis [name]	**Document**	**Year**
Probabilistic Safety Assessment of Nuclear Power Plant Krško Level 2	24. Krško Level 2 PSA, Section L2-2.0, »Level 1/Level 2 Integration«, Westinghouse	April 93
IPE of Nuclear Power Plant Krško Level 2 Report	25. Volume 1, Introduction, Containment Event Tree Notebook – Parts 1 and 2 (WENX/95/24)	Avg. 95
	26. Volume 2, Containment Event Tree Notebook – Part 3 (WENX/95/24)	
	27. Volume 3, Source Term Notebook (WENX/95/24)	
IPE of Nuclear Power Plant Krško Level 2 Report	28. Volume 4, Containment Event Tree Notebook – Part 4 (WENX/95/24)	Avg. 95
	29. Summary Report, Rev. 1 (WENX/95/25)	
	30. Summary Report, Rev. 2 (WENX/95/25)	Oct. 95
	31. Summary Report, Rev. 3 (WENX/95/25)	Nov. 96
Probabilistic Safety Assessment of Nuclear Power Plant Krško Level 1 & Level 2	32. Submittal Report, Volume 1, IPE Krško Study	Avg. 95
	33. Submittal Report, Volume 2, IPE Krško Study	
Probabilistic Safety Assessment of Nuclear Power Plant Krško Level 2	34. Internal Fire Analysis-Lambright Technical Associates	June 97
NEK comments	35. IPERS Level 2 – preliminary report ING.ANDOV-093.98/VBK/4153	Mar. 98
Probabilistic Safety Assessment of Nuclear Power Plant Krško Level 2	36. Internal Fire Analysis- Lambright Technical Associates	Avg. 99
Probabilistic Safety Assessment of Nuclear Power Plant Krško External Event Report	37. 3.0 Internal Flooding	Avg .95
	38. 4.0 Other External Events IPEEE	July 95
	39. 1.A IPEEE Seismic PRA	Oct. 95
	40. 1.B IPEEE Seismic Relay Chatter Evaluation	Sep. 95
Probabilistic Safety Assessment of Nuclear Power Plant Krško	41. Internal Fire Analysis – Volume 1	Jun. 96
	42. Internal Fire Analysis – Volume 2	
	43. Fire IPEEE Report – Volume 1.0 (Lambright-Dukes Technical Associates, Inc)	
	44. Fire IPEEE Report – Volume 2.0 (Lambright-Dukes Technical Associates, Inc)	
	45. Fire IPEEE Report – Volume 3.0 (Lambright-Dukes Technical Associates, Inc)	
NEK Fire Protection Action Plan	46. Log. Number: 204822, Rev. 2 (Lambright-Dukes Technical Associates, Inc)	Apr. 98
Probabilistic Safety Assessment of Nuclear Power Plant Krško	47. Internal Fire Analysis – Volume 1- Lambright Technical Associates	Avg. 99
	48. Internal Fire Analysis – Volume 2- Lambright Technical Associates	
Summary Report	49. NEK PSA Project – NEK ESD-TR-14/97, Rev. 0	Apr. 98
NEK Baseline PSA Level 1 Model Optimization	50. NEK ESD-TR-23/98, Rev. 0	July 98

Optimization of Level 1/Level 2 Interface of NEK Baseline PSA Model and Implementation of the IPERS Comments - Internal Initiating Events	51. NEK ESD-TR-01/99, Rev.0	July 99
Integrated Safety Assessment of Nuclear Power Plant Krško	52. Modifications and Modernization Project, (Stage 1) ESD-TR-05/99, Model NEK 1998	Jan. 00
	53. Modifications and Modernization Project, (Stage 2) ESD-TR-06/99, Model NEK 2000	Mar. 00
Integration of Seismic Level 1-Level 2	54. Interface into optimized NEK PSA model NEK ESD-TR-22/99, Rev.0	Mar. 00
Post-modernization NEK PSA Baseline Model Update and IAEA IPSART Mission Comments Implementation	55. NEK ESD-TR-20/00, Model NEK 2001	Jan. 01

ANNEX G. Periodic Safety Review Program of the Krško NPP

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ANNEX H. Krško NPP Modernization Program

The Krško NPP is one of the last European pressurized-water design reactor NPP's of western design (Westinghouse) that has decided to replace the existing steam generators (SG) and perform the power uprating at the same time. The decision about a long-term plant modernization based on international experience, the recommendation of expert missions and its own operating experience.

The Krško NPP modernization program consisted of four projects: supply (design, manufacture and transport) of steam generators, steam generator replacement (installation: removal/replacement), power uprate analyses and supply of a full-scope simulator. The project was entitled the Krško NPP Modernization, due to the close relationships between these four projects and their influence on plant safety and long-term operation.

The specific goals of the Krško Modernization were:

- to increase the overall operational safety,
- to minimize the risk of environmental radioactive releases and reduce the number of plant trips and unplanned shut-downs,
- to improve the qualifications of operational staff and satisfy the international standards,
- to increase the plant availability to a level over 85 % percent and standardize plant refueling outage duration to approximately 35 days,
- to uprate the plant's nominal power by 6.3 %, from 1882 MW to 2000 MW,
- to reduce the operational costs of the energy produced,
- to sustain the operation over the plant's anticipated lifetime, which is the year 2023.

The program started in 1997. The Siemens-Framatome Consortium is the manufacturer of the new steam generators and also the main contractor of the steam generator installation. The contractor for safety analyses is Westinghouse, and the supplier of the full-scope simulator is the Canadian company CAE (Canadian Aerospace Electronic).

Design, Manufacturing and Transport of Steam Generators

The steam generators delivered by Siemens-Framatome were designed in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III, Class 1 Components. Class 1 components are those which form the reactor coolant pressure boundary. The new steam generators are designed in accordance with the Siemens KWU design concept.

It was necessary to replace worn out (old) steam generators because of many degraded tubes (nearly 18 % of tube plugging). In the design and manufacture of the new steam generators, a number of changes were anticipated which would ensure better resistance to tubes degradation. One of the major changes is the new steam generator tubing material. The tubes in the new steam generator are made from Inconel 690 TT alloy. Inconel 690 TT was developed to resist stress corrosion cracking (SCC) and general corrosion in the high-temperature water environments such as those associated with (nuclear) steam generators. The degradation mechanisms in the old steam generators are mainly influenced by materials (Inconel 600), environment (water chemistry), and improper design (split feedwater flow).

Comparison between some interesting data of steam generators:

	Westinghouse, D4 (old)	Siemens-Framatome,72W (new)
Thermal power per SG	941 MW	1000 MW
Heat transfer area	4487 m^2	7177 m^2
Tube material	Inconel 600MA	Inconel 690TT
Number of tubes	4578	5428
Outer diameter of the tube	19.05 mm	19.05 mm
Steam pressure	6.35 MPa	6.50 MPa
Max. steam moisture	0.25 %	0.10 %
Total dry weight	321 t	345 t

Manufacturing of the steam generators was a complex task that was successfully completed in the factory ENSA (Spain). The Siemens-Framatome Consortium as the main contractor co-ordinated numerous sub-suppliers (Japan Steel Works, Sandvink Steel, ANSALDO, etc.).

In the phase of steam generator design and manufacturing, the regulatory body and the authorized (technical support) organizations took part in QA audits at the steam generator designer, components manufacturers and at the steam generator assembly plant. Additionally, manufacturing and testing of the new steam generators were independently checked by the authorized organizations, including the Faculty of Mechanical Engineering, the Institute for Metal Structures, the Institute of Metals and Technology, and the Welding Institute.

There were no significant findings or major non-compliances, so that the TSO's mentioned above and the Slovenian Nuclear Safety Administration (SNSA) approved the licensing package.

The new steam generators were transported from Santander (Spain) to Koper by ship and from Koper to Krško by truck without any damage.

The steam generators were at the Krško NPP site in September 1999, and they were stored in the storage building (multipurpose building), until the replacement in May 2000.

Power Uprate Analyses

A feasibility analysis of parallel power uprating was undertaken (Westinghouse report: WENX 91-42, 1991) within the framework of the preparatory works for steam generator replacement. The main conclusion of that study was that a power increase of 6.3 % (from 1882 MWt to 2000 MWt) is feasible without extensive modifications to the plant system and components.

According to Slovenian regulations, the nuclear power plant safety status must be documented in a Final Safety Analysis Report. The minimum information required to be included and the format are established by regulatory guidelines. The Krško NPP Safety Analysis Report therefore contains information that describes the facility, presents the design basis and the limits on its operation, and presents analyses of structures, systems and components and postulated accident analyses of the facility.

The replacement of the steam generators and the power uprating have affected the current primary operating parameters. In addition, the new steam generators have a different geometry, material properties and different hydraulic characteristics. All changes and modifications have had an impact on the original and current licensing and design basis documentation; therefore, new safety analyses and assessments have been required to prove that the plant will be able to operate safely. The safety reassessment and analyses cover the thermal-hydraulic (TH), mechanical and structural aspects of modifications introduced by the modernization project.

Comprehensive analyses were started and performed by Westinghouse in 1997 to demonstrate plant safety performance and to confirm the mechanical integrity and lifetime of the systems and components.

The analyses needed to prove that all transients and accident conditions remain within the limits and acceptance criteria for the operating window. The original analyses were performed for one operating condition only, while the new analyses covered an operating window. The concept of operating window provided more flexibility in plant operation than the currently licensed operating point. The analyses verified the plant maneuverability for the selected operating window and safe operation with the new steam generators at an uprated power. The analyses were proceeded in four major phases:
Phase 1, Establishment of new operating conditions (operating window),
Phase 2, Verification of new operating conditions,
Phase 3, Plant operating justification,
Phase 4, Plant Documentation.

The analyses supporting the operating window were consistent with American and European practice.

All of the above analyses are documented in Work reports, the Summary report and a revised Updated Safety Analyses Report (USAR) including a revised Krško NPP Technical Specification.

These documents represented the documentation submitted to the regulatory body (SNSA) for approval.

Each of the work reports was reviewed in parallel by the Krško NPP, the Technical support organizations (TSO's) and the SNSA. These reviews resulted in a list of comments and required changes. After clarification and resolution of all comments, the TSO's, in accordance with Slovenian licensing legislation, prepared Independent evaluation report(s), which were submitted together with other licensing documentation (Work reports, etc.) to the SNSA for a final review and approval.

The following Technical support organizations were selected by the Krško NPP and in agreement with the regulatory body (SNSA) to act as independent reviewers for the analyses performed by Westinghouse:

- Jožef Stefan Institute, Ljubljana;
- Faculty of Electrical Engineering and Computing Department of Power Systems, Zagreb, Croatia;
- Faculty of Civil and Geodetic Engineering, Ljubljana;
- Enconet, Vienna, Austria.

Their findings support an appropriate safety level of the Krško NPP after power uprating and steam generators replacement.

An additional review and evaluation were conducted for the steam generators replacement activities and associated modifications as a regular part of the SNSA and TSO's activities during each outage.

The "Leak-Before-Break" (LBB) Concept

The analyses under the title ‘Snubber Reduction Program’ were carried out within the framework of the power uprate analyses for the Krško NPP. This segment of analyses is documented with more than 10 reports and comprises besides mechanical analyses also a seismic load analysis. The prerequisite for the ‘Snubber Reduction Program’ is implementation and approval of the concept known as ‘Leak-Before-Break’ (LBB). In a separate administrative procedure and on the basis of the presented evidence, the SNSA passed a decision on February 2, 1999, which rejected the use of the ‘Leak-Before-Break’ concept in the power uprate and steam generator replacement project. The Krško NPP appealed against the decision in the first instance, namely to the Ministry of Environment and Spatial Planning, which returned the case to the SNSA for reconsideration.

The steam generators replacement and power uprating are now supported by a substantial set of adequate analyses. The reports comprise safety analyses, which are a prerequisite for granting the licenses.

The final reports of analyses have been completed, with the exception of some minor documentation changes relating to power uprate and new operating conditions.

The SNSA issued a temporary licensing permit for power uprate operation (until the outage in 2002), because the ‘Leak-Before-Break' (LBB) concept as part of uprate analyses is still under review.

Steam Generators Replacement

In February 1998 the Krško NPP signed the contract for the steam generators replacement project with the Siemens-Framatome Consortium. The project was performed on a ‘turnkey’ basis, which means that the Consortium performed all engineering, preparation of the modification packages and site activities. An additional review and evaluation were conducted for steam generators replacement activities and associated modifications as part of the regulatory body and technical support organizations activities during each outage. The regulatory body (the SNSA) requested a separate licensing process for the RCS pipes cutting and welding of the new steam generators to the RCS pipes. The technical solutions that were based on the measurements and findings performed during the 1999 outage, were introduced in drawings and projects as planned. A project review of the modifications was completed on the following systems: reactor coolant, main feedwater, steam generator blowdown and condensate water.

Steam generators replacement project scope

- Steam generators rigging and handling

The rigging part comprised all the activities required for handling and transportation of the old and new steam generators (SG) between the outside storage location in the multi-purpose building and the steam generator cubicles in the reactor building.

The systems employed for these tasks were mainly based on equipment used in heavy lifting, specially adapted for this purpose. The entire process of steam generators rigging and handling was investigated in view of nuclear risk. As most of the steam generators replacement activities were performed after shutdown of the plant with an unloaded core, the safety evaluations for nuclear risk mainly concerned the requirement that the fuel in the spent fuel pool was not a danger.

- Steam generators optical survey, clamping, cutting, fit-up and welding

This part of the replacement concerned the adaptation of the new steam generators to the existing reactor coolant system.

The basic technique for the optical survey was determination of 3-D coordinates of the object points by optical focusing and triangular calculations. For these measurements an industrial measurement system with electronic theodolite was used.

The RCS pipe cutting was performed using a mechanical process. The welds in the RCS piping system were performed with the mechanized gas tungsten arc welding (GTAW) process. The steam generators nozzle ends and the existing elbows were machined to a specific narrow gap weld geometry. The weld joint was made using a remote-controlled narrow gap orbital-welding unit. The weld was performed using a layer-by-layer technique and with constant welding parameters around the weld circumference. Non-destructive examinations of liquid penetrant test, X-ray examination and pre-service inspection ultrasonic test were performed on the entire completed weld.

During the steam generators replacement process, a number of activities were performed on the secondary systems (main steam, main feedwater, blowdown, auxiliary feedwater, condensate, etc.).

Within the scope of the project of steam generators replacement, a multi-purpose building was included for the following purposes:
- storage of old steam generators,
- storage of low and intermediate-level waste from the steam generators replacement,
- decontamination area,
- mock-up area,
- personnel radiation-health area.

The steam generators were successfully replaced during the outage in June 2000.

Full Scope Simulator

The Krško NPP full scope simulator enables the training of all operators' activities that are performed from the main control room and from the local shutdown panels. It was built in accordance with the American standard, ANSI/ANS-3.5. This standard is used by most countries as acceptance criteria for determining simulator conformance.

The project of full scope simulator supply and site acceptance testing did not follow the schedule due to the delay in factory tests. The Krško NPP applied for an extension of the deadline for the installation of the simulator, which was set to January 1, 2000. The licensing process finished on March 1, 2000. After the final phase of simulator acceptance testing, it was ready for training in April 2000.

The use of a plant specific full scope simulator represents an improvement in the nuclear safety and training system. Acquisition of a plant specific full scope simulator represents the fulfillment of a licensing amendment of the SNSA and the recommendations of international missions.

ANNEX I. International missions in the period of 1998 – 2000 and planned missions

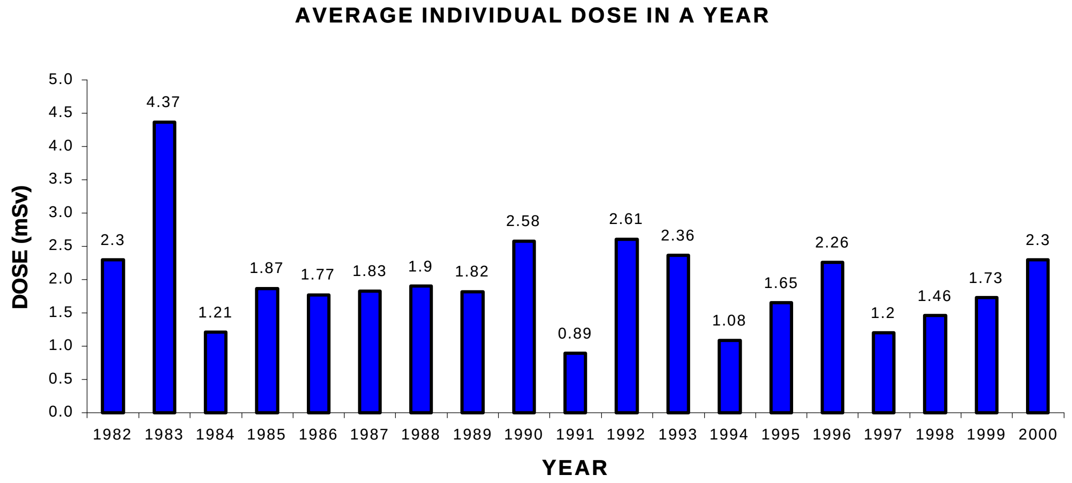
1. IPSART (International Probabilistic Safety Assessment Review Team), 1999,
2. IAEA-IRRT (International Regulatory Review Team), 1999,
3. TransSAS (Transport Safety Appraisal Service), 1999,
4. IRRT (International Regulatory Review Team); 1999,
5. IAEA Review Mission on the Seismic Studies Performed in the Framework of the Krško NPP Modernization Program; 1999,
6. IPSART (Individual Plant Safety Assessment Review Team); 2000,
7. ORPAS (Occupational Radiation Protection Appraisal Service), 2001,
8. RAMP (Review of Accident Management Programs), 2001,
9. OSART (Operational Safety Assessment Review Team), 2003.

ANNEX J. Additional information on Article 15 - Radiation protection

History of NPP Krško operation

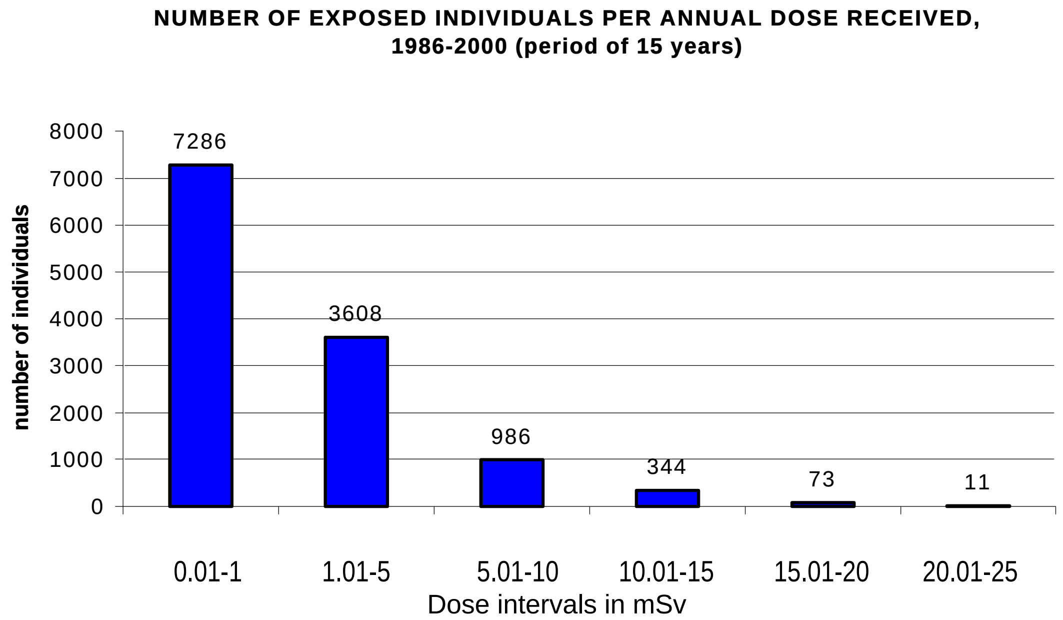
- **Individual doses**

Average annual dose: 2.30 mSv (2000)
Maximum dose: 20.99 mSv (2000)



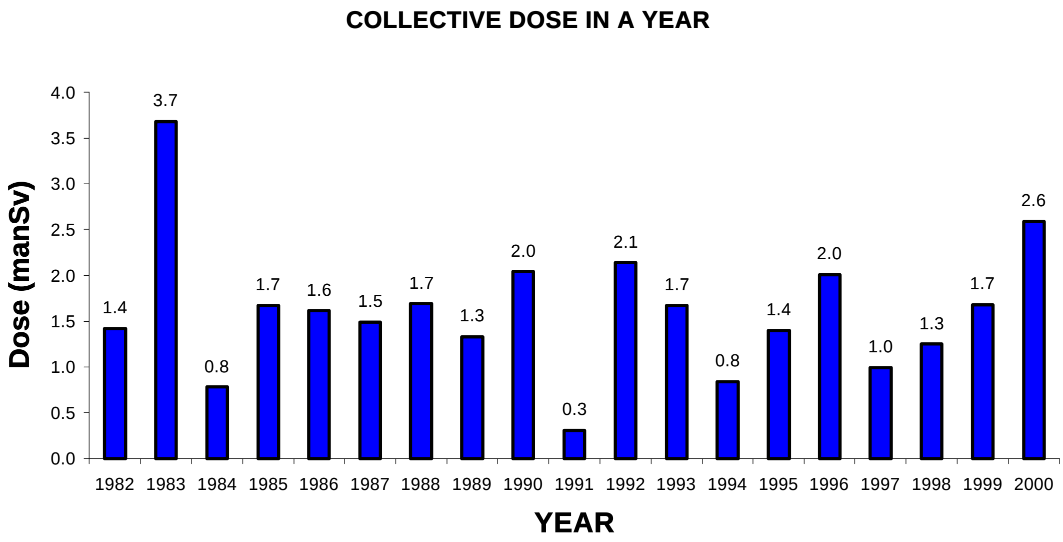
Notes:

It has been found out that in the recent years the average individual and collective doses have shown a rising trend as a consequence of plant modification works performed, plant upgrade and the modernization program.

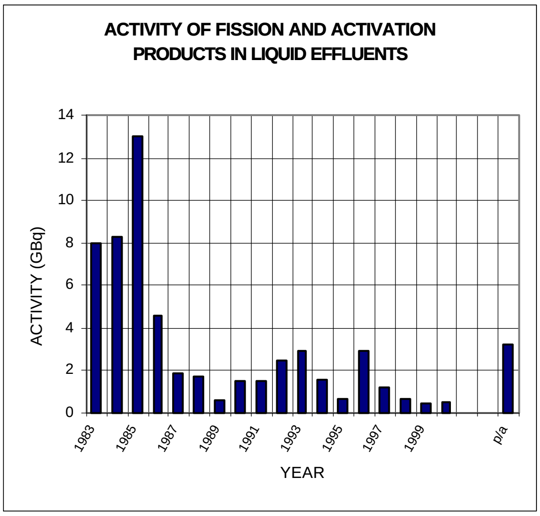


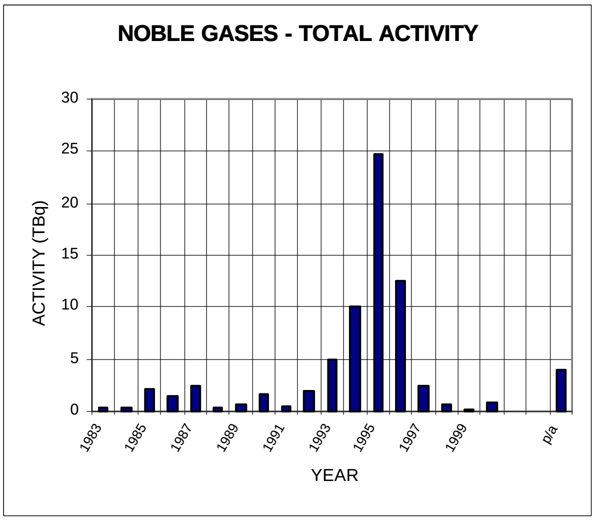
- **Collective doses**

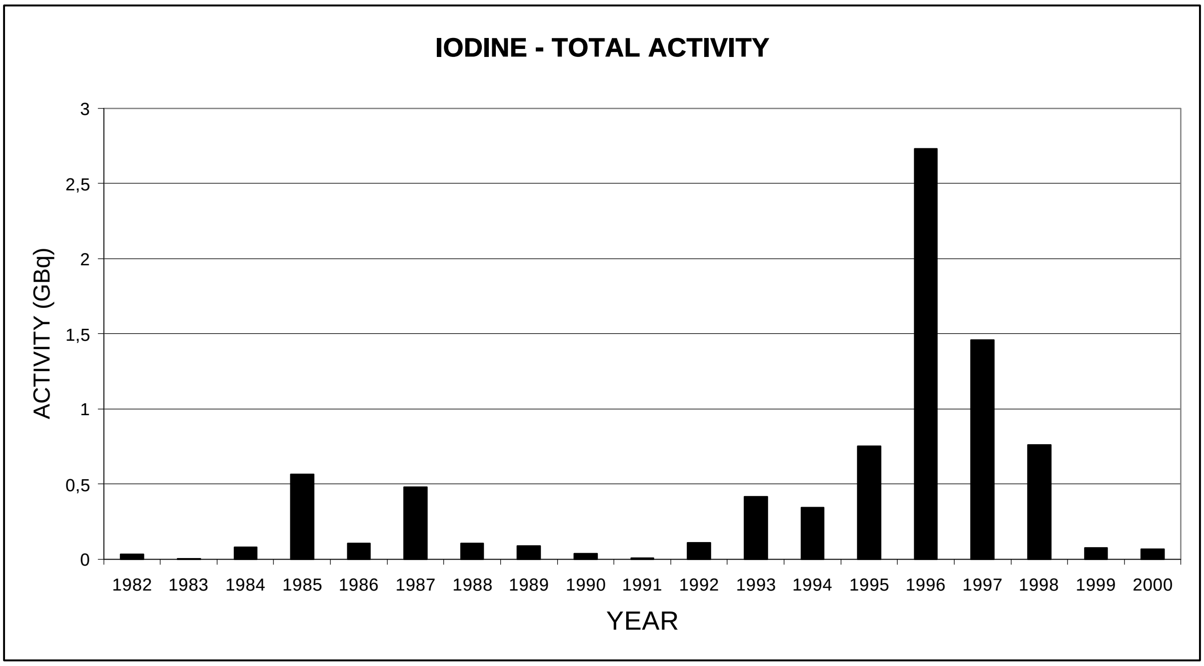
Collective dose: 2.60 manSv (in year 2000)
Collective dose per GWyear: 4.78 manSv (in year 2000)



- **Release of radionuclides**






IODINE - TOTAL ACTIVITY
ACTIVITY (GBq)
3
2,5
2
1,5
1
0,5
0
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
YEAR

ANNEX K. The Research Reactor TRIGA Mark II of the Jožef Stefan Institute

General information

Details on TRIGA research reactor technical characteristics and general operation experience at the J. Stefan Institute can be found in the IAEA Research Reactor Database http://www.iaea.org/worldatom/rrdb/.

Research Reactor Details	TRIGA - MARK II LJUBLJANA
Country	Slovenia
Facility Name	TRIGA- MARK II LJUBLJANA
Status	OPERATIONAL
Owner	Jožef Stefan Institute, Ljubljana
Operator	Jožef Stefan Institute, Ljubljana
Administrator	Dr. Matjaž Ravnik, head of reactor operational group
Address	Brinje 40, SI-1000 Ljubljana,
Telephone	386-1-5885450
Fax	386-1-5612335
E-Mail	matjaz.ravnik@ijs.si
Web Address	www-rcp.ijs.si
Licensing	Slovenian Nuclear Safety Administration
Construction Date	1964/01/01
Criticality Date	1966/05/31
Safeguards	IAEA

Technical Data

Reactor Type	TRIGA Mark II
Thermal Power, Steady (kW)	250
Max Flux SS, Thermal (n/cm2-s)	1.0E+13
Max Flux SS, Fast (n/cm2-s)	6.0E+12
Thermal Power, Pulsed (MW)	1.800.00
Moderator	H_2O, ZrH
Coolant	light water
Natural Convection Cooling	yes
Reflector	graphite
Reflector Number of Sides	annular
Control Rods Material	B_4C
Control Rods number	4

Experimental Facilities

Horizontal Channels	8
Horizontal Max Flux (n/cm2-s)	1.0E+11

Horizontal Use	irradiations, experiments, nuclear chemistry, isotopes production
Vertical Channels	5
Vertical Max Flux (n/cm2-s)	3.3 E+11
Vertical Use	neutron radiography
Reflector Irradiation Facilities	40

Fuel data

Min. Critical Mass (kg U-235)	2.20
Normal Core Loading (kg U-235)	3.30
Enrichment Min %	19.90
Enrichment Max %	19.90
Origin of Fissile Material	USA
Equilibrium Core Size	72
Dimensions of Rods (mm)	37.3 DIA, 723.9 L
Cladding Material	SS
Cladding Thickness (mm)	0.51
Fuel Material	UZRH
Fuel Loading per Element (g U-235)	56
Burnup on Discharge, max (%)	25
Burnup Average (%)	5
Last Spent Fuel Shipment, Year	1999
Last Spent Fuel Shipment, Rods	219
Final destination	USA
Last Receipt Year	1986
Last Receipt Element	86
Spent Fuel Storage Capacity	600
Fuel Fabricator	GENERAL ATOMICS, USA
Fuel, present status, core	56
spent fuel storage	0
fresh fuel storage	38
total at location	94

Reactor Utilization

Hours per Day	5
Days per Week	5
Weeks per Year	47
MW Days per Year	12
Materials/fuel test experiments	NO
Isotope Production	NO
Neutron Scattering	NO
Neutron Radiography	YES
Activation Analysis	YES
Number of samples irradiated/year	1700
Teaching:	
Number of students/year	20

Training NPP operators:

Number of operators/year	10

Ad. Article 10: Priority to safety

The following elements of nuclear safety are implemented:

- inherently safe reactor design,
- technical specifications and limitations based on safety analysis,
- organization and staffing,
- training of personnel,
- quality assurance system,
- regular inspections and maintenance,
- inspections,
- promotion of safety culture,
- international inspections (safeguards, INSARR missions).

The basic safety documents are: Safety Analysis Report (originally provided by the reactor manufacturer, updated following IAEA standard format in 1991), Emergency Procedures and Operating Procedures.

Reactor safety is implemented and controlled by the internal Reactor Safety Committee consisting of members of the Institute management. All actions, experiments, plans and documents related to reactor safety must be reviewed and approved by the Committee.

Safety experience (1966-present):

- no abnormal events recorded,
- no abnormal radioactive releases recorded,
- no radiological accidents recorded.

Ad. Article 11: Financial and human resources

Financial and human resources available:

Annual Cost	200,000 US$
Total Staff	5
No. of Operators	4

Safety improvements financed within the yearly budget (200,000 US$).
Financial provisions for decommissioning are not provided.
Financial provisions for radioactive waste management are provided by the Agency for Radioactive Waste.

Ad. Article 12: Human factor

Reactor operators are trained and licensed according to internal regulations specified in the Safety Analysis Report. Human errors are prevented by:

- organization and system of personal responsibilities,
- quality assurance program,
- verification and control.

Strong emphasis is put on personal qualification and responsibilities. The operation staff are carefully selected and trained.

Ad. Article 13: Quality assurance

Quality assurance is implemented as part of the Jožef Stefan Institute Quality Assurance Program. The head of the reactor operation department is responsible for its implementation. Appropriate internal QA and QC documentation is applied. QA activities in reactor operation are subject to internal (J. Stefan institute QA manager team) and external (Slovenian Nuclear Safety Administration) audits and inspections.

Ad. 14: Assessment and verification of safety

The reactor is regularly maintained. Major reconstruction and renewal was performed in 1991. The spent fuel was shipped from the location for permanent storing in the USA in 1998.

The in-service inspection plan is implemented as part of the QA/QC program. Periodic safety evaluations are performed.

External safety inspections are provided by the Slovenian Nuclear Safety Administration and by IAEA (INSARR missions).

Ad. 15: Radiation protection

Radiation protection is implemented and performed by the Radiation protection service of the Jožef Stefan Institute. Internal, national and international regulations and recommendations are respected. The maximum dose for a reactor operation staff member is 2 mSv per year.

Ad. 16: Emergency preparedness

Emergency plans for TRIGA reactor are specified in the Safety Analysis Report according to an appropriate IAEA format (SAR: Varnostno poroèilo za reaktor TRIGA Mark II v Podgorici, IJS-DP-5823, Revizija 3, junij 1992 - in the Slovenian language). Appropriate procedures are prepared in the form of special written documents for practical use in emergency situation (Emergency procedures: Reaktorski infrastrukturni center - Postopek za ukrepe v sili, Revizija 3, julij 1993, updated 12.12.2000 in the Slovenian language). The procedures are subject to internal and external verification and approval.

The procedures include: reactor status data, identification of emergency situation, description of the actions, alarming, reporting, informing and responsibilities for the following internal and external emergency events:

radiological reactor accidents:

- loss of reactor shielding (primary water),
- release of radioactivity in the controlled area,
- release of radioactivity outside controlled area,

non-radiological accidents:

- fire in the reactor building,
- earthquake,
- sabotage and not-authorized access,
- riots and demonstrations,
- chemical emergency from outside (due to a chemical plant in the vicinity of the reactor center).

The procedures are part of the operation documentation permanently available in the control room, in the office of the reactor center and in the physical protection office. The reactor operation staff, the radiological protection staff and the physical protection staff are trained in using the procedures. Periodic retraining is provided.

Since 1993, when the emergency procedures were introduced, there have been no events that would require their application.