REPUBLIC OF SLOVENIA
MINISTRY OF NATURAL RESOURCES AND SPATIAL PLANNING
SLOVENIAN NUCLEAR SAFETY ADMINISTRATION

CONVENTION ON NUCLEAR SAFETY

10th National Report of the Republic of Slovenia for the 10th Review Meeting

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Acronyms, Abbreviations and Definitions

Term	Meaning, definition
ACPDR	Administration for Civil Protection and Disaster Relief
ALARA	As Low As Reasonably Achievable
AMP	Aging Management Program
AOP	Abnormal Operating Procedure (at Krško NPP)
ANSI	American National Standards Institute
ARAO	(Slovenian) Agency for Radioactive Waste Management
ARTEMIS	Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (IAEA review mission)
ASME	American Society of Mechanical Engineers
CNS	Convention on Nuclear Safety
CRR	Country Review Report
ENSREG	European Nuclear Safety Regulators Group
ECR	Emergency Control Room
EEOP	Evacuation Emergency Operating Procedures (at Krško NPP)
EIP	Emergency Implementation Procedures (at Krško NPP)
EOP	Emergency Operating Procedure (at Krško NPP)
EPR	Emergency Preparedness and Response
EPRI	Electric Power Research Institute
EU	European Union
FROG	Framatome Reactors Owners Group
GALL	Generic Aging Lessons Learned
GSR	General Safety Requirements (of IAEA Safety Standards)
HOF	Human and Organisational Factors
IAEA	International Atomic Energy Agency
IEEE	Institute of Electrical and Electronics Engineers
IGALL	International Generic Aging Lessons Learned
INES	International Nuclear and Radiological Event Scale
INEX	International Nuclear Emergency Exercise
INSARR	Integrated Safety Assessment of Research Reactors (IAEA review mission)
IRRS	Integrated Regulatory Review Service (IAEA review mission)
ISEG	Independent Safety Engineering Group (at Krško NPP)
ISI	In-Service Inspection
IMS	Integrated Management System
INPO	Institute of Nuclear Power Operations
LILW	Low- and Intermediate-Level Waste
MCR	Main Control Room
MECE	Ministry of the Environment, Climate and Energy
MNRSP	Ministry of Natural Resources and Spatial Planning
MSIP	Mechanical Stress Improvement Process (at Krško NPP)
NAcP	(Slovenian post-Fukushima) National Action Plan
NAR	National Assessment Report (in TPR)
NCFSI	Non-conforming, Counterfeit, Fraudulent and Suspect Items
NGO	Non-governmental Organisation
NI	Nuclear Installation
NPP	Nuclear Power Plant
NR	National Report
NUMEX	Nuclear Maintenance Experience Exchange
NUREG	Nuclear Regulatory Report (by U.S. NRC)
OECD/NEA	Organisation for Economic Co-operation and Development / Nuclear Energy Agency
OSART	Operational Safety Review Team (IAEA review mission)

OSC	Operation Support Centre (at Krško NPP)
PSA	Probabilistic Safety Assessment
PSR	Periodic Safety Review
QA	Quality Assurance
PWR	Pressurised Water Reactor
PWROG	Pressurised Water Reactor Owners Group (of Westinghouse)
PWSCC	Primary Water Stress Corrosion Cracking
R&D	Research and Development
RANET	Response and Assistance Network (at IAEA)
RCS	Reactor Coolant System
RHWG	Reactor Harmonisation Working Group (of WENRA)
RM	Review Meeting
RPU	Radiation Protection Unit (at Krško NPP)
SALTO	Safety Assessment of Long-Term Operation (IAEA review mission)
SAMG	Severe Accident Management Guidelines
SAR	Safety Analysis Report
SAT	Systematic Approach to Training (at SNSA)
SFDS	Spent Fuel Dry Storage (facility at Krško NPP)
SMR	Small Modular Reactor
SNSA	Slovenian Nuclear Safety Administration
SRPA	Slovenian Radiation Protection Administration
SRL	Safety Reference Levels (of WENRA)
SRS	Safety Reports Series (by IAEA)
SSC	Structures, Systems and Components
SSG	Specific Safety Guide (of IAEA Safety Standards)
SSR	Specific Safety Requirements (of IAEA Safety Standards)
SUP	Safety Upgrade Program (at Krško NPP)
TFS	Technical Feasibility Study
TPR	Topical Peer Review (under ENSREG)
TSC	Technical Support Centre (at Krško NPP)
TSO	Technical Support Organisation
U.S. NRC	United States Nuclear Regulatory Commission
USAR	Updated Safety Analysis Report (at Krško NPP)
VDNS	Vienna Declaration on Nuclear Safety
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators Association

INTRODUCTION

Slovenia signed the Convention on Nuclear Safety (CNS) on 20 September 1994 and ratified it in the Slovenian Parliament in October 1996. The Convention entered into force for Slovenia in February 1997. Slovenia is committed to achieving the Convention's objectives and thus prepares the national report every three years, continuing to focus its efforts on improving nuclear safety in the country. This is already the 10th National Report, which covers the period **from April 2022 to March 2025**, or the period **from 2022 to 2024** where only annual data is available. The report presents the achievements and contributions to the safety of the only nuclear power plant in Slovenia in the reporting period, focusing on its major projects, programs and modifications.

I. About This Report

This National Report fulfils Slovenia's obligations under Article 5 of the Convention on Nuclear Safety. It was prepared by the following organisations:

- Slovenian Nuclear Safety Administration (SNSA)
- Nuclear Power Plant Krško (Krško NPP)

Slovenia is a Category 2 Contracting Party to the CNS, meaning it has a small nuclear program. As such, it has reported under Articles 6 to 19. As noted in this report, Slovenia fulfils all these Articles.

This report uses blue shading within the Articles content (not in the Introduction or the Summary) to indicate information that is new or significantly different from information in the previous national report. The report has been prepared in line with Guidelines Regarding National Reports under the Convention on Nuclear Safety (INFCIRC/572) and the Template adopted at the third Extraordinary Meeting of CNS to the greatest extent possible. That is why some content may have been moved or modified compared to the previous report, to align with the Guidelines and the Template.

The main part of the Summary is the description of significant changes and notable accomplishments since the previous report (described in individual Articles), focusing also on specific issues mentioned in the Guidelines. Apart from this, the Summary also addresses challenges that were identified for Slovenia in the Country Review Report for Slovenia at the Joint 8th and 9th Review Meeting and all major common issues described in the Summary Report of the Joint 8th and 9th Review Meeting. The implementation of the Vienna Declaration on Nuclear Safety, adopted on 9 February 2015, is also described in the Summary.

In Appendix I there is a list of all legal documents regarding nuclear safety that were in force in Slovenia as of March 25, 2025. Appendix II contains a list and links to all important reports that the SNSA has made available to the public.

II. Nuclear Program in Slovenia

The competencies in nuclear and radiation safety in Slovenia are divided among two governmental authorities. The responsibility for the supervision of nuclear safety in nuclear facilities and radiation practices outside medicine and veterinary activities lies with the SNSA, while the responsibility for the supervision of radiation practices in medicine and veterinary activities lies with the Slovenian Radiation Protection Administration (SRPA).

Slovenia has one operating nuclear power plant, one research reactor, a central storage for low- and intermediate-level solid radioactive waste and a low- and intermediate-level radioactive waste repository in construction.

The Krško Nuclear Power Plant

The Krško Nuclear Power Plant, situated in the south-eastern part of Slovenia, is the only nuclear installation according to the CNS. It is a Westinghouse two-loop pressurised water reactor with a net capacity of 696 MWe. The basic safety features of the plant are typical for a two-loop Westinghouse plant. Construction of the plant began in 1974, full power was reached in August 1982, and the first full year of commercial operation was 1983.

The Krško NPP was constructed as a 50/50 joint venture project of the electric utilities of Slovenia and Croatia. In December 2001, the Government of Slovenia and the Government of Croatia signed the *Agreement on Settlement of Statutory and Other Legal Relations Regarding the Investments into Krško NPP, its Exploitation and Decommissioning*. The Agreement, which was first ratified by the Croatian Parliament, entered into force on 11 March 2003, after it was also ratified by the Slovenian Parliament on 25 February 2003. Based on the above-mentioned Agreement, the Krško NPP is registered as a company for the production of electrical energy, engineering design, technical expertise, testing, analyses, as well as research and development in the area of nuclear technology. Since the Krško NPP is located in Slovenia, it is subject to Slovenian law and the relevant nuclear safety regulations.

The safety features of the Krško NPP design were originally based on the 1973 requirements of the U.S. Atomic Energy Commission. The commitment of the plant and of the regulatory body, the SNSA, has been to follow international experience in the field of nuclear safety and to fulfil the Western safety standards. Over the years, numerous modifications and improvements have been implemented in the plant, based on developments in the industry and following changing international standards and regulatory practices. An ambitious Safety Upgrade Program (SUP) has been in place at the Krško NPP since the Fukushima Daiichi accident and has now been finalised, with all the original SUP improvements completed by the end of 2021.

Solid radioactive waste and spent nuclear fuel of the Krško NPP are stored on-site. After the Fukushima Daiichi accident, a facility for the dry storage of spent fuel was planned as an extended SUP item, which has now been completed. The solid low- and intermediate-level radioactive waste (LILW) is treated and then packed into steel drums, which are stored in the solid waste storage. The Krško NPP makes a significant effort to minimise the amount of LILW (i.e. super-compaction, incineration, in-drum drying system).

In 2012, the SNSA issued a decision which allowed the Krško NPP to extend its lifetime from 40 to 60 years, providing the given conditions were met. The Krško NPP developed and implemented appropriate programs and procedures, e.g. the Aging Management Program (AMP). In recent years, IAEA missions also verified the preparedness of the Krško NPP regarding its long-term operation. Amongst the conditions to extend its operational lifetime, the Krško NPP finalised the planned safety upgrades of SUP, received environmental consent for lifetime extension, finalised the third Periodic Safety Review (PSR) and commission the Spent Fuel Dry Storage (SFDS) facility. In 2023, the Krško NPP entered long-term operation, scheduled to continue until 2043.

Research Reactor TRIGA Mark II

The Research Reactor TRIGA Mark II of the Jožef Stefan Institute is a 250 kW_{th} pool reactor, manufactured by General Atomic and it is situated in the vicinity of Ljubljana. The research reactor was initially licensed in 1966. Its main activity is operating the reactor for research, training and practical applications. The second IAEA Integrated Safety Assessment of Research Reactors (INSARR) mission review was conducted in November 2012. The INSARR Follow-up mission in 2015 the progress on implementation of action plan for resolving the recommendations and

suggestions. At present, the reactor staff has plans to continue its operation until 2043. The second PSR was completed in December 2024, and the PSR action plan will be implemented by 2029.

Central Storage for Low- and Intermediate-Level Radioactive Waste

The Central Radioactive Waste Storage is located near Ljubljana, at the same site as the Jožef Stefan Institute and the research reactor, and it is managed by the Agency for Radioactive Waste Management (ARAO). It is used for storage of low- and intermediate-level solid radioactive waste from the research reactor centre and for waste from other small waste producers or so-called institutional users (these constitute all other users excluding the nuclear power plant), such as medical, research and industrial applications of ionising radiation.

Low- and Intermediate-Level Radioactive Waste Disposal Facility (under construction)

In July 2009, the local municipality approved the location of the final low- and intermediate-level radioactive waste repository at the Vrbina site near the Krško NPP. In December 2009, the Government adopted the Decree on the National Spatial Plan for this repository. In 2015, after many years of stalemate, the company IBE won the contract for the design of the new repository. The procedure for obtaining the environmental consent began in 2017, when ARAO filed the application for a building permit and environmental consent. The environmental consent was then issued in 2021. The consent for construction as well as decision on the status of a nuclear facility and on a facility of national importance were issued in January 2022. By the end of 2024, all the necessary new road and infrastructure and external fence were built. The construction works of the disposal facility itself started in 2024. The primary wall of the disposal silo was constructed by the end of 2024.

Former Uranium Mine (decommissioned)

The Žirovski Vrh Uranium Mine and Mill was in operation from 1985 to 1990. Its lifetime production was 607,700 tonnes of ore corresponding to 452.5 tonnes (U_3O_8 equivalent) of yellow cake. All entrances to the underground mine have been sealed. The uranium mill was dismantled, and the resulting waste was disposed of at the Jazbec mining waste disposal site. All mining waste from numerous other mining waste piles has been moved to this site and disposed of. Closure works at the Jazbec disposal site have been completed and ARAO started the long-term surveillance and maintenance of the site in 2015. Hydrometallurgical waste, mine waste and the material collected during decontamination of the immediate vicinity of the site were disposed of on the Boršt uranium mill tailings disposal site. The closure of the Boršt disposal facility was finalised in April 2025 and was also handed over to ARAO for long-term surveillance and maintenance of the site.

III. Relevant Nuclear Installations

Slovenia is a Category 2 Contracting Party. It has one nuclear installation as defined by the CNS (see Table 1).

Table 1: Relevant Nuclear Installations

Location	Licence Holder	Unit	Type	First Criticality	Gross Electrical Power [MW]	Reference Unit Power [MW]	Status
Krško	Nuklearna elektrarna Krško d.o.o.	1	PWR	11 Sep 1981	736	696	Operating

SUMMARY

National Nuclear Policy

As per the Integrated National Energy & Climate Plan, which was updated in December 2024, Slovenia's key objectives are to continue to harness nuclear energy, to maintain excellence of operation of nuclear facilities in Slovenia and to make a high-quality and transparent decision on the construction of a new nuclear power plant. At the strategic level, the Republic of Slovenia supports further exploitation of nuclear energy for electricity generation, including through the construction of new nuclear power plants (NPPs) and small modular nuclear reactors (SMRs). That is also emphasised in the *Resolution on the Long-term Peaceful Use of Nuclear Energy in Slovenia* that was adopted in May 2024.

New NPP Project – JEK2

The Government of the Republic of Slovenia continues to be active in the JEK2 project through a dedicated State Secretary in the Prime Minister's Cabinet, who is responsible for coordinating the various ministries and administrations, including the SNSA, in the preparation of the JEK2 project and the processes of licensing. The proposed new NPP would be built in Krško, next to the existing Krško NPP.

The project is progressing with the preparation of studies and other documentation to support the development of the National Spatial Plan and the necessary updates to local infrastructure. The preparation process for the National Spatial Plan is scheduled to begin in 2025.

Simultaneously, GEN energija, who is the investor to JEK2 project and also the owner of the Slovenian half of the Krško NPP, started to prepare a Technical Feasibility Study (TFS), where two NPP vendors will participate – the EDF and Westinghouse. The TFS will be completed in late 2025.

SMR Projects

In 2024, the prefeasibility study for possible SMR projects in Slovenia was launched with the support of the U.S. Department of State Phoenix project – the project aims to replace coal fired thermal power plants with SMRs. In Slovenia, several brownfield locations were assessed, including nuclear power plant-, thermal power plant- and industrial sites. The study is scheduled to be finished in 2025.

I. Significant Changes and Notable Accomplishments Since Previous Report

In the reporting period, Slovenia adopted three new resolutions for the next 10 years: *the Resolution on Nuclear and Radiation Safety in the Republic of Slovenia for the Period 2024–2033, the Resolution on the National Program for Managing Radioactive Waste and Spent Fuel for the Period 2023–2032, and the Resolution on the Long-term Peaceful Use of Nuclear Energy in Slovenia*.

The SNSA updated certain regulations, the most important for NPP operation being the *Rules on Radiation and Nuclear Safety Factors* and *Rules on Operational Safety of Radiation and Nuclear Facilities*. They were harmonised with the latest revisions of key IAEA standards, new WENRA (Western European Nuclear Regulators Association) Safety Reference Levels (SRLs) of 2020 and the recommendations of the IAEA Integrated Regulatory Review Service (IRRS) mission in April 2022.

Slovenia completed the national action plan for the first ENSREG (European Nuclear Safety Regulators Group) Topical Peer Review (TPR) on aging. Later Slovenia, specifically the SNSA and the Krško NPP, actively participated in and completed the second TPR on fire protection.

In 2023, Slovenia adopted the fourth version of the national *Nuclear and Radiological Emergency Protection and Rescue Plan*, which is the fundamental planning document addressing scenarios requiring a national-level response. Slovenia conducted a national table-top exercise entitled "Nuclear Accident 2022", where the country's response capabilities to a nuclear accident at the Krško NPP were evaluated. Slovenia also participated in the INEX-6 international exercise in 2024, which focused on long-term recovery phase of nuclear emergency, providing further insight into Slovenian recovery and resilience efforts.

In 2024, the SNSA underwent a small organisational change and gained three more full-time employees, which means the SNSA now has 44 full-time employees. At the SNSA, the first safety culture self-assessment was completed.

During the reporting period, Slovenia continued to make additional improvements for the safety of the only nuclear installation, i.e. the Krško NPP, as described below.

At the beginning of 2024, the Krško NPP started with its extended lifetime operation, that is until 2043. For that it:

- obtained the environmental consent that resulted from a transboundary environmental impact assessment, issued by the Ministry of the Environment, Climate and Energy in January 2023, that allowed lifetime extension from 40 to 60 years,
- finished the third PSR with the SNSA's approval in December 2023, with an established Action Plan for improvements to be implemented by 2028, and
- completed a SUP by building a SFDS facility in 2022 and transferring the first batch of spent fuel elements from the spent fuel pit to the dry spent fuel storage in August 2023.

In October 2023 there was a leak on the safety injection pipeline in the Krško NPP which resulted in a controlled shutdown and a 43-day outage for repairs. After the leak, immediate corrective actions were taken, and later preparation of direct and root cause analyses, together with defined action plans, were implemented.

The Krško NPP implemented the 2022 pre-SALTO (Safety Assessment of Long-Term Operation) mission action plan and prepared for the SALTO mission that took place in May 2025. Several other improvements at the plant were made based on WANO (World Association of Nuclear Operators) peer reviews in 2021 and 2024. In 2023, the Krško NPP conducted another self-assessment of safety culture.

a. Operating Experience, Lessons Learned and Corrective Actions Taken in Response to Significant Events at Krško NPP

In the reporting period, one significant event was recorded in Krško NPP, i.e. a leak on the safety injection pipeline in October 2023, which caused a shutdown of the reactor in the Krško NPP. A detailed description of the event can be found in Chapter 6.5 of this report.

b. Lessons Learned from Emergency Drills and Exercises

Effective and coordinated emergency preparedness and response (EPR) relies heavily on sustained cross-border cooperation. Participation in both bilateral and multilateral exercises enhances operational coordination and builds trust among stakeholders at the national and international level. Slovenia has consistently demonstrated its commitment to these goals through active involvement in various international exercises, including ConvEx-2a and ConvEx-2b in 2023, as well as ConvEx-2d, ECUREX 2024 and INEX-6 in 2024.

INEX-6, held in March 2024 under the auspices of the SNSA, was a pivotal international exercise focusing on long-term recovery from nuclear or radiological accidents. The exchange of good practices and collaboration with international stakeholders contributed to strengthening Slovenia's position in the international community, showcasing its preparedness and reinforcing its emergency response capabilities. Following the exercise, the analysis provided recommendations for improving the national response system.

Slovenia has also participated in regular annual exercises like the Krško NPP exercise and other national exercises. These exercises revealed key areas for improvement in organisational procedures for the SNSA EPR Team. On the other hand, the ConvEx-2b exercise, revealed key areas for improvement in national procedures for requesting and providing international assistance through RANET (Response and Assistance Network). In response, the SNSA has revised these procedures, incorporating more detailed guidance on responsibilities and the capabilities available through the RANET database.

The findings and corrective actions from the 2022, 2023 and 2024 exercises at the Krško NPP relate to familiarity with the new Operation Support Centre (OSC) systems and equipment, the use of new internal radio communications, replacing faxes in the Krško NPP emergency response centres, effective on-site intervention corrective actions during an emergency, coordination between Technical Support Centre (TSC) and OSC, and guidance for initial on-site response in the event of control loss over the plant.

More information on emergency exercises and trainings from the point view of SNSA and also the Krško NPP can be found in Chapter 16.1.4 of this report.

c. Actions Taken to Improve Transparency and Communication with the Public

In Slovenia, the right to free access to information of a public nature and public awareness is regulated by the Access to Public Information Act, that binds all administrative bodies (ministries and their constituent bodies) to public and transparent work. Besides that, the *Ionising Radiation Protection and Nuclear Safety Act* also contains such provisions: the general principle of publicity in Article 4, publicity of data in Article 8 and in the provisions of Articles 168 and 169 on the preparation of the annual report on ionising radiation protection and nuclear safety for the previous year and also determining the type and scope of data to be included in the report.

The public can best learn about the activities of the SNSA by reviewing the Annual Report of the SNSA, which is published on the SNSA's website and is freely accessible to the public. Annual reports are also presented in parliament. During this presentation, parliament members and interested parties can pose questions regarding the report and work of the SNSA. These presentations are also broadcasted on television for the general public. In addition to the report, the Radiation News, which the SNSA publishes on average three times a year, is also available to the public. It is primarily intended for informing the operators of radiation activities, but it is also accessible to the general public. Once or twice a year, the SNSA also publishes "News from Nuclear Slovenia", which is intended to inform related foreign administrative bodies about developments in Slovenia in the field of nuclear and radiation safety and is also publicly available on the SNSA's website. In addition to special news releases, the SNSA's website regularly publishes news about events and the operations of the SNSA in general, as well as on LinkedIn. The SNSA also holds regular meetings with NGO representatives.

In addition to informing the public and providing access to information, the public is also given the opportunity to participate in the design and preparation of regulations in the field of nuclear and radiation safety. Namely, before each approval of a new regulation, the regulation is opened for public consideration. During this time, the public can give their comments or opinions on a

prepared regulation. The SNSA must then decide on the proposals made by public and prepare a written position to all comments and proposals.

For informing the public, the SNSA has adopted a Public Communication Strategy, setting the basic principles, authority and responsibility for communication, defining interested parties and in particular setting out different means of communication with the public. The strategy also considers the SNSA's timely and transparent communication during a nuclear or radiological accident, which is further specified in several specialised organisational procedures, under the auspices of the Emergency Preparedness Division at the SNSA.

All the reports that are made publicly available by the SNSA are listed in Appendix II of this report.

The mission of the Krško NPP includes ensuring transparency of operations, multidirectional communication and cooperation with stakeholders. It enables essential stakeholders, including local communities, media, educational and other institutions, professional associations and the general public, to understand the power plant's operations and significance within the increasingly vital electricity sector. This understanding relies on the availability of information and is attained through the use of various communication channels, promoting cooperation and inclusion.

During the years when the Krško NPP carried out the SUP and processes to fulfil the administrative requirements for long-term operation, it enhanced the proactivity and intensity of communication and collaboration with stakeholders. Interest in nuclear energy has increased due to the challenges posed by climate change. The public accessibility of up-to-date information concerning the Krško NPP's operations, encompassing monthly and annual reports, along with real-time updates on scheduled and completed projects, as well as outages presented on the website, effectively sustains the principle of transparency. The organisation is also accessible on LinkedIn. By addressing inquiries from the media, the professional community and the general public, the Krško NPP facilitates bidirectional communication. Furthermore, coordinating visits to the power plant, where the Krško NPP annually hosts over 4000 visitors from diverse backgrounds and professions, provides firsthand experiences and opportunities for personal interaction.

d. International Peer Reviews

Before moving to the long-term operation of the Krško NPP, Slovenia invited the IAEA pre-SALTO peer review mission to the Krško NPP to evaluate their aging management program beside other programs and procedures important for safe long-term operation. The pre-SALTO mission took place at the Krško NPP in October 2021, while the final report of the mission was prepared by the IAEA at the end of January 2022. Since then, the Krško NPP has implemented a pre-SALTO action plan in order to address all the issues found during the mission. In addition, a SALTO mission has already been invited to the Krško NPP in May 2025 as a follow-up to the previously conducted pre-SALTO mission. More information on both missions can be found in Chapter 6.4 of this report. The Krško NPP is also regularly subject to WANO peer review missions.

The IRRS mission took place on the premises of SNSA in April 2022 to review the Slovenian governmental, legal and regulatory framework for nuclear and radiation safety against the relevant IAEA safety standards including an overview of the organisation and functioning of both relevant regulatory authorities in this area, the SNSA and the SRPA. The mission was organised back-to-back with an ARTEMIS mission scheduled in May 2022. Besides the strong commitment and dedication of both SNSA and SRPA staff, the importance for the government to ensure that sufficient funding and human resources are provided to both authorities to enable them to fulfil their responsibilities was recognised by the IRRS mission. Some of the recommendations and suggestions were considering a possible decision to build a new nuclear power plant in Slovenia, i.e. on licensing processes, development of regulations, NPP design requirements and commissioning. The IRRS mission included policy issues on the implications of the COVID-19

pandemic and regulatory challenges in the context of a possible new build. A good practice in SNSA's activities related to emergency exercises with cyber security scenarios was identified and several areas of good performance. The mission also commended the good working environment. Following the final report of the IRRS mission, the SNSA and the SRPA prepared an Action Plan to consider the recommendations and suggestions received by the mission and continue with its implementation. IRRS follow-up mission is planned to be invited in 2026 to verify the progress. Both regulatory authorities will try to implement all the actions included in the Action Plan by then.

II. Common Major Issues

The topics in this chapter address the issues which were considered in the Summary Report and the President's Report of the Joint 8th and 9th CNS Review Meeting.

a. Managing Extraordinary Circumstances Impacting the Safe Operation of Nuclear Installations

In 2020, the SNSA issued a document that is part of the integrated management system called "Operation of SNSA in Extraordinary Circumstances", which outlines how the SNSA ensures regulatory resilience in the face of unexpected events, such as nuclear emergencies, pandemics or natural disasters. It establishes structured protocols, clear responsibilities and coordination mechanisms to maintain regulatory oversight during such circumstances. This aligns with international expectations that regulatory bodies develop contingency plans, share experiences and incorporate lessons learned to enhance preparedness and adaptive capacity for future extraordinary situations.

b. Strengthening National Regulatory Capabilities Taking into Account New and Innovative Technologies

As stated in the beginning of Chapter I of Summary of this report, in the last several years there have been many new activities in the effort to expand the Slovenian nuclear program. Due to this, the SNSA immediately directed some of its resources into these activities and, at the same time, looked for cooperation with fellow regulatory agencies abroad to exchange information, share experience on new build projects and obtain support for SNSA's activities of building up its staff capabilities for new technologies.

Traditionally, the SNSA works with regulators within the WENRA community, where a major achievement was the development of SRLs as the basis of new regulations. The SNSA actively participates in all three working groups – the RHWG, the WGWD and the WGRR – and some special activities that are dedicated to the new generation of NPPs or SMRs.

Another important long-standing cooperation is with the U.S. NRC, important for Slovenia since both the research reactor (operating since 1966) and the NPP (operating since 1983) have been provided by U.S. vendors – General Atomics for the TRIGA research reactor and Westinghouse for the Krško NPP. The U.S. NRC provides support by providing training opportunities for SNSA inspectors and nuclear safety experts, and also in helping with special topics such as the assessment of Krško NPP events, unexpected findings and major projects of safety upgrades or lifetime extension activities.

The third important cooperation is the quadrilateral community, where the SNSA joined regulators from central European countries – Hungary, Slovakia and the Czech Republic. All of them share experience of similar nuclear programs in the past, as well as of programs of new builds. The quadrilateral cooperation has recently been expanded to include Poland and Finland.

c. Fostering International Collaboration

As stated above, the SNSA cooperates with other European regulators within WENRA and harmonises regulations with WENRA SRLs, which also adhere to IAEA Safety Standards.

Regarding the SMRs, the SNSA is active in the IAEA Nuclear Harmonisation and Standardisation Initiative (NHSI), where the SNSA actively participated in the plenary and the regulatory track within Working Group 3. The SNSA also participated in the International Conference on Small Modular Reactors and their Applications in October 2024, organised by the IAEA. The afore-mentioned Phoenix project is another opportunity for the SNSA to gain insight into experiences on regulatory strategies and approaches for addressing novel technologies used for small and advanced modular reactors.

Existing SNSA staff are currently focused on regulatory activities determined by a single operational NPP, site selection for new NPP, one research reactor, the storage of low- and intermediate-level radioactive waste and small users of radioactive sources. For the time being, there are not enough employees at the SNSA to be able to actively participate in different types of collaborative schemes for the review of SMR designs, such as the Joint Early Review that was carried out for the NUWARD SMR technology by the French, Czech, Finnish, Polish, Swedish and Dutch regulatory authorities.

d. Fostering International Peer Review Missions and Timely Addressing of Findings

The SNSA regularly invites and utilises international peer reviews, the use of which is also mandated by the *Ionising Radiation Protection and Nuclear Safety Act.* Slovenia has already been subject to OSART, IRRS, INSARR, ORPAS, RAMP, EPREV, ARTEMIS and SALTO missions, of which all reports are published in Appendix II of this report. All missions result in action plans that the stakeholders strive to fulfil in a timely manner. More on the latest SALTO mission at the Krško NPP and the latest IRRS mission at the SNSA and SRPA can be found in Chapter I. d. of the Summary of this report.

e. Possible Impact of Global Climate Changes on the Safe Operation of Nuclear Installations

Global climate change presents significant challenges to the safe and reliable operation of nuclear facilities, necessitating continuous monitoring and evaluation to ensure sustained safety and reliability. The Krško NPP proactively addresses these potential impacts, demonstrating a strong commitment to operational safety and reliability. Through deliberate and focused safety upgrades over the past decade, particularly with the implementation of its SUP, the Krško NPP has consistently maintained and enhanced its safety levels, adapting to environmental changes.

Significant safety upgrades of the plant have been implemented, including improved flood protection measures. Safety upgrades and plant modifications have been carried out to mitigate the potential impact of extreme external temperatures, ensuring continued safe operation. Similarly, enhancements have been made to address increased precipitation, Sava River flooding, drought and elevated temperatures, as well as the increased probability of severe storms and extreme winds. Additional improvements have been implemented to protect against other external hazards, including snow, glaze ice, lightning strikes and hail. These upgrades, largely implemented within the SUP, specifically address the potential impacts of climate change, ensuring the plant's continued safe operation. For newly constructed major structures at the Krško NPP site, such as the SFDS facility, bunkered buildings 1 and 2, and OSC, extended design basis conditions are already implemented, which specifically prescribe design basis requirements to ensure safe operability under increased frequency and intensity of extreme weather conditions.

External hazards are also assessed within PSRs every 10 years. It is crucial to consider the increasing frequency and intensity of extreme weather events and their combined effects. Furthermore, a comprehensive review of the impacts of extreme weather events on plant safety was conducted as part of obtaining an environmental consent for the extension of the Krško NPP's operational lifetime by an additional 20 years.

f. Securing Reliable Supply Chains

The *Rules on Radiation and Nuclear Safety Factors* define counterfeit parts as items that do not comply with applicable standards. These items include:

- non-compliant items manufactured by unknown or unapproved manufacturers that do not comply with applicable standards, specifications or technical requirements specified in the procurement documentation;
- counterfeit items that are intentionally manufactured or altered to appear to be genuine products;
- fraudulent items whose material, properties or characteristics are intentionally presented differently than they actually are;
- suspicious items for which, after visual inspection, testing, inspection of certificates of conformity or based on other preliminary information, there is or arises a suspicion that they do not comply with applicable standards, specifications or technical requirements specified in the procurement documentation.

The Article 67 of the *Rules on Radiation and Nuclear Safety Factors* (supervision of subcontractors and suppliers) stipulates that, before the use of a spare part by the supplier, pre-set requirements regarding characteristics and documentation must be met. In addition, the products must also meet previously specified safety requirements. The licensee must provide for the supervision of processes or activities by individual processes carried out for it by contractors and subcontractors in its management system.

Additionally, the *Rules on Operational Safety of Radiation and Nuclear Facilities* in Annex 7 stipulate that licensee must report any discovery of counterfeit SSC parts installed in a nuclear facility that could affect or endanger nuclear safety.

As a member of Nuclear Procurement Issues Corporation (NUPIC) the Krško NPP is sharing experience in securing supply chains and exchange information on practices in addressing Non-conforming, Counterfeit, Fraudulent and Suspect Items (NCFSI). During periodical supplier's audits it is determined if they are aware of NCFSIs and what precautions are taken to avoid them.

Addressing the lack of suppliers of aging components, the focus of the Krško NPP technological obsolescence program is on "part obsolescence" and "component obsolescence" which refers to parts, materials and components likely to be replaced one or more times over the lifetime of a plant. This program is aligned with the requirements of IAEA SSG-48 and EPRI-1016692. Once a manufacturer and model number are identified for plant equipment, an analysis is made to determine if the original manufacturer still supports (provides) replacement equipment and spare parts. If this is not the case, further efforts are made to determine if a different supplier or vendor exists through Proactive Obsolescence Management System (POMS) or the Krško NPP procurement process.

The Krško NPP provides supervision with the Quality Program. Suspicious items are subject to inspection. Control is specified in more detail in the associated procedure, which has a guide to what the inspector must do. Suspicion of a counterfeit product is an essential part, and if there is suspicion, the controller assesses the product in accordance with guide for recognising counterfeits. For each complaint where there is suspicion, the licensee writes a request for Corrective Action Program. The Krško NPP prepares a catalogue of complaints, which it has been

collecting since 2012 and is currently in physical form. The Krško NPP will thus collect all suspicious complaints in an electronic database that will enable easy searching. Receiving inspectors attend specific EPRI courses, where they also gain knowledge for performing receiving inspections. Most recently, they attended a workshop on maintenance, manufacturing and procurement of valves. However, there is no official training for recognising counterfeit items. The licensee has a list of approved suppliers. Suppliers are given certain points during input control. They are scored if the supplier has a counterfeit part, poor quality of manufacture or missing documentation. The licensee produces an internal report for management every year, which also presents the issue of counterfeit parts. The guide for identifying spare parts of suspicious origin or provenance is based on EPRI documents. Typical cases are described, photos of typical counterfeits are provided, and typical points are highlighted to pay attention to. The Krško NPP is preparing the fifth revision of this guide. The licensee has also prepared a guide for identifying casting defects, which is based on the MSS SP-55, 2021 standard.

The Krško NPP states in Annex 6.19 of the ADP-1.1.205 procedure that it is necessary to report any discovery of installed counterfeit SSC parts in a nuclear facility that could affect or endanger nuclear safety. An attempt to install counterfeit SSC parts does not constitute an event that falls into this category. The Krško NPP will supplement the procedure in a future version to more clearly specify that it is necessary to report cases where it is not possible to prove that the already installed SSC is not counterfeit.

g. Strategies for Aging Management in Support of the Operation of Nuclear Installations

In January 2024, the Krško NPP started its extended operation beyond its original design life of 40 years to extended life of 60 years based on the established Aging Management Program (AMP), which was one of the prerequisites for lifetime extension. After development the AMP was independently reviewed by the international group of experts at the end of 2010. Based on this review the Krško NPP updated its AMP and applied for a 20-year lifetime extension, which was approved by the SNSA in 2012. Furthermore, operating license is in fact subject to successfully completed periodic safety reviews, which is used for checking the safety and to extend the license every 10 years.

The Krško NPP's AMP meets the requirements of NUREG-1801 – Generic Aging Lessons Learned (GALL) and is also compliant with IAEA SRS-82 "Aging Management far Nuclear Power Plants: International Generic Aging Lessons Learned (IGALL)". The Krško NPP developed and implemented appropriate programs and procedures according to GALL, including methods for the identification and monitoring of the effects of aging and requirements for the implementation of preventive and corrective measures. The AMP is a living program constantly being improved based on internal and external operating experiences and results of R&D activities in the world. It fully complies with Slovenian regulations. In recent years, the Krško NPP has performed a review of its aging management programs to ensure they are aligned with IAEA safety standards SSG-48 and SRS-82. As a result, Krško NPP has incorporated the experience gained from IGALL aging programs into its aging management programs. The Krško NPP AMP was also checked within the scope of IAEA missions (OSART, pre-SALTO) to verify the preparedness of the Krško NPP for its long-term operation. During 2021, the Krško NPP carried out additional activities within preparations for long-term operation. The most notable were the establishment of the Department of Engineering Support for long-term operation, a new long-term operation program, upgrades of existing corrective action program for better aging management involving operating experiences as well as new programs for aging management of active components and technological obsolescence.

Krško NPP has continued to monitor and assess the current state of the plant according to all relevant international experiences which include and are not limited to IAEA, WANO, EPRI, FROG

and PWROG working groups. The intent of this cooperation is to exchange all relevant operating experience in areas of aging, equipment reliability and long-term operation.

There are also several challenges and areas for improvement in the future. The most challenging and interesting areas for R&D are electrical cables and the impact of the reactor vessel irradiation on the Krško NPP lifetime. The Krško NPP has already implemented important and comprehensive preventive measures in the past, such as the replacement of the reactor vessel head, pressuriser structural weld overlays, and the implementation of the Mechanical Stress Improvement Process (MSIP) for dissimilar metal welds on the reactor vessel to prevent primary water stress corrosion cracking (PWSCC) at the nozzle to safe end welds. Following the lessons learned from the unplanned outage in 2023 due to a leak on one of the SI lines, the Krško NPP also broadens the scope of in-service inspections including some additional 4'' welds on SI lines.

h. Strengthening Emergency Preparedness and Response Arrangements and Fostering Cross Border Collaboration

Diligent cross-border cooperation remains essential for ensuring effective and harmonised EPR. Participation in bilateral and multilateral emergency exercises strengthens operational coordination and fosters trust among national and international stakeholders. Slovenia has demonstrated its strong commitment to this principle through participation in several international exercises, including ConvEx-2a and ConvEx-2b in 2023, and ConvEx-2d, ECUREX 2024 and INEX-6 in 2024. The INEX-6 exercise focused on long-term recovery aspects and involved broad institutional cooperation at both national and international levels.

These actions are consistent with the objectives of the *Convention on Early Notification of a Nuclear Accident* and the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*. Slovenia is encouraged to continue strengthening cross-border cooperation, engage in joint emergency exercises and foster collaboration between experts in nuclear and radiation safety to enhance emergency response efforts.

Considering the armed conflict in Ukraine and the heightened risk of nuclear incidents, the SNSA is reviewing and updating EPR arrangements, with special attention to transboundary impacts. Slovenia is monitoring the situation in Ukraine, providing public information through official channels and participating in international cooperation to ensure readiness and enhance collective response capabilities in the event of a nuclear or radiological emergency.

III. Implementation of the Vienna Declaration on Nuclear Safety

1. New nuclear power plants are to be designed, sited and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating possible releases of radionuclides causing long-term off-site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions.

Principle 1 of the VDNS has been incorporated into Slovenian legislation. The *Rules on Radiation and Nuclear Safety Factors* contain the requirements for new NPPs, which are in line with the WENRA Safety Objectives for new NPPs. These require that core damage accidents with core melt, which would lead to early or large releases, are practically eliminated. For core damage accidents, which cannot be practically eliminated, practical solutions will be available, which will ensure that only limited protective measures are needed for the public (no permanent relocation, no need for evacuation from the immediate vicinity of the plant, limited sheltering and long-term food restrictions) and that enough time is available to implement these measures.

2. *Comprehensive and systematic safety assessments are to be carried out periodically and regularly for existing installations throughout their lifetime in order to identify safety improvements that are oriented to meet the above objective. Reasonably practicable or achievable safety improvements are to be implemented in a timely manner.*

The basics of Principle 2 of the VDNS have already been incorporated into the requirements for performing PSRs (according to the *Rules on Operational Safety of Radiation and Nuclear Facilities*), within which the nuclear facility must, besides verifying overall impacts of aging of the facility, effects of modifications of the facility, operational experiences, technical progress, changes at the site and other possible impacts, also verify its compliance with applicable current international safety standards and international practice and take all reasonably practicable improvement measures indicated by the results of the PSR.

The Krško NPP conducted three PSRs up to now, which all resulted in many important improvements, some of which had major impact on risk reduction (e.g. Krško NPP safety upgrade program with spent fuel dry storage and bunkered buildings, housing additional cooling water tanks and extra safety systems for injecting water into the reactor cooling system and both steam generators).

National requirements and regulations for addressing this objective throughout the lifetime of nuclear power plants are to take into account the relevant IAEA Safety Standards and, as appropriate, other good practices as identified in the Review Meetings of the CNS.

Slovenian legislation requires that, within the PSR, the existing nuclear facilities verify their compliance with applicable current international safety standards and international practice and take all reasonably practicable improvement measures indicated by the results of the PSR.

Although the IAEA Safety Standards and review meetings of the CNS are not explicitly mentioned in Slovenian legislation, they are regularly considered when dealing with the possible improvements for the existing NPP. The IAEA standards are one of the inputs for performing the PSRs – the IAEA requirements and guidelines on design, operation, safety analyses, performance and feedback of experience, are all one of the main documents against which the nuclear facilities and their operation are reviewed against.

There have also been examples where the conclusions from the CNS review meetings have directly been incorporated into the requirements for improvements. One such example was the 2nd Extraordinary CNS meeting after the Fukushima accident, when the conclusions from the meeting were fed into the development of the Slovenian post-Fukushima National Action Plan.

The SNSA systematically reviews the relevance of the IAEA Standards and their impact on potential legislation changes. In 2018 the SNSA started producing tables of concordance to verify compliance of domestic legislation and practices with the IAEA standards. By preparing new revisions of regulations, the SNSA is harmonising the legislation with the key IAEA standards.

IV. Responses to Applicable Challenges and Suggestions

Slovenia has addressed the challenges and suggestions that remain open from previous Review Meetings as follows:

Challenge 2023-1: Challenge 1 from the Joint 8th & 9th Review Meeting

As already identified by the safety authority in the national report, implement the action plan for the aging safety factor within the 3rd periodic safety review.

The third PSR (PSR3) of the Krško NPP was approved together with its implementation action plan at the end of 2023. The implementation plan includes issues from different safety factors. For the tracking purposes there are two issues in the PSR3 implementation plan within the safety factor “Aging”. The aging issues are resolved by the dedicated action plan (separated from PSR3 action plan), addressing only issues regarding pre-SALTO findings. One of them addresses all 14 issues (i.e. 5 recommendations and 9 suggestions) that were found during the IAEA pre-SALTO mission in October 2021. The Krško NPP implemented the pre-SALTO action plan immediately after the final pre-SALTO report was issued in 2022. More on the PSR3, its implementation plan and pre-SALTO action plan can be found in Chapters 6.3 and 6.4 of this report.

With the timely approval of the PSR3 implementation plan and the successful completion of the dedicated pre-SALTO action plan, Challenge 2023-1 has been effectively addressed and resolved.

Challenge 2023-2: Challenge 2 from the Joint 8th & 9th Review Meeting

Upgrading of national competencies in a view of possible new NPP.

Slovenia has initiated a number of activities aimed at upgrading national competencies in preparation for the possible construction of a new NPP. The Slovenian government has expressed clear support for the long-term use and expansion of nuclear energy, including the development of a new NPP at the Krško site (JEK2) and potentially small modular reactors (SMRs), as outlined in several strategic energy policy documents, such as the Resolution on the Long-term Peaceful Use of Nuclear Energy in Slovenia and the Integrated National Energy and Climate Plan (NECP). These ambitions require a significant strengthening of national technical, human, and institutional capacities.

Several steps have already been taken. GEN energija, the investor in the new NPP, has strengthened its internal team by hiring a significant number of engineers and establishing a dedicated internal training system to prepare them for future roles in the construction and operation phases. In parallel, the Nuclear Training Centre (ICJT) at the Jožef Stefan Institute has begun developing new training programs to address emerging competency needs.

On the regulatory side, the SNSA has performed an internal analysis of the staffing needs for upcoming years, recognising the increased demand for qualified personnel to support regulatory oversight of future nuclear projects. There are also plans to introduce new university programs and increase student enrolment in technical fields, with a focus on nuclear engineering and related disciplines. Additional R&D funding is expected to strengthen national technical support organisations (TSOs) and attract more doctoral candidates into nuclear research.

Slovenia is also pursuing enhanced international cooperation, including knowledge sharing with countries that have established nuclear program, participation in joint training schemes, and involvement in international research and development initiatives. These efforts will be crucial in developing a workforce that is aligned with modern nuclear safety and technology standards.

Despite these positive developments, this challenge remains one of the key open issues. The need to secure sufficient qualified personnel across all stakeholder organisations – including the investor, regulator, TSOs, and educational institutions – has been identified as a major concern by all relevant parties, including the governmental working group for JEK2. The government recognises that a comprehensive and coordinated approach is necessary, and the first concrete step will be the development of a national strategy on nuclear human resources, which is expected to be completed in the 2026.

In summary, while several promising initiatives have been launched, Challenge 2023-2 remains unresolved and will continue to be a major focus in the coming years as Slovenia prepares for potential expansion of its nuclear energy program.

V. Future Focus and Planned Improvements

Timely human resource planning and capacity building across all key stakeholder institutions – including the investor, regulator, technical support organisations (TSOs), and the academic sector – will be essential for Slovenia to successfully prepare for the potential expansion of its nuclear energy program. Ensuring a sufficient number of qualified experts and strengthening institutional competencies is a strategic priority that requires coordinated and sustained action. The forthcoming national strategy on nuclear human resources, expected in 2026, will serve as a key instrument to guide these efforts, ensuring that Slovenia has the skilled workforce and institutional capacity required to support the safe, effective, and timely implementation of any future nuclear energy projects.

Within this broader national effort, the SNSA must not only increase its staffing levels but also develop specific technical competencies needed for future regulatory tasks. These include expertise in siting, licensing, safety assessments, and oversight of new nuclear power plant technologies – whether large-scale conventional reactors or SMRs. Building such specialised knowledge in a timely manner is critical, given the long lead times required for training and experience acquisition in the nuclear field.

A decisive moment will come in 2028, when a national referendum will presumably determine Slovenia's future energy mix. This will clarify whether the country will pursue the construction of a new large-scale NPP, adopt SMRs, or continue relying solely on the existing Krško NPP in combination with renewables. Should the referendum favour nuclear expansion, important decisions and permitting activities will need to follow soon after – demanding a high level of preparedness and regulatory competence. The second major focus is the implementation of the Krško NPP PSR3 action plan; this is now underway and Krško NPP has already completed some measures.

The third challenge is the possible decision on the continued operation of the Krško NPP after 60 years of operation. If Slovenia decides to make this part of its energy strategy, the Krško NPP will have to start preparing for a possible extension, which will involve various upgrades, modifications and analyses.

In the upcoming years, the Krško NPP is determined to stay focused on ensuring a safe, reliable and stable operation with proactive approach for upgrading safety and reliability of the plant based on recommendations from international organisations and best industrial practices.

The SNSA will continue its oversight of the nuclear safety of the Krško NPP in accordance with current good practices, focusing particularly on any challenges that might concern the NPP's safe long-term operation. SNSA will continue to update its legislation, considering changes and developments, and adapt it in accordance with WENRA, IAEA guidelines and other standards. The focus will be on the SNSA's efforts to employ more personnel, both experts in the field of nuclear and radiation safety as well as administrative and support staff.

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 reasonably 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.

In the period from 2022 to 2024, the SNSA assessed the safety of the Krško NPP as satisfactory and in compliance with the legal requirements. This fact was pointed out in the respective annual Reports on Nuclear and Radiation Safety prepared by the SNSA and published on its website.

Besides the continuous regulatory safety assessment, the Krško NPP has experienced several different reviews and assessments of its safety since 2022. The most important activities in the area of safety reviews and assessments are described in the following chapters.

6.1 The Krško NPP Safety Upgrade Program

In September 2011, the SNSA issued a decision for the Krško NPP determining the requirements for the implementation of the Krško NPP Safety Upgrade Program (SUP). It required that the plant upgrades its systems, structures and components (SSC) to enable managing severe accidents after the extension of the plant lifetime. The requirements were based on Slovenian legislation and on the lessons learned from the Fukushima Daiichi accident in March 2011. The plant performed an analysis of the required improvements and prepared a proposal for the SUP that was reviewed and approved by the SNSA in February 2012.

The SUP was divided into three phases. The first was implemented in 2013 and included installation of the passive containment filtered venting system and the replacement of active hydrogen recombiners with passive ones which are also capable to manage hydrogen in severe accidents.

The second phase was completed by the end of 2021; it comprised the following:

- Additional flood protection of the nuclear island,
- Installation of the pressuriser power-operated relief valve bypass,
- Upgrade of the bunkered building 1 electrical power supply,
- Reconstruction of the operations support centre and establishment of a new technical support facility,
- Alternative cooling of the spent fuel pool,
- Alternative cooling of reactor coolant system (RCS) and containment,
- Installation of emergency control room (ECR),
- ECR ventilation and habitability system,
- Installation of high temperature seals for reactor coolant pumps,
- Replacement/upgrade of critical instrumentation.

The third and final phase of the SUP comprised the new bunkered building 2 that houses additional sources of borated and un-borated water with injection systems to the RCS and steam generators; this was successfully completed in 2022. Another important part of this SUP phase was also the new dry spent fuel storage facility. The building for storage of dry spent fuel was

completed by the end of 2022. The transfer of the first batch of 16 canisters filled with 592 spent fuel elements from the spent fuel pit to the dry spent fuel storage was accomplished by August 2023, which marked the completion of the dry storage project in the frames of the SUP.

6.2 Second EU Topical Peer Review

On 10 November 2020, at its 41st Plenary Meeting, European Nuclear Safety Regulators Group (ENSREG) decided that the topic of the second Topical Peer Review (TPR II) would be “Fire Protection”. The technical specifications, which were prepared by the WGTPRII Working Group (subgroup of the WENRA/RHWG group), were approved by ENSREG in 2022. For Slovenia, the following installations were taken into consideration in the National Assessment Report (NAR): the Krško NPP, Spent Fuel Dry Storage facility and Radioactive waste storage facility, the last two located at the Krško NPP site as well. The Slovenian NAR was prepared in accordance with the technical specifications of TPR II and sent to ENSREG in 2023. NARs of all participating countries were peer reviewed in 2024 under the ENSREG organisation. In the second part of 2024, two workshops were held to address and clarify several findings from the reviewed NARs, as well as to give each participating country the opportunity to defend the status of fire protection described in their NAR. Taking into account the contents of NAR and the results of both workshops, ENSREG prepared a Country Review Report (CRR) for each participating country with specific country issues. The Slovenian CRR includes two issues/findings, one in the Area for Improvement and one in the Good Performance area. The first issue addresses the omission of multiple spurious operation in the Fire Hazard Analysis, while the other finding (good performance) refers to the consideration of fire resulting from large commercial aircraft in the design basis in the deterministic studies for storage casks for spent fuel.

In 2025, all the common and specific findings for each country will be specified by ENSREG, which will lead to the formation and implementation of the national TPR II action plan in the near future.

6.3 Third Periodic Safety Review of the Krško NPP

According to Article 112 of the *Ionising Radiation Protection and Nuclear Safety Act*, the Krško NPP must ensure the regular, comprehensive, and systematic evaluation and verification of the radiation and nuclear safety of the facility. This is performed by periodic safety reviews (PSR). Approval of the PSR report is a pre-condition for the extension of the validity of the operating license for the next ten years. The requirements for the program and the performance of the PSR are defined in more detail in the *Rules on Operational Safety of Radiation and Nuclear Facilities*. In 2020, SNSA issued a new revision of practical guideline PS 1.01, which explains in detail the contents of the PSR. The requirements for the PSR of nuclear facilities and the review methodology are based on the EU *Nuclear Safety Directive*, the IAEA safety standards, and the recommendations of WENRA.

The third PSR was performed at the time of transition of Krško NPP to long-term operation and a special emphasis was therefore devoted to inspections of plant conditions, the preparedness for extending plant operation, as well as adherence to modern requirements, standards and good practices for long-term operation. Altogether, the operator reviewed 18 safety factors, of which three were new: radioactive waste and spent fuel; security; and radiation protection. The review

of the safety factor security is performed as a separate process as appropriate protection of security related sensitive information has to be ensured.

On 23 December 2020, the SNSA approved the program for the PSR3 of the Krško NPP, in which the scope, content and timeline for the review were determined. PSR3 was to be completed in 2023 with the PSR report, which would contain the global safety assessment of the facility and the plan for changes and improvements based on the review findings.

In February 2022, the operator completed the review process and submitted topical reports to the SNSA for review and comments. Within the review process, 253 issues were identified, of which 28 issues were already resolved during PSR3, and 74 issues were excluded from PSR3 due to low severity ranking. The remaining 151 issues were included in Implementation Action Plan. The Implementation Action Plan divides issues in 3 categories: 39 issues of Category I are planned to be implemented within 1 year; 87 issues of Category II will be implemented within 3 years; 10 issues of Category III are planned to be implemented within 5 years (a 5-year implementation interval is obligatory for all actions according to national legislation). Apart from those, 15 issues were included regarding the pre-SALTO (Safety Assessment of Long-Term Operation) as a short-term resolution (labelled as an Immediate Resolution Requirement) for tracking and documenting purposes, as they are resolved within the pre-SALTO action plan.

On 4 December 2023, the SNSA issued the decision on PSR3 including the approval of the Summary Report and Global Assessment of Plant Status and Implementation Action Plan. The action plan based on PSR findings is in implementation and will be completed by December 2028. The Krško NPP will submit reports to the SNSA every 6 months regarding the status of the corrective action implementation. Within 1 year after PSR3 approval, the Krško NPP completed 38 corrective actions, while 11 additional reported actions are under SNSA review.

6.4 SALTO Mission at the Krško NPP

Prior to the start of long-term operation of the Krško NPP, Slovenia wanted to invite the IAEA pre-SALTO mission to confirm the effectiveness and adequacy of the aging management program and the Krško NPP's programs and procedures, which is crucial for safe long-term operation.

Even before the implementation of the pre-SALTO mission, the Krško NPP carried out some additional activities as part of preparations for the long-term operation of the power plant. Among the most important are the establishment of an engineering support department for long-term operation, a new program for long-term operation, upgrading the program of corrective actions for better aging management in terms of operational experience and a new program for managing aging of active components and technological obsolescence.

The pre-SALTO mission took place at the Krško NPP between 5 and 14 October 2021. The mission's findings were 9 good performances, 9 suggestions and 5 recommendations. The final report of the mission was prepared by the IAEA at the end of January 2022. The Krško NPP established an action plan to address every recommendation and suggestion from the pre-SALTO mission final report. The SNSA conducts periodical inspections in order to verify the progress of the implementation of this action plan.

The successfulness of dealing with the findings from the pre-SALTO mission will also be verified by the IAEA on a 2025 SALTO mission. The SALTO mission that will serve as a pre-SALTO follow-up has already been invited to the Krško NPP. The preparatory meeting took place in October 2024, while the mission itself is scheduled for May 2025.

6.5 Events in the Krško NPP

In the reporting period, from 2022 to 2024, the following events occurred in the Krško NPP:

- Inoperable ventilation system of the ECR and TSC in December 2022,
- Earthquake near the Krško NPP in May 2023,
- Large flow and high level of the Sava River in August 2023,
- Emergency shutdown of the Krško NPP due to a leak on the safety injection pipeline in October 2023,
- Earthquake near the Krško NPP in November 2023,
- Degraded diesel fire pump FP100PMP-001 in December 2023,
- Inoperable diesel fire pump FP100PMP-001 in January 2024.

None of these events compromised nuclear and radiation safety. All events were reviewed and analysed also by the SNSA. The only event that caused a shutdown of the Krško NPP is described below.

Unplanned shutdown of the Krško NPP due to a leak on the safety injection pipeline

On 4 October 2023, Krško NPP was in normal power operation. Operators in the main control room identified a decreasing level in the Volume Control Tank, which is part of the Chemical and Volume Control System (CVCS), and an increasing level in the containment building drainage sump. Due to these conditions, entry into abnormal operating procedure (AOP) was initiated. The unidentified leakage was quantified at 27.8 l/h which was below the limit laid down by the Technical Specifications (TS) Limiting Condition for Operation (LCO) of 227 l/h for the reactor power operation with unidentified leak. The plant was conservatively shut down to identify the leak location and to conduct repair activities.

The leakage was identified to originate from the direct safety injection (SI) pipeline SI-53 approximately one meter from the reactor pressure vessel. The identified leak was caused by a crack on the weld. Following initial inspections, the Krško NPP contracted Westinghouse to carry out the repair (replacement of affected pipe segments on SI-53 and on the sister line SI-52) and determination of counter measures to improve and monitor the condition of SI-52 and SI-53 lines.

Segments of the SI-52 and SI-53 pipelines were sent to the laboratories, where mechanical tests and metallographic analyses of the stainless-steel base material, the weld seam and the crack were carried out. Data from laboratory tests, displacement sensors, strain gauges and temperature measurements during NPP operation, as well as thermal-hydraulic and mechanical analyses performed, were used to prepare a root cause analysis report for a discovered SI-53 leak.

The root cause of the SI-53 leakage was determined to be a design deficiency with excessive thermal stratification caused by low-flow safety injection transients and low amplitude – high cycles transients (in-out water flow from the reactor vessel) or so-called thermal fatigue.

Based on the root cause analysis report, an action plan was drawn up to minimise the effects of thermal stratification.

Summary Statement for Article 6

Slovenia addressed the obligations of Article 6 for nuclear installations that were in existence when the CNS came into force for Slovenia (see Slovenian national report for the 1st Review Meeting).

Slovenia is in compliance with the obligations of Article 6 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

During the reporting period, Slovenia continued to make additional improvements for the safety of the only nuclear installation, i.e. the Krško NPP, with the following activities:

- Completion of the SUP with finished construction of SFDS facility and transfer of the first batch of 16 canisters filled with 592 spent fuel elements from the spent fuel pit to the dry spent fuel storage;
- Completion of ENSREG second TPR on fire protection;
- Completion and approval of third PSR with established Action plan for improvements to be implemented until 2028;
- Implementation of pre-SALTO mission action plan and preparation for SALTO mission;
- Implementation of immediate corrective actions taken after leak on the safety injection pipeline, preparation of direct and root cause analyses, together with defined action plans;
- The plant developed and is using a 360° Virtual Walkdown application which connects the picture of an equipment with all its design and maintenance data and supports related aging management activities. Virtual Walkdown application is an outstanding tool for supporting all forms of trainings: the initial training for newcomers; the continuous training for the staff; leadership training; the special trainings and pre-job briefings.

Future Focus

The SNSA will continue its oversight of the nuclear safety of the Krško NPP in accordance with current good practices, focusing particularly on any challenges that might concern the NPP's safe long-term operation.

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 licence;*
   - *(iii) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences;*
   - *(iv) the enforcement of applicable regulations and of the terms of licences, including suspension, modification and revocation.*

7.1 Description of the Legislative and Regulatory Framework

In Slovenia, the primary law governing nuclear and radiation safety is the *Ionising Radiation Protection and Nuclear Safety Act*, adopted in 2017 and amended in 2019 and 2021. The previous Act was adopted in 2002 and subsequently revised four times. It must be noted that after the adoption of the Act in 2017, substantial work was devoted to updating the whole set of secondary legislation (the so-called Decrees and Rules).

The Act regulates ionising radiation protection, nuclear safety and security measures, and safeguards. It also defines the responsibilities and duties of the competent regulatory authorities and ministries in these areas.

The legislative framework is further supplemented by government and ministerial decrees and regulations issued under the *Ionising Radiation Protection and Nuclear Safety Act*. Slovenia's nuclear and radiation safety legislation complies with international treaties, EU law, and international safety standards.

Since our last report (9th National Report) in July 2022, the following by-laws have been adopted based on the *Ionising Radiation Protection and Nuclear Safety Act*, i.e. Governmental Decrees and Rules of the minister responsible for the natural resources and spatial planning and/or the minister responsible for health and minister responsible for the interior:

- *Rules on the Expert Council for Radiation and Nuclear Safety*,
- *Rules on Authorised Radiation and Nuclear Safety Experts*,
- *Rules on Radiation and Nuclear Safety Factors*,
- *Rules on Operational Safety of Radiation and Nuclear Facilities*,
- *Rules on the Physical Protection of Nuclear Facilities, Nuclear and Radioactive Materials and the Transport of Nuclear Materials*,
- *Order on Establishing Professional Development Programs and Periodic Professional Development of Security Personnel for the Implementation of Physical Protection of Nuclear Facilities, Nuclear or Radioactive Materials and the Transport of Nuclear Materials*.

It is worth noting that the following two documents are also a part of the comprehensive legislative framework: the *Resolution on Nuclear and Radiation Safety in the Republic of Slovenia for the period from 2024 to 2033*, adopted by the Parliament in November 2023, and the *Resolution on the national program for managing radioactive waste and spent fuel for the period from 2023 to 2032*, adopted by the Parliament in January 2023. Both resolutions build upon and further develop the previous resolutions adopted a decade earlier, ensuring continuity and progress in nuclear safety and radioactive waste management. In addition, a *Resolution on the Long-term Peaceful Use of Nuclear Energy in Slovenia* was adopted in 2024 to create a strategic framework for the sustainable and safe use of nuclear energy and especially for new builds in Slovenia.

The comprehensive legislative and regulatory framework which governs the areas related to nuclear and radiation safety is attached to this report (see Appendix I). It consists of the national legal framework as well as of those international instruments (multilateral and bilateral treaties, conventions, agreements/arrangements) to which Slovenia is a party.

7.2 Provisions of the Legislative and Regulatory Framework

The *Ionising Radiation Protection and Nuclear Safety Act* is the most important piece of legislation on nuclear safety in Slovenia since it provides the requirements for protection from the effects of ionising radiation and nuclear safety measures. The definition of "nuclear safety" is given in point 27 of Article 3:

"Nuclear safety shall mean technical and organisational measures which result in the safe operation of a nuclear facility, prevention of emergencies or mitigation of the consequences of emergencies, and which protect exposed workers, the population and the environment against ionising radiation."

Besides the main principles (among others also "primary responsibility for safety", "the causer-pays principle", "justification", "optimisation", "ALARA" and "the preparedness principle", the *Ionising Radiation Protection and Nuclear Safety Act* also includes, with respect to nuclear and radiation safety area, provisions on:

- Reporting an intention to carry out radiation practices or to use radiation source,
- Licensing of the radiation practice or use of radiation source,
- Classification of facilities,
- Licensing procedures with respect to siting, construction, trial operation, operation and decommissioning of nuclear, radiation and less important radiation facilities,
- Radioactive contamination and intervention measures,
- Radioactive waste and spent fuel management,
- Import, export and transit of nuclear and radioactive materials and radioactive waste and spent fuel,
- Physical protection of nuclear materials and facilities,
- Non-proliferation and safeguards,
- Administrative tasks and inspection,
- Penal provisions.

Concerning the prescribed measures on radiation protection or nuclear safety, the facilities are classified as nuclear facilities, radiation facilities and less important radiation facilities. A basic selection of facilities classified as nuclear facilities has already been done by the *Ionising Radiation Protection and Nuclear Safety Act* itself, where in point 29 of Article 3, a nuclear facility

is defined as “a facility for the processing or enrichment of nuclear materials or the production of nuclear fuels; a nuclear reactor in critical or sub-critical assembly; a research reactor; a nuclear power plant; a facility for storing, processing and depositing nuclear fuel or high radioactive waste; a facility for storing, processing or depositing low and medium radioactive waste. A nuclear facility shall also mean several of nuclear facilities when they are functionally linked in the same geographically confined territory and are managed by the same person.” Furthermore, the *Decree on radiation activities* determines the criteria for the classification of radiation facilities and less important radiation facilities.

The competencies in nuclear and radiation safety are divided among two governmental authorities. The responsibility for the supervision of nuclear safety in nuclear facilities and radiation practices outside the medicine and veterinary activities lies with the SNSA, while the responsibility for the supervision of radiation practices in medicine and veterinary activities lies with the SRPA, the Slovenian Radiation Protection Administration (see more under Article 8 in this report).

7.2.1 Licensing

The initial three steps in the licencing process of a nuclear facility are led by competent ministries, not by the SNSA; however, approval or an opinion from the SNSA is still required. In accordance with the *Ionising Radiation Protection and Nuclear Safety Act,* these are:

- The siting of a nuclear facility (Article 95),
- The construction of a nuclear facility (Article 97),
- The trial operation of a nuclear facility (Article 108).

Nuclear facilities are sited through the national spatial planning process with the use of the *Spatial Management Act*. The process is led by the ministry responsible for spatial planning. In parallel, a strategic environmental assessment, in a national and transboundary context, is carried out which is led by the ministry responsible for the environment. Both these processes include the public and several governmental stakeholders as opinion givers, among which is also the SNSA. The opinion by SNSA is based on provisions of the *Ionising Radiation Protection and Nuclear Safety Act* and the *Rules on Radiation and Nuclear Safety Factors*.

The building permit process is again led by the ministry responsible for spatial planning, using the *Building Act*. In parallel, the environmental impact assessment, that also includes transboundary context, is carried out and managed by the ministry responsible for environment. In both processes the SNSA is involved as an opinion giver.

Apart from the *Ionising Radiation Protection and Nuclear Safety Act*, the *Rules on Radiation and Nuclear Safety Factors* apply to the process of issuing an opinion by the SNSA. To issue an opinion on the building permit, the SNSA obtains an expert opinion from an authorised expert for radiation and nuclear safety, which also includes conclusions on the acceptability of the proposed construction from the point of view of nuclear and radiation safety and on the adequacy of the report on the environmental and societal impacts during its operational lifetime. The SNSA then approves the preliminary SAR and other documentation such as the preliminary decommissioning program and the cyber security program and determines any changes to the extent of the area of limited use of space and the restrictions on the use of space in such an area around the site of nuclear facility. Together with the opinion on the building permit, the SNSA issues a decision on the status of a nuclear facility.

According to the *Building Act*, after construction is completed, a building, i.e. nuclear facility, needs to obtain an operating permit which is issued by the ministry responsible for spatial planning. The first prerequisite for obtaining an operating permit is a technical inspection where all the relevant stakeholders, including the SNSA, confirm that the design and other conditions are fulfilled. The

second prerequisite, since it is a nuclear facility, is to have results of a trial operation, which lasts for a limited period but not exceeding two years.

According to the *Rules on Radiation and Nuclear Safety Factors*, an application for the trial operation of the nuclear facility must include a final SAR and the opinion of an authorised expert on the radiation and nuclear safety of the nuclear facility and on other prescribed documentation such as the results of the preoperational testing. The SNSA approves the SAR and the program of trial operation, as well as the cyber security program and then issues an approval for start of the trial operation.

Apart from the previously described first three steps, there are several other steps in licensing of nuclear facilities where a license by the SNSA is required, no other ministries involved. In accordance with Article 109 of the *Ionising Radiation Protection and Nuclear Safety Act* these are:

- The start or end of operation of a nuclear facility,
- The start of disposal of radioactive waste at the radioactive waste disposal facility,
- The closure of radioactive waste disposal facility,
- The start or end of decommissioning of a nuclear facility,
- Storing fresh fuel at a nuclear power plant or research reactor construction site.

The application for obtaining any of the above-mentioned licenses must contain the Updated SAR (USAR), an opinion of an authorised expert on the radiation and nuclear safety of the nuclear facility and other documentation prescribed in the *Rules on Radiation and Nuclear Safety Factors*.

During the operation the operator of a nuclear facility must also, according to the *Ionising Radiation Protection and Nuclear Safety Act* (Article 112), ensure regular, comprehensive and systematic assessment and verification of the radiation or nuclear safety of the facility through periodic safety reviews. These are a precondition for extending the validity of operating license which is limited to a maximum of 10 years. The content, scope and timeline for the implementation of the periodic safety review must be approved by the SNSA, and the details are regulated by the provisions of the *Rules on Operational Safety of Radiation or Nuclear Facilities*.

The operator of a nuclear facility must also, according to the *Ionising Radiation Protection and Nuclear Safety Act* (Article 116), assess any intended modification related to the facility or the method of its management or operation, including maintenance works, inspection, testing or the introduction of a technical, organisational or any other modification relating thereto, that affects or could indirectly affect the content of the SAR, in terms of the significance of such modification for radiation or nuclear safety while applying safety analyses. For modifications significant for radiation or nuclear safety the operator of a nuclear facility needs to obtain an approval from the SNSA. The process is regulated in detail by the provisions of the *Rules on Operational Safety of Radiation or Nuclear Facilities*.

7.2.2 Inspection and Enforcement

In accordance with Article 178 of the *Ionising Radiation Protection and Nuclear Safety Act*, the inspection and enforcement of nuclear and radiation safety rests with the SNSA. The SRPA also oversees the inspection and enforcement of radiation practices and use of radiation sources in health and veterinary care, while in the area of physical protection inspection the authority rests with the Ministry of the Interior, and the inspection of emergency preparedness and response with the Ministry of Defence. Emphasis has been given to joint inspections. During joint inspections the inspectors from different institutions, e.g. SNSA, SRPA, Administration for Civil Protection and Disaster Relief (ACPDR), Ministry of the Interior, cooperate and coordinate cross-cutting activities. The inspections include control over the implementation of the provisions of the *Ionising Radiation Protection and Nuclear Safety Act*, the ordered measures and the rules and decrees issued in accordance with the Act.

The elements of risk-informed inspections are already partially incorporated into the current annual inspection program, such as the inspection assessment of the NPP activities analysed by the Probabilistic Safety Assessment (PSA) as well as review of shutdown PSA during the outages.

Within the scope of an inspection, an inspector may:

- issue decisions, conclusions and/or orders within the framework of administrative proceedings;
- order measures for radiation protection and measures for radiation and nuclear safety;
- order the cessation of a radiation practice or use of a radiation source when it is established that an applicable license has not been issued or if the prescribed methods of handling a radiation source or radioactive waste have not been followed. An appeal against such decision of an inspector does not prevent its execution.

In the *Ionising Radiation Protection and Nuclear Safety Act* there is only one article on inspections, since the comprehensive *Inspection Act* also exists and stipulates the general principles of inspection such as its organisation, the status, rights and duties of inspectors, inspection measures and other issues in relation with inspection, and which is also to be followed by nuclear and radiation safety inspectors.

For each inspection, a separate administrative procedure (case) must be opened. Such an "inspection case" may be closed/terminated by a decision/conclusion if there is no evidence of non-compliances with the regulations, violations of the provisions of the legislation or if the inspector does not require corrective measures. In all other situations, the inspector must issue a written decision/conclusion to the licensee to remedy the errors and/or violations found. While performing an inspection, the inspector may order, for example, material sampling, temporary or permanent seizure of any means, documents check, searching of premises, examinations, hearings, and so on.

The enforcement of applicable regulations and of the terms of the license is ensured by the application of penal provisions, inspection provisions and provisions related to suspending of the operation of a nuclear facility, as provided for in Articles 139 to 142 of the *Ionising Radiation Protection and Nuclear Safety Act*. The SNSA may order the suspension of the operation of a nuclear facility on the initiative of a competent inspector or *ex officio*. The SNSA can order the suspension of the operation of a nuclear facility on the initiative of a competent inspector when it can be concluded that the prescribed conditions for radiation or nuclear safety are not fulfilled, and the licensee has not met the prescribed conditions within a reasonable period despite a request from the inspector to remedy the deficiencies. The SNSA can order the suspension of the operation of a nuclear facility *ex officio* if the licensee has started maintenance work, testing, or introducing modifications referred to in Article 116 of the *Ionising Radiation Protection and Nuclear Safety Act*, which are significant for the radiation or nuclear safety of a facility, without the prior approval of the SNSA. There is no right of an appeal against the decision on suspension of the operation of a nuclear facility.

In addition, the inspector must also apply the provisions of the *Minor Offences Act*. Based on this Act, minor offences are divided into two main categories. For most of the offences the inspector imposes a fine (penalty payment) directly, while for the second category of offences (only five of them, specifically specified in the Act), the inspector may only initiate an administrative offence prosecution to the competent court. The same applies when an inspector finds more serious unlawful activities, omissions, or negligence, which the Penal Code qualifies as a criminal offence; also, in these cases, as defined by the *Criminal Procedure Act*, the inspector may only report and initiate the criminal offence to a public prosecutor.

Summary statement for Article 7

Slovenia is in compliance with the obligations of Article 7 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

During the reporting period, Slovenia has undergone these changes:

- The adoption of three new resolutions for the next 10 years: *Resolution on Nuclear and Radiation Safety in the Republic of Slovenia for the Period from 2024 to 2033* and the *Resolution on the National Program for Managing Radioactive Waste and Spent Fuel for the Period from 2023 to 2032* and the new *Resolution on the Long-term Peaceful Use of Nuclear Energy in Slovenia*;
- Updating regulations: five Rules and one Order.

Future Focus

The SNSA will continue to update its legislation, taking into account changes and developments, and adapt it in accordance with WENRA, IAEA guidelines and other standards.

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 organisation concerned with the promotion or utilisation of nuclear energy.*

8.1 Establishment of the Regulatory Body

In 1987, the Republic Administration of Nuclear Safety (RUJV) was established as an independent administrative body by the *Organisation and Work Area of the Republican Administrative Bodies and Republican Organisations Act*. The RUJV was responsible for matters relating to the safety of nuclear facilities and the inspection of the implementation of acts and other regulations governing the safety of nuclear facilities.

Until 1987, the Republic Committee for Energy, Industry and Construction was responsible for matters relating to the safety of nuclear facilities and inspections of the implementation of laws, other regulations and general acts of national jurisdiction governing the safety of nuclear facilities. In 1982, the Committee for Energy, Industry and Construction issued a permit for the commercial operation of the Krško NPP.

With the *Act on the Organisation and Work of Ministries*, adopted in November 1994, the RUJV was renamed the Slovenian Nuclear Safety Administration (SNSA) and came under the auspices of the Ministry of the Environment and Spatial Planning as its constituent body. In 2023, a new government law was passed that reorganised the ministry. The Ministry of Natural Resources and Spatial Planning (MNRSP) was established, which manages nature, waters, and spatial planning, under which the SNSA has operated since then as a constituent body. This Act also partially extended its competences to the field of radiological safety of nuclear facilities and to the physical protection of nuclear materials and nuclear facilities. The competence and scope of work of the SNSA has then further expanded several times, especially with the provisions of the *Ionising Radiation Protection and Nuclear Safety Act*.

The Ministry of the Environment, Climate and Energy is currently responsible for the field of energy and thus also the production of nuclear energy. According to the current act regulating nuclear and radiation safety (*Ionising Radiation Protection and Nuclear Safety Act*), it has no tasks and competencies in this area and is thus completely separate from the SNSA in terms of legislation, administration and organisation.

The *Ionising Radiation Protection and Nuclear Safety Act* maintains the division of competencies in nuclear and radiation safety among two regulatory bodies, namely the SNSA and the SRPA. The SNSA is accountable for nuclear safety and the safety of industrial radiation sources, while the SRPA is accountable for radiation protection of patients, medical surveillance of exposed workers, radiological surveillance of workplaces, dosimetry and dose registers, and education in radiation protection. Besides this general division there are some parts of the legislative and regulatory framework, as referred to under Article 7 of this Report, which are entrusted to other institutions, i.e. the ACPDR of the Ministry of Defence is accountable for emergency preparedness and planning, while the Ministry of the Interior is responsible for the physical protection of nuclear facilities and nuclear materials.

8.2 Status of the Regulatory Body

8.2.1 The Slovenian Nuclear Safety Administration

As a regulatory body in nuclear and radiation safety, the SNSA is a functionally autonomous institution within the Ministry of the Natural Resources and Spatial Planning. The SNSA's responsibilities and competencies are defined in the *Decree on Administrative Authorities within Ministries* as follows: "The Slovenian Nuclear Safety Administration performs administrative and development tasks in the areas of nuclear and radiation safety, radiation practices and the use of radiation sources, with the exception of medicine and veterinary medicine, environmental protection against ionising radiation, physical protection of nuclear materials and facilities, nuclear non-proliferation and protection of nuclear materials, radiation monitoring and liability for nuclear damage; it also carries out inspection duties in the above areas and in case of radiological or nuclear emergencies cooperates with the State Civil Protection Headquarters in the determination of protective measures for the population and informing the public."

The Management Manual, as the key document of the internal management system of the SNSA, defines its mission and vision:

Mission

The SNSA ensures that the harmful effects of ionising radiation on people and the environment are prevented or limited, and that sources of ionising radiation are used only for peaceful purposes.

Vision

The highest level of radiation and nuclear safety, the lowest possible radiation exposure for humans and the environment, and the use of ionising radiation sources only for peaceful purposes.

The detailed scope of competencies of the SNSA and other relevant administrations, entrusted with the implementation of the legislative framework in radiation protection and nuclear safety, are prescribed primarily in the *Ionising Radiation Protection and Nuclear Safety Act* and in the other pieces of national legislation, which are listed in Appendix I.

The SNSA is organised into five divisions:

- Nuclear Safety Division,
- Radiation Safety and Security Division,
- Radiation and Nuclear Safety Inspection,
- Management and Cyber Security Division, and
- Emergency Preparedness Division.

The current organisational chart of SNSA is shown in Figure 1.

Each position in the SNSA organisational chart has recognised necessary competences for the staff members occupying it. When the SNSA employs new (and usually young) members, they usually do not yet have the proper competences. In the call for application, only formal requirements are specified, such as education, working experience and knowledge of languages. Once employed, the new employee must pass the state exam for public employees, which mostly covers general topics.

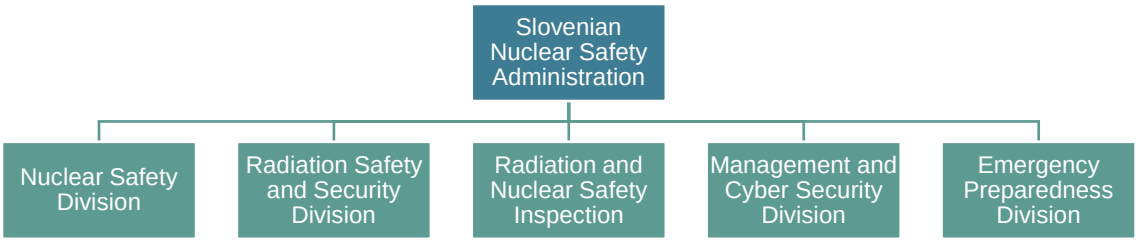

Figure 1: Organisational chart of the SNSA

The individual program for acquirement of the necessary competences is a part of the SNSA Systematic Approach to Training (SAT). The course on Fundamentals of Nuclear Technology and other courses at the Nuclear Training Centre in Ljubljana are frequently included in this program, as well as events (courses, workshops) organised by the IAEA. Also, many of the SNSA staff attended courses on Westinghouse Technology organised in the U.S. NRC Training Centre in Chattanooga, Tennessee. The training needs are defined for groups of job positions and are divided into the initial and the refreshment training courses (see more on the SNSA SAT in Chapter 11.2.2 of this Report). Each year the SNSA prepares the so-called Educational and Training Plan for its employees, in which special attention is given to newly employed colleagues. There are also other tools used for career development of the young staff members, such as career planning interviews, on-the-job trainings and so on.

Since our last report in 2022, several new employments have been approved to the SNSA; some of these newcomers represent so-called replacement job positions (but full-time), either for employees who have retired, found other employment or are on maternity leave. Some of them have previously been employed on SNSA projects, so they are well acquainted with working at the SNSA. According to the staffing plan of MNRSP 2024 and 2025 the quota for the SNSA is set at three more than at the end of 2021, that is 44 full-time employees and a quota for the employment of one trainee for a fixed term. The SNSA is solving the staffing shortage with short-term project employment.

At the beginning of 2024, the SNSA employed 43 public employees, and at the end of 2024, 46 public employees. Three public employees joined during the year, and none left. The number of employees includes all employees who are employed for a fixed or indefinite period, regardless of the source of funding. As of 1 January 2024, there was one project employment, one public employee was employed due to a temporarily increased workload, and one employee was an intern, which is a total of 3 fixed-term employments. At the end of 2024, 3 public employees, one intern, and two were also employed for a fixed term. Of the 46 employees, 3 are not included in the staffing plan, so the SNSA did not exceed the specified employment quota at the end of 2024.

The budget of the SNSA is determined based on a financial plan that takes into account the proposed activities for the following two years, as well as the expenditure realisation from the previous year. This financial plan must first be approved by the competent minister responsible for natural resources and spatial planning, followed by the Ministry of Finance. Finally, the overall state budget – which includes the SNSA budget – is adopted by the National Assembly upon the proposal of the Government realisation from the previous year. The budget is the only source for financing the SNSA fundamental activities. The operators of nuclear or radiation installations and other licensees do not pay any licensing or inspection fees. The only fee envisaged by the general

Act on Administrative Fees is the administrative tax for the licensing (administrative) procedure, which is a symbolic amount. This fee is paid to the state budget and not directly to the SNSA. Furthermore, if the SNSA determines that some expertise is needed within the licensing (administrative) procedure, the applicant bears the costs according to the provision of the *Act on General Administrative Procedure*.

Although the SNSA is a body within the MNRSP, it still has its own share in the Ministry's budget and is independent in allocating the programs, projects and other expenses from the budget. The State budget is prepared for a biennial cycle. The composition of the SNSA budget in the reporting period (2022–2024) is shown in Table 2. This budget comprises all activities within the SNSA competence. In addition to those provided by the budget (integral funds), Table 2 also shows the funds which the SNSA receives from its participation in the international projects (project funds).

Table 2: The SNSA budget for 2022, 2023 and 2024

STRUCTURE		**2022 [€]**	**2023 [€]**	**2024 [€]**
Salaries		1,763,586	1,860,000	1,931,020
Material expenditures		145,882	175,000	196,796
Investments and maintenance costs		236,982	129,000	73,300
International projects		171,500	86,500	68,100
Membership fees (IAEA, OECD/NEA membership, U.S. NRC programs)		410,000	458,550	432,000
Outsourcing	Nuclear safety	77,418	131,673	132,450
	Radiation safety and monitoring	229,195	301,019	300,509
Total		**3,034,563**	**3,141,742**	**3,134,175**

In 2001, the SNSA started to develop and introduce the management system. Now, the SNSA management system is established, applied, and sustained in accordance with the IAEA Standard GSR Part 2 "Leadership and Management for Safety". The SNSA management system is an integrated management system based on the process approach. It is described in more detail in Chapter 13.1 of this report.

8.2.2 Other regulatory bodies

The *Ionising Radiation Protection and Nuclear Safety Act* gives the competence in the area of radiation practices and use of radioactive sources in health and veterinary care to the SRPA, which was established in March 2003 within the Ministry of Health. The SRPA responsibilities and competencies are also generally defined in the above-mentioned *Decree on Administrative Authorities within Ministries*. The SRPA performs technical, administrative, inspection and development tasks in the area of radiation practices and use of radiation sources in health and

veterinary care; health protection of people against detrimental effect of ionising radiation; systematic inspection of working and living premises due to exposure of people to the natural radiation sources; implementation of monitoring of radioactive contamination of foodstuffs and drinking water; reduction, restriction and prevention of health detrimental effects of non-ionising radiation and assessment of compliance and authorisation of radiation protection experts.

Furthermore, in the area of emergency preparedness and response, the *Ionising Radiation Protection and Nuclear Safety Act* gives the competence to the ACPDR within the Ministry of Defence. Their responsibilities and competencies are also generally defined in the abovementioned *Decree on Administrative Authorities within Ministries*. It performs administrative and professional protection, rescue and relief tasks, as well as other tasks regarding protection against natural and other disasters. In more detail, the tasks and responsibilities of the ACPDR are defined in the *Act on Protection against Natural and Other Disasters* and *Decree on the Content and Elaboration of Protection and Rescue Plans*.

Besides the SNSA, the SRPA and the ACPDR, some other administrations, ministries and organisations are also entrusted with the implementation of the legislative frame which governs the safety of nuclear installations, in particular:

- Ministry of the Interior has competencies in the area of physical protection of nuclear materials and nuclear facilities in general (while the SNSA only approves the Safety Analysis Report (SAR) to which the plan of physical protection is attached as a separate and restricted document),
- Agency for Radioactive Waste Management,
- The Fund for Decommissioning of the Krško NPP,
- The Nuclear Insurance and Reinsurance Pool,
- Technical Support Organisations.

As mentioned above, one of the key stakeholders in the implementation of powers and tasks arising from legislation in the field of nuclear and radiation safety, are also so-called authorised expert organisations or TSOs. Current legislation stipulates that the operators of radiation and nuclear facilities must obtain expert opinions provided by the TSO related to specific interventions in facilities. The *Ionising Radiation Protection and Nuclear Safety Act* specifies the cases when the operator must enclose an opinion of the authorised organisation to its application (for obtaining a permit or other administrative act of the SNSA). The Act also sets out the basic conditions for the TSO to obtain an authorisation issued for a limited period of time (five years, which can be renewed and extended) by the SNSA, while the program for verifying compliance with the conditions for carrying out the work of an authorised expert, the register of authorised experts, the manner and scope of regular reporting, the form and content of the expert opinion and other conditions that must be met by the authorised experts in connection with the assessment of radiation and nuclear safety are specified in the *Rules on Authorised Experts on Radiation and Nuclear Safety*.

The Expert Council for Radiation and Nuclear Safety was appointed in 2003 as an advisory body to the now MNRSP and the SNSA, and the Expert Council for the Protection of the Population against Ionising Radiation for Radiological Procedures and Use of Radiological Sources in Health and Veterinary Care serves as an advisory body to the Ministry of Health and the SRPA. Both Expert Councils were established based on the Act on Radiation Protection and Nuclear Safety of 2002. After the entry into force of the *Ionising Radiation Protection and Nuclear Safety Act* in 2017, both Councils continued their work.

Summary statement for Article 8

Slovenia is in compliance with the obligations of Article 8 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

During the reporting period, the Slovenian regulatory body for nuclear safety, the SNSA, has undergone a small organisational change and gained three more full-time employments, which means the SNSA now has 44 full-time employees. Other than that, there are no significant changes to report.

Future Focus

The focus will be on the SNSA's efforts to employ more people, both experts in the field of nuclear and radiation safety as well as administrative and support staff.

Article 9: Responsibility of the Licence Holder

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

At the outset it should be emphasised that the IAEA GSR Part 1, Requirement 5: “Prime responsibility for safety” is fully summarised in the *Resolution on Nuclear and Radiation Safety in the Republic of Slovenia for the Period 2024–2033*.

Furthermore, the “prime responsibility” principle is defined in the seventh paragraph of Article 4 of the *Ionising Radiation Protection and Nuclear Safety Act* as follows: “The user of a radiation source shall be responsible for radiation protection and the facility operator shall be responsible for the nuclear safety of a nuclear facility”.

Throughout the *Ionising Radiation Protection and Nuclear Safety Act* there are several provisions designed for the execution of the above stated principle. For example, the Act states that the operator of a radiation or nuclear facility shall:

- ensure the safety of a concerned facility, including the safety of radioactive substances, radioactive waste or spent fuel management, which are found or produced in a facility (second paragraph of Article 87),
- ensure that monitoring programs on operating experience are carried out and that the findings of such programs shall be considered while assessing, verifying, and improving radiation and nuclear safety (Article 90),
- have sufficient financial resources guaranteed throughout the operating lifetime of a facility for implementing the prescribed measures of radiation and nuclear safety (Article 91),
- ensure, throughout the operating lifetime of a facility, enough qualified workers with suitable education, additionally trained for the activities related to radiation and nuclear safety (Article 92),
- set up and implement a quality assurance program (Article 93).

The “prime responsibility” principle is also embodied in Article 100 (design basis of a nuclear facility), Article 111 (operation of the facility) and Article 115 (extended design basis of a nuclear facility).

In addition, the *Rules on Radiation and Nuclear Safety Factors* and the *Rules on Operational Safety of Radiation and Nuclear Facilities* include provisions for the implementation of “prime responsibility” for nuclear safety of the operator in day-to-day activities.

There are also provisions on the open and transparent communication of the license holder with the public. The requirement for informing the public about the conditions under normal operation is stipulated in in Article 8 of the *Ionising Radiation Protection and Nuclear Safety Act* and for information on emergencies at the facility, the provisions are laid in Articles 134 and 135.

There are several methods by which the Krško NPP maintains the open and transparent communication with the public: press releases/conferences, printed materials, brochures, etc. More than 5000 visitors from Slovenia and abroad take plant tours every year. The main tool in public communication is also their website, where general information on a nuclear power plant, electricity, nuclear technology, and nuclear and radiation safety can be obtained. A special section of the website is dedicated to "Latest Data", while in the "News Centre" visitors can get acquainted with news and various reports, such as monthly operation reports, annual radioactivity measurements reports, yearly business reports, etc. Furthermore, the plant makes actual data available on the local television and local environmental data display boards.

Functions and responsibilities, including adequate resources and powers for effective on-site management of an accident and mitigation of its consequences by the license holder of the nuclear installation (and response organisations) are assigned by the *Ionising Radiation Protection and Nuclear Safety Act*, *Rules on Operational Safety of Radiation And Nuclear Facilities*, *Rules on Radiation and Nuclear Safety Factors*, *Protection Against Natural and Other Disasters Act* and with other secondary legislation.

The SNSA verifies the compliance of the on-site emergency arrangements of the license holder of the nuclear installation against the regulatory requirements before the commencement of operation of the facility and during the lifetime of the facility, as prescribed in the *Ionising Radiation Protection and Nuclear Safety Act* and the *Decree on the Content and Elaboration of Protection and Rescue Plans*. The license holder of the nuclear installation must prepare an on-site emergency plan of the facility and ensure the necessary organisational structure for the clear allocation of responsibilities, authorities and arrangements to emergency workers. This plan is reviewed in the licensing process in the framework of SAR review and assessment.

Inspections of emergency response arrangements in the nuclear facilities are regularly planned and conducted according to the respective SNSA Annual Inspection Plan. Apart from inspections, the analyses of exercises are also extremely important, as they show if there is a need to make some further improvements of different emergency response elements, either regarding management, equipment, trainings etc. Therefore, one of the important parts of emergency response inspections at the Krško NPP is also the review of the action plans conducted after the exercises and the improvements/changes that were adopted after the exercises.

Summary statement for Article 9

Slovenia is in compliance with the obligations of Article 9 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

Slovenia has no significant changes to highlight under Article 9 during the reporting period.

Future Focus

The SNSA will continue to ensure that each licence holder meets its responsibility.

Article 10: Priority to Safety

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

10.1 Main Requirements and Administrative Arrangements

The priority to nuclear safety is given in the general principles of the *Ionising Radiation Protection and Nuclear Safety Act*. The Act defines nuclear safety as "technical and organisational measures which result in safe operation of a nuclear facility, the prevention of emergency events or the alleviation of the consequences of emergency events, and which protect exposed workers, the population and the environment against ionising radiation". Requirements based on the 2014 amended *Nuclear Safety Directive* and the revised WENRA SRLs for Existing Reactors 2020 are included in the Act.

Article 93 of the *Ionising Radiation Protection and Nuclear Safety Act* defines requirements for integrated management system (IMS) that has to be continuously reassessed and improved. The IMS must include provisions for safety culture. The IMS also needs to establish oversight over suppliers and contractors. Article 94 of the Act defines the Management System of the authority to be responsible for nuclear safety with the same provisions on establishing, implementing, assessing and continuous improving of the management system as it was defined in Article 93.

The *Rules on Radiation and Nuclear Safety Factors* and the *Rules on Operational Safety of Radiation and Nuclear Facilities* further define the *Ionising Radiation Protection and Nuclear Safety Act* provisions, and they were both revised in 2024 according to the new WENRA Safety Reference Levels of 2020.

The *Rules on Radiation and Nuclear Safety Factors* give a detailed definition of safety culture. Chapter 5 (Integrated Management System and Leadership) of the Rules includes requirements for an integrated management system (Article 53), responsibilities and authorities for the management system (Article 54), graded approach of the management system (Article 55), organisational structure (Article 56), leadership for safety (Article 57), planning (Article 58), interaction with interested parties (Article 59), documentation of the management system (Articles 60), storage of the documentation of nuclear and radiation facilities (Article 61), management policy (Article 62), safety policy (Article 63), provision of resources (Article 64), personnel of the radiation or nuclear facility (Article 65), management of processes and activities (Article 66), supervision of subcontractors and suppliers (Article 67), quality of the project and installed equipment (Article 68), safety culture (Article 69), measuring, monitoring and improving of the management system (Article 70), non-conformances and corrective and preventive actions (Article 71), self-assessment (Article 72), independent assessment (Article 73), management system review (Article 74), improvements (Article 75), measurement, assessment and improvement of leadership for safety and of safety culture (Article 76).

The Article 112 of the *Ionising Radiation Protection and Nuclear Safety Act* defines the requirement to perform the PSR and the Chapter 5 and Annex 9 of the *Rules on Operational Safety of Radiation and Nuclear Facilities* further define the content of a PSR that includes the safety factors of safety culture (including priority to safety), management system and human factors. The SNSA practical guideline PS 1.01 defines the content and the scope of the PSR in more detail.

10.2 Implementation

In the course of the harmonisation of the WENRA reference levels and their transposition into Slovenian regulation, the SNSA verified the compliance of the Krško NPP arrangements with all the WENRA issues, including to those defining approach to priority to safety. The result shows that all of these requirements for priority to safety have already been implemented in the Krško NPP policy, processes, programs and procedures. Most of these documents and processes have been in place for several years and this has been reported on extensively in the Slovenian national reports since the second Review Meeting.

The Krško NPP has a management system which gives the overriding priority to nuclear safety. Nuclear safety has the priority over operating goals, cost limitations and operational availability by achieving adequate operating conditions, preventing accidents and/or mitigating their consequences, to ensure the safety of the employees and the environment. Nuclear safety must be dealt with proactively foreseeing difficulties and responding early enough to prevent major deviations. Nuclear safety management is an inseparable part of management which clearly defines responsibilities and creates organisational culture in support of nuclear safety. The managers promote and implement the safety culture as outlined in the Code of Safety and Business Ethics, as well as with open communication which enables the employees to feel free to raise nuclear safety concerns without fear of retaliation. In order to improve the safety culture and performance of personnel, the Internal Commitments and Goals Management Manual has been recently supported by three priority areas: to reinforce the culture of leadership, to develop human resources and to ensure equipment reliability for safe and stable long-term plant operation.

In 2023, the Krško NPP conducted a self-assessment of safety culture. Improvement was recognised in the area of understanding and paying regard to several traits of safety culture. This can be derived from self-assessment results in five out of ten traits. Improvement was recognised in safety communication, respectful work environment, leadership accountability, environment for raising concerns and in work processes. Areas for improvement remain the same as in 2018 and apply to one of the attributes of leadership accountability (resources) and one of the attributes of work processes (overload with administrative procedures). There is no major change in comparison to the 2018 self-assessment regarding personal accountability, questioning attitude, decision-making, continuous learning and problem identification and resolution traits. Krško NPP is planning to perform the next Safety Culture Self-Assessment in the year 2026.

In 2023, the third PSR (PSR3) was completed by the Krško NPP and it also included a review of three new safety factors: radioactive waste and spent fuel; security; and radiation protection. The review of the safety factor security was performed as a separate process, as appropriate protection of security related information had to be ensured. The review phase of PSR3 did not identify any issue with high risk or with non-tolerable degradation of defence-in-depth. The findings of the PSR3 were prioritised according to their impact on safety and appropriate actions were included in the PSR3 action plan; some of which have already been completed. The PSR3 concluded that the Krško NPP demonstrates safety of design and operation. Safety of continued operation until the next PSR and for the long-term operation will be ensured with the planned implementation of PSR3 actions, Pre-SALTO Program actions, as well as other plant programs, procedures and provisions for control of plant design, equipment and human factor performance and operational safety. In 2033, the fourth PSR (PSR4) will be carried out.

In the Krško NPP, the nuclear safety overview is being achieved through the functioning of various committees and departments, such as the Krško Operating Committee, the Krško Safety Committee and the Independent Safety Engineering Group (ISEG). The ISEG maintains a Performance Indicators Program which also includes a set of 10 indicators for the monitoring of safety culture. Regular reviews of performance indicators identify weak points and define corrective actions for the adverse trend indicators. The findings and corrective actions for the safety culture indicators are communicated all over the plant organisation. The Team for Monitoring Safety Culture and Human Behaviour meets monthly. In the reporting period, approximately 370 examples were prepared and evaluated yearly by team members. Most of them identified possible improvements and some recognised good practices. The most common reasons for deviations were from areas of configuration control, tagging, foreign materials intrusion and modifications. In the area of safety culture indicators, there are no indicators with red (unacceptable zone) or yellow (delayed/behind schedule) status, only the indicators in green (excellent) and white (normal) zone. All Safety Culture Performance Indicators are in the green zone except for the indicators “Number of Human Related Deviations/Events”, “Number of Operation Human Performance Events”, “Number of Events Due to Inadequate Adherence to Procedures” and “Percentage of Overdue Analyses” which are in the white (normal) zone.

According to the *Ionising Radiation Protection and Nuclear Safety Act* and the *Rules on Operational Safety of Radiation and Nuclear Facilities,* the Krško NPP is required to assure that the Operating Experience Program is established and used effectively to promote safety within the organisation. This program is used for assessing its own operational experience, also including those events that are connected to the safety culture and human errors. For foreign operation experience the Krško NPP uses a program of industry experience for effective identification, reporting and screening of reported events.

On its own initiative and based on various industry issues, the Krško NPP initiated some safety improvement projects. The SUP aim was to improve the plant safety against extreme external hazards and to increase plant capabilities for the prevention or mitigation of severe accidents. The implementation of the Krško NPP's SUP was completed with all off the original SUP improvements being realised by the end of 2021. The Spent Fuel Dry Storage facility was put in operation in 2023.

In 2011, the Krško NPP introduced the Electronic Business Suite that covers most of the plant processes and also includes Electronic Asset Management with a work order system, bill of material and warehouse database. The main benefits are data availability, configuration control and transparency. The communication between the process users and participants is transparent, immediate and available at the workplace in the plant.

The Krško NPP performs controls of its suppliers and contractors. The selection of suppliers is based on the evaluation of their capability to provide items or services in accordance with procurement requirements prior to the award of contract. The suppliers capable of meeting such requirements are included in the Approved Supplier List. Audits of suppliers are performed to determine their technical and quality capabilities by direct evaluation of their facilities, activities, personnel and the implementation of their Quality Assurance Program. Local and mostly EU-based suppliers are audited directly by the Krško NPP while suppliers from the U.S. are audited in cooperation with Nuclear Procurement Issues Committee organisation. The audit report with relevant findings and proposals for corrective actions is sent to the supplier and the supplier submits evidence on the completion of corrective actions. The Krško NPP also supervises the performance of contractors. The representatives of contractors’ companies are involved in coordination activities prior to work execution during online maintenance and during outage. Many

contractors attend Krško NPP training courses. All contractors' workers are required to attend Krško NPP industrial safety and fire protection training.

The actions already implemented by the Krško NPP in response to the Fukushima accident as well as the planned activities can be seen as an example of good safety culture. The Krško NPP personnel have an understanding of the nuclear safety concept of the plant with valuable knowledge and experience and are willing to continuously improve and develop their competences. The safety thinking of employees is incorporated into the training programs. The Krško NPP work force is stable. There is an open relationship of the Krško NPP with the authorities, supporting industry and local community.

There were several improvements made after 2021, based on the WANO Corporate Peer Review 2021 in the areas of industrial safety and contractual oversight and pre-SALTO mission 2021 in the areas of aging management and support of long-term operation. To further improve the safety and reliability of the plant, action plans are being developed corresponding to the WANO Peer Review 2024 observations.

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

Permanent safety improvements are made by a number of modifications. All the changes are evaluated for the licensing applicability in accordance with the criteria defined in *Rules on Operational Safety of Radiation and Nuclear Facilities*. For that purpose, an administrative procedure called the Evaluation of Changes in NEK was developed.

10.3 Regulatory Review and Control

The review of the implemented measures in the Krško NPP has been performed in the framework of the inspections and audits, as well as through safety and performance indicators.

Independent reviews of outage activities and surveillance tests are performed by the TSOs. The TSOs are engaged in the inspection, witnessing and safety evaluation of refuelling, surveillance and modifications activities. The SNSA carefully monitors all the activities with an emphasis on ensuring nuclear safety during the outage of the Krško NPP. The SNSA prepares the outage report which includes the action plan.

The level of NPP safety is also determined by a thorough review and analysis of the plant operational events. There were some reportable events, all of them with low safety significance. No events were rated higher than INES (International Nuclear and Radiological Event Scale) level 0 and there were no negative consequences or any radiological releases to the environment.

Since 2007, the SNSA has included a set of performance indicators into the regulatory approach in supervising the Krško NPP. The SNSA maintains a set of 38 safety and performance indicators (e.g. primary system leakage, number of corrective maintenance work order, number of events, number of safety system failures, violation of regulation and Technical Specifications, fire safety, etc.) that are collected based on weekly, monthly, quarterly or annual basis, based on data from reports of the Krško NPP. Each indicator could be in one of the following states: normal, warning or alarm. The purpose of the SNSA safety and performance indicators is to identify potential weaknesses that might lead to the degradation of nuclear safety.

The SNSA also performs a thematic inspection covering the safety culture and thematic inspection covering the human and organisational factors (HOF) on a regular basis. In the reporting period there were two inspections on HOF performed, the latest during the refuelling outage in April 2024. The inspection concluded that progress has been made regarding the human factor issues at the Krško NPP.

10.4 Priority to Safety Provisions of the Regulatory Body

The SNSA designed and developed an integrated management system for its own use. The SNSA issues and regularly updates the Management Manual, the inspection plan, the organisational procedures and guidance, which in general cover all SNSA activities within the processes, management, control of radiation and nuclear safety, review and assessment, licensing, analysis (outage activities, operational events), inspection and enforcement, preparation of regulation and emergency preparedness and response. The priority to safety is ensured through the mission, the vision and the values of the SNSA, as well as in the SNSA policies. The SNSA Director regularly communicates with SNSA staff about the information on nuclear and radiation safety in Slovenia as well as presents the SNSA's work and its international cooperation. As a method of the regulator's self-assessment, once every two years a questionnaire is filled-out by SNSA staff to provide feedback to SNSA management on how the regulator is performing its duties.

The *Ionising Radiation Protection and Nuclear Safety Act* in Article 4a includes requirements for the self-assessment of the regulatory body every ten years. This self-assessment reviews the regulatory organisation and the legislation according to the international standards. After the completion of the self-assessment the regulatory body is subject to an international expert review of the regulatory body with the aim to provide long-term and continuous improvements in nuclear and radiation safety.

Article 8 of the *Ionising Radiation Protection and Nuclear Safety Act* defines the provision that all the information on radiation practices, nuclear and radiation facilities are public, except for the information relevant to the safeguards of nuclear materials and for the physical security. Access of the public to this information is regulated by the *Public Information Act*. The SNSA also prepares annual reports on radiation and nuclear safety in Slovenia that are presented to the Government, Parliament and are published on the SNSA's a to provide information to the general public.

The licensees that obtain permits and licences from the SNSA are provided with a questionnaire to assess the SNSA services and performance. In general, the licensee's feedback gives good marks to the SNSA but in case of more substantial remarks or complaints these would provide the basis for improvements of SNSA's processes.

The SNSA has been assessing the safety culture at the Krško NPP since 2012. The SNSA collects the observations on safety culture at the Krško NPP from inspections, communications with the licensee, licensing process and reviewing of the NPP's events analysis reports. After each outage, a report is written. A working group which consists of the safety culture experts from the Krško NPP and SNSA discusses the SNSA's findings on the Krško NPP safety culture in order to unify their interpretation.

In 2020, the SNSA conducted a safety culture self-assessment through a questionnaire (online survey with 42 statements; answers from strongly disagree to strongly agree). After the survey, a report was written, and an action plan was established. One of the steps in the action plan was to conduct interviews for the statements where more than 20% of employees did not agree with them. Interviews were completed in 2022 and the report with the action plan on the safety culture self-assessment was revised in 2023.

10.5 Voluntary Activities

On the SNSA website there are several reports that are regularly published, such as the Annual Reports on Radiation and Nuclear Safety in the Republic of Slovenia, National Reports under Convention on Nuclear Safety, National Reports under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Reports to the European Commission on compliance with obligations under different EU directives.

There are also additional or one-time reports and documents published, for example Slovenian National Report on Nuclear Stress Tests and the Slovenian Post-Fukushima Action Plan, the reports of international missions, the reports on the seismic safety of the Krško NPP area, the reports on the event with fuel damage in Krško NPP in 2013, updates on the situation at Ukrainian nuclear facilities.

The Slovenian legislation currently in force is available on the website, including the Practical Guidelines on the conduct of the periodic safety review, about the contents of the SAR, about the management of design changes in the NPP, etc.

In addition, the SNSA prepares newsletter “News from Nuclear Slovenia” in English biannually and the “Radiation News” in Slovene, a newsletter published at least twice per year and delivered by mail to Slovenian licensees. Both of them are available on the website.

The SNSA participates in the High-Level Group on Nuclear Safety and Waste Management under ENSREG and is a member of the WENRA, an informal association consisting of representatives of nuclear regulatory authorities from European countries with nuclear power plants. Since 2011, Slovenia has been a full member of the Nuclear Energy Agency (NEA) of the Organisation for Economic Cooperation and Development (OECD), where it actively participates in most of the committees and working groups. Slovenia also successfully cooperates with the IAEA and has representatives in all their committees.

In the reporting period, the SNSA has been involved in four EU assistance projects, all aimed at enhancing the capabilities of the Turkish, Bosnian and Herzegovinian, Ghanian and Nigerian nuclear regulatory authorities.

The SNSA believes that open communication and provision of information to the Slovenian and international public is a good practice which can improve the level of the radiation and nuclear safety in the country.

Summary statement for Article 10

Slovenia is in compliance with the obligations of Article 10 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

In the reporting period, Slovenia made the following improvements:

- In 2023 the Krško NPP conducted another self-assessment of safety culture.
- At the Krško NPP, several improvements were made based WANO peer reviews in 2021 and 2024 and pre-SALTO mission findings.
- The first safety culture self-assessment at SNSA was completed.

Future Focus

The SNSA is set to start with the second safety culture self-assessment in the near future.

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 the nuclear power plant, according to the *Ionising Radiation Protection and Nuclear Safety Act* This responsibility includes providing both adequate financial and human resources to support the safety of the power plant throughout its lifetime.

11.1 Financial Resources

The *Ionising Radiation Protection and Nuclear Safety Act* contains as one of the main principles the "causer pays" principle (paragraph 8 of Article 4): "The user of a radiation source shall cover all costs related to the radiation protection measures in accordance with this Act, the preparedness for emergencies and intervention measures, as well as the costs of mitigation of the consequences of an emergency".

Based on this principle the *Ionising Radiation Protection and Nuclear Safety Act* introduced a provision (Article 91) which relates strictly to the obligation of the operator of a radiation or nuclear facility to ensure sufficient financial resources guaranteed throughout the operating lifetime of a facility for implementing the prescribed measures of radiation and/or nuclear safety. In accordance with the *Treaty between the Government of the Republic of Slovenia and the Government of the Republic of Croatia on the Regulation of the Status and Other Legal Relationships, connected to Investment in the Krško Nuclear Power Plant, Its Exploitation and Decommissioning*, which entered into force in March 2003, such financial resources will be ensured to the operator by the current owners of the facility, to the level of all operational costs as well as costs of maintenance investments, including investments in technological renewals relating to the measures of radiation or nuclear safety.

For the time being, the Krško NPP operator has allotted sufficient financial resources for maintaining the appropriate level of nuclear safety. The price of a kWh of electricity produced in the Krško NPP is set out by the NPP management and approved by the Supervisory Board, based on the annual business plan. This price covers all gross operating expenses, i.e. electricity generation costs as well as necessary investments. Besides this, the Supervisory Board annually approves the Long-term Investment Plan (for five years). The amount foreseen for investments and improvements in recent years is stable and gives the management proper flexibility for the long-term maintenance of nuclear safety including the SUP. Both owners are obliged to settle their respective obligations towards the Krško NPP within 15 days of issuing an invoice. In the reporting period there have been no problems with any delayed payments.

The suitability of ensuring financial resources, the amount thereof and the forms of warranties, as well as the method to be used for the enforcement of warranties are assessed by the SNSA during the procedure for issuing the operation license for a radiation or nuclear facility.

In conjunction with the Article 109 of the *Ionising Radiation Protection and Nuclear Safety Act*, which deals with licensing, the Article 137 requires that for obtaining the license the evidence about financial guarantees must be forwarded to the regulatory body. The financing of measures for the protection against ionising radiation and nuclear safety is prescribed in Chapter 12 of the *Ionising Radiation Protection and Nuclear Safety Act*, where the division between the regular (and

extra) costs of the user of a radiation source (Article 172) and the public expenses (Articles 173 and 174) is defined.

Besides other explicitly itemised tasks and measures, the operator must also cover the costs of ensuring a sufficient number of qualified workers involved in the operation of a radiation or nuclear facility.

In accordance with the provisions of the Treaty between the Government of the Republic of Slovenia and the Government of the Republic of Croatia on Regulating the Status and Other Legal Relations on Investment in the Krško NPP, Its Exploitation and Decommissioning, which entered into force in March 2003, Slovenia and Croatia are obliged to meet the obligations relating to the management and exploitation of the jointly owned power plant. The treaty stipulates that in a period of twelve months at the latest after the entry into force of the treaty, Slovenia and Croatia must each establish a special fund to collect financial resources for their half of the expenses to cover the radioactive waste and spent nuclear fuel management and the final plant decommissioning.

For the Slovenian share, adequate financial resources for the decommissioning of the Krško NPP and for the construction of a repository are ensured by the provisions of the *Act on the Fund for Financing Decommission of the Krško NPP and Disposal of Radioactive Waste from the Krško NPP*, adopted in 1994. The amount for every kWh of the Slovenian share of electric energy produced by the Krško NPP is regularly contributed to the Slovenian fund for decommissioning by the Slovenian owner GEN energija d.o.o. For more information on this see Chapter 19.8 of this report.

In the event of a nuclear accident, financial resources to compensate the claim are provided through the Slovenian third party liability legislation and through the Nuclear Insurance and Reinsurance Pool, taking into account that in 2001 Slovenia became a party to the Paris Convention on Third Party Liability in the Field of Nuclear Energy, and in 2003 also a party to the Brussels Supplementary Convention. Furthermore, the Slovenian Parliament already ratified the Protocols to both Paris Convention and to Brussels Supplementary Convention. The instruments of ratification were deposited in mid-December 2021 in Paris by all signatories to both Protocols and both Protocols entered into force on 1 January 2022 by prior agreement between the contracting parties.

11.2 Human Resources

11.2.1 The Krško NPP

Krško NPP Human Resources policy, defined in the plant management programs, ensures that all requirements of regulatory acts and USAR Chapter 13.1 are appropriately fulfilled. At the end of 2024 there were 656 employees in the Krško NPP who adequately filled all the necessary positions for the technical operation, including QA, training and engineering. There are six operation shifts with a minimum shift composition of five licensed operators per shift, including an on-duty shift engineer. In the event of accidents, the staffing of the organisation needs to respond appropriately and in accordance with regulatory requirements and USAR. Krško NPP also continuously contracts 234 workers to support various processes, while additional external workers are contracted during outages or projects implementation.

Sufficiency of staffing is assessed in accordance with international guidelines and standards (IAEA, WANO), including benchmarking of good practices, use of operating experience, conduct of internal assessments, audits, etc.

The training and qualification activities at the Krško NPP are governed by:

- The *Ionising Radiation Protection and Nuclear Safety Act,*
- The *Rules on Providing Qualification for Workers in Radiation and Nuclear facilities*,
- The plant's USAR, applicable plant procedures/programs,
- The annual training program for licensed operators and shift engineers, which is submitted to the SNSA.

The education and training requirements are outlined in the USAR, Chapter 13.2 "Training". The process is further elaborated in the administrative procedure Training and Qualification of the Krško NPP Personnel. Further training procedures cover specific areas, such as the Licensed Operator Training Program, the Licensed Shift Engineer Training Program, the Non-licensed Operator Training Program, the Health Physics Training Program, etc. In addition, the Krško NPP personnel are trained and assessed for using other relevant standard industry guides in areas such as occupational safety, hazardous chemicals, welding, non-destructive testing, specific equipment and machinery operation.

In general, the training programs are divided into initial and continuous trainings. In addition to the training for the Krško NPP personnel, specific training courses are conducted for subcontractors, specifically in the area of General Employee training and Radiation Protection training and specific Work practices. The Systematic Approach to Training principles, including Job and Task Analyses, are applied for developing technical training programs.

The training program for a licensed operator and shift engineer is completely implemented in-house. The continuous training for the licensed personnel consists of multiple weekly training segments (four per year per shift) which comprise a two-year cycle of re-qualification training. Each training day consists of lectures and exercises using a simulator. Initial licenses and their renewals are obtained based on the examinations conducted by the Expert Commission for the Examination of the Operator's Qualifications. In accordance with the legislation, the SNSA nominates members of the Commission. At least two members of the Commission come from the regulatory body, two from the Krško NPP and others from TSOs or are retired senior experts. The examination consists of:

- written examination: 38 to 40 questions (mainly multiple choice),
- simulator examination: GOP, ARP, AOP, EOP and EIP procedures,
- oral examination: reactor physics, nuclear safety, thermo-hydraulics, technical specifications and administrative procedures, emergency preparedness,
- walk-down (for new reactor operators only).

In 2002, the first group of operation personnel successfully finished the initial training program for the reactor operator on the Krško NPP full scope simulator. The latest generation of initial training (6 reactor operators) successfully completed training in 2024. There were 69 licensed reactor operators, senior reactor operators and shift engineers at the end of 2024.

Other types of training courses are conducted for specific areas, for example refuelling operations, maintenance, engineering, radiation protection, chemistry, security, emergency preparedness, SAME (Severe Accident Management Equipment) mobile equipment and others.

The training for maintenance personnel is conducted in a special training centre, either by using the Krško NPP own resources (instructors and subject matter experts) or by contracting such services from certified institutions or equipment vendors. Supervisory personnel and technicians also obtain specific knowledge at various equipment vendor training facilities. The maintenance training centre houses classrooms and laboratories that are designed for various maintenance groups and is equipped with practical tools needed to conduct the hands-on training.

11.2.2 The Slovenian Nuclear Safety Administration and the Technical Support Organisations

The SNSA has a human resource management called SAT-SNSA. It systematically determines the necessary competencies for individual job position. Competencies are made on the basis of work tasks, which are also determined for an individual job. The work tasks are determined by analyses, where the basis is the Management Manual, where the processes are determined, and on the basis of the processes the tasks are then defined in more detail. There are also goals assigned for a particular job position that are used to monitor the success of the process in particular. In addition, success is assessed at annual interviews, where the competencies of employees are also assessed. Based on this, the annual training plan is prepared.

Within the SAT-SNSA, the necessary training for each process and the specifics of trainings for particular job position are also determined. Special attention is given to newly employed colleagues for whom a special training plan has been prepared. The SNSA usually recruits new employees without prior expertise in the field of nuclear and radiation safety, thus the training program with on-the-job trainings for SNSA new employees, which is tailored for particular job position in accordance with SAT-SNSA, is paramount to achieve an adequate level of competence.

The training of the TSO personnel is organised according to the type of institution. They also attend international workshops, reactor technology and other training courses at the Nuclear Training Centre in Ljubljana and similar events. Furthermore, the *Ionising Radiation Protection and Nuclear Safety Act* stipulates that their training is also funded from the national budget.

Summary statement for Article 11

Slovenia is in compliance with the obligations of Article 11 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

Slovenia has no significant changes to highlight under Article 11 during the reporting period.

Future Focus

The SNSA will continue to ensure the participation of the employees in education, training and workshops.

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.

12.1 Regulatory Requirements and Assessments

The Slovenian legislation covers the human factor issue in the Article 92 of the *Ionising Radiation Protection and Nuclear Safety Act* which defines workers' qualifications and physical as well as psychological requirements. The health surveillance of exposed workers is dealt with in the Article 56 and the re-evaluation of the assessment of fitness to work in the Article 59 of the Act. The health of workers must be regularly assessed. The employer must also ensure regular updating of the workers' professional knowledge. *The Rules on Providing Qualification for Workers in Radiation and Nuclear Facilities* further elaborate on these requirements.

The *Rules on Radiation and Nuclear Safety Factors* comprises basic human factors requirements in the nuclear installations design. *The Rules on Operational Safety of Radiation and Nuclear Facilities* comprises basic human factors requirements for operating nuclear installations.

The SNSA performs reviews and supervision activities related to human factors. The qualification of the licensed personnel is controlled by the SNSA. The Ministry of Health issues licences to the radiation protection staff while the SNSA licenses the operators. As part of the operational events analysis, the SNSA independently performs root cause analyses and determines any human factors that would lead to the events. The refuelling outages are supervised by the SNSA and the analysis of the outage activities is performed, which also includes the review of organisational and human factors' deficiencies identified by the SNSA inspectors.

The SNSA conducted thematic inspections, which is described in Chapter 10.3 of this report.

The latest comprehensive review of the safety factor: Human Factors at the Krško NPP was performed as part of the PSR3 of Krško NPP. Systematic assessment of human factors was performed in order to evaluate arrangements in the Krško NPP for ensuring that personnel have the necessary competences for their jobs, that the human resources needs are anticipated, and that the performance is monitored and continually improved. The review identified a series of strengths and good practices. The required trainings for every job position in each organisational unit are defined and regularly reviewed. This shows the awareness of the operator that all employees must be properly trained to enable the high-quality execution of their work. The share of non-completed and missed courses was improved to less than 2%. The systematic process for succession planning for leading positions was implemented. Within the ISEG, a Safety Culture and Human Performance Officer position was introduced which enhanced utilisation of expertise in the social and behavioural sciences. To improve human performance, a team for continuous monitoring of safety culture and human behaviour was established, and the responsibilities of the team and individual members were specified. The management of handling the COVID-19 pandemic was successful, with all measures timely introduced in good compliance with requirements from authorities and guidance from the industry.

The issues identified in PSR3 are of medium and low safety significance level and there were no findings which could violate Krško NPP Technical Specifications. Resolving findings would lead to enhancement and improvement of human performance and subsequently of plant safety.

12.2 Methods and Programs at the Krško NPP

The methods of dealing with human factor issues at the Krško NPP are covered in various plant documents like policy documents, plant programs and high-level administrative procedures. The methods which are used to prevent, detect and correct human errors are covered by the Operating Experience Assessment Program, supported by procedures such as the Use of Corrective Action Program and the Root Cause Analysis. The analysis of human errors is performed mainly by the ISEG. The man-machine interface issues are covered in the Human Factors Engineering Design Guidelines.

Human performance aspects are taken into consideration by setting up the organisation and management of the plant. There are arrangements, such as the Quality Assurance Plan, the Plant Management Manual, the Krško NPP Policies and Goals, the Self-assessment Program, the Safety Culture Traits, the Human Performance Error Prevention Tools, the Company General Employee Training Handbook, the Operating Experience Assessment Program, and others, which focus on developing, communicating, understanding, and monitoring the strategy to improve safety. These arrangements also cover reporting and analyses of human induced events at the Krško NPP and the feedback on the lessons learned regarding plant operation procedures and training programs.

The staff workload is strictly regulated. Overtime is limited in accordance with the *Labour Relations Act*. Two of the plant administrative procedures deal with working time and salaries. The responsibility for controlling the workload of the personnel according to the procedures lies with the heads of the departments. The overall monitoring of actual workload for the plant personnel is performed by the division of administration on a monthly basis. The staff turnover is rather low and is mostly due to retirement.

Internal procedure “Continuous Monitoring of Safety Culture and Human Performance” is also in place. This procedure describes roles and responsibilities of Safety Culture and Human Performance Monitoring Panel which consists of representatives from each department.

The group of ten performance indicators from different areas was established in 2018 to monitor the Human Performance. The indicators are:

- Number of Operation Human Performance,
- Number of Unplanned Personnel Contamination,
- Number of Unplanned Personnel Internal-External Exposure,
- Number of Human Related Deviations/Events,
- Number of Registered Industrial Safety Events,
- Number of Near Miss Industrial Safety Events,
- Percentage of Overdue Corrective Actions,
- Percentage of Overdue Analyses,
- Number of Procedures with Expired Review Date,
- Workforce Engagement Indicator,
- Number of Recurrences.

At the time of reporting (March 2025), the performance indicators: Number of Unplanned Personnel Contamination, Number of Unplanned Personnel Internal-External Exposure, Number

of Registered Industrial Safety Events, Number of Near Miss Industrial Safety Events, Percentage of Overdue Corrective Actions, Number of Procedures with Expired Review Date and Workforce Engagement Indicator are all in the green (excellent) area. The rest of the human performance key performance indicators: Number of Operation Human Performance, Number of Human Related Deviations/Events, Percentage of Overdue Analyses and Number of Recurrences are in the white (normal) area.

The codes and indicators at the Krško NPP are reviewed for trends by the Quality and Nuclear Oversight Group. The codes and indicators are also reviewed in the Quality and Nuclear Oversight yearly trend report. The Corrective Action Program database also allows binning of the codes within the online program. Binning is performed by the Safety Culture and Human Performance Monitoring Panel. This enables each employee to be able to see the binning of codes for their events and more easily utilise the information to develop corrective actions. Krško NPP utilises software which is on the Krško NPP internal portal that allows easy access and editing particular indicator (entering data, analysis, visual presentation, hierarchic arrangement, aggregation, etc.).

The Krško NPP conducts cross-functional trainings as part of the Operations Simulator Training to promote the use of human performance tools. The staff from outside of Operations are included in the applicable simulator training scenarios. The senior level managers are designated to oversee each of the focus areas. Indicators were created for each of the focus areas and are regularly monitored, i.e. quarterly.

Based on the 2024 WANO peer review, some improvements in the areas of human performance and meeting plant management expectations have been implemented. The Krško NPP has a strong safety culture with a deep understanding of the nuclear safety concept. The overall organisation is based on trust, at all levels within the organisation. The workforce is treated with respect. Individuals communicate openly. Anyone who recognises any deviation is encouraged by managers to issue a condition report. The site has a no-blame culture, which is well understood at all levels. Safety Culture Traits and Human Performance including Tools for the Prevention of Events has become a regular part of training programs for organisational units. Deviations and events connected with human behaviour are presented weekly at technical staff meeting. Improvements were identified and implemented in the areas of observation, coaching, communication between departments and vertical communication among organisation.

Different pocket cards for workers are used to help them perform their jobs, for example pocket cards with phonetic alphabet symbols, pre-job briefing questionnaire, human performance tools and safety culture traits. In the existing human performance related events area of the Corrective Action Program two additional categories "Safety Culture" and "Human Performance Tools" were added in 2019 for the more precise monitoring of all human performance tools and safety culture traits. Improvements in practical training for the human performance area in the Main Control Room Simulator and Flow-Loop Simulator were made. The Krško NPP established various training approaches on human performance tools for different departments (Operations, Maintenance, etc.). Human performance tools are also incorporated in the Manager in the Field Program and are analysed inside the "Team for a Continuous Monitoring of Safety Culture and Human Performance" and reported in the Quality and Nuclear Oversight Division’s yearly report.

The Krško NPP has included the human factor evaluation in its modification process. During the preparation of conceptual design packages for the modifications, the human machine interface is evaluated. Design changes are in the agreement with the procedures “Human Factors Engineering Design Guidelines” and “Rules for Process Computer Systems HMI”, where applicable.

The Krško NPP utilises various activities in support of human performance monitoring. These activities include: self-assessments, monitoring of performance indicators, trending, observations, event and human performance analysis, operating experience feedback. Due to the large number and scope of modifications being carried out in the last years, there is also a negative trend in human behaviour related to the execution of work. Most of the significant deviations due to inappropriate human behaviour occurred during the refuelling outage. In order to improve the situation in the human performance field, Krško NPP initiated a series of corrective actions.

Summary statement for Article 12

Slovenia is in compliance with the obligations of Article 12 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

Slovenia has no significant changes to highlight under Article 12 during the reporting period.

Future Focus

The Krško NPP will update documentation (procedures and USAR) based on the minor finding of PSR3 related to the Human Factor. The SNSA will follow implementation and oversight this area through inspection and assessment of different reports.

Article 13: Quality Assurance

Each Contracting Party shall take the appropriate steps to ensure that quality assurance program 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.

13.1 SNSA Management System

The SNSA integrated management system (IMS) is based on the process approach. All activities regarding the SNSA IMS are performed according to the requirements of the IAEA safety standard GSR Part 2 “Leadership and Management for Safety” and to the ISO 9001:2015 standard.

The processes are divided into one management process, eight core processes and one supporting process, as presented in Figure 2.

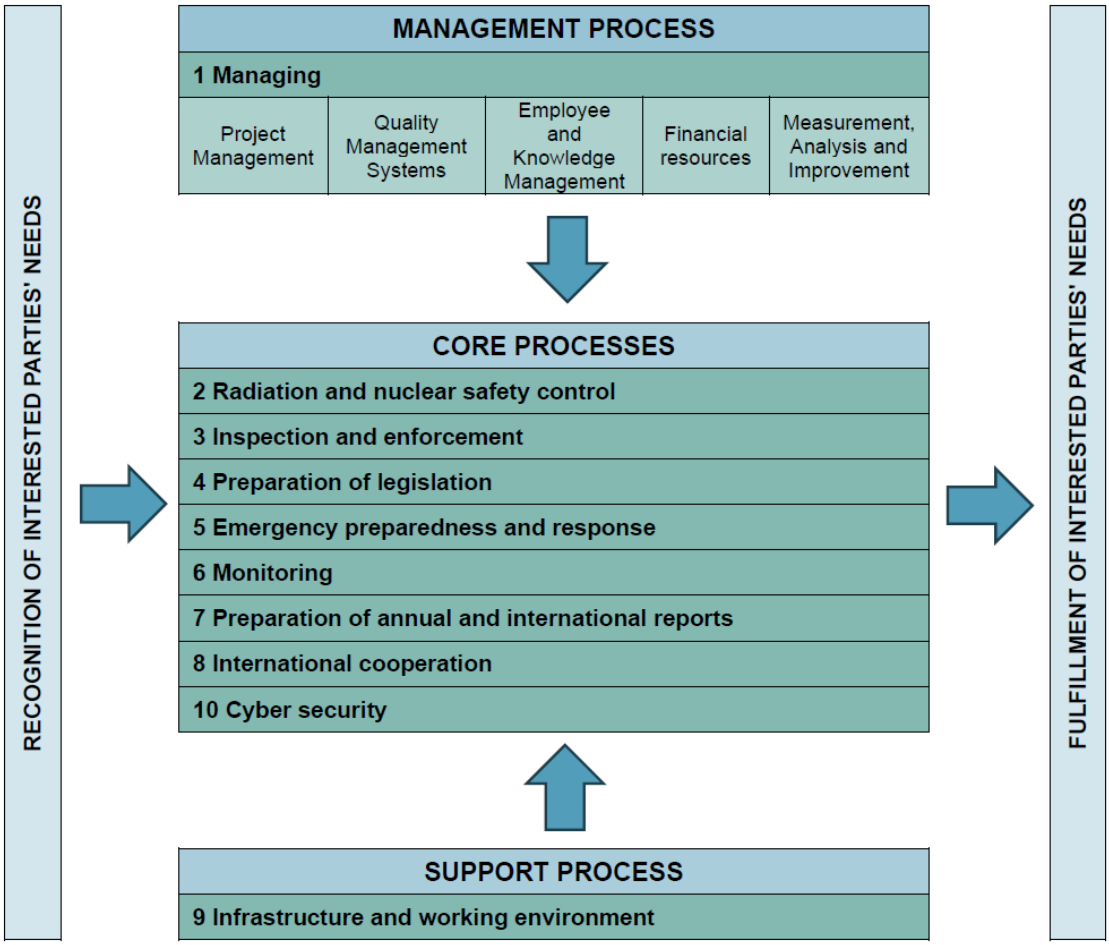

Figure 2: Structure of SNSA integrated management system

The processes are documented at five levels of the management system documentation:

- Level 0: Mission, vision, values and policy statements of the SNSA;
- Level 1: Management manual (Q), which defines the concept of the SNSA IMS. This level also includes the SNSA strategic objectives and the SNSA annual plan;
- Level 2: organisational procedures (OP) which describe management of the processes;

- Level 3: organisational instructions (ON), in which the detailed performance of individual activities is described;
- Level 4: Records that are a result of IMS activities.

Even though the SNSA did not renew the certificate of compliance of the management system with ISO 9001 gained in 2007 at the end of 2013 due to austerity measures, the SNSA continues to carry out all its activities in accordance with the requirements of this standard and the IAEA safety standard GSR Part 2 and will ensure the continuous improvement of the effectiveness and efficiency of its operations.

During the reporting period, several measures, assessments and improvements of the SNSA management system have been performed through:

- Internal audits,
- Management system reviews,
- Reviews of fulfilment of the SNSA goals, strategies, plans and objectives,
- Self-assessments of the SNSA safety culture.

Internal audits are conducted in accordance with the SNSA procedure “Conduct of Audits”. Internal audits of the IMS are conducted only by trained and independent auditors. According to the internal audit annual plan each SNSA process has been audited once per year till 2019. Since then, the audits for each process are performed once every two years due to the higher maturity of the processes.

SNSA management regularly reviews and evaluates the performance of the management. The management system reviews are performed at the beginning of each year for the performance of the previous year to ensure its continuing suitability, effectiveness and efficiency.

SNSA management is responsible for setting long-term/strategic goals, strategies, plans and short-term goals which are described in the SNSA Annual Plan. The goals are based on management policy, are measurable, time-defined and have their designated owner. The realisation of the goals is monitored every four months when the owners of goals report about the status of achievement of the goal. The IMS manager reviews the status of each goal and informs the director about the status. The SNSA management annually reviews the long-term strategic goals, plans and short-term goals in the management review.

SNSA management performs self-assessment of the management system in order to permanently improve the management system. SNSA activities are compared with activities of administrative bodies worldwide. Process owners implement self-assessment of their processes and describe the self-assessment findings in the report for the management system review.

The SNSA is also committed to conducting self-assessments of safety culture, the first one is described in Chapter 10.4 of this report.

The SNSA processes are described in the Management System Manual as well as in the pertinent procedures. The new revision of the SNSA Management Manual is in line with all the requirements of IAEA GSR Part 2.

13.2 Regulatory Requirements

The regulatory requirements for management systems are defined in the Slovenian legislation, namely in:

- The *Ionising Radiation Protection and Nuclear Safety Act* – Article 93 (Management System) and Article 94 (Management System of the Regulatory Body Competent for the Nuclear Safety) and
- The *Rules on Operational Safety of Radiation and Nuclear Facilities* – Chapter 5 (Management System).

Article 93 of the *Ionising Radiation Protection and Nuclear Safety Act* defines the requirements relating to the management system of the investor or operator of a radiation or nuclear facility. Article 94 of the Act additionally defines that the authority, competent for the nuclear safety, shall establish, implement, assess and continuously improve the management system.

In accordance with the EU *Nuclear Safety Directive* and the EU *Directive on the Responsible and Safe Management of Spent Fuel and Radioactive Waste*, the Article 5 of the *Ionising Radiation Protection and Nuclear Safety Act* requires that the competent authority shall at least every ten years carry out a self-assessment, which includes harmonisation of its own organisation and legislation with internationally recognised standards in the field governed by this Act and regulations issued pursuant thereto, and other regulations in the field of peaceful uses of nuclear energy.

The most important regulation defining management systems is the *Rules on Radiation and Nuclear Safety Factors*. Chapter 5 (Integrated Management System) with Articles 53 to 76 of the Rules is dedicated to the requirements of the process for an IMS and transposes the requirements of the IAEA safety standard GSR Part 2 “Leadership and Management for Safety” as well as all the management system provisions from the latest WENRA Safety Reference Levels.

13.3 The Krško NPP Quality Assurance System

The Krško NPP integrated management system brings together in a coherent manner all the requirements for managing the organisation. The main aim of the management system is achieving and improving safety with planned and systematic actions necessary to provide adequate confidence that all these requirements are satisfied, and ensuring that health, environmental, security, quality and economic requirements are not considered separately from the safety requirements. The policy is established by the Management Board’s Statement of Policy and Authority.

The Krško NPP Quality Assurance Program is established and systematically implemented in accordance with the Slovenian regulations and the U.S. regulation 10 CFR 50, Appendix B. The Quality Assurance Program defines the control activities which affect the quality and operational conditions of nuclear fuel, systems, structures and components, as well as the quality of related services in accordance with their importance to nuclear safety. The program involves observation of work processes and activities, an evaluation of their effectiveness, systematic review and monitoring of discrepancies and implementation of appropriate corrective actions. Quality related activities must be performed under controlled conditions, which include the fulfilment of all prerequisites for the performance of activities. The program also provides for and requires special inspections, procedures, tests, tools and personnel training for achieving desired quality. The Quality Assurance Program is regularly reviewed and updated by the management.

Since the beginning of the Krško NPP operation, the overall Quality Assurance Program described in the Quality Assurance Plan and its applicable programs and procedures have been in place to

ensure that all planned and systematic actions necessary to provide adequate confidence that an item or service will satisfy given quality requirements are in place. The overall requirements for quality as one of the major objectives for Krško NPP operation are also set forth in the USAR as a base document for operating license and the Quality Assurance Plan which incorporates various changes and improvements resulting from regulatory requirements (*Ionising Radiation Protection and Nuclear Safety Act*, *Rules on Radiation and Nuclear Safety Factors*, *Rules on Operational Safety of Radiation and Nuclear Facilities*), international standards (IAEA GSR Part 2, ISO 14001, ISO 17025, ISO 45001, ASME NQA-1, ANSI/ASME N45.2, etc.) and revised international guidelines (WANO, INPO, U.S. NRC etc.). The Quality Assurance Plan defines the expectations for the implementation of the following: internal plant audits, supplier audits, oversight of plant modifications, procedures review and approval, procurement documents control, evaluation and approval (qualification) of suppliers, observation of plant activities, review and approval of outage documents, oversight of equipment manufacturing and other activities.

The Quality Assurance Program applies to safety-related and seismic-related structures, systems and components, including their foundation and supports, and non-safety related structures, systems and components important to quality (augmented quality). The program is an intrinsic part of the overall management system aiming at continuous progress in nuclear safety, thus ensuring that the measures taken will not jeopardise nuclear safety.

13.4 The SNSA Review and Control Activities

The SNSA reviews and controls the activities regarding the licensee's quality assurance and management system program. This is performed through:

- Licensing related to the changes of USAR and in particular related to the changes of the Chapter 17 of USAR "Quality Assurance",
- Inspection process, and
- Periodic safety review.

The SNSA annual inspection plan provides at least one inspection per year dedicated to the licensee's management system. Additionally, reactive inspections of the management system can also be performed in a case of deficiencies of the licensee's management system found during any other inspection. The inspection oversight of the licensee's management system is performed in three steps:

- Review and assessment if the management documentation is in line with the requirements of legislation,
- Review and assessment if the implementation of the management system is in line with the management documentation,
- Appropriate enforcement actions in the event of deficiencies.

The SNSA regularly performs inspections of the Krško NPP Management System. In the reporting period there were two inspections focused on the human and organisational factor.

According to the *Rules on Operational Safety of Radiation and Nuclear Facilities*, the management system is reviewed as a part of the PSR of a nuclear facility. In 2022, the SNSA reviewed the Safety Factor Organisation and the Management and Safety Factor Safety Culture during the third PSR.

Summary statement for Article 13

Slovenia is in compliance with the obligations of Article 13 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

The biggest change in the reporting period was the adoption of the *Rules on Radiation and Nuclear Safety Factors* in 2024, which now include everything related to quality assurance, according to IAEA GSR Part 2 and WENRA Safety Reference Levels.

Future Focus

In the next reporting period, the SNSA will focus on conducting an inspection to verify the compliance of the Krško NPP IMS according to the new *Rules on Radiation and Nuclear Safety Factors* and on conducting an inspection on safety culture at the Krško NPP.

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

14.1.1 Regulatory requirements

The *Ionising Radiation Protection and Nuclear Safety Act* ensures that the licensee writes a SAR for a nuclear facility under construction, commissioning or operation, following termination of operation or under decommissioning. The Act incorporates the contents of the Euratom *Basic Safety Standards Directive.* In this way, it transfers the main provisions of the most up-to-date standards in the field of radiation safety into the national legislation.

Details of radiation and nuclear safety, as well as operational safety of radiation and nuclear facilities are regulated by secondary legislation. The Rules on Radiation and Nuclear Safety Factors, revised in 2024, include the revised WENRA Safety Reference Levels requirements from 2020, more detailed requirements are in line with the latest revisions of the IAEA safety standards (particularly SSR-2/1, SSR-2/2, SSR-3, GSR Part 4, GSR Part 5 and GSR Part 6) and the recommendations of the latest IAEA IRRS mission from 2022. It also gives an exhaustive list of topics which must be included in the SAR, such as the safety basis and project concepts, an analysis of the location, the facility technical characteristics, the programs for quality assurance, the evaluation of the protection of exposed workers against radiation, the programs for pre-operating tests and programs for trial operation, training programs, the assessment of the exposure of the population and the environment, a safety analysis, the anticipated discharge of radioactive substances into the environment and emergency planning.

The *Rules on Radiation and Nuclear Safety Factors* stipulate that the SAR must provide sufficient information about the facility allowing an independent assessment of the safety of the facility. Detailed information about the content of the SAR is laid down in the SNSA Practical Guidelines 1.04: “Content of the radiation or nuclear facility safety report”.

The assessment of the nuclear facility safety throughout its life is ensured through the provisions of the Rules on Operational Safety of Radiation and Nuclear Facilities, also revised in 2024; this revision harmonises the national legislation with the latest revision of key IAEA safety standards (especially SSR 2/2), new WENRA Safety Reference Levels of 2020 and the recommendations of the IAEA IRRS mission from 2022.

Concerning modifications, the *Ionising Radiation Protection and Nuclear Safety Act* requires that for each intended modification relating to the facility or to the management method used or to the operation of the facility, including maintenance work, inspection, testing or the introduction of a

technical, organisational or any other modification which affects or could indirectly affect the content of the SAR, the licensee must evaluate the modification in relation to its significance for radiation or nuclear safety. Modifications are classified into three categories with regard to their importance to radiation or nuclear safety:

- 1st category modifications, for which it is necessary to notify the SNSA; these modifications do not change the facility as described in the USAR or reference documentation,
- 2nd category modifications, for which the intention of their implementation must be reported to the SNSA; the licensee may commence the implementation of the proposed changes after the SNSA confirms in writing that it is not necessary to obtain approval for the changes,
- 3rd category modifications of significance for radiation or nuclear safety, for the implementation of which a license from the SNSA must be obtained; the licensee must attach a proposal for the amendments to the USAR and an expert assessment from an authorised expert for radiation and nuclear safety.

Recommendations for the licensee considering modifications are collected in the SNSA Practical Guidelines 1.02: “Modifications in Radiation or Nuclear Facilities”. This guideline is specifically aimed at the NPPs, but it can be also applied to other radiation and nuclear facilities. It provides instructions that can help the licensee to fulfil the requirements in the *Ionising Radiation Protection and Nuclear Safety Act* and the above-mentioned Rules with regard to modifications. Implementation of this guideline by the licensee significantly facilitates the decision-making process of the SNSA.

The *Ionising Radiation Protection and Nuclear Safety Act* requires that the licensee of a nuclear facility ensures regular, complete and systematic assessment and examination of radiation and nuclear safety of the facility by the PSR which has to be performed every ten years. The operator must draw up a PSR report and hand it over to the SNSA. An approved PSR report is a condition for the further operation of a facility. Detailed information about performing a PSR is laid down in the *Rules on Operational Safety of Radiation and Nuclear Facilities* and in the SNSA Practical Guidelines: PS 1.01 “Content and scope of the safety review of a radiation or nuclear facility”. The SNSA can require an extraordinary safety review if new and important evidence on the radiation or nuclear safety of a facility has come to light.

The *Ionising Radiation Protection and Nuclear Safety Act* states that the SNSA must ensure that international missions are carried out for the purposes of fulfilling the obligations of the Republic of Slovenia in international treaties in the field of peaceful uses of nuclear energy. If the mission is the inspection of nuclear or radiation facility, the operator must allow such inspection.

14.1.2 Implementation

At the Krško NPP, a comprehensive program is established for the design modification control, which defines the roles and responsibilities of the site organisational units involved in the plant modification process. For performing the plant modifications, guidance is provided to the NPP staff as well as to the contractors. The screening criteria for determining the need for safety evaluations, guidance for the implementation of these safety evaluations and the requirements for documentation review and approval are specified in the *Rules on Operational Safety of Radiation and Nuclear Facilities*.

The set of procedures covers all the aspects of design modifications, from request, prioritisation, safety screening, the preparation of the design package, review and the preparation of installation package, to the evaluation of impact, testing/commissioning requirements, documentation revision and modification handover.

The control of temporary modifications is performed by a specific procedure which requires safety screening and evaluation similarly to the one for permanent modifications.

The SNSA reviews in detail the submitted documentation and assesses it in accordance with a dedicated procedure. Such assessment also takes into account all the relevant operating experience and the significant new safety information. In accordance with the procedure, a review assessment report must be prepared as a basis for the final decision. The SNSA uses its own information system for archiving the modification data which is also useful for modification reviewers. In general, the information system stores the following operational experience (OE) data: on-site events, plant trips, modifications and corrective actions. Also, the Krško NPP PSA model, inspections database, SNSA decisions issued to licensees, interesting operation events from foreign NPPs, radiation sources database, contracts, open problems, the register of persons and organisations are accessible through the SNSA information system.

14.1.3 Current actions and upgrading measures

The SNSA approved the third PSR program in December 2020, while the actual PSR3 and its implementation plan were approved in December 2023. The program of PSR3 followed closely the national requirements from the *Rules on Operational Safety of Radiation and Nuclear Facilities* and the recommendations of IAEA SSG-25. There were 18 safety factors included in the program scope, since Safety Culture, Radioactive Waste and Spent Fuel and Radiation Protection were separate safety factors in comparison to IAEA SSG-25. Apart from that, a new safety factor (Physical Security) was introduced. The PSR3 was particularly important, since it was the last PSR before the planned long-term operation of the Krško NPP. Among others, the PSR3 also reviewed the majority of implementations of the Krško NPP's SUP, which included several post-Fukushima improvements.

The Slovenian post-Fukushima National Action Plan (NAcP) was prepared as a result of all the activities carried out in Slovenia in response to the 2011 nuclear accident in Fukushima Daiichi. These activities included, but were not limited to, the implementation of the European stress test process, the review and analysis of possible long-term improvements based on which the Krško NPP's SUP was prepared, the review of several reports and analyses regarding the Fukushima lessons learned, etc. However, the core of the NAcP and the post-Fukushima improvements is the Krško NPP's SUP, which was required, reviewed and approved by the SNSA. The details of the Krško NPP's SUP can be found in the Chapter 6.1 of this report.

14.2 Verification of Safety

14.2.1 Actions of the Licensee

In 2012, the SNSA issued a decision which allowed the Krško NPP to extend its life span beyond 2023 if certain conditions were met. Among the conditions to extend its operational life span the Krško NPP had to finalise the already planned safety upgrades, regularly implement periodic safety reviews in a ten-year cycle and maintain the Aging Management Program (AMP). The AMP was developed in accordance with the U.S. NRC regulations as stipulated by 10 CFR 50.54 (License Renewal Program) and meets all the requirements of NUREG-1801 – Generic Aging Lessons Learned (GALL). The objective of the AMP is to determine whether the aging processes are being managed effectively and if the required safety margins are maintained. The program connects more than 40 plant programs, such as In-Service Inspection Program, Containment Inspection Program, Boric Acid Inspection Program, Erosion and Corrosion Program, Steam Generators Program, Cable Aging Program, Reactor Vessel Irradiation Surveillance Program and others. In 2017, Slovenia prepared the Technical Report within the First TPR on Aging Management under the 2014 amended *Nuclear Safety Directive*. The report covered the aging management of electrical cables, concealed pipework, the reactor pressure vessel and the

concrete shield building in the Krško NPP. After a review of all the technical reports, Slovenia received from the ENSREG one good practice, four good performances, five areas for improvement and four overall challenges applicable for all countries. These provide input for the national action plan that defined the scope and time frame of the necessary improvements and actions to be implemented, which were identified during the TPR process. The SNSA defined nine actions in the national TPR action plan from the areas of electrical cables, concealed pipework, reactor pressure vessel, concrete containment structure and general AMP of the Krško NPP, and also conducted several topical inspections in the mentioned areas. All actions from the national TPR action plan were successfully completed and the final report was sent to ENSREG in 2023.

The In-Service Inspection (ISI) program is carried out by the plant's specialists and subcontractors. The program is in compliance with the U.S. NRC regulatory policy 10 CFR 50.55a and ASME Code XI, the components subject to examination are Class 1, 2 and 3 pressure retaining components and their integral attachments. The U.S. NRC Regulatory Guides are applied here as well, which may require additional examination when the component part is not covered by the ASME Section XI. The ISI program employs the examination techniques as described in ASME Section XI and ASME Section V, such as the visual examination method, the surface examination method including magnetic particles, liquid penetrant and eddy current, and the volumetric examination method including ultrasonic, radiographic, eddy current and acoustic emission examinations. The inspection intervals last 10 years. The results of the ISIs are reviewed and evaluated after each outage. The procedure for the correction of deviations has been established.

The periodical verifications of the efficient connection of activities from different programs is required with regard to components failure, the trends of components and systems performance, the corrective actions prioritisation and the verifying of the status of long-term investment plan and maintenance activities.

The monitoring of the effectiveness of maintenance is implemented by the Maintenance Rule program. This program follows closely the U.S. NRC document 10 CFR 50.65 and states that the licensee must monitor the performance or condition of SSC against licensee-established goals, in a manner sufficient to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions. Since 2001, the Maintenance Rule Expert Panel quarterly evaluates and reports on the performance or condition of structures, systems and components. The Maintenance Rule scoping, performance criteria and implementation are performed according to the updated procedures. The Krško NPP also has a set of procedures that cover the support of PSA to online maintenance program, PSA support to online modification and corrective maintenance activities as well as the evaluation procedure for outages.

With the purpose of establishing and maintaining evidence that SSCs will perform their function under normal and accidental environment conditions, the Environmental Qualification Program (EQ) is being developed together with appropriate procedures. In accordance with U.S. NRC requirements from 10 CFR 50.49 and IEEE 323-1974 standard, the EQ program includes safety related and non-safety related (that is important to safety) electrical equipment located in harsh environmental conditions. An additional scope of EQ (the so-called Equipment Survivability requirements) was added into the EQ program in 2018 in accordance with WENRA Safety Reference Levels for Existing Reactors and the IAEA SSR-2/1.

Slovenia is also taking part in the second TPR on fire protection, for which ENSREG approved the technical specifications in 2022. Detailed information on this topic is provided in Chapter 6.2 of this report.

14.2.2 Regulatory Surveillance

The SNSA carries out its surveillance responsibilities with a combination of tasks, e.g. inspections, review of documents, approval of modifications and regular monitoring and evaluation of the NPP's performance. During a refuelling outage, the TSOs are engaged to inspect and evaluate selected activities of plant maintenance and testing that are important for safety, i.e. equipment inspection and surveillance tests, execution of plant modifications, and changing of fuel. These activities are selected and approved by the NPP, TSOs and SNSA several months before the planned outage. Members of TSOs are present daily in the NPP during outages and conduct either technical or administrative inspections and/or surveillance in situ. TSOs report once a week to the representatives of the NPP and SNSA about their work and potential findings. They are contracted for the duration of the outage but are also obliged to issue a Collective Expert Assessment of the Outage and Fuel Change in the Krško NPP in 45 days after the outage (according to the *Rules on Operational Safety of Radiation and Nuclear Facilities*). Before a reactor becomes critical after an outage, the NPP must obtain the so-called Summary Report of Authorised Organisations for Resumed Criticality. This statement is also provided by the TSOs and is based on evaluations of the activities from nuclear and radiological safety point of view. Apart from that, the TSOs also provide the second Summary Report that the NPP can operate safely after the outage based on the above-mentioned evaluation.

The SNSA does not have resident inspectors on site. Inspectors are based at their headquarters in Ljubljana approximately 100 km from the plant and have more than 70 inspection days yearly at the Krško NPP site during non-outage years. Furthermore, the inspectors are present every day at the NPP during the outages.

During the plant outages, the inspections of the plant staff and subcontractors' work are performed more frequently. As a result of the supervision of the plant outage, the SNSA prepares a report called "Krško NPP Outage Analysis", which includes a list of planned SNSA activities aimed to improve outage activities or to eliminate the deficiencies found at the Krško NPP during the outage.

The SNSA also carries out its surveillance responsibilities through the systems of safety performance indicators, the operational experience and event analyses, as described in Chapter 10.3 of this report.

The SNSA has developed its own system for tracking, screening and evaluating operational experience of the nuclear installations. SNSA staff regularly tracks operating experiences throughout the world and screens them for applicability in Slovenian nuclear facilities. The operating experiences which pass the screening are thoroughly evaluated and also the recent operational events in these facilities are taken into account. If the analysis shows that the lessons learned are also applicable for Slovenian licensees, then more information is gathered to carry out an evaluation, and appropriate corrective actions are considered. Considering the foreign operating experience, a few minor modifications of some of the Krško NPP's procedures were implemented, as well as some major corrective actions and modifications were carried out at the Krško NPP in recent years, such as the installation of Permanent Magnetic Sludge Removal Structure in main condensers, application of Film Form Amine for secondary systems surface area protection, Mechanical Stress Improvement Process (MSIP) applied to the reactor vessel (hot leg and cold leg) with the safety injection nozzles to prevent and mitigate primary water stress corrosion cracking (PWSCC) at the nozzle to safe end welds, and the recalculation of Loss of Coolant Accident doses for actual unfiltered in-leakage.

The Slovenian licensees must submit a report to the SNSA if a situation important to safety occurs, according to the *Rules on Operational Safety of Radiation and Nuclear Facilities*. Such a report must include a brief description of the event, description of the state of SSCs before the event,

overview of relevant domestic and foreign operating experience, timing of the event, deviations from the expected response or measure, the PSA of the event, the analysis of contributing, direct and root causes, implemented and planned measures with their time scale and potential evaluation, and the classification of the event according to the international nuclear and radiation event scale. In parallel, the SNSA has developed an internal system for event analyses. It serves for the identification of shortcomings in the NPP operation and for the identification of priority areas of the SNSA operation oversight. In this way, it enables to independently evaluate the analyses and corrective actions taken by the licensee. SNSA can therefore determine priority areas of increased surveillance over the nuclear facility. Apart from that, the system helps the SNSA to decide on potential targeted inspections that can in turn pose additional requirements to the licensee in order to manage the events in question and their potential consequences.

In October 2021, an IAEA pre-SALTO mission took place at the Krško NPP. The mission was expected primarily to verify the quality and adequacy of the aging management program with subject programs and procedures of the Krško NPP, since these are key factors for safe long-term operation. Apart from that, a SALTO mission is scheduled for the Krško NPP in May 2025. Further information on the pre-SALTO mission and the forthcoming SALTO mission can be found in Chapter 6.4 of this report.

Summary statement for Article 14

Slovenia is in compliance with the obligations of Article 14 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

During the reporting period, Slovenia has accomplished the following:

- New revisions of the *Rules on Radiation and Nuclear Safety Factors* and *Rules on Operational Safety of Radiation and Nuclear Facilities*, harmonised with the latest revisions of key IAEA standards, new WENRA Safety Reference Levels 2020 and the recommendations of the IAEA IRRS mission from 2022,
- Completion of major safety upgrades from the Krško NPP's SUP,
- Completion and approval of the third PSR and its action plan for the Krško NPP,
- Completion of the national action plan for the first TPR on aging,
- Active participation in second TPR on fire protection,
- Invitation for the IAEA SALTO mission at the Krško NPP.

Future Focus

The main future focus is assessment and verification of safety during the long-term operation of the Krško NPP – until 2043.

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 Dose Limits and Control of Occupational Exposure

The radiation exposure of workers and the public is limited according to the *Decree on Dose Limits, Reference Levels and Radioactive Contamination*. The regulatory approved effective dose constraint is set to 15 mSv per year for the Krško NPP workers of category A. The annual limit for equivalent dose for eye lenses is set to 20 mSv for Krško NPP.

Individual exposures are measured monthly with passive optically stimulated luminescent dosimeters and daily with electronic alarm dosimeters. The Krško NPP has its own accredited methods of its dosimetry service, approved by the SRPA. The exposure data for plant workers also include neutron doses and internal exposures derived from the whole-body counter measurements. All doses are recorded in the national exposure register, maintained by SRPA. The dose constraint for internal dose is set to 0.2 mSv per year. Table 3 shows personal dosimetry data for the reporting period.

Table 3: Personal dosimetry data for 2022-2024 for Krško NPP workers and contractors

2022			
	No. of persons	Average dose (mSv)	Max. measured dose (mSv)
NPP personnel	436	0.42	8.69
Outside workers	937	1.02	14.03
Total	**1373**	**0.83**	
2023			
	No. of persons	Average dose (mSv)	Max. measured dose (mSv)
NPP personnel	440	0.37	8.03
Outside workers	561	0.59	8.00
Total	**1001**	**0.49**	
2024			
	No. of persons	Average dose (mSv)	Max. measured dose (mSv)
NPP personnel	453	0.44	7.06
Outside workers	873	0.46	7.94
Total	**1326**	**0.45**	

Radiation protection at the Krško NPP is organised and implemented by the Radiation Protection Unit (RPU). There are fifteen well-educated and trained staff members and three others who are currently undergoing training. Five of the RPU staff hold university degrees and the others are technicians who perform tasks based on internal written procedures. The head of the RPU is a qualified expert in radiation protection.

Figure 4 shows the 3-year rolling average of collective doses in the Krško NPP in the period from 2000 to 2024. After 2000, when both steam generators were replaced, the collective doses reached new lower expected values for the Krško NPP. Then the reactor vessel head replacement

was performed in 2012 with new gamma and neutron shielding. In the following year, resistance temperature detectors by-pass piping was removed and these also have beneficial effect for the future maintenance activities. During the outages in 2013 and 2015, the radiation protection staff carefully controlled the additional beta/gamma and alpha contamination due to some fuel failures caused by the rod fretting. No cases were detected of the effective dose exceeding 15 mSv or the internal dose over 0.2 mSv per year. After the work on the reactor baffle up-flow conversion in the 2015 outage the problem of fuel failures has been eliminated.

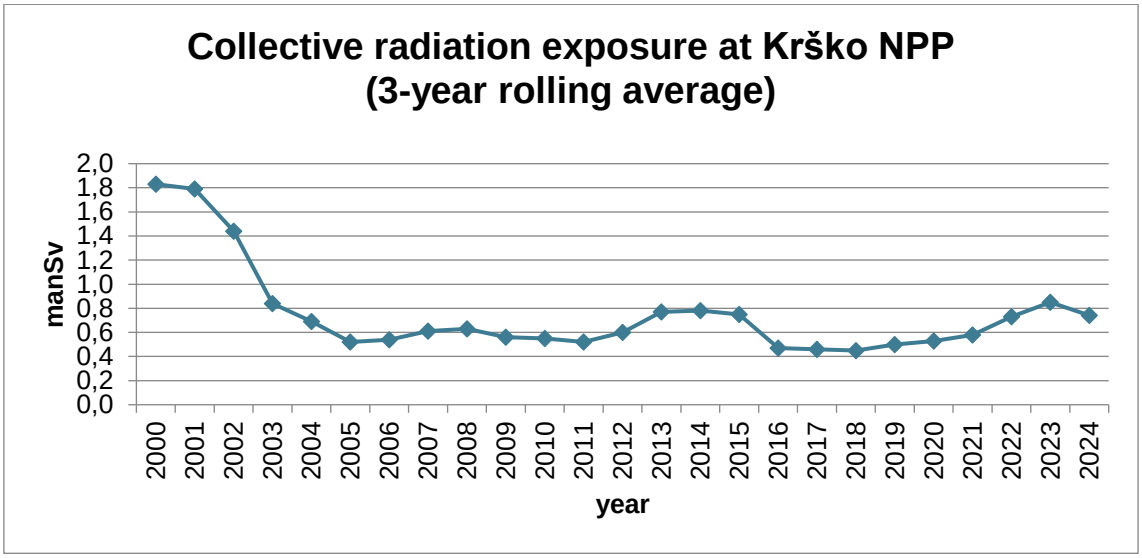

Figure 3: Collective radiation exposure at the Krško NPP – 3-year rolling average since 2000

Between 2016 and 2018, the construction of the new waste manipulation building took place to improve the working conditions for the staff and to optimise the contaminated water management. The preparations required additional radioactive waste handling and drums transportation.

The slight increase in the collective dose between 2019 and 2021 was mostly due to works connected to radioactive waste management, as well as some major modifications, e.g. Auxiliary Residual Heat Removal system.

The increase in collective dose in the reporting period (2022–2024) is a result of demanding projects, among which are MSIP and SFDS (transportation of the spent fuel from the pool to the new facility) are the most important, and also the forced shutdown in 2023 (more about the event in Chapter 6.5 of this report).

15.2 Radioactive Discharges and Environmental Monitoring

The authorised dose limit for the members of the reference group due to radioactive discharges from the Krško NPP during its normal operation was set to 50 μSv per year. This figure takes into account all the pathways of radionuclide transfer. Additionally, the limit of 200 μSv per year was set for external radiation from the plant facilities, controlled at the fence. Additional operative controls are set by the limitations of gaseous and liquid discharges (see Table 4). The annual limits of discharged activities into the environment are stipulated by the operation license of the Krško NPP. The limits of annual liquid releases are given for the fission and activation products and separately for ^{3}H. Besides the annual limits, the quarterly limit for fission and activation

products (without ^{3}H) is also set. The annual activity limits for releases of radioiodine isotopes (in ^{131}I equivalent) and aerosols are also set. There is no limit for each nuclide or group of nuclides, since they are accounted for through their contribution to the overall dose. Due to historical reasons, some are still separately reported (e.g. ^{3}H and ^{14}C), in order to follow long term trends.

The environmental radioactivity monitoring of the nuclear installation is defined in the *Rules on the Monitoring of Radioactivity* and prescribed in detail within the Krško NPP Radioactive Effluent Technical Specifications. The program itself constantly evolves and is adapted to the modifications and follows the scientific and technical state of the art. From 2022, the most notable changes were additions of neutron environmental dosimeters due to dry storage facility, as well as more emphasis on ^{14}C measurements.

The SNSA annually reports to the European Commission on the radioactive releases from nuclear installations according to the requirements of Article 37 of the *Euratom Treaty*.

The off-site radiological monitoring reports for 2024 showed that the conservatively estimated effective dose received by the members of the general public as a result of the Krško NPP emissions amounts to a value of less than 0.08 µSv per year due to atmospheric and liquid discharges. The value represents 0.16% of the authorised effective dose limit (50 µSv), which is the sum of the contributions from all exposure pathways to the member of the public at 500 m distance from the reactor or beyond. Therefore, the estimated sum of all radiation contributions from the NPP to the member of the public in its vicinity is only about 0.002% of the characteristic unavoidable natural background. There is no substantial change regarding the previous years and the variations are a consequence of the 18 months fuel cycle.

Table 4: Activities of radioactive discharges from the Krško NPP in the period 2022–2024 and the corresponding limits

LIQUID EFFLUENTS		**2022**	**2023**	**2024**
Fission and activation products (Limit: 100 GBq)	Released activity	19.0 MBq	21.3 MBq	25.4 MBq
	% of the limiting value	**0.019%**	**0.021%**	**0.025%**
Tritium (^{3}H) (Limit: 45 TBq)	Released activity	24.3 TBq	11.7 TBq	5.73 TBq
	% of the limiting value	**54.0 %**	**26.0 %**	**12.7 %**
GASEOUS EFFLUENTS		**2019**	**2020**	**2021**
Fission and activation gases (Limit: 50 µSv)	Dose to the public	0.015 µSv	0.012 µSv	0.049 µSv
	% of the limiting value	**0.03%**	**0.024%**	**0.1%**
Iodines (^{131}I and others) (Limit: 18,5 GBq (eq. ^{131}I))	Released activity	2.3 MBq	10 MBq	6.9 MBq
	% of the limiting value	**0.0033%**	**0.044%**	**0.0035%**
Aerosols (Co, Cs, …) (Limit: 18.5 GBq (eq. ^{131}I))	Released activity	0.36 MBq	14.6 MBq	0.39 MBq
	% of the limiting value	**0.0019%**	**0.079%**	**0.0021%**
Tritium (^{3}H) (No limit)	Released activity	5.0 TBq	7.4 TBq	9.1 TBq
Carbon (^{14}C) (No limit)	Released activity	87 GBq	130 GBq	43 GBq

15.3 Implementation of the ALARA optimisation principle

Every radiation practice must cause exposure only to the level which is as low as reasonably achievable (ALARA), taking into account the economic and social factors (the principle of radiation protection optimisation). The radiation protection in the Krško NPP is effectuated by the RPU, which is separated from other organisation units. The trained engineers and technicians in the unit perform the tasks based on the internal written procedures.

In addition, there is the regulatory requirement that an independent qualified expert must prepare an overall radiation survey at the NPP site and give assessment twice a year regarding the activities of the RPU. In the cases of ALARA plans (e.g. during outages or during some other demanding works), when the planned collective dose is higher than 100 man-mSv or when the planned individual dose is higher than 10 mSv, the qualified expert has to control such works.

The optimisation of radiation exposure covers aspects such as the nature of the job, the configuration of the workplace, suitable tools, training, preventive measures against radiation and other risks at the workplace.

The collective doses in the Krško NPP shown in the Figure 3 were optimised by the ALARA planning.

15.4 Regulatory Control Activities

The Krško NPP also has some additional licenses, other than those covered by the operating license. In 2004 the SNSA issued the licenses for internal industrial radiography, for an X-ray device used in the internal control of received goods, and for radioactive sources for the calibration of radiation measurement equipment. These radiation sources are regularly inspected by the SNSA.

The Krško NPP also applied for authorisation to carry out measurements of effluents, as stipulated in the *Rules on The Monitoring of Radioactivity*. The SNSA granted authorisation based on independent ISO 17025 accreditation for several measurement techniques.

The site inspections of the NPP concerning radiation protection are mostly oriented to the control of the workers' exposure. The inspections are carried out by the SRPA. They cover the external and internal exposures, the maximum individual exposures, the overview of working procedures, the classification of workers in the categories A and B, the medical surveillances of workers, the organisational scheme during the outage, etc. In addition to the exposure of internal and outside workers during the operation period and during outages, the inspections also include a review of the ALARA program.

SNSA inspectors ensure oversight of the Krško NPP environmental monitoring program, as well as conduct joint inspections with SRPA inspectors.

Extensive inspections were also related to the control of solid materials, which were released from the NPP site. The usage of clearance levels was inspected, as well as the process of decontamination at the site. The Krško NPP updated the clearance levels according to the legislation.

Summary statement for Article 15

Slovenia is in compliance with the obligations of Article 15 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

There are no significant changes since the last reporting period. Results of monitoring programs show steady results, without significant changes and the same applies to doses received by the workers and the public.

Future Focus

Due to changes in the aquatic basin following the construction of the Brežice hydro power plant, a new model was developed to calculate exposures of the population due to liquid discharges. The focus will be on the verification of the modelling results which would allow the inclusion of this model in yearly dose assessments for regulatory purposes.

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 Emergency Plans and Programs

16.1.1 Regulatory framework

Emergency preparedness and response arrangement in Slovenia is regulated by the *Act on Protection Against Natural and Other Disasters*. According to this Act, protection against natural and other disasters is organised and implemented as a unified system at facility, local, regional and national levels.

During a nuclear or radiological emergency, all competent organisations and authorities in Slovenia must take appropriate actions according to their pre-prepared response instructions or emergency plans. The response of organisations and competent authorities to an emergency is determined by the (national) Emergency Response Plan for Nuclear and Radiological Accidents, which is prepared by the ACPDR in cooperation with ministries, state authorities and professional organisations. Plans are also prepared at regional, local and facility levels.

In accordance with the requirements of the *Ionising Radiation Protection and Nuclear Safety Act*, operators of radiation activities that are not obliged to prepare a protection and rescue plan must prepare instructions for a response in the event of an emergency. These response instructions are based on expected events and scenarios.

Slovenia has two regulatory bodies overseeing on-site emergency preparedness and response. The first is the SNSA and another one is SRPA. Additionally, off-site emergency preparedness and response falls under the ACPDR, under Ministry of Defence. Additionally, the Ministry of Interior oversees the physical security plan.

16.1.2 Emergency plans in Slovenia

The *Decree on the Content and Elaboration of Protection and Rescue Plans* (i.e. emergency response plans) sets the requirements for the content of the emergency response plans on all levels, the procedure of adoption of plans, including provisions on public participation and coordination with stakeholders, maintaining and revising of plans and publicity of plans.

The basic emergency response plan for nuclear and radiological accidents is the national plan. It is prepared by the ACPDR in cooperation with ministries and other government bodies and professional organisations. All emergency response plans for nuclear and radiological accidents and activities at all levels of planning (at the regional, local, organisational level) must comply with the national plan.

The last revision of the National Nuclear or Radiological Emergency Plan was adopted by the Government in 2023. The new revision is considering the EU Basic Safety Standards Directive and the IAEA GSR Part 7 requirements. It provides an overall umbrella for response and for preparedness to nuclear and radiological accidents. This plan is one of ten national plans issued by the Government and defines the responsibilities of all involved stakeholders (state bodies, civil protection, medicine, fire services, police, NPP, etc.). The ACPDR, under the Ministry of Defence, prepares it in cooperation with ministries and other organisations. The National Plan sets out the concept of the response to such emergencies and regulates the tasks to be carried out at the national level. The aim of the Plan is to reduce the consequences of accidents. The Plan was prepared for:

- A nuclear accident at the Krško NPP involving a major release of radioactive materials into the environment,
- A nuclear accident abroad with significant releases of radioactive material, which could affect Slovenia in the event of certain weather conditions,
- A radiological accident in the event of an uncontrolled return of a satellite with radioactive material. The scope of the emergency response activities depends on the size of the affected area and the population density in it.

The structure of the Plan covers:
- the scope of planning,
- response capabilities needed for the implementation of the plan,
- monitoring, notification and warning,
- activation of response capabilities,
- responsibilities and tasks of managing authorities,
- personal and mutual protection.

In the event of a nuclear or radiological accident, the Government of the Republic of Slovenia is responsible for decision making on protective actions. Operational management in response phase is a task of Civil Protection authorities (CP commanders supported by CP Staff) at different planning levels. The decision-making process is the same for all hazards.

The SNSA is the competent authority in Slovenia on radiation matters during an emergency. The SNSA emergency response team provides advice on protective actions to the national Civil Protection Commander. SRPA staff are members of our emergency team as well.

The first information of a potential incident at the Krško NPP is sent by the NPP to the Regional Notification Centre in Brežice. The Regional Notification Centre then informs the National Notification Centre of the Republic of Slovenia. The Krško NPP sends notification of an incident using a special form via the inter-ministerial communications system (KID) or by fax. The first notification must be confirmed by the recipient by telephone or by other means of communication.

The NPP is obliged to notify off-site authorities (the Regional and National Notification Centre and the SNSA) within 15 minutes of emergency declaration and after any other significant changes. They must report every 30 minutes during an emergency and provide plant parameters via an online system. They also must provide recommendations for protective actions.

16.1.3 Emergency preparedness system by the licence holders

According to the *Ionising Radiation Protection and Nuclear Safety Act,* the operator's emergency response plan is a part of the SAR, which is the principal licensing document for any nuclear facility. The operator must be capable of classifying accidents, assessing the consequences of the event and proposing countermeasures. In the operator's emergency plan, the intervention measures must be planned based upon the emergency class declared. Based on the classification of possible emergencies, the operator must ensure the technical and other

conditions, for example a skilled team for the implementation of radiological measurements to provide during an emergency the assessment of consequences of the emergency and to determine the extent of the necessary protective measures. The operator must provide all the available requested information to the emergency planners. The operator must maintain emergency preparedness and provide responses as stipulated by the on-site emergency plan. The emergency response plans must be prepared with the objective to avoid deterministic effects and reduce the risk of stochastic effects, taking account of the general principles of radiation protection and the reference levels as set by in the legislation.

The emergency classification for Krško NPP is based on emergency action levels. For Krško NPP there are four emergency levels:

- Level 0 – Unusual Event: potential degradation of safety; no off-site response is expected. In such event, which is not addressed in the Plan, the SNSA is notified, which in turn informs the public and the international expert community.
- Level 1 – Alert: declared by Krško NPP in the event of developments which impair or may impair safety at the nuclear power plant. While a minor release of radioactive materials is possible, no serious risk to the environment is anticipated.
- Level 2 – Site Emergency: declared by Krško NPP in the event or developments which result or may result in a major failure of the power plant's safety functions. There is a possibility that radioactive material may be released, on a scale that requires protective measures to be taken at the NPP, including evacuation of its area and the area under its direct control (500 m).
- Level 3 – General Emergency: declared by Krško NPP when core damage or meltdown is imminent or has occurred, along with potential damage to the containment vessel. There is a high probability that radioactive materials may be or have already been released into the environment to an extent that requires protective actions outside the NPP area.

The protection strategy is based on a 100 mSv reference level. For an emergency at the NPP, protective actions are predefined and based on emergency classification. Evacuation of a 3 km zone is ordered when a general emergency is declared, which is followed by the evacuation of a 10 km zone. Evacuation is accompanied by Iodine Thyroid Blocking (ITB), if needed. In the 25 km zone, protective actions are based on field measurements and dose assessments.

Krško NPP regularly carries out activities for planning and maintaining emergency preparedness (EP). This includes revisions of EP references (threat assessment, notification list, EIPs, SAMGs, EDMGs), completions of on-site emergency response organisation, realisation of emergency response training, maintenance of emergency response facilities and equipment, communications and data systems testing, testing the responsiveness of intervention personnel, reporting. maintaining EP performance indicators, coordination activities within internal organisation, with external support organisations, with off-site emergency planners and task performers and with off-site authorities. To ensure efficient and high-quality implementation of the above EP activities, the Krško NPP ensures comprehensive integration of emergency response program into the plant's work process. Important element is also regular coordination and cooperation between the NPP and the off-site EP planners.

In 2022, the Krško NPP put into operation a new Technical Support Centre (TSC) and new Operation Support Centre (OSC). The TSC is located in a bunker building next to the Emergency Control Room (ECR). The OSC is located in a standalone building outside the plant's technological area. The NPP also provides an Emergency Off-Site Facility (EOF) located in premises of the ACPDR in Ljubljana, as well as a Near-Site Alternate Location for the TSC and OSC. In 2024 , the hardware and software were updated and cyber security was improved, and new communication systems (internal radio system, faxes, satellite telephone, display boards)

were installed in the plant's emergency response facilities. The establishment of the program for regular testing of OSC's systems and equipment is in progress.

In 2022, emergency planning of the Krško NPP was the subject of the Third SPR. The review revealed that significant improvements had been achieved in the area of emergency preparedness between the second and third PSR, including the modifications and acquisitions of the equipment with the scope of the SUP; construction of new on-site emergency response centres (technical support centre and operational support centre); actions performed as a response to the issues identified in the second PSR, WANO and IAEA OSART and EPREV reviews; in response to the deficiencies identified during the exercises; and the upgrade of the human resources dedicated exclusively to emergency planning. The reviews did not identify any major safety concerns. It has been shown that Krško NPP has adequate plans, staff, facilities and equipment for dealing with emergencies. The Organisation Arrangements in Krško NPP are coordinated with local and national systems and are regularly exercised.

In October 2024, the Krško NPP's emergency preparedness was subject to a review by the international WANO Peer Mission. The review confirmed the adequate preparedness of Krško NPP for emergencies and severe accidents management.

16.1.4 Trainings and exercises

National and international exercises are organised in accordance with long term and annual plans. The organisations can hold exercises independently of the Exercise Plan in the Defence System and System for Protection against Natural and Other Disasters.

On the national level, in November 2022, the ACPDR organised the national table-top exercise "Nuclear Accident 2022". The exercise assessed the preparedness to respond to an accident at the Krško NPP and the implementation of protective measures with emphasis on evacuation in accordance with the emergency response plans at various levels of planning. The participants, 50 in total, welcomed the performance of such exercises. They reported to have gained new experience on the course of a nuclear accident and better understanding of their individual roles and the roles of other institutions in the event of a nuclear accident at the Krško NPP. Several challenges of emergency response plans were also identified, such as the need to update the NPP's public information brochure with information relevant to vulnerable members of the public, the need to improve plans for traffic control of cordoned areas and the need to reconsider the current method of distribution of ITB tablets in case of an accident at Krško NPP or abroad.

As a member of the OECD/NEA, in March 2024 Slovenia took part in the sixth International Nuclear Emergency Exercise (INEX-6) and more than 15 organisations participated in the exercise. This exercise focused on the long-term recovery phase, one year after the emergency. This phase of an emergency has never been tested before on an international level. Slovenia actively participated in all four modules and tested recovery areas such as health effects, food safety, remediation and decontamination, and radioactive waste management. The overall evaluation in Slovenia showed a great success and positive feedback from the participants.

The Krško NPP has a long tradition in systematic training of its personnel for an emergency response. Besides the regular training, they conduct annual exercises run by their full scope simulator, which are jointly organised with the SNSA. The Emergency Response Training at the Krško NPP consists of classroom courses (22 different courses), drills (10 different drills) and full-scale exercises (normally 2 exercises per year). Training is based on Annual emergency response training plan.

The implementation range in the reporting period (2022–2024) of the annual training was an average 93%, with an average number of 3300 participants in all annual emergency response training activities. In November 2022, the Krško NPP cooperated in preparation of before mentioned national table-top exercise and also participated as player in exercise.

Exercises are run by a full scope simulator and include scenarios of design basis accidents, extensive damage conditions and severe accidents. Emergency response elements integrated and tested in exercises are based on eight-year plan. It consists of 70 elements: execute emergency and accident procedure, assign the highest priority to maintaining core cooling and containment integrity, interpret post-event data and indications given a sound knowledge of plant operation, safety systems and design basis, perform task associated with the installation and use of portable equipment during emergency conditions, determine expected plant conditions when essential plant status information is uncertain or unavailable, scope of unavailability of primary communication methods as well as methods for monitoring critical plant parameters and emergency response functions, plant control activation under severe accident, evacuation of control room (simulator) to emergency control room (simulator).

The preparation and execution of the exercise is carried out in accordance with the procedure "Exercises and Drills at Krško NPP". The exercise is prepared by exercise preparation team. Safe exercise performance is led by exercise leader and directed by exercise guides, who also act as exercise evaluators. Observers from the SNSA regularly monitor the exercise on-site. Each exercise is evaluated, and exercise report is issued. Identified deficiencies are eliminated and necessary corrective actions are realised within plant corrective actions program NPP's off-site support organisations, SNSA, national and local notification centre regularly participate in exercises.

Krško NPP conducted 2 exercises in 2022, 1 exercise in 2023 and 2 exercises in 2024. Findings and corrective actions from the 2022, 2023 and 2024 exercises relate to familiarity with new OSC, systems and equipment of new OSC, use of new internal radio communications, replacing faxes in NPP's emergency response centres, effective implementation of on-site intervention corrective actions during an emergency, coordination between TSC and OSC, guidance for the on-site initial response in case of control loss over the plant. Corrective actions from the exercises are realised or their realisation is in progress.

16.1.5 International arrangements

Slovenia is a party to the *Convention on Early Notification of a Nuclear Accident* and to the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*.

Slovenia has bilateral agreements with all neighbouring countries on notification and information exchange. Emergency preparedness is a regular item on the agenda at bilateral meetings and at the quadrilateral meetings of the Czech Republic, Hungary, Slovakia, Finland and Slovenia, which are held every year.

16.2 Information of the Public and Neighbouring States

Based on requirements of the *Ionising Radiation Protection and Nuclear Safety Act,* the operator of a radiation or nuclear facility must regularly inform the public of the important facts of/for the emergency response plans, the envisaged protection measures and how they shall be implemented. This information will be updated at regular intervals or in the event of major changes.

The Krško NPP prepared the information brochure entitled “What to Do in a Nuclear Emergency” which was delivered in hard copy to residents living within the 10 km urgent protective action planning zone. Information is also available online and in local newspaper. Updating of the brochure is underway and will include information regarding pre-distribution of ITB tablets in local pharmacies.

Notification of the IAEA (trough the USIE platform) and the EU (through the WebECURIE platform) is the responsibility of the SNSA, which, in line with the bilateral agreements on early notification, also informs the neighbouring countries.

In the event of an accident, the Ministry of Foreign and European Affairs informs the diplomatic missions of other countries in Slovenia, Slovenian diplomatic missions abroad, and international organisations which, in line with the adopted international commitments, are not informed directly by the SNSA and the ACPDR.

Summary statement for Article 16

Slovenia is in compliance with the obligations of Article 16 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

In 2023, the Slovenian government adopted the fourth version of the national Nuclear and Radiological Emergency Protection and Rescue Plan, which is the fundamental planning document addressing scenarios requiring a national-level response.

In terms of conducting national and international exercises, two recent exercises should be noted. First, the national table-top exercise "Nuclear Accident 2022", where Slovenia evaluated the country’s response capabilities to a nuclear accident at the Krško NPP. This exercise led to valuable feedback, prompting updates to emergency plans and response procedures. Second, Slovenia participated in the INEX-6 international exercise in 2024, which focused on long-term recovery phase of nuclear emergency, providing further insight into Slovenian recovery and resilience efforts.

Future Focus

The future focus for the SNSA in emergency preparedness and response will concentrate on several key areas. First, strengthening the staffing, particularly in the fields of IT and Systematic Approach to Training (SAT), will be a priority. Ensuring the ongoing competence of SNSA personnel in critical areas such as dose assessment, nuclear accident analysis, and the evaluation of cyber-attacks that could trigger a nuclear or radiological emergency will also be in focus. Additionally, the SNSA will continue to enhance practical arrangements for a harmonised response to nuclear emergencies, with particular emphasis on strengthening cross-border cooperation with neighbouring countries, especially Croatia. The development of an integrated

EPR framework will be a key focus, where identified gaps in regional emergency response assistance, particularly through RANET, will be addressed.

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.

17.1 Evaluation of Site-Related Factors

The nuclear facility in Slovenia is sited through the national spatial planning process. The process is led by the Ministry for Natural Resources and Spatial Planning (MNRSP). In parallel a strategic environmental assessment, in national and transboundary context, is carried out which is led by the Ministry of the Environment, Climate and Energy (MECE). Both these processes include the public and several governmental stakeholders as opinion givers, among which is also the SNSA.

The licensing process of siting a nuclear facility is stipulated by the *Spatial Management Act*, the *Environmental Protection Act* and the *Ionising Radiation Protection and Nuclear Safety Act*.

The national spatial planning process begins with a national spatial plan initiative of the investor delivered to the MECE which then as an initiator presents the application to the MNRSP. Members of the project team formed by different spatial planning authorities should provide all necessary data from their areas of competence related to the spatial plan in preparation. One of those authorities is the SNSA which gives guidelines (in the beginning of the process) and an opinion (as a final stage of the process) regarding nuclear and radiation safety.

Article 95 (the siting of a nuclear facility) of the *Ionising Radiation Protection and Nuclear Safety Act* determines that the selection of a site for the location of a nuclear facility shall be based on an Environmental Report, of which a special part will be dedicated to the nuclear and radiation safety. This part of the Environmental Report is used to assess all the factors at the site of the future nuclear facility which may affect the nuclear safety of the facility during its active life and the effects of the facility operation on the population and the environment, and it shall include:

- field investigations and analysis of characteristics of the site area, e.g. geological, seismological, seismotectonical, geotechnical, hydro-geological and meteorological investigations, the extreme impacts of human activities in the site area, demographic and socio-economic characteristics, as well as the use of terrain and water in the site area including especially protected areas, the areas of special application and ecologically sensitive zones;
- the assessment of radiological impact of the nuclear facility on humans and environment;
- the feasibility study of the emergency plan; and
- a proposal of design bases for the nuclear facility and safety measures, that result from the analysis of characteristics of the site area and selected external design basis events.

The detailed content and scope of the part of the Environmental Report dedicated to nuclear and radiation safety are determined by the SNSA at the beginning of the siting process.

The *Rules on Radiation and Nuclear Safety Factors* stipulate that the design bases must take into account, besides the internal initiating events, as a minimum, the following external natural hazards together with their relevant and still probable combinations:

- geological hazards,
- seismotectonic hazards,
- meteorological hazards,
- hydrological hazards,
- biological phenomena,
- external fires.

Besides the natural hazards, the design bases must also take into account man-made events, such as aircraft accidents and other transportation accidents, as well as the events in other industrial facilities in the vicinity or at the site, including other units on the site, which could cause fires, explosions or other hazards that could affect the power plant.

In addition to the documentation requested by the *Spatial Management Act* and the *Environmental Protection Act*, there is another document that needs to be provided for the SNSA to issue their opinion. According to the *Ionising Radiation Protection and Nuclear Safety Act* an expert opinion on the acceptability of the proposed construction from the point of view of radiation and nuclear safety needs to be provided.

The Environmental Report must provide sufficient information about acceptable impacts that the facility might have on the environment and members of the public. After the preparation of the Environmental Report, it is the subject to public hearing and the consultation with the neighbouring countries (cross-boundary impacts) and becomes a public document. The public hearing shall take at least 30 days. The competent ministries and organisations prepare their positions to the opinions and comments given by the public and the neighbouring states. Th final decision (agreement or disagreement on siting) must also take into account opinions given by local communities and other involved parties. When positive opinions of all competent ministries, municipalities and other organisations are given, the National Spatial Plan is adopted with a governmental decree. Together with the adoption of the plan, the design conditions for the nuclear facility are also issued.

17.2 Impact of the Installation on Individuals, Society and the Environment

As described in the previous chapter, the special part of the Environmental Report dedicated to nuclear and radiation safety also presents the assessment of radiological impact of the nuclear facility on population and the environment. This part must include the assessments of radioactive releases during normal operation and accident conditions, dispersion of the releases into the atmosphere and water (surface water and groundwater), land use and population distribution, as well as the evaluation of the effect of facility releases on the population.

The *Rules on Radiation and Nuclear Safety Factors* stipulate (in line with the WENRA SRLs and requirements for new designs) that the accidents with core melt, which would lead to early or large releases, would be practically eliminated, meaning that this kind of accidents is almost impossible by design for new builds. Yet for accidents that cannot be practically eliminated, solutions must be in place to assure that only limited protective measures in area and time are needed for the public (no permanent relocation, no need for emergency evacuation outside the immediate vicinity of the plant, limited sheltering, no long-term restrictions in food consumption).

17.3 Re-evaluation of Site-Related Factors

The *Ionising Radiation Protection and Nuclear Safety Act* as well as the *Rules on Radiation and Nuclear Safety Factors* and the *Rules on Operational Safety of Radiation and Nuclear Facilities* stipulate that the plant must perform a PSR every 10 years, which must, besides re-evaluating design against newest standards and assessing the overall state of the power plant, also re-evaluate the natural hazards on site taking into account the latest site related data and the state-of-the-art methodologies.

One of most important results of the first PSR for the Krško NPP in 2003 was the re-evaluation of seismic and flooding hazards, which resulted in several large improvements, such as installing the third safety related diesel generator, upgrading the flood protection dikes, etc. Some other hazards (severe winds, aircraft accidents) were reassessed and recommendation for improvements were given.

The review of the natural hazards was an important part of the second PSR of the Krško NPP in 2013, which again suggested some hazard re-evaluations (heavy rainfalls, floods and droughts, lighting, aircraft accidents, etc.) taking into account the latest site related data.

The third PSR of the Krško NPP was finalised in 2023, at the transition of the Krško NPP to long-term operation. A special emphasis was therefore devoted to inspections of plant conditions, the preparation for extending plant operation beyond the original lifetime of 40 years, as well as adherence to modern requirements, standards, and good practices for long-term operation. New requirements were introduced in the period since the second PSR, such as WENRA reference levels on natural hazards, that were also evaluated during PSR3.

Impacts of the Krško NPP to the population and environment were also recently assessed during Environmental Impact Assessment for the lifetime extension of the plant from 40 to 60 years. The process took place from 2021 to 2023, and it included the Slovenian public as well that of neighbouring and other countries (Croatia, Italy, Austria, Hungary and Germany), according to the *Espoo Convention* and the *Aarhus Convention*. The environmental consent to the Krško NPP for their lifetime extension until 2043 was issued by MECE in January 2023.

17.4 Consultation with Other Contracting Parties Likely to be Affected by the Installation

According to the *Spatial Management Act* and the *Environmental Protection Act* public involvement in the siting process is ensured through spatial conferences, public hearings, neighbouring countries consultation and the public availability of the documentation. It starts with the presentation of the National Spatial Plan and the Environmental Report to the general public. Consultations with the neighbouring and any other countries take into account the *Convention on Environmental Impact Assessment in a Transboundary Context* (informally called the *Espoo Convention*), that was ratified by Slovenia in 1998. This convention was used in the Environmental Impact Assessment for the lifetime extension of the Krško NPP from 40 to 60 years, with neighbouring and other countries (Croatia, Italy, Austria, Hungary and Germany) being involved in the process.

Slovenia has bilateral agreements with all neighbouring countries on the early exchange of information in the event of a radiological emergency. All bilateral agreements are listed in Appendix I of this report, under B.2.

Summary statement for Article 17

Slovenia is in compliance with the obligations of Article 17 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

The site-related factors of the Krško NPP were assessed during the Environmental Impact Assessment for the lifetime extension of the plant from 40 to 60 years, and also during the third PSR. Other than that, Slovenia has no significant changes to highlight under Article 17 during the reporting period.

Future Focus

The SNSA will endeavour to develop guidelines for the evaluation of site-related factors, especially in the light of the siting process for the new NPP.

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 (defence 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 dependable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

18.1 Implementation of Defence in Depth

The building license for a nuclear facility is issued by the Ministry of Natural Resources and Spatial Planning based on the *Building Act*. In the process of obtaining the building license, the SNSA gives its opinion for building (as stipulated in Article 97 of the *Ionising Radiation Protection and Nuclear Safety Act*). The submitted application for the SNSA's opinion must include relevant design documentation, like SAR, including relevant evaluations, the opinion of authorised expert for radiation and nuclear safety, the decommissioning program, and other documents. The contents of the design documentation and other conditions are prescribed by the *Rules on Radiation and Nuclear Safety Factors*.

The *Ionising Radiation Protection and Nuclear Safety Act* and the *Rules on Radiation and Nuclear Safety Factors* contain provisions for the Defence in Depth concept. According to the Rules, this concept is used as the basic criteria for designing a nuclear facility and especially for designing safety systems, systems for mitigating radioactive releases and fire protection systems. Also, the Rules stipulate that external hazards must be considered in the design bases of the plant and in the design extension conditions. As a minimum, the following external initiating events must be taken into account:

- Extreme winds,
- Extreme outside temperatures,
- Extreme rainfall, extreme snowfall, flooding, extreme cooling-water temperatures and freezing,
- Earthquakes,
- Aircraft crashes,
- Other events on nearby transport routes, in industrial facilities or within the site region that might lead to fire, explosion or other hazards to the safety of the nuclear power plant.

The *Rules on Radiation and Nuclear Safety Factors* were last revised in 2024 and took into account recommendations of the IAEA IRRS mission to the SNSA in April 2022 and the revised WENRA SRLs of 2020. Major changes, in particular those coming from the revised WENRA SRLs, concern the internal hazards and external human induced hazards for existing reactors and the area of natural hazards, which require the reasonably achievable improvements to be implemented, which would ensure the plant could withstand low probability initiating events (internal and external) and their combinations. Based on IRRS mission recommendations, new requirements on the human factor engineering and human-machine interface were introduced to the Rules, as well as two important programs – the cyber security program and the commissioning

program. The commissioning program will be approved within the process of preparation of building permit.

The Krško NPP was designed and constructed in compliance with the U.S. NRC "General Design Criteria for Nuclear Power Plants", Appendix A to 10 CFR 50, thus ensuring the use of the criteria such as single failure, protection by multiple fission product barriers, redundancy, independency, diversity, fail safe failure modes, etc.

The *Rules on Radiation and Nuclear Safety Factors* stipulate that the plant shall upgrade its SSCs to enable it to manage severe accidents. This was required for the Krško NPP as a condition for the plant lifetime extension. Based on the stress tests results and the deterministic and probabilistic analysis of potential safety improvements, the Krško NPP prepared the SUP in 2012, which was completed in 2021. More information on the SUP can be found in Chapter 6.1 of this report.

Other important design improvements implemented in the reporting period in the Krško NPP, related to safety and operability, were:

- Replacement of the high-pressure turbine with a power uprate in 2022,
- Mechanical Stress Improvement Process (MSIP) in 2022,
- Seismic Instrumentation System Upgrade in 2022,
- AMSAC Process Cabinet Replacement in 2022,
- Update of Post Accident Radiation Monitoring System (PARMS) Radiation Monitors Phase 1 in 2023,
- Protection Against Failures of One Phase and Replacement of Secondary Equipment in 110 kV and 400 kV Fields in 2023,
- Modernisation and Adaptation of Radioactive Waste Handling Systems in 2023 and 2024,
- Replacement of the component cooling system heat exchangers in 2022 and 2024,
- Replacement of the Ultrasonic Reactor Coolant Level Measurement System on Loop 1 in 2024,
- Comprehensive Lightning Protection Upgrade in 2024, that will be concluded in 2025.

The application of the defence in depth concept in the design is verified mostly during the licensing of plant design modifications. Implementation of the defence in depth is also regularly checked by SNSA inspections. In December 2023, the third PSR of the Krško, which also included a review of the application of the concept of defence in depth, was completed. More information on PSR3 can be found in Chapter 6.3 of this report.

18.2 Incorporation of Proven Technologies

The *Rules on Radiation and Nuclear Safety Factors* stipulate the use of proven technology as one of the fundamental design principles and requires ensuring the system reliability through the application of proven components. Proven components shall mean components that have demonstrated their adequacy in similar operational conditions or are appropriately tested and qualified. The SNSA promotes the use of proven technologies by stressing its importance during licensing of design modifications. The modifications, which can be demonstrated by the plant, that the technology is well proven by operating experience, testing and analysis, can get the approval of the SNSA much easier than the technology that is used for the first time and has not yet been licensed anywhere else in the world and requires proof that nuclear design standards have been

properly applied in the design and manufacturing of such equipment. This includes equipment installed within the SUP.

The design requirements for instrumentation and control in the *Rules on Radiation and Nuclear Safety Factors* define that appropriate standards shall be applied in the design, installation and testing of software and hardware of computer-supported systems relevant to safety. Software for digital instrumentation and control shall be verified, validated and tested. Due to the integral nature of computer-supported systems, an additional degree of conservatism is necessary in their analyses.

It is the Krško NPP's strategic approach not to introduce solutions whose supplier and equipment do not a have verified references in other similar nuclear power plants in the world. The Krško NPP maintains the approved suppliers list and verifies regularly the performance of suppliers on this list, e.g. by audits.

18.3 Design for Reliable, Stable and Manageable Operation

The *Rules on Radiation and Nuclear Safety Factors* include requirements for the consideration of human factors in the design of the NPP, including the ergonomics of control systems, information needed for safe operation and control, as well as requirements for protection of personnel. Based on the implementation of the 2020 IAEA IRRS mission recommendation, the Rules were amended in 2024 with requirements for human factor engineering and human-machine interface.

The *Rules on Radiation and Nuclear Safety Factors* require that the design ensures that the plant operator has a period of 30 minutes from receiving the first characteristic information on an event to the time when the first action to prevent or mitigate the consequences of the event is required. In the meantime, the activations and control of the safety functions are automated or accomplished by passive means.

The *Rules on Operational Safety of Radiation and Nuclear Facilities* require from the operator to implement a plant-specific symptom-based emergency operating procedures (EOP). These assure adequate identification of the event and a reliable and efficient restoration of critical safety functions and stable conditions of the plant. Likewise, the Rules require that the licensee implement the Severe Accident Management Guidelines (SAMG), which must be based on plant-specific analysis of severe accidents and their phenomena. Both the EOPs and SAMGs must be validated against all possible scenarios and must be regularly used in trainings of operators with the simulation of events on the plant-specific full-scope simulator which is capable of simulating severe accidents. The Krško NPP has plant-specific EOP as well as SAMG in place, which are regularly updated and verified during trainings and simulated exercises on their plant-specific full-scope simulator. Within the implementation of training and exercises, the Krško NPP also observes the impacts of the human factors, which are then incorporated into the changes of procedures and controls of the plant if necessary.

The main control room (MCR) of the Krško NPP has systems in place which ensure adequate working conditions for the operators, e.g. the MCR air conditioning, the MCR charcoal clean-up system and chilled water generating and distributing system. During the accident conditions, the MCR ventilation is automatically isolated. The MCR clean-up system is started to keep the area habitable. The MCR air conditioning and charcoal clean-up systems are a redundant, safety related, seismically qualified system energised from independent safety power buses.

In addition, in April 2018 the Krško NPP installed the Emergency Control Room (ECR), which has its own independent power supply system and independent instrumentation and controls,

qualified for severe accidents conditions. It is located in the physically separated bunkered building 1, meeting the design extension conditions to sustain higher seismic loads, severe floods, severe weather, large aircraft crashes and fires. For the operators in the ECR, a set of Evacuation Emergency Operating Procedures (EEOP) was developed. The EEOP were also validated at the full scope simulator, which also contains an ECR simulator.

Each modification of the safety related equipment (including MCR) must be reviewed and approved by the SNSA. The SNSA is also regularly informed of all changes in the EOPs and SAMGs and other relevant procedures, such as Alternative Equipment Support Procedures for mobile equipment. The SNSA inspection with support of other SNSA technical staff oversee the regular operation and changes implemented in the plant. The SNSA staff takes part in the emergency exercises. The SNSA performs licensing of the reactor operators.

Summary statement for Article 18

Slovenia is in compliance with the obligations of Article 18 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

The *Rules on Radiation and Nuclear Safety Factors* were last revised in 2024 that considered recommendations of the IAEA IRRS mission to the SNSA in April 2022 and the revised WENRA Safety Reference Levels of 2020. Other than that Slovenia has no significant changes to highlight under Article 18 during the reporting period.

Future Focus

There will be no major upgrades or modifications at the Krško NPP in the near future, as the SUP was just finished. Nevertheless, the SNSA and the Krško NPP will ensure adequate safety assessment and implementation of any other modifications at the Krško NPP.

Article 19: Operation

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the initial authorisation 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 licence to the regulatory body;

(vii) programs to collect and analyse 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 organisations 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 Authorisation

After the construction of the facility is completed, the investor applies for a license for the use of the facility, as stipulated by the *Construction Act*. Before such license is issued, a technical inspection and a trial operation are performed. The investor also applies to the SNSA for approval to start trial operation, enclosing the program for trial operation with other documentation. After issuing this approval, the MNRSP issues a decision for the start of trial operation. Note that the trial operation and the technical inspection represent the commissioning phase, which is a more popular term in the nuclear industry. The purpose of the technical inspection together with the trial operation is to verify that the construction of the facility was performed in line with the construction license and that the facility complies with the licensed design basis. The technical inspection and trial operation are supervised, among others, by the SNSA. The MNRSP issues the license for the use of the facility after it verifies that parameters regarding environmental impacts from trial operation meet the prescribed limits.

The operator applies to the SNSA for an operating license after receiving the license for the use of the facility. The application for the operating license contains an USAR, an opinion from an approved expert for radiation and nuclear safety and other prescribed documentation according to the *Ionising Radiation Protection and Nuclear Safety Act* and the *Rules on Radiation and Nuclear Safety Factors*. The safety report must be updated with the changes that occurred during trial operation.

19.2 Operational Limits and Conditions

In accordance with the *Ionising Radiation Protection and Nuclear Safety Act*, the proposed operational limits and conditions must be submitted to the regulatory body as a part of the application for an operating license.

The *Rules on Radiation and Nuclear Safety Factors* define the content of the operational limits and conditions, with respect to:

- safety limits,
- limiting settings for safety systems,
- limiting conditions for normal operations,
- surveillance requirements,
- requirements for the operator of a nuclear facility related to reporting.

The Krško NPP Technical Specifications are based on U.S. NRC document NUREG-0452. In the reporting period (2022–2024), the SNSA has licensed 11 changes to the Technical Specifications that were defined as 3rd category modifications, and 7 changes defined as 2nd category modifications. The description of modification categories is in Chapter 14.1.1.

19.3 Procedures for Operation, Maintenance, Inspection and Testing

In accordance with Article 27 of the *Rules on Radiation and Nuclear Safety Factors,* the documentation submitted for an application for an operating license must also contain a list of prepared operating procedures and rules together with the plant start-up report, the QA program report, the Technical Specifications, the SAR and maintenance and testing instructions.

The USAR comprises of the Initial Test Program, which defines preoperational testing and initial start-up testing. General testing and inspection requirements for systems and components, including the Technical Specifications, are described in the appropriate SAR sections. The Krško NPP developed a set of programs, including administrative and implementing procedures for maintenance, testing and inspection, which are in compliance with the SAR, the Technical Specifications, other regulatory requirements and the in-house requirements. In the field of operation, there are several programs and administrative procedures: Conduct of Operation, Tagging, Shutdown Safety, Temporary Modification Control and others.

All procedures at Krško NPP are developed and written by experienced personnel. Before approval, the procedures are reviewed and commented by plants experts, author's department superintendent and involved personnel and/or superintendents from other departments. All procedures are subject to independent verification by the Licensing Department and QA team. If the procedure is related to safety, it must be reviewed by the Krško Operating Committee. Certain operational procedures are also subject to verification on the Krško NPP full scope simulator. Finally, the procedures are approved and signed by the affected members of management.

In the field of maintenance, the Krško NPP has developed the following programs, such as: Preventive Maintenance (separate programs for each specific set of equipment), Predictive Maintenance, Implementation, Monitoring and Evaluation of Preventive Maintenance, Corrective Action, Surface Protection Maintenance, and Technical Surveillance of Civil Structures and Other Structures.

In the field of monitoring, inspection and testing, there are the following programs and administrative procedures at the Krško NPP: Plant Performance Monitoring, Reliability of

Operation and Aging of the Equipment, System Health and Maintenance Rule, Steam Generator, Emergency Diesel Generator Reliability, Corrosion-Erosion, Fuel Integrity, Control of Civil Structures and Other Constructions, In-service Inspection; Containment Inspection Program; Snubber Program; Boric Acid Inspection Program; ASME Section XI Pump and Valve In-service Testing Program; Containment Leakage Rate Testing Program; Motor Operated Valves Program; Pressure Vessel Inspection Program; and Fuel Integrity Program.

The activities of the aging management are implemented in the Krško NPP through numerous GALL (report NUREG-1801) programs, for example: Water Chemistry; Reactor Head Closure Stud Bolting; Boric Acid Corrosion; Flow Accelerated Corrosion; Bolting Integrity; Steam Generator Tube Integrity; Compressed Air Monitoring; Fire Protection; Reactor Vessel Surveillance; Selective Leaching of Materials; External Surfaces Monitoring Program; Monitoring Of Neutron-Absorbing Materials Other Than Boraflex; Buried and Underground Piping and Tanks; Piping components, Heat Exchangers, and Tanks; Structures Monitoring Program; Electrical Cables and Connections; Metal-enclosed Bus; Fuse Holders and many other.

In recent years, the Krško NPP has performed a review of its AMPs to ensure they comply with IAEA safety standards and guidelines (SSG-48, SRS-82). As a result, the Krško NPP has incorporated the experience gained from IGALL programs into its aging management programs.

19.4 Procedures for Responding to Operational Occurrences and Accidents

The Krško NPP has developed and applied a full set of Abnormal Operating Procedures (AOPs), Emergency Operating Procedures (EOPs), Evacuation Emergency Operating Procedures (EEOPs), Fire Response Procedures, Alternative Equipment Support Procedures, Severe Accident Management Guidelines (SAMGs) and Extensive Damage Mitigation Guidelines. The AOPs, EOPs and EEOPs have been reviewed by the SNSA and the TSOs. All these sets of procedures and guidelines were verified during the operator's simulator training. The plant specific EOPs are written in accordance with Pressurised Water Reactor Owners Group (PWROG) generic procedures. In 2023, PWROG developed a new generic SAMG package, which combines generic SAMG package applicable to U.S. PWRs and generic SAMG package applicable for international plants. The validation of the international plant SAMG features added to the new generic PWROG SAMG was performed on the Krško NPP's full scope severe accident capable simulator in March 2023. A wide range of SAMG was covered, including loss of DC power/instrumentation, degraded condition of Passive Autocatalytic Recombiners, use of the Passive Containment Filtered Vent System for overpressure challenge, severe accident during shutdown in parallel with the Spent Fuel Pool event, etc.

Currently, plant specific Shutdown Emergency Response Procedures (SERPs) are being written in accordance with PWROG Abnormal Response Guidelines (ARGs) generic procedures.

19.5 Engineering and Technical Support

In-house capabilities have been developed to provide engineering and technical support at the Krško NPP. It is capable of processing minor design changes in-house. The capability of preparing purchase specifications, reviewing bids and bidder selection, quality assurance, quality control and engineering follow-up of the projects and review and/or acceptance testing of the product are

available within organisational units of the Krško NPP. Other engineering and technical support is assured through outsourcing at research and engineering organisations in Slovenia or abroad. However, major projects require an open bidding process.

Design changes in the Krško NPP categorised as 2nd category (SAR changes) or 3rd category (Technical Specifications changes) are subject to licensing procedure of the SNSA in accordance with *Ionising Radiation Protection and Nuclear Safety Act*. That includes all the work done by the Krško NPP staff or by research and engineering organisations in Slovenia or abroad through outsourcing. When licensing 3rd category modifications, the TSO assessment is mandatory. The SNSA uses its own technical support within outage supervision, design modification licensing through expert opinions prepared by TSOs, research projects, etc.

The Ministry of Higher Education, Science and Innovation financially supports the research and development projects in the field of nuclear safety in the Republic of Slovenia through a research fund.

19.6 Reporting of Incidents Significant to Safety

The Article 120 of the *Ionising Radiation Protection and Nuclear Safety Act* (reporting on the operation of facility) stipulates that the operator shall submit extraordinary reports to the SNSA with information on:

- equipment defects which could cause an emergency, emergencies and measures taken for the mitigation of the consequences of the defects or emergencies,
- errors made by workers while handling or operating a facility, which could cause an emergency,
- deviations from operational limitations and conditions,
- all other events or operational circumstances which significantly affect the radiation or nuclear safety of the facility.

According to the Article 135 of the *Ionising Radiation Protection and Nuclear Safety Act* the licensee is required to report to the SNSA and to other competent authorities about the accident conditions as soon as possible.

The *Rules on Operational Safety of Radiation and Nuclear Facilities* prescribe detailed requirements for reporting to and notifying the regulatory body by the operator of a nuclear facility. The regulation distinguishes between routine reporting, notification and reporting in the case of an abnormal event. It specifies the time period for reporting. The reporting criteria define the set of abnormal events. In the reporting period (2022–2024) the Krško NPP reported 7 events, of which one caused an unplanned shutdown. Events are described in the Chapter 6.5 of this report.

Slovenia is a member of the IAEA INES reporting system. Events from the Krško NPP are rated in accordance with the INES scale and reported to the IAEA. The rating is done by INES national officer and discussed with the licensee and internally in the SNSA.

19.7 Operational Experience Feedback

In accordance with the Article 90 of the *Ionising Radiation Protection and Nuclear Safety Act* (the use of experiences gained during operational events), the operator of a nuclear facility shall ensure that the programs for recording and analysing operational experience at the nuclear facility are implemented. In the assessment, examination and improvement of the radiation and nuclear

safety, the operator of the nuclear facility shall take into account the conclusions of the programs referred to in the Chapter 19.3 of this report.

At the Krško NPP the root cause analysis of significant events is performed. The lessons learned from the analysis are followed up and training is given where appropriate. Human performance is included in the root cause analysis through the event and causal factor charting, barrier analysis and change analysis. The plant policy for a restart following a reactor trip requires that the cause of the trip is known, understood and corrected before the restart. The SNSA supervises the corrective actions defined by the facility. More complex events are also analysed through internal SNSA investigation, and the results are compared to the facility's corrective actions. If necessary, the SNSA can request additional actions from the operator.

At Krško NPP the operating experience feedback program is in place, which includes the consideration of in-house as well as external operating events. This activity is performed by the ISEG. The program has been expanded by developing a corrective actions program including low level events and near misses, all types of deviations, failures, malfunctions, and deficiencies.

The off-site event reports safety screening is part of the Krško NPP operating experience assessment program. The off-site event reports are provided by the SNSA, IAEA, INPO, U.S. NRC, WANO, NUMEX, Westinghouse and PWROG. Regarding Industry Operating Experience in the reporting period (2022–2024) the Krško NPP made screening of about 10.000 documents. Out of those, 450 records were created in the Corrective Action Program. This resulted in 147 direct assignments and 22 in-depth analyses with 34 actions. The other records were distributed to appropriate departments as interesting for their further use. Based on industry experience the Krško NPP created plans to replace Clevis Insert Bolts in outage 2027 and outage 2028. Clevis bolts are made of Alloy X750 and are suspected to stress corrosion cracking.

The Krško NPP shares on-site events with industry. These events are significant occurrences which affect the plant safety or reliability (e.g. transients, redundant safety system malfunctions, events involving nuclear safety, fuel handling and storage, excessive radiation exposure or personnel injury, excessive discharge of radioactivity etc.), personal safety and conditions which affect the quality of process. The technical director confirms the suitability of information for reporting, which is prepared according to the WANO operating experience program guidelines.

The SNSA has also created the system for screening and analysing all kinds of operating experiences, not only incidents. It covers two types of events – in the Krško NPP as well as international operating experiences, which are screened and analysed for their applicability to nuclear safety in Slovenia. The results of such screening and analyses are communicated internationally either through formal channels like the International Reporting System on Operating Experience or at different international meetings and conferences. In the reporting period (2022–2024), 47 potentially interesting events were evaluated by the SNSA.

At Krško NPP the plant performance monitoring program covers more than 100 indicators. They have been collecting performance indicators for many years and include them into the annual reports. The plant performance monitoring program comprises also the international performance indicators defined by the WANO, which are regularly reported to this organisation.

Besides the Krško NPP's own set of indicators, the SNSA developed an internal set of indicators for the Krško NPP. The SNSA monitors a set of 38 safety and performance indicators, which help to recognize the problems, which may affect nuclear safety, when they are still in the early stage. The set of performance indicators includes thresholds for warnings and alarms, which have been devised to allow the Krško NPP enough time for implementing corrective actions, which prevent further deterioration. With respect to the Krško NPP indicators and their yearly reporting, some

SNSA indicators are evaluated through monthly or quarterly periods. In the reporting period (2022–2024), the indicators have not shown significant negative trends. Some warnings or alarms have been associated with safety systems failures, risk of unplanned unavailability of equipment, limiting conditions for operation entries, unplanned personal contamination, temporary modifications, mitigating system performance index and collective radiation exposure performance indicators.

19.8 Management of Spent Fuel and Radioactive Waste on the Site

All operational radioactive waste from the Krško NPP is stored within the plant area. The plant is responsible for radioactive waste management at the site. During the operation of the Krško NPP, various radioactive substances in liquid, gaseous and solid form are generated. The radioactive waste management system is constructed to collect, process, store and package waste in a suitable form and minimise releases into the environment. Three fundamental systems are used for radioactive waste management, namely for liquid, solid and gaseous radioactive waste.

Numerous program improvements, design changes and work practice improvements have been pursued at the plant with the aim of decreasing the generation rate of radioactive wastes of different types. With the introduction of a 18-month fuel cycle in 2004, the generation of radioactive waste was further reduced. The plant uses an external service for the incineration of combustible waste and melting of metal radioactive waste material. To reduce the volume of solid radioactive waste to be stored, super-compaction campaigns have been carried out. The original Westinghouse procedure for evaporator bottoms and spent resins treatment was replaced with a treatment called the In-Drum Drying System. Tube-type containers are used as an over-pack for the storage of standard 200-liter drums and products of super-compaction in the plant radioactive waste storage facility. In 2006, the Krško NPP initiated the continuous compression of radioactive waste with their super-compactor installed in the waste manipulation building. The total volume of waste accumulated by the end of 2024 amounted to 2,513.5 m^3. The total gamma and alpha activity of the stored waste were 1.92 $\cdot 10^{13}$ Bq and 3.10 $\cdot 10^{10}$ Bq, respectively.

Based on the SNSA decision regarding prevention of severe accidents and mitigation of their consequence issued in 2011, the Krško NPP assessed the options to reduce risk associated with spent fuel stored in the spent fuel pool. Due to the fact that the plant was firmly on the path to long-term operation until 2043, the wet storage capacity was not adequate. The Krško NPP proposed the new spent fuel management strategy to store the spent fuel in a new spent fuel dry storage on the site with a possibility of later reprocessing. From a technical point of view, this option is the best storage strategy for spent fuel for the time being. It was decided that a dry storage facility for spent fuel with a design lifetime of 100 years would be constructed. The SFDS facility was constructed and was put in operation in March 2023 followed by the relocation of the first 592 spent fuel assemblies from the spent fuel pool in August 2023. The next campaign of relocating an additional 592 spent fuel assemblies is planned for 2029.

The *Resolution on the National Program for Managing Radioactive Waste and Spent Nuclear Fuel for the Period 2023–2032* takes into consideration the results of stress tests and all the various solutions, which should include the options of long-term storage and different options for fuel reprocessing and final disposal in a geological repository (national, regional and multinational).

In 2018, the Krško NPP waste manipulation building was built and licensed. With the construction of the new facility, the plant has been provided with new premises for drums storage in the process of manipulation and the preparation for transport, collection, and sorting of radioactive waste. There is space provided for different activities such as packing, compaction, super-compaction, radiological measurements and radiological monitoring of shipments, maintenance of shock-absorbers, workshops and warehouses for maintenance staff, and improved processing and reuse of primary water.

The Krško NPP has established a system and procedures for clearance of radioactive waste and material from the controlled area. All procedures are in accordance with legislative criteria. The SNSA issues an approval prior each clearance.

In the *Agreement between the Government of the Republic of Slovenia and the Government of the Republic of Croatia on the Regulation of the Status and Other Legal Relations Regarding the Investment, Exploitation and Decommissioning of the Krško NPP*, in 2003 the following policy was adopted:

- The contracting parties shall in equal shares assure funds for the preparation and execution of the decommissioning program and the funds for the preparation of the program for the disposal of radioactive waste and spent fuel. If the contracting parties agree on a joint solution for the disposal of radioactive waste and spent fuel, they shall finance it in equal shares or they shall finance their shares of activities;
- The Republic of Slovenia and the Republic of Croatia shall jointly prepare and approve a new plan for decommissioning of the Krško NPP and disposal of low- and intermediate-level waste (LILW) and high-level waste;
- The Croatian party shall, according to the Agreement, establish its own fund for the management and collection of financial resources for its share of decommissioning and radioactive waste disposal costs.

All agreements and ongoing issues between Slovenia and Croatia regarding decommissioning, radioactive waste and spent fuel of the Krško NPP are dealt with by the Intergovernmental Commission. GEN energija d.o.o., as owner of the Slovenian half of the Krško NPP, and Hrvatska elektroprivreda d.d., as owner of the Croatian half of the Krško NPP, each contribute into their own fund for financing the decommissioning and disposal of radioactive waste and spent fuel. The basis for determining contribution rates is the radioactive waste and spent fuel disposal program from the Krško NPP, prepared by the Agency for Radioactive Waste Management (ARAO) from Slovenia and the Krško NPP Fund from Croatia, and Krško NPP Decommissioning Program, prepared by the Krško NPP in cooperation with the ARAO and the Krško NPP Fund. Based on the decision of the 17th session of the Intergovernmental Commission, held in October 2023, a new deadline for the takeover of the LILW from the Krško NPP was determined. Both aforementioned responsible parties must initiated the takeover of the LILW from the Krško NPP by the beginning of 2028 at the latest.

Slovenia has selected a site for its Low and Intermediate Radioactive Waste Disposal facility in Vrbina near Krško NPP. The facility is being built by ARAO. A construction permit for a nuclear facility, where SNSA was also involved, was issued in 2022 and for the infrastructure construction early in 2023. By the end of 2023, the road reconstruction with all the necessary infrastructure had been finalised. The work on the construction of an external fence, which is part of the physical security system was finished in April 2024. The construction works of the disposal facility itself started in 2024. The primary wall of the disposal silo was constructed by the end of 2024.

Summary statement for Article 19

Slovenia is in compliance with the obligations of Article 19 of the CNS.

Summary of Significant Changes and Notable Accomplishments Since Previous Report

In the reporting period, the Krško NPP continued to operate safely based on the appropriate procedures and according to the USAR and Technical Specifications.

In 2023, the SFDS facility was constructed and the relocation of the first 592 spent fuel assemblies from spent fuel pool was completed. A new deadline for the takeover of the LILW from the Krško NPP was determined by the Intergovernmental Commission. Both countries must start the takeover of the LILW by the beginning of 2028 at the latest. The Slovenian half of the LILW will be stored in a LILW Disposal Facility near the Krško NPP site that is currently being built.

Future Focus

The SNSA will oversee all aspects of operation through inspections, safety indicators and reviews and assessments of licensee reports. Based on the findings, the appropriate enforcement actions will follow as necessary. The Slovenian ARAO and Croatian Fund will initiate the takeover of the LILW from the Krško NPP by the beginning of 2028 at the latest. In the meantime, preparations for that action need to be completed and all necessary prerequisites need to be fulfilled.

APPENDICES

Appendix I: List of relevant legislation in force

(as of March 25, 2025)

A National legal frame

A.1 Resolutions and Acts in the field of nuclear and radiation safety

- *Resolution on Nuclear and Radiation Safety in the Republic of Slovenia for the period 2024-2033* (Official Gazette of the Republic of Slovenia, No. 122/23)
- *Resolution on the National Program for Managing Radioactive Waste and Spent Nuclear Fuel for the period 2023-2032* (Official Gazette of the Republic of Slovenia, No. 14/23)
- *Resolution on the Long-term Peaceful Use of Nuclear Energy in Slovenia* (Official Gazette of the Republic of Slovenia, No. 43/24)
- *Ionising Radiation Protection and Nuclear Safety Act* (Official Gazette of the Republic of Slovenia, No. 76/17, 26/19, 172/21 and 18/23 – ZDU-10)

A.2 Governmental Decrees and Ministerial Regulations issued on the basis of *Ionising Radiation Protection and Nuclear Safety Act*

- *Decree on Radiation Activities* (Official Gazette of the Republic of Slovenia, No. 19/18 and 6/24)
- *Decree on Dose Limits, Reference Levels and Radioactive Contamination* (Official Gazette of the Republic of Slovenia, No. 18/18)
- *Decree on the Areas of Limited Use of Space due to a Nuclear Facility and the Conditions of Facility Construction in These Areas* (Official Gazette of the Republic of Slovenia, No.78/19)
- *Decree on National Radon Program* (Official Gazette of the Republic of Slovenia, No. 18/18, 86/18 and 152/20)
- *Decree on the Reduction of Exposure due to Natural Radionuclides and Existing Exposure Situations* (Official Gazette of the Republic of Slovenia, No. 38/18)
- *Decree on Safeguarding of Nuclear Materials* (Official Gazette of the Republic of Slovenia, No. 34/08 and 76/17 – ZVISJV-1)
- *Decree on the Criteria for Determining the Compensation Rate due to the Restricted Use of Areas and Intervention Measures in Nuclear Facility Areas* (Official Gazette of the Republic of Slovenia, No. 92/14, 46/15, 76/17 – ZVISJV-1 and 8/20)
- *Decree on Checking of the Radioactivity of Consignments that Could Contain the Orphan Sources* (Official Gazette of the Republic of Slovenia, No. 10/19 in 44/22 – ZVO-2)
- *Decree on the Implementation of Council Regulations (EC) and Commission Regulations (EC) on the Radioactive Contamination of Foodstuffs and Feedstuffs* (Official Gazette of the Republic of Slovenia, No. 52/06, 38/10 and 76/17 – ZVISJV-1)
- *Rules on the Expert Council for Radiation and Nuclear Safety* (Official Gazette of the Republic of Slovenia, No. 114/24)
- *Rules on the Use of Radiation Sources and on Activities Involving Radiation* (Official Gazette of the Republic of Slovenia, No. 27/18)
- *Rules on Authorised Experts on Radiation and Nuclear Safety* (Official Gazette of the Republic of Slovenia, No. 126/23)
- *Rules on Providing Qualification for Workers in Radiation and Nuclear Facilities* (Official Gazette of the Republic of Slovenia, No.162/20)

- *Rules on Radiation and Nuclear Safety Factors* (Official Gazette of the Republic of Slovenia, No. 56/24)
- *Rules on Radioactive Waste and Spent Fuel Management* (Official Gazette of the Republic of Slovenia, No.125/21 and 74/24)
- *Rules on Operational Safety of Radiation and Nuclear Facilities* (Official Gazette of the Republic of Slovenia, No. 27/24)
- *Rules on the Monitoring of Radioactivity* (Official Gazette of the Republic of Slovenia, No. 27/18)
- *Rules on Transboundary Shipments of Radioactive Waste and Spent Fuel* (Official Gazette of the Republic of Slovenia, No. 22/09 and 76/17 – ZVISJV-1)
- *Rules on the Transboundary Shipment of Nuclear and Radioactive Substances* (Official Gazette of the Republic of Slovenia, No. 75/08, 41/14 and 76/17 – ZVISJV-1)
- *Rules on Requirements for New Constructions and Interventions in the Existing Buildings in Order to Protect Human Health From the Harmful Effects of Radon* (Official Gazette of the Republic of Slovenia, No.14/22, 55/23 and 76/23)
- *Rules on Functioning of the Expert Council for the Issues of Ionising Radiation Protection, Radiological Activities and the Use of Radiation Sources in Human and Veterinary Medicine* (Official Gazette of the Republic of Slovenia, No. 62/03 and 76/17 – ZVISJV-1)
- *Rules on the Criteria for Using Ionising Radiation Sources for Medical Purposes and for the Deliberate Exposure of Individuals for Non-Medical Purposes* (Official Gazette of the Republic of Slovenia, No. 33/18)
- *Rules on Special Radiation Protection Requirements and the Method of Dose Assessment* (Official Gazette of the Republic of Slovenia, No. 47/18 and 30/21)
- *Rules on Health Surveillance of Exposed Workers* (Official Gazette of the Republic of Slovenia, No. 2/04 and 76/17 – ZVISJV-1)
- *Rules on Authorising Ionising Radiation Protection Practitioners* (Official Gazette of the Republic of Slovenia, No. 39/18)
- *Rules on Authorising Ionising Radiation Protection Experts* (Official Gazette of the Republic of Slovenia, No. 47/18)
- *Rules on the Obligations of Ionising Radiation Protection Practitioners and Holders of Ionising Radiation Sources* (Official Gazette of the Republic of Slovenia, No. 43/18)
- *Rules on Radiation Protection Measures in Controlled and Monitored Areas* (Official Gazette of the Republic of Slovenia, No. 47/18)
- *Rules On The Use Of Potassium Iodide Tablets In The Case Of Radiation Or Nuclear Accident* (Official Gazette of the Republic of Slovenia, No. 59/10, 17/14 – ZZdr-2, 24/25 – ZZdr-2B and 27/25)
- *Rules on Implementation of National Screening Programs for the Early Detection of Precancerous Changes and Cancer* (Official Gazette of the Republic of Slovenia, No. 57/18 and 68/19)
- *Rules on Monitoring Radioactivity in Drinking Water* (Official Gazette of the Republic of Slovenia, No. 74/15, 76/17 – ZVISJV-1 and 104/20)
- *Rules on Physical Protection of Nuclear Facilities, Nuclear and Radioactive Materials and Transport of Nuclear Materials* (Official Gazette of the Republic of Slovenia, No. 100/23)
- *Order of Establishing Professional Development Programs and Periodic Professional Development of Security Personnel for The Implementation of Physical Protection of Nuclear Facilities, Nuclear or Radioactive Materials and the Transport of Nuclear Materials* (Official Gazette RS, No. 100/23)
- *Rules on the Equipment for Inspectors Carrying Out Inspection on Physical Protection of Nuclear and Radioactive Materials and Facilities* (Official Gazette of the Republic of Slovenia, No. 42/12 and 76/17 – ZVISJV-1)

A.3 Other legislation

Third Party Nuclear Liability

- *Act on Liability for Nuclear Damage* (Official Gazette of the Republic of Slovenia, 77/10)
- *Decree on Determining the Persons for Whom the Insurance of Liability for Nuclear Damage is not Mandatory* (Official Gazette of the Republic of Slovenia, 110/10)

Decommissioning of the Nuclear Power Plant Krško

- *Act on the Fund of Republic of Slovenia for Financing Decommissioning of the Krško NPP and Disposal of Radioactive Waste and Spent Fuel from the Krško NPP (Official Gazette of the Republic of Slovenia*, No. 130/22)
- *Instruction on the Method of Charging and Payment to the Fund for Financing Decommissioning of the Krško Nuclear Power Plant Krško and Disposal of Radioactive Waste from the Krško NPP* (Official Gazette of the Republic of Slovenia, No. 53/96)

Radioactive Waste

- *Decree on the Method and Subject of and Conditions for Performing a Public Utility Service of Radioactive Waste Management* (Official Gazette of the Republic of Slovenia, No. 8/22 and 19/24)

Civil Protection and Disaster Relief

- *Act on Protection Against Natural and Other Disasters* (Official Gazette of the Republic of Slovenia, 51/06, 97/10, 21/18 – ZNOrg in 117/22)
- *Decree on the Content and Elaboration of Protection and Rescue Plans* (Official Gazette of the Republic of Slovenia, No. 24/12, 78/16 and 26/19)

Mining

- *Mining Act* (Official Gazette of the Republic of Slovenia, 14/14, 61/17 – GZ, 54/22, 78/23 – ZUNPEOVE and 81/24)
- *Act on the Permanent Cessation of Uranium Ore Mining and the Prevention of the Consequences of Mining at the Žirovski Vrh Uranium Mine* (Official Gazette of the Republic of Slovenia, No. 22/06)
- *Decree Determining the Area and of the Compensatory Amount due to the Limited Use of the Environment in the Area of Žirovski Vrh Uranium Mine* (Official Gazette of the Republic of Slovenia, No. 22/08 and 50/09)

Energy, Spatial Planning, Building, Environment

- *Energy Act* (Official Gazette of the Republic of Slovenia, No. 38/24)
- *Spatial Management Act* (Official Gazette of the Republic of Slovenia, No. 199/21, 18/23 – ZDU-1O, 78/23 – ZUNPEOVE, 95/23 – ZIUOPZP, 23/24, 109/24 and 25/25 – odl.)
- *Building Act* (Official Gazette of the Republic of Slovenia, No. 199/21, 105/22 – ZZNŠPP, 133/23 and 85/24 – ZAID-A)
- *Environmental Protection Act* (Official Gazette of the Republic of Slovenia, No. 44/22, 18/23 – ZDU-1O, 78/23 – ZUNPEOVE, 23/24 in 21/25 – ZOPVOOV)

Administrative

- *General Administrative Procedure Act* (Official Gazette of the Republic of Slovenia, No. 24/06, 105/06 – ZUS-1, 126/07, 65/08, 8/10, 82/13, 175/20 – ZIVOPDVE and 3/22 – ZDeb)
- *Act on Administrative Fees* (Official Gazette of the Republic of Slovenia, No. 106/10, 14/15 – ZUUJFO, 84/15 – ZZelP-J, 32/16, 30/18 – ZKZaš and 189/20 - ZFRO)
- *Inspection Act* (Official Gazette of the Republic of Slovenia, No. 43/07 and 40/14)

- *Penal Code* (Official Gazette of the Republic of Slovenia, No. 50/12, 54/15, 6/16, 38/16, 27/17, 23/20, 91/20, 95/21, 186/21, 105/22 – ZZNŠPP, 16/23 in 107/24 – odl.)
- *Act On Minor Offences* (Official Gazette of the Republic of Slovenia, No. 29/11, 21/13, 111/13, 74/14 – odl., 92/14 – odl., 32/16, 15/17 – odl., 73/19 – odl., 175/20 – ZIUOPDVE, 5/21 – odl. and 38/24)

B International instruments to which Slovenia is a party

By the Slovenian Constitution all published 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:

B.1 Multilateral agreements

- Statute of the International Atomic Energy Agency (including its Amendment of Articles VI and XIV)
- Agreement on the Privileges and Immunities of the International Atomic Energy Agency
- Convention on the Physical Protection of Nuclear Material (including the 2005 Amendments)
- Convention on Early Notification of a Nuclear Accident
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
- Convention on Nuclear Safety
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- 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)
- Comprehensive Nuclear-Test-Ban Treaty
- Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960, as Amended by the Additional Protocol of 28 January 1964 and by the Protocol of 16 November 1982 (including the 2004 Protocol)
- Convention of the 31 January 1963 Supplementary to the Paris Convention of 29 July 1960, as Amended by the Additional Protocol of 28 January 1964 and by the Protocol of 16 November 1982 (including the 2004 Protocol)
- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention
- Act on ratification of the Agreement between the Kingdom of Belgium, the Kingdom of Denmark, the Federal Republic of Germany, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of Netherlands, the European Atomic Energy Community and the International Atomic Energy Agency in implementation of Article III (1) and (4) of the Treaty on the non-Proliferation of Nuclear Weapons
- Law on ratification of the Additional Protocol to the Agreement between the Republic of Austria, the Kingdom of Belgium, Kingdom of Denmark, Finland, Federal Republic of Germany, the Hellenic Republic, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of the Netherlands, the Portuguese Republic, the Kingdom of Spain, Kingdom of Sweden, the European Community Atomic Energy Community and the International Atomic Energy Agency in implementation of Article III (1) and (4) of the Treaty on the non-Proliferation of Nuclear Weapons

B.2 Bilateral agreements

- Agreement between the U.S. 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 the 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
- Treaty between the Government of the Republic of Slovenia and the Government of the Republic of Croatia on the regulation of the status and other legal relations regarding investment, exploitation and decommissioning of the Krško Nuclear Power Plant
- Memorandum of Understanding between the Slovenian Nuclear Safety Administration and the State Office for Nuclear Safety of the Czech Republic on the Exchange of Information on Nuclear and Radiation Safety Matters (as a non-treaty type of bilateral arrangement)
- Memorandum of Understanding between the Slovenian Nuclear Safety Administration and Radiation Safety Directorate of Macedonia on the exchange of information on matters of nuclear and radiation safety (as a non-treaty type of bilateral arrangement)
- Memorandum of Understanding between the Slovenian Nuclear Safety Administration and the Agency for Radiation and Nuclear Safety of Bosnia and Herzegovina on the exchange of information on matters of nuclear and radiation safety (as a non-treaty type of bilateral arrangement)
- Memorandum of Understanding between the Slovenian Nuclear Safety Administration and the National Nuclear Agency of the Republic of Albania on the exchange of information on matters of nuclear and radiation safety (as a non-treaty type of bilateral arrangement)
- Memorandum of Understanding between the European Nuclear Safety Regulators Group and the International Atomic Energy Agency for International Peer Review Missions to the EU Member States (as a non-treaty type of bilateral arrangement)
- Memorandum of Understanding between the Slovenian Nuclear Safety Administration and the Ministry for Emergency Situations of the Republic of Belarus on the Exchange of Information on Nuclear and Radiation Safety Matters (as a non-treaty type of bilateral arrangement)
- Memorandum of Understanding for Cooperation and Exchange of Information in Nuclear Regulatory Matters Between the Slovenian Nuclear Safety Administration and the President of the National Atomic Energy Agency of the Republic of Poland (as a non-treaty type of bilateral arrangement)
- Memorandum of Understanding Between the Moroccan Agency for Nuclear and Radiological Safety and Security and the Slovenian Nuclear Safety Administration for the Exchange of Technical Information and Cooperation in the Fields of Nuclear and Radiation Safety (as a non- treaty type of bilateral arrangement)

Appendix II: Reports made available to the public

All the information on nuclear safety can be found on the SNSA website, with reports and registries being published on the Slovenian Open Data Portal. A lot of information can also be found directly on the Krško NPP website.

Annual Reports on Radiation and Nuclear Safety in the Republic of Slovenia

- Three versions: long Slovene version, short Slovene version, short English version
- Published by the SNSA every year since 1985
- Available at: https://podatki.gov.si/dataset/letna-porocila-o-varstvu-pred-ionizirajocimi-sevanji-in-jedrski-varnosti-v-republiki-sloveniji

Reports for the Convention on Nuclear Safety

- National reports, questions and answers from other contracting parties to Slovenia
- Published by the SNSA every three years since 1998
- Available at: https://podatki.gov.si/dataset/porocila-po-konvenciji-o-jedrski-varnosti

Reports to the European Commission on the Nuclear Safety Directive 2014/87/EURATOM about Topical Peer Reviews

- National TPR Reports
- Published by the SNSA in 2017 and 2023
- Available at: https://podatki.gov.si/dataset/porocila-evropski-komisiji-po-direktivi-o-jedrski-varnosti-2014-87-euratom-o-strokovnih-pregledih

Reports after the Fukushima Daiichi Accident

- Krško NPP Special Safety Review (so-called Stress Tests), Slovenian national action plan reports and implementation updates
- Available at: https://podatki.gov.si/dataset/porocila-slovenije-po-fukushimi

International Peer Review Mission Reports

- Mission reports at nuclear installations (Krško NPP or TRIGA Research Reactor) and regulatory bodies (SNSA and SRPA), all available at: https://podatki.gov.si/dataset/porocila-eu-in-strokovnih-misij
- Latest IRRS mission at the SNSA in 2022: https://podatki.gov.si/dataset/060fcf96-fa30-45df-8311-fc3dd30280c6/resource/f2a9d570-4e70-49ae-ab46-d16fcc41be6e/download/finalirrsreportslovenia2022.pdf
- Pre-SALTO mission at the Krško NPP in 2021: https://podatki.gov.si/dataset/060fcf96-fa30-45df-8311-fc3dd30280c6/resource/cbf05bee-6029-4841-b973-d4e5dbd8e379/download/49krskosaltoreportfinal.pdf