# BRIEF SUMMARY

In the reporting period from October 2023 to March 2024, all nuclear installations in Slovenia have been operating safely and without any significant safety events. The new Resolution on Nuclear and Radiation Safety for the period 2024–2033 entered into force, the third Periodic Safety Review of the Krško NPP was completed and the plant entered long-term operation. The activities on the project for the construction of a new Slovenian power plant are progressing.

The Slovenian Nuclear Safety Administration (SNSA) continues to maintain good bilateral relations with foreign regulatory bodies, regularly monitors the status of nuclear installations in Ukraine and participates in relevant emergency exercises. Furthermore, the Procedures for the termination of a nuclear or radiological emergency have been prepared under the revised National Emergency Response Plan.

# GENERAL NEWS AND LEGAL SYSTEM

## New Resolution on Nuclear and Radiation Safety in the Republic of Slovenia for the Period 2024 - 2033

At the end of November 2023, the National Assembly of the Republic of Slovenia adopted the *Resolution on Nuclear and Radiation Safety in the Republic of Slovenia for the period 2024-2033*. The resolution represents a high-level commitment of the Republic of Slovenia and signals an unwavering commitment not only to maintain but to elevate nuclear and radiation safety standards over the next ten years. As an overarching program document, it unequivocally prioritizes nuclear safety over all other considerations in the peaceful use of nuclear energy. The resolution considers the latest strategic documents on the future use of nuclear energy in the Republic of Slovenia and addresses some of the challenges in this respect, such as human resources needed, research and development.

The first part of the resolution sets out ten fundamental principles and emphasizes the protection of people and the environment from the harmful effects of radiation, both now and in the future, as a fundamental safety objective. This is followed by a brief history, a description of the development of radiation and nuclear activities on the territory of the Republic of Slovenia, the current situation and the strategic documents that provide for the continued peaceful use of nuclear energy. International cooperation in the field of nuclear and radiation safety is presented, followed by a description of the current legal and institutional framework in which the tasks and competencies of state authorities and other organizations, associations, expert councils and commissions in this field are defined. A specific chapter is devoted to research and the education and training of personnel and to ensuring the competence of all stakeholders in the field of nuclear and radiation safety. The resolution also sets out the objectives for each of the areas addressed and the specific measures to achieve them, including the promoters of the measures, the timetables and the sources of funding for the measures. Finally, it provides for monitoring and reporting on the implementation of the resolution in the Annual Report on Protection Against Ionising Radiation and Nuclear Safety in the Republic of Slovenia.

## Information Security

As part of SNSA efforts to enhance information security, an external compliance assessment with the ISO 27001 standard for information security was conducted. The main objective was to review the current state and process "Information Security". For this purpose, external contractor reviewed existing procedures and documentation, conducted interviews, and made direct observations. Through active collaboration between the SNSA and the contractor, an action plan was prepared and implemented. The plan's realization involved addressing identified deficiencies by supplementing and updating procedures of process "Information Security" as well as all related management, inspection, and emergency preparedness procedures. The updates of documentation were implemented as part of the regular annual update. The assessment also included a compliance review with the Information Security Act. With this assessment, the SNSA significantly advanced toward potential future certification under the ISO 27001 standard.

## The Phoenix project: a Pre-feasibility Study on SMRs in Slovenia

Slovenia has joined the Phoenix Small Modular Reactor project, led by the Ministry of Environment, Climate and Energy, and initiated by the USA State Department. The Phoenix project aims to facilitate the transition from coal-fired plants to SMRs.

In Slovenia, the SNSA is part of the Phoenix partnership, supported by a consulting company from the USA. The primary goal of the project is to conduct a pre-feasibility study for potential SMR deployment in Slovenia. Currently, five possible locations across Slovenia and various SMR technologies, mostly pressurized water reactor types, are under consideration. The outcomes of the study will be purely informative and will not entail any final consequences. The pre-feasibility study is projected to conclude by mid-2025.

# THE KRŠKO NPP

## Long-Term operation

The Krško NPP commenced long-term operation (LTO) at the beginning of 2024. A mixed approach was chosen for the approval of the LTO, which included the following:

* preparation of the Ageing Management Programme (AMP), similar to the licence renewal by the US Nuclear Regulatory Commission;
* successful completion of the Periodic Safety Review (PSR); and
* completion of an environmental impact assessment (based on environmental legislation) as a prerequisite for the subsequent environmental consent.

The AMP was prepared by the NPP and independently reviewed by an international group of experts at the end of 2010. Following the update and completion of the regulatory review, a decision on the approval of the AMP and the amendment of the Safety Analysis Report (SAR) was issued by the SNSA in 2012.

The Krško NPP carried out additional activities related to the preparations for the LTO:

* establishment of the Department of engineering support for the LTO;
* introduction of a new LTO programme;
* updating the corrective action programme with the involvement of operational experts; and
* introduction of new programmes for the ageing management of active components and technological obsolescence.

In addition, an IAEA pre-SALTO mission (Safety Aspects of Long Term Operation) was invited to the Krško NPP; the mission took place in October 2021. At the end of 2021, an action plan was prepared by the Krško NPP in accordance with the findings of the pre-SALTO mission; its implementation is monitored by the SNSA. An environmental impact assessment was carried out in 2022, involving both national and cross-border (Austria, Croatia, Germany, Hungary, Italy) stakeholders. The environmental consent was issued in January 2023 and allows extended operation of the Krško NPP until 2043. The operating licence for the Krško NPP is subject to a successfully completed PSR every 10 years; the last (third) PSR report was finally approved together with the action plan in December 2023.

## Third Periodic Safety Review

The third Periodic Safety Review of the Krško NPP (PSR3), which started in December 2020 with the PSR3 program, was finally completed on 4 December 2023 with the approval of the PSR3 report, which contains the global safety assessment of the Krško NPP and the action plan for its implementation. The PSR3 report was also reviewed and confirmed by an independent authorized expert organization.

The approval of the PSR3 report by the SNSA also triggered the start of the implementation of the PSR3 action plan, which must be completed within 5 years. With the approval of the PSR3 report, the Krško NPP has fulfilled the requirement for the extension of the operating license for another 10 years. Another important contribution of PSR3 is that it provides an indication that continuous operation will be safe for the next 10 years. Long-term degradation processes are monitored and controlled so that safety is also guaranteed for the remaining 20 years of the plant's extended operation.

The global safety assessment has shown that the safety of the power plant has improved significantly over the last ten years, mainly due to the implementation of the Krško NPP Safety Upgrade Program that addressed the lessons learned from the Fukushima accident and the EU stress tests. Another important aspect of PSR3 was the transition to long-term operation after the NPP had reached 40 years of operation. For this reason, the recommendations of the IAEA pre-SALTO were included in the action plan for the implementation of PSR3.

The summary of the PSR3 report was translated into Slovenian in order to transparently inform the Slovenian public about the objective of the periodic safety review, the review methodology, the PSR3 results and the assessment of plant safety. The summary report also contains the complete action plan for the implementation of PSR3. The Slovenian version is published on the SNSA website.

## Unplanned shutdown due to primary coolant leakage: follow-up

The Krško NPP was preventively shut down due to an unidentified leakage from the reactor coolant system (RCS). During the unplanned outage conducted from 6 October to 17 November 2023 after the exact location of the leak was identified on the weld of the safety injection (SI) pipeline (SI-53), another crack was detected during ultrasonic testing (UT) on the same pipeline next to the safe end connecting the pipeline to the reactor vessel. Another crack indication was detected on the second line of the safety injection system (SI-52) at approximately the same location as the leak on SI-53. No traces of leakage were found at these two locations. It was decided to replace both pipelines in the part between the safe end of the reactor vessel and the first valve of each line.

The cut-off parts of the SI-52 and SI-53 pipelines were examined by NPP personnel and subcontractors using various non-destructive methods, which did not reveal any new evidence or causes of leakage.

During the unplanned outage, 18 additional welds with similar degradation mechanisms and materials as at the SI-53 leak site were subjected to UT on the safety injection pipelines. No evidence was found. In addition, the functional tests were carried out on five snubbers on the SI-52 and SI-53 safety injection pipelines, which could cause moving restraints and thus additional stresses in the pipeline. All snubbers were found operable. A temperature monitoring system was also set up to monitor thermal stratification at the edge of the safety injection pipeline perimeter. The current temperature data will be used for computer analysis of the thermal fatigue of the pipeline, which will be incorporated into the root cause analysis.

During the regular outage in April 2024, in addition to the planned welds, 40 welds on the primary system piping, the safety injection system, the chemical composition and volume control system, and the residual heat removal system will be examined as part of the extended in-service inspection programme.

Parts of the SI-52 and SI-53 pipelines on which cracks were found were sent to the USA, where the destructive and metallographic analysis of the material and weld seams will be carried out in the hot cell laboratory.

By the end of November 2024, the Krško NPP will carry out a detailed root cause analysis and submit it to the SNSA.

# The JEK2 project - New Nuclear Power Plant in Slovenia

The JEK2 project is led by the investor GEN energija, d.o.o. In 2024, the project underwent a transformation, by broadening the range of acceptable options. The plant will be a Pressurized Water Reactor (PWR) of either GEN III or GEN III+ design, comprising 1 or 2 units. Three potential suppliers for the Nuclear Power Plant (NPP) are being considered: Westinghouse from the USA, EDF from France, and KHNP from South Korea.

Currently, the initiation of the national spatial plan is nearing completion, incorporating concept solutions for JEK2, including 8 possible combinations of NPP units with varying power outputs, from 1000 Mwe to 2400 MWe envelope. Simultaneously, GEN energija is preparing bidding documentation and facilitating collaboration between the three vendors and local suppliers and subcontractors. Additionally, GEN energija is establishing the operational framework by recruiting new personnel and conducting training sessions.

Since June 2023, the Government of the Republic of Slovenia has been actively involved in the JEK2 project. A dedicated State Secretary to the Prime Minister’s cabinet is leading a working group comprising ministries, the investor, the regulatory body (SNSA), the operator of Slovenia's electric power transmission network (ELES) and the Krško NPP. In addition the Prime Minister’s cabinet with the Ministry of the Environment, Climate and Energy prepared a national strategic document, namely the *Resolution on the Long-Term Peaceful Use of Nuclear Energy in Slovenia*. The resolution has been approved by the Government and sent to the Parliament for the adoption. Notably, the resolution underscores a commitment to high levels of nuclear and radiation safety.

In November 2024, a national advisory referendum is expected to be announced, seeking public opinion for this project deemed of national importance for the next century.

The process of preparing the National Spatial Plan is planned to commence in June 2024. SNSA's role in the first part of the siting process involves issuing guidelines on nuclear and radiation safety for plan preparation. Simultaneously, a Strategic Environmental Assessment will be conducted, including an evaluation of transboundary impacts on neighbouring countries. The extensive vendor selection process is anticipated to conclude before 2028, aligning with the preparation of the Final Investment Decision, which will serve as the basis for selecting the NPP vendor.

# INTERNATIONAL COOPERATION

## Bilateral Meeting with Croatia

The 13th annual meeting under the relevant bilateral agreement with Croatia took place on December 19, 2023 in Zagreb, Croatia. Participants of both regulatory authorities discussed the latest developments in the fields of legislation and regulatory infrastructure, emergency preparedness and radiation monitoring, and exchanged brief practical information on other important developments. The countries reaffirmed their close cooperation and the need for a rapid and open exchange of data, information and experience in all relevant areas of nuclear safety and radiation protection.

## Projects of Assistance to the Third Countries

The SNSA has been active for years in several projects carried out under the auspices of the European Commission's Instrument for Nuclear Safety Cooperation. The aim of these projects is to support non-EU countries in developing or improving their regulatory infrastructure for nuclear and radiation safety.

At the end of 2023, activities began for two new assistance projects, both of which are aimed at supporting the nuclear regulatory authorities of the beneficiary countries in improving the knowledge, expertise and management skills of their staff and in transferring the methodology of experienced EU nuclear regulators. The first project, entitled *“Increased capacity and capabilities of the Nigerian Nuclear Regulatory Authority”*, will run for two years. The second project, entitled *“Further strengthening the nuclear safety and radioprotection regulator in Türkiye”* will run for 36 months.

# EMERGENCY PREPAREDNESS

## Exercises and Trainings

In December 2023, the SNSA took part in the annual exercise of the Krško NPP “NEK2023-1”, which had been announced in advance. The main objective of the exercise was to test the emergency response, communication and coordination between the emergency teams of the NPP and the SNSA.

In January 2024, the SNSA conducted a review of the implementation of the 2023 training plan. The review found that the plan was 95% implemented, with a total of 1,705 man-hours of training delivered. Members of the SNSA Emergency Response Team had the opportunity to attend 95 individual training sessions and 24 lectures on emergency preparedness and response topics. In addition, 13 exercises took place in 2023.

In March 2024, the SNSA took part in the sixth International Nuclear Emergency Exercise (INEX-6), which focused on the long-term management of radiological and nuclear emergencies. This exercise, prepared by the OECD's Nuclear Energy Agency, 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. More than 15 organisations participated in the exercise. The overall evaluation in Slovenia showed a great success and positive feedback from the participants.

## SNSA Emergency Preparedness and Response During the War in Ukraine

Two years after the start of the armed conflict in Ukraine, the SNSA continues to closely monitor the situation at the Ukrainian nuclear facilities. It continues to actively participate in relevant meetings with international organizations and in bilateral and multilateral meetings on this issue.

## Emergency Response Planning

After the government adopted the revised *National Emergency Response Plan* in May 2023, most of the appendices to the plan were finalised by the end of 2023. In collaboration with other organisations involved in nuclear and radiological emergency response, the SNSA has developed the *Procedures for the termination of a nuclear or radiological emergency*. This document contains criteria for the transition from the intervention phase to the recovery phase, defines the responsibilities of competent authorities and organizations and represents a significant advance in emergency planning for these types of emergencies.