NUCLEAR SAFETY BULLETIN

RECENT DEVELOPMENTS IN NUCLEAR SAFETY IN HUNGARY

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CONTENTS:

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GENERAL

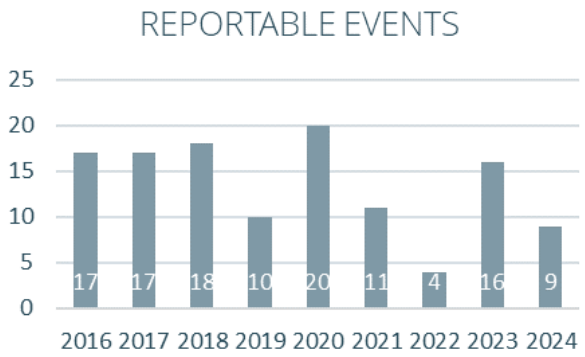
2024 ANNUAL SAFETY PERFORMANCE ASSESSMENT OF NUCLEAR FACILITIES

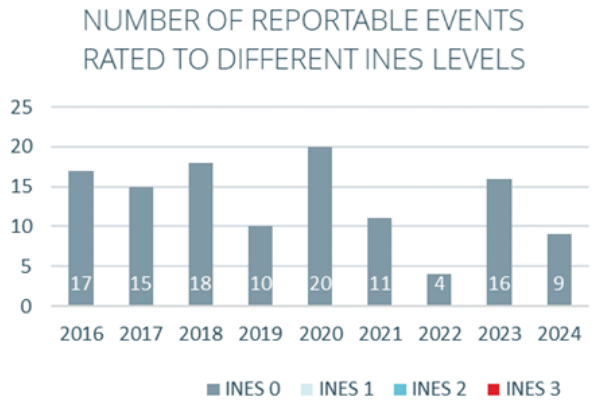
The HAEA regularly evaluates the safety performance of operators of nuclear facilities. The main sources of data for the assessment are regular reports and event reports of the licensees, the protocols of regulatory inspections including regular and comprehensive inspections focusing on specific areas, and reactive inspections.

A brief extract is provided below from the annual safety performance assessment.

Paks Nuclear Power Plant

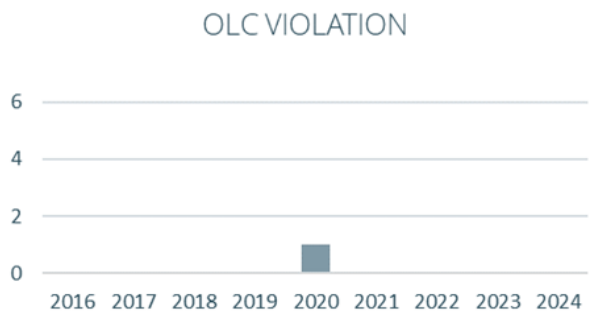
In 2024, nine reportable events occurred. Two of the events were due to measurement circuit malfunctions, one was caused by fire during maintenance work, two due to electrical faults, two due to exceeding an administrative limit, one due to high-cycle fatigue and one due to human error.

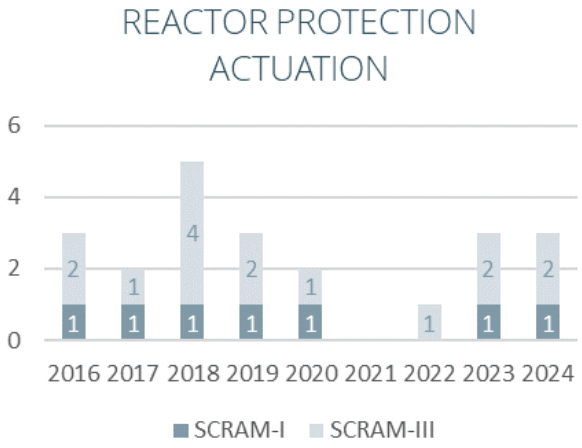




All 9 reportable events were classified as „below scale" corresponding to Level 0 on the seven-level International Nuclear and Radiological Event Scale (INES). No event classified as INES 1 or higher has occurred since 2012.

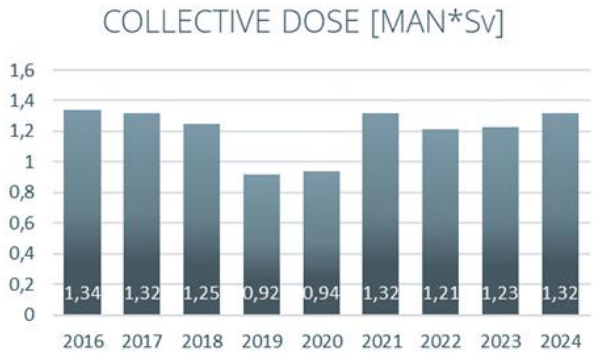
There was no OLC (Operational Limits and Conditions) violation in 2024.





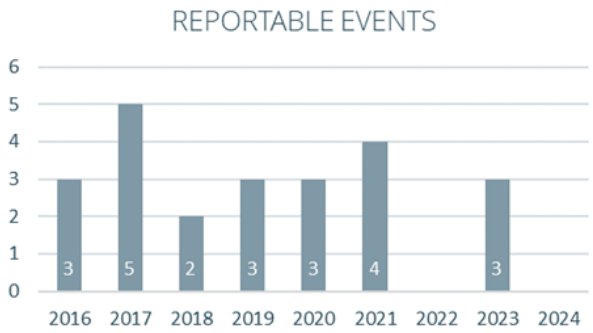
In 2024, there was one SCRAM-I reactor protection activation due to simultaneous differential protection activation on Unit 1 generators. Additionally, two events occurred involving SCRAM-III reactor protection activations: one caused by a fault on the electrical grid and the other by the failure of a main circulation pump due to a false protective signal.

The collective dose of the workers increased slightly in 2024 compared to the precious year, but it is similarly low as in the previous year.



Budapest Research Reactor

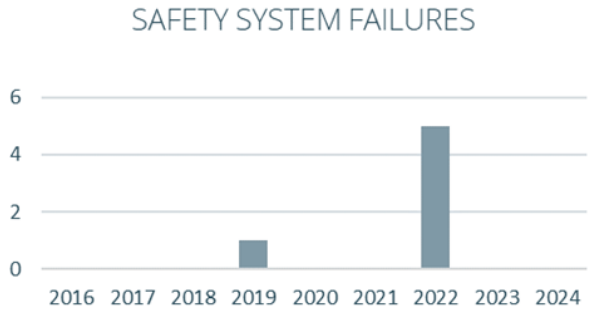
No reportable events occurred at the Budapest Research Reactor in 2024.



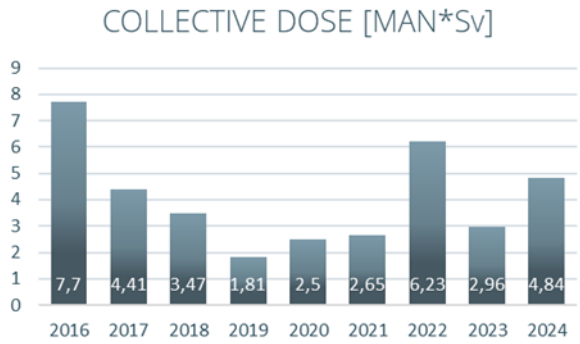
BUTE Training Reactor

In 2024, one reportable event occurred at the Training Reactor: the outer glass of one of the reactor building's windows cracked due to a stone thrown up during lawn mowing.

In 2024, no safety system failure occurred.

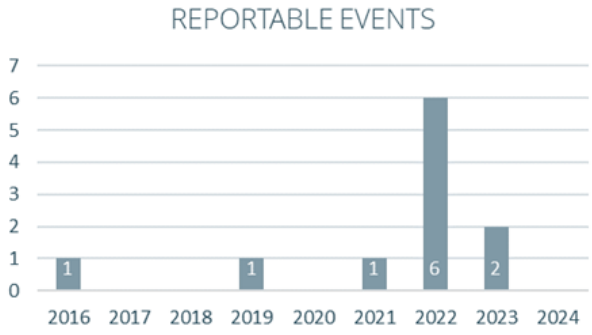


Interim Spent Fuel Storage Facility



In 2024, the collective dose of the workers increased compared to the previous year. In the first half of the year, this was due to maintenance-related work, while in the second half of the year the collective dose of the operating personnel was increased.

In 2024, no reportable events occurred.



LEGAL CHANGES IN THE FIRST HALF OF 2025

The primary purpose of the recent amendments of the Act CXVI of 1996 on Atomic Energy (Atomic Energy Act) is to create the statutory provisions regulating the planned further lifetime extension of Paks Nuclear Power Plant, however, several other points have also been modified.

Based on the amendment to the Atomic Energy Act, the Minister responsible for energy policy shall ensure the preparation of the national programme presenting the implementation of the objectives of the national policy on the management of spent fuel and radioactive waste and its review. The amendment to the Atomic Energy Act assigns the responsibility of the Minister responsible for energy policy to inform the European Commission about the review of the national programme, its significant amendment, and to provide the Commission with the information requested in relation to the national programme.

The new paragraph (4) of Section 6/N of the Atomic Energy Act establishes a special rule regarding study contracts concluded in connection with studies related to the commissioning and operation of a nuclear facility, in order to allow the civil servant to undertake not to terminate his civil service relationship for a maximum of ten years.

Human resources, the accumulation of specialized knowledge, and its preserving are of fundamental importance not only from the perspective of the given nuclear facility and the Hungarian Atomic Energy Authority (HAEA) but also for nuclear safety. In light of this, it has become necessary to extend the above provision not only to public servants employed at the HAEA but also to employees of nuclear facilities in the new (1a) paragraph in Section 11 of Atomic Energy Act.

Further amendment of the Atomic Energy Act stipulates that the deadline of the administrative procedure for obtaining license for further lifetime extension is 11 months, which can be extended by 60 days in certain cases.

The amendment enables the HAEA to conduct priority procedures, meaning that the HAEA will make its decision within the administrative deadline specified in Section 12/B of the Atomic Energy Act, but in the shortest possible time. The specific cases in which priority procedures can be applied may be determined by the presidential decree issued for the implementation of the Atomic Energy Act.

Section 14 (1a) of the Atomic Energy Act clarifies that the temporal validity of a fixed-term license may be extended upon request, provided that the extension is permitted by law.

Further amendment of the Atomic Energy Act assigns to the HAEA the authority to grant licenses for maintaining nuclear power plant systems, system components, structures, and building elements in a condition differing from the original design. Additionally, it authorizes the approval of the implementation program for further lifetime extension.

Annex 2 of the Atomic Energy Act designates the authorities participating as specialized authorities in the HAEA's administrative procedures. The amended Atomic Energy Act designates the National Directorate General for Disaster Management of the Ministry of the Interior as an additional specialized authority for civil protection and nuclear accident response matters.

The competent metropolitan and county government office, acting in its fire protection competence, serves as a specialized authority in matters of fire protection.

The 1/2022. (IV. 29.) HAEA Decree on the nuclear safety requirements of nuclear facilities and on related regulatory activities has been modified on many points, among others with provisions on further lifetime extension of a nuclear power plant and on maintaining deviation from design.

SUCCESSFUL „ABOUT ATOMIC ENERGY – FOR EVERYONE" EVENT IS GYŐR: NEARLY THREE HUNDRED STUDENTS AND TEACHERS PARTICIPATED IN THE EVENT

In cooperation with Széchenyi István University and the TIT Studio Association, the HAEA held an event called "About Atomic Energy - for Everyone" on December 12, which was attended by nearly three hundred teachers and students. In addition to the presentations, participants could learn about the various applications of nuclear energy, the management of radioactive waste, tour the Paks Nuclear Power Plant with virtual reality glasses, and conduct radiation measurements, all while talking directly with experts.

Following the educational presentation on radiation, the audience received an overview of the Chernobyl and Fukushima nuclear power plant accidents and their lessons learnt, then learned about the 21st century utilization possibilities of nuclear energy and fusion energy production, and finally received information about the utilization of nuclear energy in outer space. Between the presentations, the students played knowledge games, and at the exhibition they asked a lot of questions, using a new application they were able to virtually assemble a nuclear power plant, and they could try equipment used by the disaster management organisation, such as radiation measuring device.

Given the success of the event, HAEA will continue the event series in 2025, and will share new educational content and interesting facts throughout the year on its Instagram page.

PREPARATION FOR THE IRRS MISSION

The HAEA and the relevant domestic partner authorities (Baranya County Government Office, National Public Health and Medical Center, and Ministry of Energy) are currently preparing for the second Integrated Regulatory Review Service (IRRS) mission. During the mission, a group of international experts will examine, based on the standards of the International Atomic Energy Agency (IAEA), the level of Hungary's regulatory framework in the field of nuclear and radiation protection compared to international expectations. Hungary hosted the first IRRS mission in 2015, and the follow-up mission in 2018, so taking into account the 10-year cycle defined by Directive 2014/87/EURATOM, the next mission will take place in October 2025.

The next step in the preparations was a preparatory meeting held at the HAEA headquarters on 23-24 April 2025, at which the HAEA, together with its partner authorities, presented the IAEA representatives the Hungarian legal background for the use of atomic energy and the preliminary results of the self-assessment carried out so far during the preparations. During the meeting, the participants also discussed organizational issues related to the mission planned for October.

Following the meeting, the HAEA developed a schedule for the preparation of the Advance Reference Material (ARM), which is the final step of the self-assessment and will serve as background material for the mission reviewers.

INTRODUCTION OF A NEW ELECTRONIC ADMINISTRATION SYSTEM

In December 2024, the electronic administration system used in the administrative procedures of the HAEA changed: instead of the previously used “atomic energy related regulatory procedure supporting electronic documentation system” (ATDR) through the use of the Personalized Administration Interface (hereinafter referred to as the Portal) clients of the HAEA can now submit documents via the state operated website magyarorszag.hu, utilizing the form submission support service (hereinafter referred to as the e-Form Service).

The interface of the Portal is user-friendly and accessible both from desktop computers and smart devices using widely known browsers and operating systems.

As part of the e-Form Service, HAEA has developed and published nearly 200 case-specific forms on the Portal. A comprehensive list of these case types is also available on the official website of the HAEA, under the "E-Administration" menu. Clients can select the form corresponding to the subject of their submission from this list, thereby facilitating the work of both parties: administrative processing of submissions to the appropriate professional departments within HAEA is faster and more accurate, while client representation rights can be more clearly defined.

Submitting cases through the Portal is significantly easier for licensees, there is a drastic reduction in the number of help and support requests related to form submissions.

Thanks to the related services provided by the Hungarian state on the new interface, login, verification of authorization, and electronic authentication of submitted documents have all been simplified.

Clients initiating administrative procedures can access the Portal following a central two-factor authentication, their authorization can be more easily verified, and authorizations registered in the Authorization Register can be more accurately tracked. As a result, HAEA clients can be assured that only individuals they have authorized act on their behalf, and only in the case groups for which the authorization was granted.

The system allows for a pre-submission validation to minimize formal and content-related errors by preventing the submission of incomplete or incorrectly completed forms.

The electronic authentication of submissions is handled by an integrated authentication service within the form. For attachments submitted with the form, clients can choose whether to upload a document already electronically signed (using DÁP or services offered by commercial providers) or to authenticate the attachments during submission using the embedded authentication service.

Documents delivered to the client’s electronic storage may be retrieved and reviewed at any time, provided that they are transferred to the permanent archive within the prescribed deadline.

For professional questions related to the submitted cases, HAEA personnel continue to assist clients. However, for technical issues – such as login failures, authentication problems or missing confirmations – clients should contact the government customer service by calling 1818.

PAKS NPP

POWER REDUCTION AT UNIT 4 DUE TO SHUTDOWN OF A MAIN CIRCULATION PUMP

On February 9, 2025, at nominal power operation of Unit 4 of the Paks Nuclear Power Plant, the 2nd Main Circulation Pump (MCP) was shut down due to a technological protection signal. In response, the reactor protection system reduced the reactor power to a level corresponding to the number of the remaining operating MCPs. After the protective action, the staff stabilized the unit's parameters and began troubleshooting.

The shutdown of the MCP was caused by the inadvertent generation of a "not open" signal from the end position switch of the interlock transmitter, despite the valve responsible for organized leakage drainage being in the open position. After replacing the end position switch unit, the affected interlock points were tested, confirming correct operation. Subsequently, the 2nd MCP was restarted and Unit 4 was brought back to nominal power.

The replaced end position switch was examined by experts under workshop conditions, and no fault-indicating symptoms were detected during the inspection. To determine the root cause of the event, a full review of the affected interlock circuit is scheduled during the 2025 general overhaul of Unit 4.

According to the International Nuclear and Radiological Event Scale (INES), the event was rated 0 (below scale), meaning it had no safety significance.

PAKS II PROJECT

CRACKS IN THE WALL OF THE WORKING PIT OF THE NUCLEAR ISLAND OF UNIT 5 AND THE DETACHMENT OF THE CORNERS OF THE SOUTHERN LOWER PART

As part of the site preparation activities preceding the construction of the new nuclear power plant units, soil excavation to the design level began on 24 September 2024, in the area of the planned Unit 5. In the previously established soil-stabilized block – which functions as a spatial boundary wall for the Unit 5 work pit – cracks appeared in November 2024. On 30 January 2025, at the corners of the southern berm-peninsula of the work pit, soil-stabilized blocks collapsed along more pronounced cracks. The collapse of the corners of the lower berm – composed of stabilized blocks and serving as spatial boundary walls –occurred locally and according to the information provided by Paks II. Ltd., did not endanger the structural integrity of the work pit.

The construction site of the Paks II Nuclear Power Plant, nuclear island of Unit 5 in the location of the lower part of the Southern working pit affected by collapse (The photo was taken by Paks II. Ltd.)

In response to these events, the HAEA implemented several measures; in an entry made in the HAEA's special construction e-log on 31 January 2025, HAEA ordered an immediate halt to further work, which the HAEA inspectors formally communicated to representatives of Paks II. Ltd. during an inspection conducted that day. On the same day, in accordance with legal regulations, HAEA also issued an order prohibiting the continuation of construction activities in the Unit 5 work pit along the souhern wall and the other sections at risk. On 6 February 2025, in its resolution, it called upon Paks II. Ltd. to take further necessary measures (elimination of irregularities, targeted measures to ensure stability on all relevant sections in order to preserve the integrity of the structure) regarding the prohibition of continuing the soil excavation works for the nuclear island of Paks Nuclear Power Plant Unit 5.

The HAEA conducted numerous site visits with the involvement of external experts and withthe participation of HAEA leaders. Paks II. Ltd., together with its Main Contractor (JSC ASE), secured the affected areas, extended monitoring activities, and prepared an action plan to repair the spatial boundary walls of the work pit in sections where integrity was compromised. Within the framework of the action plan, unstable parts were removed and additional reinforcement was applied. Based on data from the monitoring system, after reaching the design level – according to information provided by Paks II Ltd. – movements toward the pit have consolidated, the reports on the measures are being processed.

The construction site of the Paks II Nuclear Power Plant, nuclear island of Unit 5 the location of the lower part of the Northern working pit reinforced with soil nails (The photo was taken by HAEA.)

RADIOACTIVE WASTE MANAGEMENT

JOINT CONVENTION: 8TH REVIEW ON THE SAFETY OF SPENT FUEL AND RADIOACTIVE WASTE MANAGEMENT

The 8th Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management took place at the IAEA in Vienna between 17 and 28 March 2025.

Every three years, the Contracting Parties to the Convention hold a review meeting to report on developments and changes since the previous meeting, as well as to share national practices. Prior to the review meeting, the Contracting Parties submit a national report to the IAEA and then submit written comments and questions to each other. Developments that occurred after the submission of the report are presented during the review meeting in the form of national presentations.

Over the course of two weeks, Contracting Parties presented and discussed their national reports through a constructive exchange of views so that they can learn from each other about solutions in the field of safe management of spent fuel and radioactive waste.

The Hungarian national report was discussed on the fourth day of the Review Meeting. Hungary was represented by a delegation led by the President of the HAEA, Andrea Beatrix Kádár. The delegation included representatives from the Public Limited Company for Radioactive Waste Management (PURAM), the Ministry of Energy, and the MVM Paks Nuclear Power Plant Ltd.

The HAEA, the PURAM, and the Ministry of Energy jointly presented the national report on developments in the management of spent fuel and radioactive waste since the last review meeting. The president of HAEA, among other matters reported on the 2022 IAEA ARTEMIS mission, which highlighted the advanced status of Hungary's radioactive waste management infrastructure.

Based on the national report, the Hungarian presentation, and the answers to the questions received, the Review Meeting concluded that Hungary's practices in the management of radioactive waste and spent fuel are in compliance with the requirements of the Convention. As a challenge, completing development of safety regulations for management of very low activity level radioactive waste including disposal was noted, along with the need to strengthen the resources and competencies of the HAEA to fulfil its responsibilities related to the safety of radioactive waste and spent fuel management, in particular with regard to the development of deep geological and very low activity level radioactive waste disposal facilities. As a good performance, the meeting acknowledged the newly introduced two-step approach for stakeholder and public involvement during facility-level licensing procedures.

PUBLIC FORUM AND PUBLIC HEARING IN HAEA'S LICENSING PROCESS RELATED TO THE "APPLICATION FOR A NEW OPERATING LICENCE FOR RADIOACTIVE WASTE TREATMENT AND DISPOSAL FACILITY IN PÜSPÖKSZILÁGY"

An important step in the facility-level licensing processes is to hold a public hearing during the process, as required by the Atomic Energy Act. The public hearing in the regulatory process related to the "Application for a new operating licence for the Radioactive Waste Treatment and Disposal Facility in Püspökszilágy" was organised by the HAEA through electronic way on its website. In preparation for this, the notice was published on 28 February, together with the summaries (the summary of the HAEA and the summary of the licensee, PURAM). Questions, comments and opinions on the process could be sent by e-mail from 10 March. The electronic public hearing was closed on 17 March.

As a novelty, prior to this, PURAM held a public forum in Kisnémedi on 27 February 2025, where they informed the public in person about the new storage concept planned for the Radioactive Waste Treatment and Disposal Facility, the introduction of a new cask storage system for disused sealed sources with significant radioactivity. The HAEA was also invited to the forum, represented by István Lázár, head of the department, who gave a brief overview of the related regulatory procedure and drew attention to the public hearing to be held in March.

INTERNATIONAL COOPERATION

HAEA PRESIDENT MEETING WITH THE US NUCLEAR REGULATORY COMMISSION CHAIRMAN

The U.S. Nuclear Regulatory Commission's (U.S. NRC) 2025 Conference was hosted in Rockville, Washington between 11 and 13 March, focusing on such topics as the latest trends in the nuclear sector, new regulatory challenges as well as the opportunities offered by innovative technical and engineering solutions. The delegation of the HAEA led by President Andrea Beatrix Kádár participated in the event.

The conference offered the opportunity for the Hungarian delegation to engage in bilateral talks with David A. Wright, the newly appointed U.S. NRC Chairman. During the meeting the parties touched upon among others possible avenues of further cooperation, fuel diversification, and challenges related to regulatory oversight of the new nuclear units, the nuclear workforce challenges, preparation of the IRRS mission to Hungary at the end of 2025 and cooperation opportunities in the field of small modular reactors.

TECHNICAL WORKSHOP AT THE HAEA ON AGEING MANAGEMENT AND LIFETIME EXTENSION OF NUCLEAR POWER PLANTS

On 11-12 February 2025, the HAEA hosted a technical workshop with the participation of the HAEA's management and representatives of MVM Paks Nuclear Power Plant Ltd. (Paks NPP), the Russian partner authority Rostechnadzor and the Russian state-owned utility JSC Rosenergoatom. The main topic of the event was ageing management and the review of certain regulatory and operator tasks related to further lifetime extension of the Paks NPP, as well as the analysis and summary of known international experiences and further enhancement of the expert dialogue.

The presentations of the HAEA and the Paks NPP provided detailed information on preparations for the lifetime extension of the Paks NPP and its legal background. Furthermore special attention was paid to ageing management and solution of those tasks that have been identified as ones requiring major technical intervention during the implementation of the lifetime

extension. At the technical forum Rostechnadzor and JSC Rosenergoatom contributed to the effective implementation of the activities aimed at further lifetime extension of the VVER-440/V213 type units at Paks by presenting best practices based on the extensive experience gained in successfully implemented similar projects.

INTERREGIONAL TRAINING COURSE ON NUCLEAR SAFETY ASSESSMENT FOR NUCLEAR POWER PLANTS

Due to the increasing number of countries developing nuclear power plants, the IAEA has launched an initiative to provide training series in the safety analysis and assessment of new nuclear power plants. The training series aims to provide a comprehensive overview of all safety concepts and their application in the design and operation of nuclear power plants and research reactors. For candidates who have mastered the preliminary training materials and successfully answered the related questionnaires, the IAEA has provided the opportunity to attend a 2-week training course in Cairo, which is the first stage of an expanded 4 weeks long series of courses, planned for later. The training course in Cairo focused on basic safety concepts and deterministic safety analysis (DSA), with an approximate 50/50 mix of theoretical and practical lectures, during which candidates worked in groups to solve review and analysis tasks. In later phases of the initiative, the safety analysis course will be expanded to include the topics of first and second level probabilistic safety analysis.

As invited lecturer/expert a nuclear safety inspector of the HAEA attended to the second week of the training in Cairo in order to provide lectures on the basics of DSA (e.g.: identification and selection of postulated initiating events, validation and verification, DSA methods and approaches, etc.) supplemented by case studies of certain events such as medium break loss of coolant accidents and spent fuel pool accident scenarios. Invited lectures/experts also provided lectures on relevant theoretical (e.g.: design extension condition analysis, practical elimination) topics and case studies (e.g.: station blackout scenarios).

The second half of the week was devoted to a purely practical training. During this, the lecturers divided the participants into groups and provided them with documentation of pre-prepared analyses. Their tasks included:

- Determine what acceptance criteria the analyst should apply to the given initial events and scenarios;
- Determine what additional information they would need in order to be able to judge whether the calculation was appropriate;
- Examine the submitted analyses and identify any errors/problems.

At the end of the training, an exam was completed by the attendees to verify the successful acquisition of knowledge and in accordance with IAEA practice, the participants' feedback was collected and evaluated. According to the participants, both the theoretical and practical training sessions were found to be outstanding.

The expanded four-week course is planned to take place in 2025, likely in China, and will cover not only safety principles and deterministic safety analyses, but also probabilistic safety analyses of the first and second levels. Although the primary target audience of the event is young professionals from embarking countries, domestic interested parties should check the IAEA

Intouch+ system and/or the HAEA website regularly, where the list of events available to the Hungarian target audience is constantly updated.

SECOND TOPICAL PEER REVIEW

In line with Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations and in the framework of second topical peer review (TPR II) defined by European Nuclear Safety Regulators Group (ENSREG), the Hungarian nuclear facilities and co-authorities responsible for nuclear and fire safety carried out a comprehensive self-evaluation in the field of fire safety/protection, the results of which were presented in the form of a National Assessment Report. This combined effort was coordinated by the HAEA in Hungary, for the HAEA invited the National Directorate General for Disaster Management, Ministry of the Interior (NDGDM) as the general authority for fire protection. The specifics of the self-assessment as well as the structure and expected content of the various chapters within the National Assessment Report were defined by ENSREG in a dedicated Technical Specification document developed by Western European Nuclear Regulators' Association (WENRA). The Technical Specification document addressed the format and content elements of the National Assessment Report to be prepared and the WENRA Safety Reference Levels (SRL) to be taken into account/examined for each chapter.

Based on the Technical Specification, the HAEA invited the following facilities into the self-assessment:

- Paks Nuclear Power Plant
- Budapest University of Technology and Economics –Training Reactor
- Budapest Research Reactor
- Interim Spent Fuel Storage Facility

As part of the TPR II self-assessment, the HAEA and the NDGDM carried out on-site inspections at all facilities involved in TPR II project in order to make sure that well-founded regulatory assessments are developed for the National Assessment Report and to identify potential non-conformities that would not be possible in another format of the self-assessment and identify potential improvement areas that remained hidden in the previous phases of the self-assessment.

As a result of the self-assessment, a nearly 150-page National Assessment Report was compiled, which the HAEA sent to ENSREG in accordance with it’s request and made publicly available on the HAEA's website. For the licensees invited to the self-assessment, the authorities formulated a total of 16 corrective actions, the implementation of which the licensees voluntarily undertook.

As part of the TPR II process, a group of ENSREG experts conducted a site visit at the Budapest Research Reactor, with the participation of representatives of the research reactor, HAEA and NDGDM.

During the walk-down, the ENSREG experts reported positive experiences, expressing that the experiences at Budapest Research Reactor are largely in line with those at similar facilities, however, they are ahead of similar facilities in some areas, but at the same time one remark was

also made to further improve fire safety (regarding the separation of diesel engines with fire barriers).

The experiences of the site visits and the national assessment reports were evaluated by the groups of international experts invited by ENSREG and the authorities and nuclear facility operators of the European Union member states, the results of which were presented to the countries participating in the review at two expert meetings in Luxembourg in the fall of 2024. The solving of the non-conformities (mainly minor administrative and procedural errors and deficiencies) identified during the self-assessment and the previous on-site visits by ENSREG experts were already implemented before the events took place, and the HAEA plans to deal with the remainders as part of the related TPR II National Action Plan.

ENSREG is currently in the phase of finalization a European-wide report and evaluating the individual national reports, while the draft reports are being discussed with representatives of the countries and facilities participating in the project. Regarding Hungary, the opinions expressed so far can be considered mostly positive, no critical deficiencies were identified, and the overwhelming majority of the identified deficiencies were included in the Hungarian National Report during the self-assessment. As these problems were already known in earlier phases of the project, the implementation of corrective actions is already underway in many cases. After the publication of the final ENSREG report for Hungary and based on it, the HAEA will draft a National Action Plan and monitor the related activities of the licensees. A follow-up mission from ENSREG is expected in 2025, where the progress of the implementation of the National Action Plan will be examined, during which the vast majority of the corrective measures will be completed as planned.

NUCLEAR AND RADIOLOGICAL EMERGENCY RESPONSE

CONVEX-2A EXERCISE

On April 2, 2025, the HAEA participated in the ConvEx-2a methodological exercise organized by the IAEA, aimed at testing international rapid notification and radiological monitoring systems. During the exercise, HAEA's Nuclear Emergency Response Organization (ERO) tested its internal protocols, focusing on reporting, data upload, and workflow improvement.

The participants executed their work from the emergency response center (CERTA) at the HAEA with continuous IT support. Task execution was organized through designated roles, including crisis manager, reporter, Emergency Inspector on Duty, radiological expert, and logistics officer. An evaluation report was compiled after the exercise, documenting best practices, identified shortcomings, and recommendations for improvement. Overall, the exercise achieved its objectives and was deemed successful.

SUMMARY OF THE STATUS OF THE UKRAINIAN NUCLEAR FACILITIES

Nuclear Safety in a Wartime Environment

In the first quarter of 2025, the nuclear safety situation in Ukraine remained highly unpredictable and vulnerable. The IAEA maintained a continuous presence at the most critical Ukrainian

facilities, yet the scale and intensity of the conflict posed new challenges, demanding increasingly complex technical and diplomatic responses.

Zaporizhzhia Nuclear Power Plant – Under Constant Threat

Throughout the first quarter of 2025, explosions were heard nearly daily in the vicinity of the Zaporizhzhia Nuclear Power Plant. Some occurred close enough to pose significant risks to the facility's safety systems. In February, the plant faced another critical situation when it lost its last remaining 330 kV backup power line and was left relying solely on a single 750 kV transmission line. Although the reactors are currently shut down, a continuous power supply is essential for the operation of cooling systems and other safety-critical functions. Since the onset of the war, the facility has experienced complete loss of off-site power eight times, relying solely on diesel generators on the site during those periods.

IAEA experts conducted multiple inspections within the plant during the first quarter, including the reactor control rooms, turbine halls, and switchyards. Although no physical damage was reported, the frequent explosions, power supply instability, and gradual degradation of infrastructure raise serious long-term concerns.

Drone Attack at Chernobyl – Damage to the New Safe Confinement

On February 14, 2025, a drone attack struck the New Safe Confinement (NSC) structure over Reactor 4 at Chernobyl. The attack ignited a fire in the upper insulation layer of the structure and breached both its outer and inner shells. While radiation levels remained stable according to IAEA measurements, the damage undermined one of the NSC's most critical functions – the isolation of radioactive materials. The fire took more than two weeks to extinguish, with firefighting efforts hampered by adverse weather and the complexity of the structure.

By mid-March, the situation was declared "under control" and preparations began for repairs. Investigations revealed a hole about six meters in diameter in the roof and extensive damage to electrical cabling. Repair work is expected to take considerable time and can only begin once the further fire risk is completely eliminated.

Persistent Threats Around All Ukrainian Nuclear Power Plants

Attention was not limited to Zaporizhzhia and Chernobyl. Daily air raid alerts were reported near the Khmelnytskyi, Rivne, and South Ukraine Nuclear Power Plants. In several cases, IAEA observers had to take shelter or suspend inspections. Drone activity was frequently reported within the security perimeters of the facilities. While no direct damage was caused, these incidents continue to exert psychological stress on personnel and limit operational flexibility.

International Presence and Technical Support

The IAEA maintained its physical presence at all four major Ukrainian nuclear facilities during the first quarter. At Zaporizhzhia, the scheduled rotation of the IAEA support team was delayed in February due to on-site military activity. The team was successfully rotated under safe conditions in March, marking the 27th rotation since the mission began.

During the first three months of the year, the IAEA delivered 113 technical consignments to Ukraine. These included medical equipment, radiation monitoring instruments, components for

industrial automation systems, and telecommunications and surveillance tools. The support was funded by the European Union, the United States, Norway, France, Sweden, and Ireland.

High-Level Diplomatic and Technical Engagement

In February, Director General Rafael Mariano Grossi visited Ukraine for the 11th time, meeting with President Volodymyr Zelenskyy as well as the ministers of energy and foreign affairs. Special attention was paid to the condition of substations that are vital for ensuring power to nuclear power plants. IAEA experts inspected several such sites earlier this year, documenting significant physical damage and maintenance deficiencies. Although restoration efforts are ongoing, the infrastructure remains fragile.

Overall Assessment

Based on the events of the first quarter of 2025, it is clear that Ukraine's nuclear infrastructure remains under persistent threat. The incidents at Zaporizhzhia and Chernobyl underscore how rapidly a serious nuclear safety crisis can arise—whether due to direct attack or disruptions in power supply. The IAEA's on-site presence and international support efforts are crucial to maintaining operational stability, but long-term security can only be achieved through a reduction in hostilities.