HUNGARIAN ATOMIC ENERGY AUTHORITY
Nuclear Safety Bulletin

H-1539 Budapest, P.O. Box 676,
Phone: +36 1 4364-800, Fax: +36 1 4364-804, e-mail: haea@haea.hu

website: www.haea.hu

RECENT DEVELOPMENTS IN NUCLEAR SAFETY IN HUNGARY

July 2024

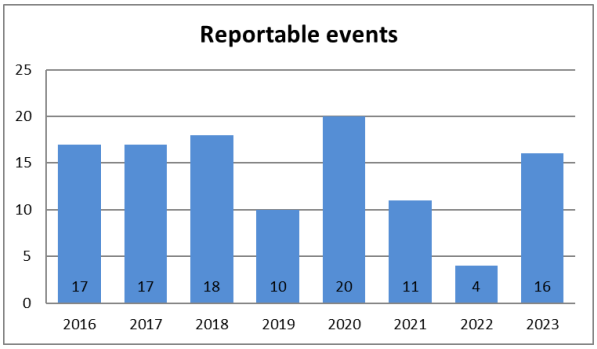
General

2023 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 records of regulatory inspections including regular and comprehensive inspections focusing on specific areas, and reactive inspections.

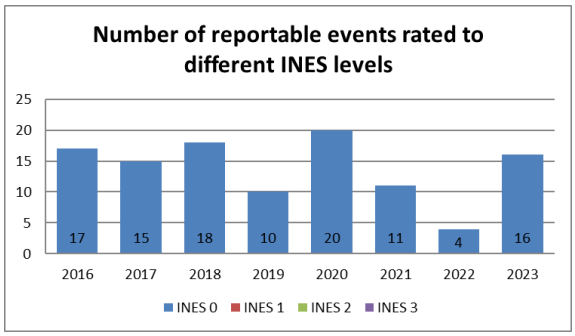
A brief extract is provided below from the annual safety performance assessment.

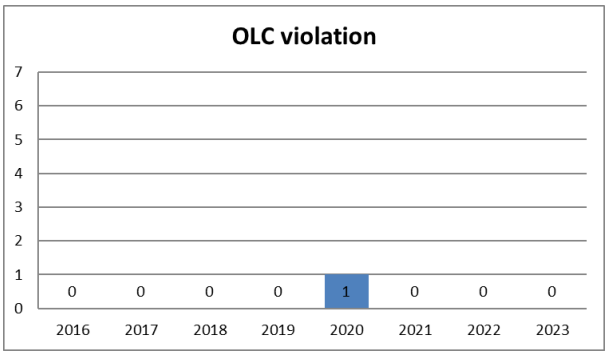
Paks Nuclear Power Plant



In 2023, 16 reportable events occurred. It is more than in the previous year, but this does not represent a big difference compared to previous years. Three of the events belonged to the promptly reportable event category. 5 events occurred due to the inoperability of the spent fuel pool cooling loop. 3 events were the result of inappropriate human intervention, two of which were related to the outage of the nuclear unit.

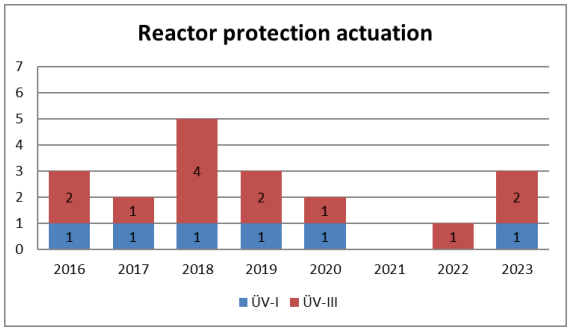
16 events have been reported by the NPP altogether, all of them were of category „below scale" corresponding to Level-0 on the seven-level International Nuclear Event Scale (INES). No event classified as INES 1 or higher has occurred since 2012 in a nuclear facility.

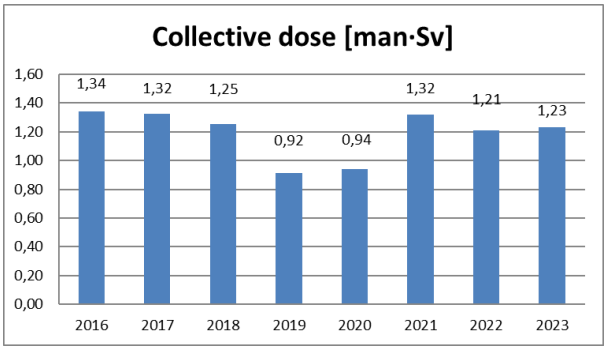




There was no OLC (Operational Limits and Conditions) violation in 2023.

In 2023 one SCRAM-I occurred after protection actuation due to exceeding the water level limit of the high-pressure preheater. Two SCRAM-III occurred, one due to the inoperability of two safety systems, the other due to shut down of a main circulation pump to a false protection signal.

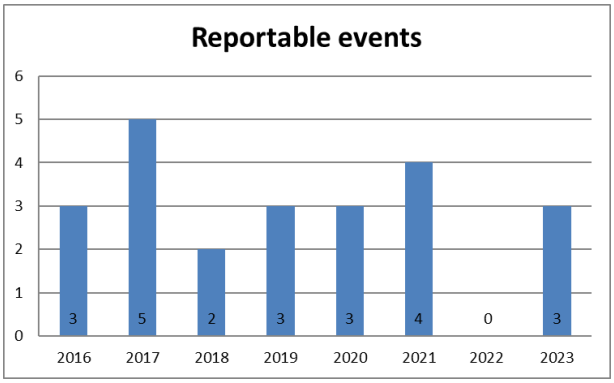




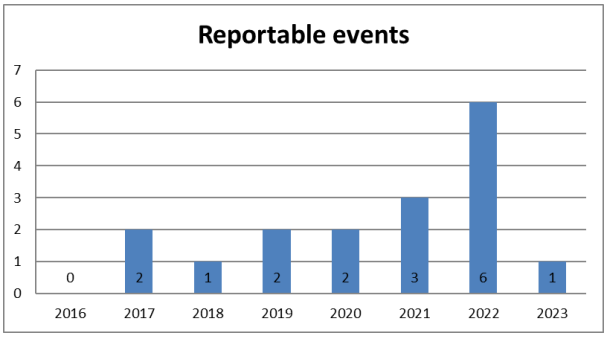
The collective dose of the workers increased slightly in 2023 compared to the previous year, but it is similarly low as in the previous years.

Budapest Research Reactor

3 reportable events occurred at the Budapest Research Reactor. Once the reactor had to be shut down during reactor start-up due to a malfunction of a status indicator, the other two were due to voltage drop originated from the external network.

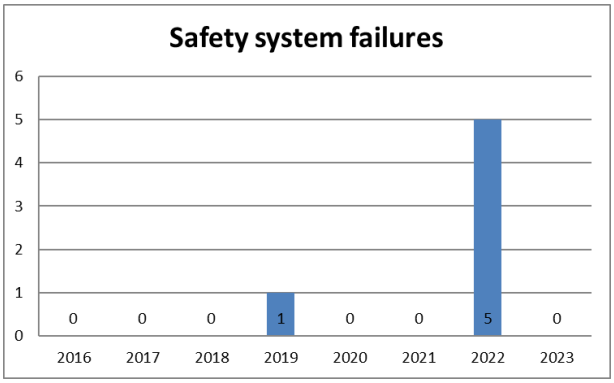


BUTE Training Reactor

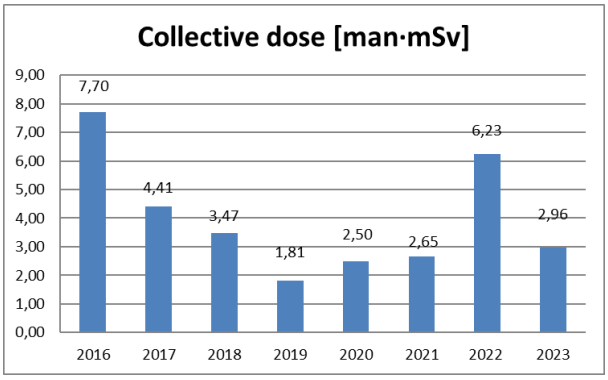


One reportable events occurred in 2023, due to a suspected leakage in the heating tank.

In 2023, no safety system failure occurred.

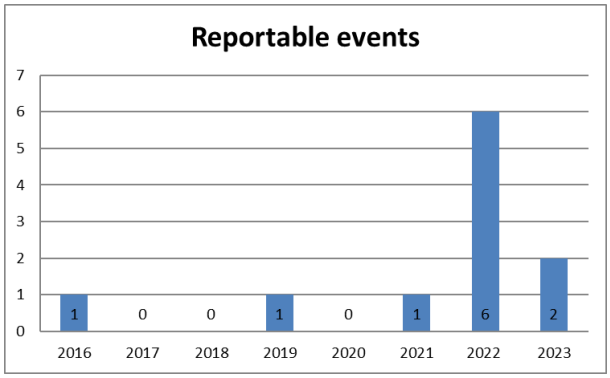


Interim Spent Fuel Storage Facility



In 2023, the collective dose of workers did not exceed the limit of 15 person*mSv either.

In 2023, there were two reportable events. Both events occurred due to failures of the cassette dryer's rubber seal.



Based on the comprehensive safety performance assessment it can be stated that during 2023 the nuclear safety of facilities inspected by the HAEA were at appropriate level, as in previous years.

Latest amendments of the Hungarian Atomic Energy Act (second half of 2023)

The aim of the recent amendments of the Hungarian Atomic Energy Act is to create the statutory provisions necessary for the first stage review of 1/2022 HAEA Decree on the nuclear safety requirements of nuclear facilities and on related regulatory activities (hereinafter referred to as 1/2022 HAEA Decree).

The definition of independent inspection organization authorized under legislation has been added to the provisions of the Hungarian Atomic Energy Act. The latest amendment of the Atomic Energy Act enables the Hungarian Atomic Energy Authority (hereinafter referred to as the HAEA) to cooperate with the National Accreditation Authority in the capacity of the atomic energy oversight authority. This cooperation will cover those accreditation procedures in which the assignment of an expert who has gained

professional experience in the field of application of nuclear energy is compulsary. The cooperation enables the HAEA civil servant's participation in the evaluation phase of the National Accreditation Authority's accreditation procedure and in the work of the evaluation group in the nuclear field.

Further amendment of the Atomic Energy Act requires occasional payments to be delivered into the Central Nuclear Financial Fund by the licensee of a nuclear facility at the time when the licensee already possesses a license of siting, but does not have a license of operation yet. The licensee pays the costs of the preparatory tasks related to the management of radioactive waste and the management of spent fuel prior to the entry into force of the licence of operation by means of a case-by-case payment to the Central Nuclear Financial Fund. The amount to be paid is determined by the law on the central budget of the given year.

According to the new amendment of the Atomic Energy Act the HAEA issues a service ID card to persons representing the HAEA in order to be able to prove their eligibility during the performance of their official duties. The HAEA keeps a register of service ID cards. The president of the HAEA shall establish all the detailed rules and data content relevant to the service card in a separate HAEA decree.

Chapter III on Regulatory Oversight of the Atomic Energy Act is added with the subhead on the procedure for the acknowledgement of notification and the procedure for the notification of deviations. In these procedures the licensee cannot be called upon by the HAEA to remedy the deficiency as well as these procedures cannot be combined, neither ex officio nor upon request.

According to the provisions of 1/2022 HAEA Decree specific activities may be carried out by an inspection organization independent of the licensee and authorized under legislation. These organizations possess the MSZ EN ISO/IEC 17020 standard type "A" accreditation of independence, their accreditation certify their ability to carry out audit tasks independent of the licensee as defined in accordance with the nuclear safety regulations. According to the latest amendment of the Atomic Energy Act, accreditation alone is not sufficient for performing activities according to the nuclear safety regulations any more (inspection affecting nuclear safety), the HAEA has to even register these

accredited organizations. The HAEA carries out the administrative fee-based registration procedure in accordance with the provisions of Act CL of 2016 on the Code of General Administrative Procedure.

The amendment of the Atomic Energy Act clarifies that regarding the modificiation of the system and system elements of the nuclear facility (including introduction of a different fuel assembly in the case of a nuclear power plant), planning, fabrication, assembly (installation), commissioning, operation, procurement, shutdown, decommissioning activities, the competence of the HAEA applies to nuclear safety licensing and inspection.

Latest amendments of 2/2022 HAEA Decree

2/2022 HAEA Decree on the protection against ionizing radiation and the corresponding licensing, reporting (notification) and inspection system has been modified. The aim of amending Section 2 of the HAEA Decree on exemption and release is to clarify and supplement the existing provisions governing the release procedure and to eliminate the regulatory deficiencies.

Organisational changes in the HAEA

In order to better adapt to the challenges of the future, the HAEA has reviewed its previous organisational functioning and structure, in preparation for the expected tasks related to the further extension of the Paks NPP's operating lifetime and the oversight of the construction of new units, and taking into account the experience gained from its functioning so far. The aim of the organisational changes is to operate more efficiently, to make greater use of the graded approach to oversight activity, to better allocate resources and to achieve a clearer separation of responsibilities among the different departments. Accordingly, in the new organisational structure created from 1 May 2024, new departments have been created with clearer responsibilities for a specific type of facility. The organisational change has mainly affected the oversight departments, but other supporting departments have also changed to some extent.

In the future, the Operating Nuclear Power Plant Oversight Department will be responsible for the supervision of the Paks NPP, the Construction Oversight Department for the supervision of the new units, while the Waste Management and Research Reactor Oversight Department will be basically responsible for the supervision of the radioactive

waste storage facilities, the research reactors and the Interim Spent Fuel Storage Facility. The Strategic and Support Department is responsible for coordinating and providing professional support for oversight activities, the Nuclear Security, Non-proliferation, Emergency Preparedness and Response Department for the regulatory tasks related to safeguards, security and emergency preparedness and response, while the Radiation Protection Oversight Department for the radiation protection supervision of small licensees.

Development of HAEA's communication tools

The communication activities of the Hungarian Atomic Energy Authority are primarily determined by compliance with legal obligations, but at the same time, the HAEA constantly follows the development and changes of communication tools, international trends, and emerging needs, and decides on developments accordingly, while optimizing the necessary financial and human resources.

After nearly a year of preparation, HAEA introduced three new communication platforms (Instagram, LinkedIn, intranet website) in the first quarter of 2024. These are independent tools, but at the same time they form a complex system and there is a synergy between them: posts on Instagram are sometimes linked to longer news on the website, and LinkedIn posts come from international news on the website. These platforms can be accessed via the HAEA website.

The internal communication of the Authority was not in focus in previous years, however, with the significant increase in the number of employees, the introduction of an intranet website that promotes community building, supports the flow of information and provides useful information updated daily has become extremely important for the operation of the organization and its two hundred employees. In addition to news section, it also includes training materials, internal regulatory documents, a telephone directory, calendar and information related to human resource management. The preparation of the internal website also served as a "pilot project": HAEA started the process of renewing its external website, the experience it gained during the creation of the intranet website will be utilized during this work. In addition, HAEA is also testing the new, fresher, more

colourful and modern, user-friendly web design of the intranet, which will serve as a sample for the external website.

One of the HAEA's most successful series of events, "About atomic energy - for everyone", which is specifically created for high school students, has a decade-long history. It presents the nuclear field, the use of nuclear energy and its risks in an interactive and entertaining way, involving students in direct conversations. Young people, as a target group, are particularly important for the HAEA, since its human resource management is also determined by the number of students of natural science faculties, and by the popularity of trainings related to the nuclear field. Thinking further about the event series, in accordance with its concept and spirit, the HAEA launched its Instagram profile as an independent platform, which provides useful and interesting information about the nuclear field in an easy-to-understand style, in the form of short posts, fun facts, in a pioneering way on an international level.

The introduction of the LinkedIn page is a step towards the domestic and international professional target audience, in line with the objective of making the HAEA a reference point for the nuclear field. The characteristics of the LinkedIn allow HAEA to connect organizations and colleagues, the profile supports cooperation between organizations, and it makes activities related to cooperation more recognizable externally. All the posts are bilingual (English, Hungarian).

About "Atomic Energy - for Everyone" event in Debrecen

On 12 December, in Debrecen, "About Atomic Energy - for Everyone" event was held, jointly organized by the HAEA and TIT Stúdió Egyesület, with the support of the University of Debrecen. Nearly two hundred high school students and teachers took part in the event, who got a comprehensive picture of the fields of application of nuclear energy. In addition to lectures, the interactive exhibition provided visitors with a wide range of interesting information, including on ionising radiation, medical applications, fusion

power generation, nuclear reactor operation, radioactive waste management and nuclear accidents.

In the first part of the program, the students could learn about radioactivity, how it was discovered, and how it is widely used by mankind in the 21st century. They received information about the most well-known nuclear accidents, as well as got insight into the areas of use of nuclear fusion and nuclear fission, supernovae and their research potential. They learned about a Hungarian-developed intelligent camera system for monitoring the plasma generated in an experimental nuclear fusion power plant. In addition to the lectures, the participants took part in an interactive exhibition where, with the help of illustrative tools, they had the opportunity to get to acquainted, among other things, with the fields of application of nuclear energy, the instruments of the Disaster Management Organization's Radiation Detection Unit, which have already been used in the detection of numerous radiological incidents and inspections. The participants could to take a virtual walk in the reactor hall of the Paks nuclear power plant and obtain additional information about fusion reactors and the management and disposal of radioactive waste and they could also present their newly acquired knowledge in a playful way.

Nuclear emergency preparedness

Information on nuclear emergency preparedness

The personnel of the Emergency Response Organisation of the Hungarian Atomic Energy Authority (HAEA ERO) were able to successfully practice their nuclear emergency response tasks on several occasions in 2023 and 2024 as well.

The colleagues participated in a national nuclear emergency response exercise based on the exercise of the Paks Nuclear Power Plant in November 2023, where members of the Management Group, the Nuclear Group, and the Radiological Group from the HAEA ERO staff were able to demonstrate their readiness. On the occasion of the successfully completed exercises, the good experiences, and any suggestions for improvement were collected and recorded in the evaluation report.

In April 2024, the International Atomic Energy Agency organised the international methodological exercise ConvEx-2a, which gave the HAEA ERO the opportunity to practice

using the IAEA's international rapid notification (USIE) system, filling in the forms correctly and uploading the radiation monitoring data.

With the cooperation of the HAEA, Hungary joined the INEX-6 international table-top exercise organised by the OECD Nuclear Energy Agency (NEA), which took place from 4 to 7 March 2024. The exercise aimed at testing national measures for the longer-term recovery phase of nuclear emergencies. This was the first time the recovery measures to be tested internationally. The HAEA, as the official main organiser of the exercise in Hungary, held regular meetings with the members of the Central Preparatory Committee, which was set up to organise the exercise in Hungary, where all the details and technical conditions of the Hungarian exercise were discussed, thus ensuring the continuous organisation of the exercise. In summary, after the implementation of the INEX-6 nuclear emergency response exercise in Hungary, the original objectives of the exercise were achieved and the exercise was successful. The participants in each module came from a wide range of professional backgrounds, ensuring a diverse exchange of views, constructive criticism and useful opinions and experiences.

Nuclear Safety Challenges in the Russia-Ukraine Conflict

In the shadow of the Russia-Ukraine conflict, the Zaporizhzhia Nuclear Power Plant (ZNPP) continues to demand heightened attention regarding nuclear safety. Continuous inspections are carried out by the experts of the IAEA at the NPP, including the reactor

Zaporizhzhia Nuclear Power Station (source: OSINTdefender / X)

units, safety systems and staff qualifications. The employees of the power plant work

under constant stress, and since the beginning of the conflict their numbers have been significantly reduced.

In the final months of 2023, the plant's external power supply was disrupted multiple times, forcing it to rely on backup diesel generators. The ongoing explosions and military activity in the vicinity raise serious concerns about nuclear safety. Although experts from the International Atomic Energy Agency (IAEA) found no evidence of explosives on the plant's premises, they assessed the neglected maintenance work as a risk. Signs of a minor boron leak were detected in reactor unit 6, which was later stabilized.

Rafael Grossi, the Director General of the IAEA, has repeatedly called on the parties involved in the conflict to respect the safety of the nuclear power plant. On March 6, 2024, he personally met with Russian President Vladimir Putin to discuss the issue of nuclear safety.

On April 10, a drone crashed into the roof of the ZNPP training center, 500 meters from reactor unit 1. The attack did not jeopardize nuclear safety, but as a precaution, the last reactor in hot shutdown (unit 4) was also placed in cold shutdown. Currently all six reactors are in cold shutdown. The IAEA continues its efforts to enhance the safety of Ukrainian nuclear power plants. With the support of the European Union and the European Commission, two Starlink terminals and a mobile helium leak detector were delivered to the Khmelnytskyi and South Ukraine nuclear power plants. In total 46 aid shipments have arrived in Ukraine.

These events highlight the ongoing challenges in maintaining the safety of Ukrainian nuclear power plants amidst the military conflict. IAEA experts are committed to monitoring nuclear facilities and continuously overseeing safety measures, while the international community continues to support Ukraine with the necessary equipment and devices.

The Hungarian Atomic Energy Authority continuously monitors and evaluates information related to the Russia-Ukraine conflict, with particular attention to Ukraine's nuclear safety situation. It follows the announcements of international organizations, primarily the IAEA, and informs the domestic population if necessary.

Training of IAEA inspectors in Hungary under the Additional Protocol

Hungarian Safeguards Support Programme

In 1991, Hungary joined to those Member States that gives support the International Atomic Energy Agency (IAEA) strengthening its safeguards system. The Hungarian safeguards support programme is coordinated by the Hungarian Atomic Energy Authority (HAEA) and is mainly related to three areas: IAEA training activities, testing of new instruments and equipments, and development of equipments and technologies.

The Hungarian nuclear facilities and licensees with nuclear material have been providing locations for practical trainings since the beginning of our support programme in order to assist in the IAEA training program of international professionals. Due to our expertise and the diversity of facilities operating in Hungary, we are able to host various IAEA trainings, including contribution to the development of training scenarios and conducting trainings as well, thus contributing to the expansion of the knowledge of international nuclear material inspectors.

Training under the Additional Protocol

Within the framework of the Hungarian Safeguards Support Programme, the IAEA regularly organizes trainings for its inspectors in Hungary. The purpose of the Additional Protocol inspection is to confirm that there are no on-going nuclear activities taking place on facilities that have not been reported to the IAEA or that the declared facility is not carrying out unreported activities. During the training the participants simulate inspections under the Additional Protocol. As a summary of the experience gained from the exercise, participants prepare verification reports in the same way as they are prepared at the IAEA and used by the IAEA to prepare reports on the nuclear activities of countries and on non-nuclear fuel cycle activities. The information received is compared or supplemented with the information that the IAEA collects on our country from open sources or from reports of other countries.

The training of IAEA inspectors took place in Hungary between 6-10 May 2024, organized by the Hungarian Atomic Energy Authority. Training of the nine participants was aided by four IAEA inspectors, two HAEA inspectors and operators from invited organisations. The inspectors were trained at the Centre for Energy Research, the Institute of Isotopes Co.

Ltd., Radanal Ltd. and the Mecsek Environmental Protection Base of the Public Limited Company for Mining Property Utilisation. The last two days of the training were held at the headquarters of the HAEA, where participants evaluated their experiences and summarized the lessons learned.

The IAEA representative thanked the participating institutions and the HAEA for the successful conduct of the training course.

Montage on the training activities of IAEA inspectors

Paks NPP

Reactor Scram at Paks NPP Unit 4 due to a malfunction in the secondary circuit

On 25.12.2023, several turbines of the NPP participated in load following, with the power reduction of reactor unit 4, turbine unit 7. At partial load, the pressure conditions of the turbine is changing, and the route of precipitation drainage from the high-pressure preheaters is also changing. Maintaining the condensate level in the preheaters is a priority, because the condensate can cause water hammer at the turbine.

After the MAVIR (Transmission System Operator in Hungary) request, the NPP staff started to increase the power of Unit 4. During this operation, precipitation drainage of the high-pressure preheaters should return to the nominal state by interlocking, without operator intervention. However, this interlocking function was not performed properly: the automation closed one of the precipitation drainage routes, but did not open the other.

The high-pressure preheater level started to rise. In the main control room, there was a warning signal about the level deviation, and then, since the drainage path was still blocked, the water level reached the „Water Level Limit I" which triggered a protective actuation. But that actuation didn't stop the level rise and the water level reached Water Level Limit II. According to the established logic, both turbines received the "OFF" command, and then Unit 4 shut down with reactor scram.

The direct cause of the event was the failure of a relay contact, as a result of which during the routing intelocking operation a valve did not go into the open position. As root cause was determined that „Water Level Limit I" protection did not prevent „Water Level Limit II" being reached.

The necessary corrective actions (training on lessons learned, engineering review) have been taken.

To evaluate the event, the HAEA launched a higher level ("Type C") investigation involving several specialized fields (mechanical engineering, human factors, operational safety).

Relay involved in the event

Regulatory oversight on the equipment takeover of the core-catcher and manufacturing process of the reactor pressure vessel belonging the 5th unit of the new Paks II Nuclear Power Plant

Between 19 and 29 March the main contractor (JSC Atomstroyexport) conducted the equipment takeover inspection of the core-catcher equipment of the 5th unit of the New Paks II NPP at the manufacturer's site (JSC Energotex) in Kurchatov, Russia. The specialists of the licensee (Paks II Ltd.) and the inspectors of the HAEA (Hungarian Atomic Energy Authority) supervised the processes.

Due to its location below the reactor tank, the core-catcher is one of the first devices to be installed in the reactor building of the new Units. As a passive protection equipment its function is to prevent the corium (melted core along with melted parts of reactor internals and vessel) from escaping into the environment during a severe accident event in such a way that the core-catcher vessel receives the corium coming out of the damaged reactor vessel and prevents it from interacting with the concrete base plate. This equipment is one of the prerequisits for the new Paks II NPP to meet the requirements of a new 3+ generation NPP unit.

The equipment takeover was carried out by the specialists of the main contractor. The processes included visual checkout of the assembled equipment, after the disassembly the quality inspection of the main units were conducted, including checking the main dimensions, the quality of the welding, and then the inspection of the documents. Paks II. Ltd. specialists followed the processes, randomly checked the incoming materials inspection reports and material test reports were gathered and made during production.

The OAH continuously supervised the activity of the specialists of Paks II Ltd.

The core-catcher is being shipped soon to Paks II NPP construction site, where it will be properly guarded until installation.

In April 2024, production of another main equipment, the reactor pressure vessel belonging to unit 5 began at the SpecStal factory of the AEM-Technologies Group, a subsidiary of Rosatom. The production plant is located in Kolpino near St. Petersburg, where typically raw materials and semi-finished products are manufactured. The production started with casting the ingots of the upper and the lower shells of the nozzle-area of the vessel, followed by the forging of those parts.

The inspectors of the HAEA along with the specialists of Paks II Ltd. also took part in the forging of the lower shell, as part of an inspection in the presence of the main contractor's specialists. The manufacturing processes are based on detailed production technology descriptions. After the production of the pieces, they are transferred to the AEM-Technologies Group's Atommash factory in Volgodonsk, where the pieces of the vessel will be welded together.

The production of the approximately 330 ton, 11 m high and 4.5 m diameter reactor vessel is not an easy task due to not only its size as well, but at the same time it must withstand the loads resulting from the operational environment during its lifetime. It takes almost 3 years to complete the whole equipment.

Budapest Research Reactor

Issue of a new operating licence to replace the expiring operating licence of the Budapest Research Reactor

The HUN-REN Energy Research Centre, as the licensee of the Budapest Research Reactor (BRR), carried out a periodic safety review of the BRR in 2022, which is required by law to be carried out every 10 years to assess whether the nuclear installation is operating in accordance with the licensing basis. In December 2022, the licensee submitted a Periodic Safety Analysis Report (PSAR), which serves as the basic document for the regulatory process. On the basis of the PSAR, the HAEA started the process for the periodic safety review, which was completed by the end of 2023.

Having considered the documents, analyses and information submitted to the HAEA, the questions, comments and opinions raised during the public hearing, as well as the

opinions of the coauthorities involved in the procedure, it took its decision on the issuance of the new operating license for the BRR, which was granted by 15 December 2033.

HUN-REN Centre for Energy Research Budapest Research Reactor

International Cooperation

Preparations for the IRRS mission

The HAEA and the relevant Hungarian co-authorities have started preparations for the second IRRS Integrated Regulatory Review Service mission, which will be hosted by Hungary in October 2025. The first IRRS mission was in 2015 and the follow-up mission in 2018, so taking into account the 10-year cycle of Directive 2014/87/EURATOM, Hungary has again invited the IAEA IRRS mission to review the domestic regulatory system supporting the peaceful nuclear energy applications.

In preparation, two experts from the IAEA provided a preparatory training on the mission's objective, process and sub-tasks to representatives of the HAEA and the co-authorities from 8-10 May 2024. The training included a detailed presentation of the eSARIS database that Member States fill in for the mission reviewers, describing their national regulatory system in the light of IAEA standards. The training provided a detailed introduction to the application of the database and gave the opportunity to exercise the response, assessment and action plan preparation functions by the users concerned. In

the frame of the interactive training the IAEA experts shared a number of practical tricks for using the database and answered questions raised.

Extended quadrilateral meeting hosted by HAEA

The traditional annual meeting of the leaders of the Czech, Hungarian, Slovak and Slovenian nuclear authorities organized this year by the Hungarian Atomic Energy Authority took place on May 14-15, 2024 in Balatonfüred, Hungary. Partner authorities of Finland and Poland also participated in this year's event.

Besides legislative and organisational changes affecting the regulatory activity participants also discussed the challenges of the existing national regulatory mechanisms and the regulatory tasks related to new nuclear power plants and small modular reactors. The meeting, held in the spirit of cooperation and genuine professional dialogue, provided an excellent opportunity to review issues related to joint EU projects for capacity building of nuclear safety authorities of third (non-EU) countries and the cooperation on EU level and through international institutionalized frameworks.

The next meeting will take place in Slovenia in 2025.

Participants of the quadrilateral meeting

HAEA delegation attended an international conference in the USA

The delegation of the Hungarian Atomic Energy Authority (HAEA) led by Andrea Beatrix Kádár, President of the HAEA visited Rockville on March 12-14, 2024 to attend the annual international conference of the US Nuclear Regulatory Commission (NRC). During the event the NRC presented the main results of its activities over the past year. The participants also had the opportunity to attend technical sessions to learn about technical

and technological opportunities and challenges of the global nuclear sector as well as the potential solutions and proposals in this context.

In the framework of the visit, the delegation conducted a consultation with Raymond Furstenau, the acting Executive Director for Operations of the NRC. During the meeting the parties reviewed the current cooperation between the authorities, discussed further possibilities for developing bilateral relations and shared their experience of recently executed authority activities. The President of the HAEA underlined that collecting and analysing international good practices and experiences is an essential tool for the authority to address the challenges ahead - the new lifetime extension of Paks NPP and the effective supervision of the newbuild units construction. Andrea Beatrix Kádár underlined that the US experience has been incorporated into the national practice in the past, and the results of the conference as well as further cooperation will contribute to the development of the national supervisory system. The NRC highlighted that international reviews serve as a useful tool for harmonisation and commended the HAEA's active participation in international review missions, both as reviewer and recipient.

HAEA – U.S. NRC consultation