



HUNGARIAN ATOMIC ENERGY AUTHORITY Nuclear Safety Bulletin

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RECENT DEVELOPMENTS IN NUCLEAR SAFETY IN HUNGARY December 2023

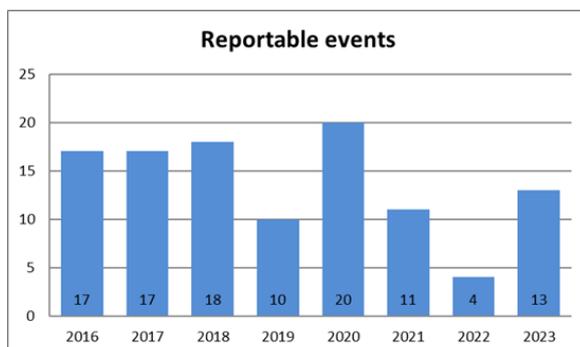
General

2023 Semi-annual safety performance assessment of the nuclear facilities

The Hungarian Atomic Energy Authority (HAEA) regularly evaluates the safety performance of the operators of the nuclear facilities. The main source of data for the assessment are the regular reports and the event reports of the licensees, as well as the protocols of regulatory inspections including regular and comprehensive inspections focusing on specific areas and reactive inspections.

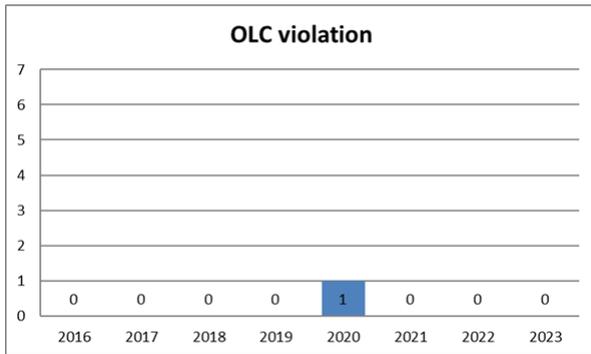
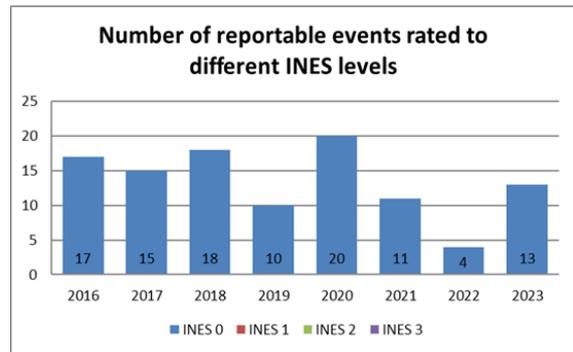
A brief extract from the semi-annual safety performance assessment is provided below. The safety performance data are taken from the first and second quarterly reports of the Paks NPP and the first semi-annual reports of the other licensees.

Paks Nuclear Power Plant



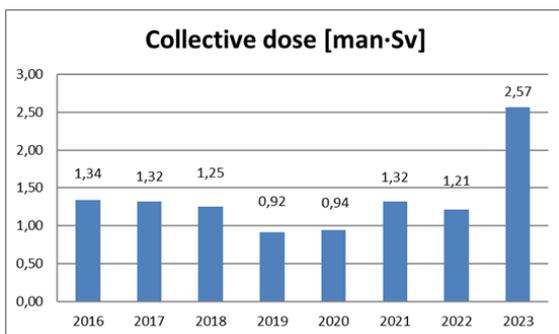
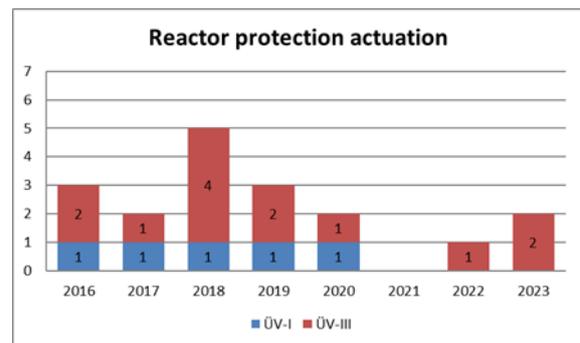
In the first half of 2023, 13 reportable events occurred. Out of these, 4 incidents were related to the cooling circuit of the spent fuel pool, 4 incidents were the result of inappropriate human intervention, 3 incidents were directly related to the execution of the main repair and 2 incidents were due to equipment failure.

All 13 reportable events were classified as „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.



There was no violation of the Operational Limits and Conditions (OLC) in the first half of 2023.

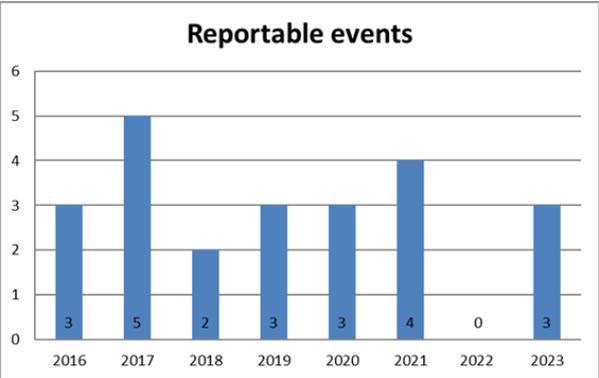
In the first half of 2023, 2 automatic reactor protection actuations occurred. Both SCRAM-III events occurred during the critical (normal operation) state of the reactor.



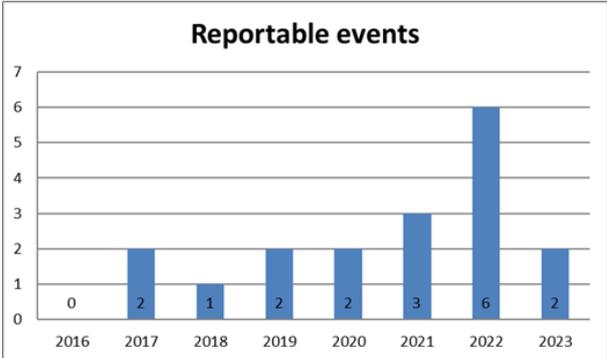
The collective dose for workers in the first half of 2023 was higher than in the previous year. The reason for the increase was that during the overhaul of the unit 2, more work with radiation exposure were executed than previously.

Budapest Research Reactor

In the first half of 2023, there were 3 reportable events. Among these, 2 were due to a disturbance of the external electrical power supply, while 1 incident was caused by a failure of the limit switch of the safety protection rod position indicator.



BUTE Training Reactor

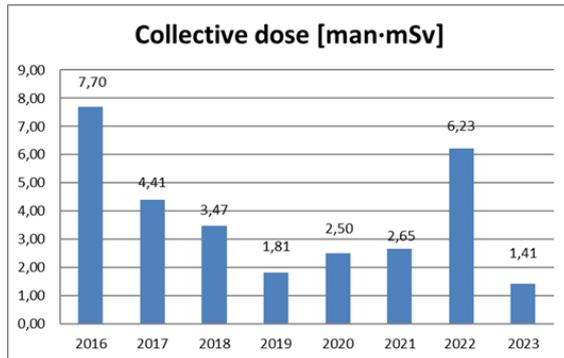


There were 2 reportable events in the first half of 2023.

In 2023, there were no safety system failures.

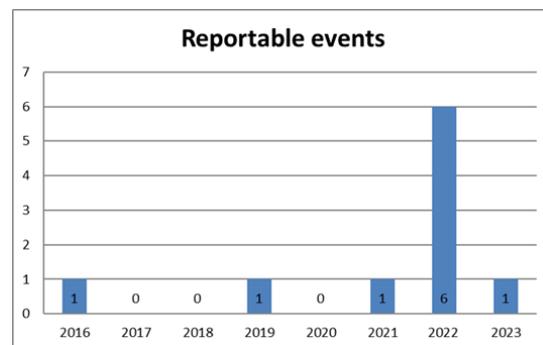


Interim Spent Fuel Storage Facility



The collective dose of the workers decreased in the first half of 2023, compared to the previous year.

In the first half of 2023, 1 reportable event occurred, caused by a puncture of an inflatable seal.



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

Legal changes of the first half of 2023

Amending the Act on Atomic Energy

The Act on Atomic Energy has been amended regarding to the legal relationship for the performance of tasks related to the Hungarian presidency of the Council of the European Union for the second half of 2024.

New HAEA Decrees

In the second half of 2022, the HAEA issued three decrees, which replaced the legislation previously regulating specific fields. Three decrees listed below entered into force in January 2023. The content of the HAEA decrees remained unchanged compared to the repealed relevant legislation.

- 9/2022. HAEA Decree on the safety requirements for facilities ensuring interim storage or final disposal of radioactive wastes and the corresponding authority activities
- 10/2022. HAEA Decree on special professional training of the employees employed in the nuclear facility and on the range of persons entitled to continue activities related to the application of nuclear energy
- 11/2022. HAEA Decree on certain administrative procedures of the Hungarian Atomic Energy Authority and on the fees to be paid for its administrative services

The 10/2022. HAEA Decree expanded the previous regulation with the general requirements for training programs for employees of nuclear facilities and radioactive waste repositories.

Renewed international transport decrees

The agreements concerning the international carriage of dangerous goods by inland waterways (ADN), by road (ADR) and by rail (COTIF), renewed every two years, were announced in Govt. Decree 282/2023., Govt. Decree 283/2023. and Govt. Decree 284/2023.

Interesting facts on the "Atomenergy - for everyone" program

Over 200 students and teachers took part in the scientific educational event of the HAEA called "About atomic energy - for everyone" on June 6, in Miskolc. During the program and the related exhibition, organized jointly with the University of Miskolc and the TIT Stúdió Egyesület, many questions were asked by the students, showing the ever-increasing interest in the field of energy, including nuclear energy. For the HAEA, it is highly important to provide first-hand information about the latest scientific results and applications related to the everyday use of atomic energy. The primary goal of the event is also to raise awareness in the faculties of natural sciences and engineering, as today's high school students will become tomorrow's professionals. In this spirit, the HAEA organizes the event "About atomic energy - for everyone" twice a year, in cooperation with various universities in Hungary.

In her opening remarks, Ms Zita Horváth, rector of the University of Miskolc, highlighted the fact that learning tools and resources are more varied and more readily available to today's youth than ever before.

Mr Béla András Balczó, head of HAEA's Presidential Cabinet, thanked the university for hosting the event and taking an active part in the program as an exhibitor and speaker, and emphasized that first-hand authentic information has a particularly important role in a time when hundreds of news stories are published every day concerning nuclear facilities - often with rather imprecise wording or offering one-sided information.

Presentations discussed the various types of radiation and their effects on life, lessons learned from nuclear accidents, international and domestic nuclear energy trends, future perspectives of the use of nuclear energy, and how nuclear forensic analytics can be used during an investigation.

At the interactive exhibition, representatives from the Public Limited Company for Radioactive Waste Management gave an overview of the domestic radioactive waste storage facilities and the management of radioactive waste. The Paks Nuclear Power Plant showcased their newly developed smartphone applications, and provided an opportunity to view the interior of the reactor hall using virtual reality glasses. The National Directorate General for Disaster Management of the Ministry of Interior presented a number of disaster prevention tools, and made it possible to perform radiation measurements. The Hungarian Nuclear Society provided information on fusion energy and the operation of the international thermonuclear experimental reactor. The HAEA presented a number of interesting aspects of the field, from medical applications through energy production and radioactive waste storage to the management of emergency situations, drawing attention to special features, such as the Cherenkov radiation, observable in the Training Reactor.



"About atomic energy - for everyone" in Miskolc

HAEA held public hearing in July

The HAEA held a public hearing for the public and the clients of the public administrative procedure without personal appearance of the stakeholders, in order to learn their opinions and comments in the regulatory procedure of the Budapest Research Reactor of the Centre for Energy Research "application for a new operating license triggered by the expiring operating license of the BRR CER". During the public hearing held between July 3, 2023 and July 7, 2023, interested parties could send questions, comments and opinions related to the case by e-mail.

The HAEA received questions related to emergency preparedness, human resources and the radiation measurement system. Involving the licensee, the HAEA, provided detailed answer in a report published on its website.

Planned amendments to the legislation related to the manufacturing and procurement of systems and components

In the first half of 2023, the HAEA carried out a review of Act CXVI of 1996 on Atomic Energy, as well as HAEA Decree No. 1/2022 (IV.29) on the nuclear safety requirements of nuclear facilities and on related regulatory activities, and its Annexes, the Nuclear Safety

Codes (NSC). The aim of the review was to move towards a modern regulatory oversight system (licensing/permitting, inspection, enforcement) that facilitate a more effective regulatory control of elements guaranteeing the nuclear safety by allowing the HAEA to concentrate its resources – in line with the graded approach - on tasks that are relevant from the point of view of nuclear safety related risks.

In the current legislative framework, the systems or components, regardless of their safety class, are being permitted several times by the HAEA during the period of the construction (including manufacturing and procurement) until the commissioning of the facility. The new oversight concept amends this multi-step permitting process, which has unnecessary duplications and consists of multiple permitting steps, by introducing a notification and derogation/deviation notification acknowledgement procedure for the manufacturing and procurement of certain systems and components deemed as having a lower risk from the point of view of nuclear safety, and are classified as safety classes 2 and 3.

The new notification acknowledgement procedure with a 15 workday administrative time limit ensures that the documentation necessary for effective regulatory oversight activities are available and reviewable, and that hold points and witness points as well as the conditions can be stipulated. The complete rejection of the application is also possible. The documentation remains continuously available even after the 15 workdays. In case of the HAEA identifies any nonconformities later, an enforcement procedure (even with the imposition of a fine) is initiated in order to ensure that the requirements are met.

Systems classified in safety class 1 will not be affected by the planned legislative change, furthermore, the nuclear safety requirements will remain unchanged and their fulfillment has still to be fully demonstrated by the licensee.

The National Assessment Report of Hungary for TPR2 is available on HAEA's website

In line with Council Directive 2014/87/Euratom, every member states that operates nuclear facilities should perform a national self-assessment on a common specific technical topic every six years. The first topical peer review started in 2017 focusing on

the topic of ageing management. The topic of the second review, started in 2023, is fire protection.

The member states shall prepare a National Report on the basis of a performed national self-assessment on fire protection of the nuclear facilities. The report shall be submitted to the competent bodies of the European Union. The report is available on HAEA's website.

According to the decision of ENSREG (the advisory body of the European Commission responsible for nuclear safety matters, consisting of the heads of EU nuclear authorities), the topic of the 2023 review was fire protection. The purpose of the review is to scrutinize the regulations of the Member States in the given area, to identify possible problems and good practices, and to share operational experience. In order to document the review in a uniform way, a specification was prepared for the extent and content of the national report.

Based on the technical specifications four nuclear facilities were selected to be subjected to the self-assessment, one nuclear power plant (MVM Paks NPP), two research reactors (Budapest Research Reactor, Training Reactor of the Budapest University of Technology and Economics) and a spent fuel storage facility (Interim Spent Fuel Storage Facility).

All the facilities carried out the self-assessment part of the review and sent their reports to the HAEA. The HAEA made a revision on the reports and using the reports, prepared the National Report based on its own assessment.

In the next phase, the member states review each other's reports, and anyone can comment on the reports and ask questions. The EU also involves experts to evaluate the reports. Review results will be presented at a conference in 2024 by the member states and invited experts, and then a summary report will be prepared.

Nuclear emergency preparedness

Information on nuclear emergency preparedness

The personnel of the Emergency Response Organisation of the HAEA (HAEA ERO) successfully carried out several nuclear emergency response exercises in 2023.

The international ECUREX exercise was held in April and September 2023, with the participation of the HAEA ERO. Within this framework, the Management Group were given the opportunity to test international communication.

In June 2023, the Spent Fuel Interim Storage Facility at Paks held a national nuclear emergency response exercise, with the participation of the HAEA ERO. The members of the Management Group and the Nuclear Group demonstrated their readiness on this exercise.

In October 2023, the International Atomic Energy Agency organised the international methodological exercise ConvEx-2c, which gave the HAEA's Emergency Response Organisation the opportunity to practice the use of related procedures and international communication described in the international conventions in the event of a cross-border nuclear emergency. During the successful exercises, good experiences, shortcomings and suggestions for improvement were collected and recorded in the evaluation report.

Additionally, HAEA's emergency analysis specialists participated several times on internal refresher trainings.

With the cooperation of the HAEA, Hungary has decided to join the INEX-6 international exercise organized by the OECD Nuclear Energy Agency (NEA). The concept of INEX-6 is to conduct a modular table-top exercise aimed at testing national measures for the longer-term recovery phase of nuclear emergencies. This will be the first time when the recovery measures are to be tested internationally. The Central Preparatory Committee (CPC), which was set up to organise the exercise in Hungary, set the exercise for 4-7 March 2024. The HAEA, as the official main organiser of the exercise in Hungary, will hold regular meetings with the CPC members to discuss the details and technical conditions of the Hungarian exercise.

Nuclear safety challenges of the Russian-Ukrainian conflict

The armed conflict between Russia and Ukraine remains a major challenge for the continuous safe operation of nuclear facilities in Ukraine. The IAEA missions of independent international experts, launched by the International Atomic Energy Agency (IAEA), are present at all nuclear power plants in Ukraine. In June 2023, after the explosion of the dam at Noha Kahovka in southern Ukraine, the Zaporizhzhia NPP's cooling water

supply problem was solved by drilling 11 wells. In October 2023, one or two reactor units of Europe's largest nuclear power plant (Zaporizhzhia) produce steam in the amount needed to heat the nearby city of Enerdohar, while the other units are in a cold shut down state, so none of the units produce electricity. IAEA experts are constantly carrying out monitoring measurements at Ukrainian nuclear power plants, based on which it can be said that radiation levels have not increased in the last six months.

The international community constantly keeps the above-mentioned issue on the agenda of international forums and assists Ukraine by sending aid deliveries matching the needs of the Ukrainian side for nuclear emergency preparedness. Since April 2023, nine more aid shipment reached Ukraine with the coordination of the IAEA.

The HAEA constantly monitors and evaluates information related to the Russian-Ukrainian conflict, with special regard to the nuclear safety situation in Ukraine, follows statements made by international organisations, in particular the International Atomic Energy Agency, and informs the public if necessary.

Paks NPP

Jeopardizing the integrity of the fresh fuel assembly Unit 3 of the Paks Nuclear Power Plant

On 16 May 2023, the enrichment measurement of the fresh fuels was carried out in the fresh fuel storage of Units 3-4. After measuring the first side of fuel assembly No. A0018, the fuel assembly had to be rotated 180° to measure the other side, for which the assembly had to be lifted out of the stand. The transfer machine operator performing the lift operated the manual control of the fuel storage crane incorrectly. As a result of incorrect operation, there was a risk of damage to the affected fuel assembly, however the measurements did not show any damage. As a result, instead of lifting the fuel assembly vertically, the fuel assembly moved horizontally. The operator corrected the lifting operation when the discrepancy was detected and no deviation of the original geometry was observed.

On 20 May 2023 it was noticed that the screws attaching the size control stand to the support beams had peeling paint, from which it was assumed that the stand had moved

from its vertical position. The verticality of the stand was checked with a laser leveling instrument, which revealed the discrepancy.

The event occurred directly because the crane operator mishandled the crane remote control carelessly. It was concluded, that the root cause is that the design of the remote control is almost symmetrical, but it is not properly visible from above. If the body harness is not worn by the operator, it is difficult to correctly identify the directions. However, no document prescribes the correct use of the body harness.

The necessary corrective actions (use of body harness, e-learning training for crane operating personnel) have been taken.

HAEA found the deterioration of defense-in-depth. Upon the occurrence of the event, after assessing the possible risk, the HAEA decided on a higher-level („type B”) investigation, involving several fields of expertise (reactor physicist, human factor specialist, operational safety specialist).

The impact of the event on nuclear safety was not significant, however, the HAEA will conduct a comprehensive inspection to monitor the implementation of remedial measures.



The crane remote control

Paks II Project

Paks II soil preparation works

On 22 November 2022, the Paks II. Ltd started the construction activities that can be carried out without a building permit, related to the site preparation works of Units 5 and 6 of the Paks Nuclear Power Plant. The construction works are related to the construction

of temporary roads connected to slurry plants, to remove the top layer of soil, construction of fences, geodetic works, and installation of construction site container facilities.

Construction activities (soil excavation above ground water level) related to Unit 5 of the Paks Nuclear Power Plant began in August 2022, then has been continued from August 2023 with construction activities related to Unit 6. During the soil excavation above ground water level, an excavation pit with a bottom of -5 m will be constructed.

In July 2023, the cut-off wall construction activities (guide wall, plastic concrete cut off wall, diaphragm wall) started with two machines in two shifts in the area of the planned Unit 5. The main function of the cut-off wall is to ensure the water-tightness of the pit from the sides. At the moment, the construction is being carried out in a multi-shift work schedule with the involvement of three machine chains.

The construction work of the Western slurry plan, that will be used to store the powder cement and bentonite required for the site preparation works for Unit 5 and 6, started in August 2023.

At the end of October 2023, after the related preparation works, the soil consolidation construction activities started with two machines in two shifts, expected to be expanded with the several machines.

The HAEA continuously over supervises the site preparatory works and holds regular inspections.

Radioactive Waste Storage Facilities

A new period in the National Radioactive Waste Repository, the delivery of compact waste packages has begun

As a result of the development of the waste packages that will be disposed of in the National Radioactive Waste Repository (NRWR), the radioactive waste is to be placed in compact waste packages instead of the previously used concrete containers. The development of the waste disposal concept was necessary in order to fill as much of the volume of the chambers as possible with radioactive waste. The new disposal concept enables more efficient use of space in the chambers while unchanging the achieved safety level. The compact waste package has a volume of 3.5 times smaller than the previously

used reinforced concrete container while accommodates the same amount of radioactive waste (with a volume of 1.8 m³). This also means that the new waste disposal concept results in filling 39% of the I-K2 chamber with radioactive waste, while in the case of the first chamber, only 13% of the chamber were filled with radioactive waste by volume.

The compact waste package is a reinforced steel container in which 4 drums containing solid radioactive waste are placed and the space between the drums is filled with radioactive cement. The steel containers are not placed directly underground, as in the I-K1 chamber, but are to be placed in the reinforced concrete pool formed in the I-K2 chamber.

The compact waste package is compiled in the area of the nuclear power plant. PURAM delivers the finished compact waste packages to NRWR. The delivery of the compact waste packages to the NRWR facility began in the summer of 2023. In the first phase, 17 compact waste packages were delivered under on-site supervision of the HAEA. To move the new type of waste packages, PURAM prepared the necessary systems and components, so the reception and buffering of the compact waste packages takes place without disturbance in the facility. The final disposal of the compact waste packages in the I-K2 chamber has not yet begun.

Nuclear Safeguards

Joint HAEA - US DOE cyber security workshop

The HAEA, together with the United States Department of Energy, organised a workshop on the protection of programmable systems (also known as cyber security), between 10th and 14th July, 2023 at the HAEA headquarters. The purpose of the event was to provide development opportunities for the Hungarian experts in a special but increasingly important field of nuclear security.

It is not enough to protect the nuclear and other radioactive materials used or stored, and the vital systems ensuring nuclear safety from theft or physical attacks, but also from the threats coming from the cyberspace. The role of cyber security is to establish and maintain the protection against such virtual threats.

As a novelty, the workshop was divided into two separate parts for different target audiences. On the first three days, cyber security specialists invited from the HAEA,

nuclear facilities, radioactive waste storage and disposal sites and the Hungarian Defence Forces received advanced training from the U.S. instructors. Through lectures and small group exercises, they covered topics such as threat assessment for programmable systems, different protection strategies and procedures, the design of defence in depth and network segmentation. During the exercises participants were also able to learn about past real incidents and the lessons learnt from them.

Last two days, representatives of institutional licensees, such as hospitals and research facilities, who are involved in the physical protection but not necessarily experienced in cyber security, received a basic comprehensive picture of the protection of programmable systems. The agenda included areas such as threats related to healthcare facilities and their assessment, the insider threat, the basics of defence strategies and incident response, as well as the cyber security aspects of procurement of programmable systems. The instructors also presented previous real events and good international practices.



Participants of the first part of the workshop

International Cooperation

67th IAEA General Conference in Vienna

Over 2,800 delegates attended the 67th IAEA General Conference, held from 25 to 29 September 2023, in person from 150 of the IAEA's 177 Member States. Delegates from international organisations, NGOs and media representatives were also present. Several side events took place on the margins of the General Conference, the most important of which was the two-day Scientific Forum entitled "Nuclear Innovations for Zero Emissions". Leading experts from around the world highlighted the role of new nuclear reactors in energy production and demonstrated how nuclear technology can be used in industrial applications and other areas to avoid greenhouse gas emissions.

The head of the delegation of the HAEA, President Andrea Beatrix Kádár, in addition to the main programmes of the General Conference, participated in bilateral and multilateral meetings with the heads of the regulatory authorities of other Member States, and met with IAEA Director General Rafael Mariano Grossi. During the meeting, the current state of play of the modernisation of the Hungarian nuclear regulatory environment was reviewed. In this context, the two leaders discussed the modernisation of the Hungarian nuclear regulatory framework, including one of the most important tasks of the HAEA in 2023, the current status of the NSC revision, and the progress of the IAEA's initiative to harmonise the regulation of small modular reactors.

The HAEA delegation held meetings with representatives of the nuclear authorities of Argentina, Bangladesh, China, the Commonwealth of Australia, Croatia, Egypt, the Netherlands, Japan, Poland, Romania, Serbia, Turkey, the United Arab Emirates and the United Kingdom. The main topics of the bilateral meetings were the overview and assessment of recent events, ongoing and future cooperation opportunities as well as the issues related to small modular reactors, the development of the related regulatory oversight system and the legal framework.

In the framework of the traditional quadrilateral meeting with the Czech, Slovak and Slovenian authorities in addition with the Finnish and Polish authorities the President of the HAEA discussed current regulatory issues of common interest (e.g. regulatory activities related to the new nuclear power plant units under construction and research

reactors) and paid special attention to professional issues on the agenda of international organisations which may require a common position (e.g. emergency preparedness and response activities in the context of the situation in Ukraine).

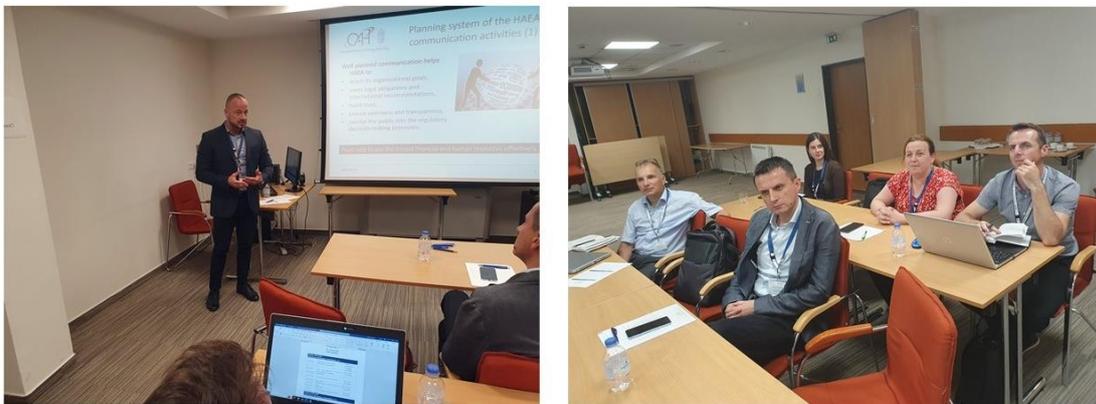
The 67th IAEA General Conference concluded with the adoption of resolutions on nuclear safety, security, strengthening and improving the effectiveness of the Agency's safeguards activities as well as the IAEA's work in the field of nuclear science, technology and applications, and technical cooperation activities.



Experts' visit from Bosnia and Herzegovina to the HAEA

Between 19-22 June 2023, a group of five experts arrived at the HAEA as part of a training course within the framework of a European Union project, to receive information about HAEA's communication activities and the practice of organizing and conducting public hearings, with special regard to experiences related to radioactive waste storage facilities. The aim of the training delivered within the EU-funded project was to provide participants with the opportunity to learn and subsequently use the practices, methodologies and experiences of EU Member States in their own country.

During the three-day training program, the experts received information on the Hungarian legal framework for nuclear regulatory communication, the interdependent process of communication strategy creation and planning, the HAEA's communication activities based on various tools and channels, the organization and conduct of public hearings, with particular regard to the HAEA's previous experiences based on public hearings related to the regulatory procedures of radioactive waste storage facilities. As part of the program, the Bosnian specialists visited the Visitors' Centre of PURAM in Bátaapáti, where they had the opportunity to obtain more information about the company's activities.



Participants of the visit