

# NUCLEAR SAFETY BULLETIN

## RECENT DEVELOPMENTS IN NUCLEAR SAFETY IN HUNGARY

NOVEMBER 2024

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Hungarian Atomic Energy Authority

## GENERAL

### 2024 SEMI-ANNUAL SAFETY PERFORMANCE ASSESSMENT OF NUCLEAR FACILITIES

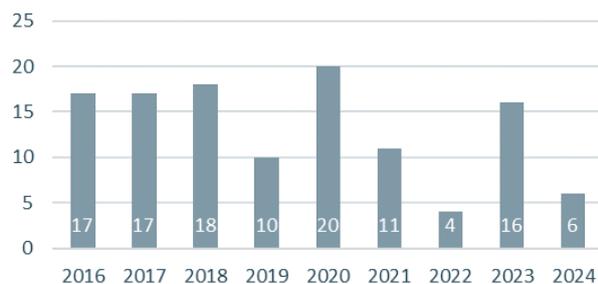
The HAEA regularly evaluates the safety performance of operators of nuclear facilities. The main sources of data for the assessment are regular reports and event reports of the licensees, the protocols of regulatory inspections including regular and comprehensive inspections focusing on specific areas,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

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

#### Paks Nuclear Power Plant

In the first half of 2024, six reportable events occurred. Two of the incidents were due to measurement circuit malfunctions, one was caused by fire during maintenance work, two due to electrical faults, and one was due to exceeding an administrative limit.

REPORTABLE EVENTS



NUMBER OF REPORTABLE EVENTS RATED TO DIFFERENT INES LEVELS

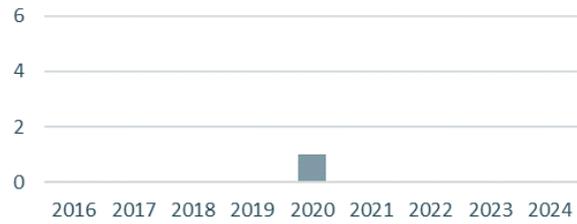


All 6 reportable events were classified as „below scale“ corresponding to Level 0 on the seven-level International Nuclear Event Scale (INES). No event classified as INES 1 or higher has occurred since 2012.

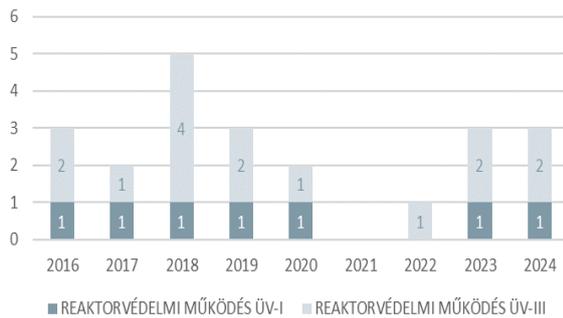


There was no OLC (Operational Limits and Conditions) violation in the first half of 2024.

### OLC VIOLATION



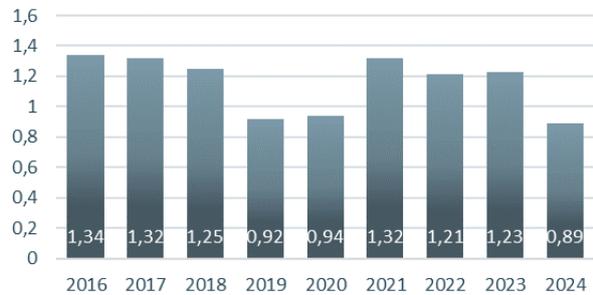
### REACTOR PROTECTION ACTUATION



In the first half of 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 for workers in the first half of 2024 was similar to last year for the given period (first half of the year).

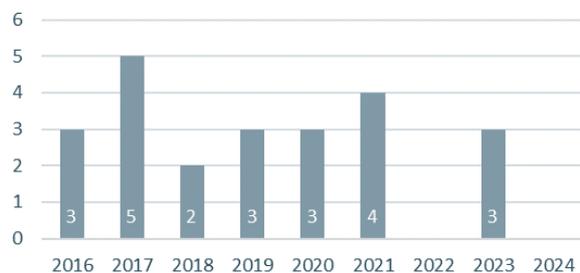
### COLLECTIVE DOSE [MAN\*Sv]



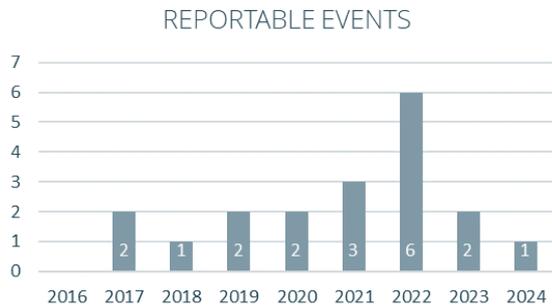
### Budapest Research Reactor

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

### REPORTABLE EVENTS



## BUTE Training Reactor

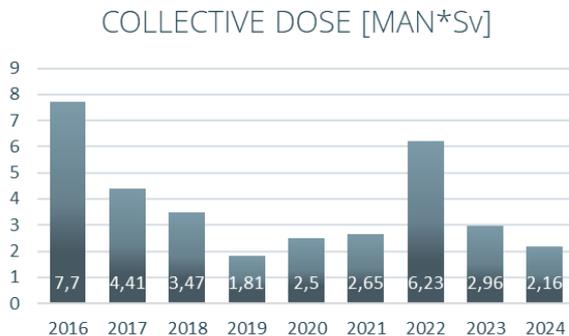


In the first half of 2024, one reportable event occurred at the Training Reactor: the outer glass of one of the reactor building's windows cracked due to a stone thrown up during lawn mowing.

In the first half of 2024, no safety system failure occurred.

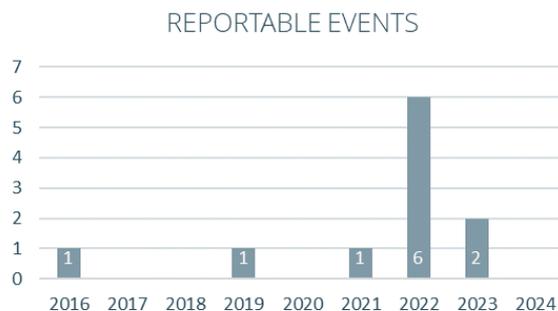


## Interim Spent Fuel Storage Facility



In the first half of 2024, the collective dose for workers increased compared to the previous half-year due to maintenance-related work.

In the first half of 2024, no reportable events occurred.



## LEGAL CHANGES IN THE FIRST HALF OF 2024

In the first half of 2024, the Hungarian Atomic Energy Authority (HAEA) issued four decrees, two of them amended the legislation previously regulating specific fields. In addition Govt. Decree 214/2013. (IV. 21.) on the rules of financial support to local government associations for monitoring and information from the Central Nuclear Financial Fund were amended.

**HAEA Decree 1/2024. (IV. 8.) on the registration of legally authorized independent inspection body and on requirements during the accreditation** entered into force on the 9th of May 2024.

The recent amendment of the Act CXVI of 1996 on Atomic Energy has made it necessary to issue the HAEA Decree.

According to the latest amendment, accreditation of a legally authorized independent inspection body is not sufficient any more for performing its activities in line with the nuclear safety regulations accredited by the National Accreditation Authority, the HAEA even has to register these accredited bodies. The professional activity can be started after registration by the HAEA.

HAEA Decree 1/2024 contains detailed rules on the registration, suspension and de-registration of a legally authorized independent inspection body and on requirements that need to fulfill during the accreditation.

**HAEA Decree 2/2024. (IV. 8.) on amending HAEA Decree 1/2022. (IV. 29.) on the nuclear safety requirements of nuclear facilities and on related regulatory activities** entered into force on the 9th of May 2024.

The aim of amending regulations of HAEA Decree 1/2022 is to apply a new supervisory concept to nuclear power plant construction activities.

In accordance with amendments on the Act on Atomic Energy that entered into force in December 2023, HAEA revised the detailed regulations affecting nuclear facilities. The amended decree defines the detailed rules for the notification acknowledgement procedure and deviation notification acknowledgement procedure, the scope and the handling of the documentation required for notifications regarding the manufacturing and procurement of systems and components classified as lower risk in terms of nuclear safety and classified in safety classes 2 and 3. The amendment defines the regulations regarding the activity and involvement of the legally authorized independent inspection body.

The amendment also defines the specific construction rules, so that the architectural categorization can also be applied to nuclear facilities under construction, and in order to simplify licensing, the modification and construction licensing can be implemented in a single procedure. HAEA Decree 1/2022 is supplemented with the requirements for construction supervision.

**HAEA Decree 3/2024. (IV. 8.) on amending HAEA Decree 11/2022. (XII. 29.) on certain administrative procedures of the Hungarian Atomic Energy Authority and on the fees to be paid for its administrative services for registration procedure and for extension of the registration** entered into force on the 9th of May 2024.

According to amendment of Act on Atomic Energy a legally authorized independent inspection body has to pay administrative service fee for registration procedure and for the extension of the registration.

Amendment of HAEA Decree 11/2022 serves to extend its material scope and to determine the item of the administrative service fee.

**HAEA Decree 4/2024. (V. 30.) on service ID card issued to persons performing official tasks at the Hungarian Atomic Energy Authority** entered into force on the 1st of June 2024.

According to the new amendment of Atomic Energy Act HAEA issues service ID cards to persons representing HAEA in order to be able to prove their professional eligibilities during performance of their official duties. The HAEA keeps records of service ID cards.

The HAEA Decree contains detailed rules on the issuance, withdrawal and the records of service ID cards.

**Government Decree 68/2024. (III. 28.) amended the Government Decree 2014/2013. (VI. 21.) on the rules of financial support to local government associations for monitoring and information from the Central Nuclear Financial Fund.**

The manager of the Central Nuclear Financial Fund concludes contract every year with the monitoring and information aimed local government associations in order to provide them financial support from the central budget in line with the provisions of Atomic Energy Act and Govt. Decree 214/2013. (VI. 21.).

Annex 1 of Govt. Decree 214/2013. (VI. 21.) was needed to be reviewed. Annex 1 defines the distribution of the central budget support among four monitoring and information aimed local government associations.

## ABOUT ATOMIC ENERGY - FOR EVERYONE IN PÉCS: NEARLY THREE HUNDRED PARTICIPANTS, FULL HOUSE

On the 30st of May 2024, the Hungarian Atomic Energy Authority held its educational event entitled "About Atomic Energy - for Everyone" in Pécs, in cooperation with the University of Pécs and the TIT Studio Association. The main auditorium of the Szentágotthai Research Center was full, nearly three hundred students and teachers listened to the lectures and participated



in the interactive exhibition. The presentations and the exhibition covered a wide range of topics, such as the natural and artificial radiation that surrounds us, the causes of nuclear accidents, and the special Hungarian-developed cameras used in the world's largest fusion project in Japan. The presentations also looked at how (nuclear) energy sources are used in outer space, and the role of nuclear

energy in medicine.

At the interactive exhibition, participants were introduced to the different applications of nuclear energy, from power generation to medical applications, to disaster management equipment, and they could also take radiation measurements, look around the Paks Nuclear Power Plant using virtual reality glasses, and learn about the operation of the nuclear power plant. They received an overview of radioactive waste management, the nuclear fuel cycle (from uranium mining, through the temporary storage of spent fuel to final disposal), and fusion power generation.

## PAKS NPP

### SHUTDOWN OF A MAIN CIRCULATION PUMP DUE TO THE FAILURE OF THE SEALING WATER TEMPERATURE MEASUREMENT DEVICE

On the 31st of May 2024, at the Paks Nuclear Power Plant, the 4th Main Circulation Pump (MCP) of Unit 3 was shut down due to a high temperature technological protection signal caused by the malfunction of the sealing water temperature measurement device. The reactor protection system reduced the reactor power to the heat removal capacity based on the number of operating MCP units. After the protective action, the staff stabilized the unit's parameters and began troubleshooting.

The protection signal was triggered by the failure of the alarm signal-setting instrument belonging to the MCP sealing water system measurement loop. The faulty instrument was replaced, and the pump protection was tested. Subsequently, the 4th MCP was restarted, and Unit 3 was brought back to nominal power. The defective component was inspected by experts under workshop conditions.

The direct cause of the event was that the alarm signal-setting instrument experienced a non-real signal ( $T > 80^{\circ}\text{C}$ ) due to a short circuit, caused by electrolyte leakage from capacitors onto the device's circuit board, which triggered an unjustified protection signal.

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

As a long-term corrective action, Paks Nuclear Power Plant decided to replace this type of alarm signal-setting instruments.

## PAKS II PROJECT

### OVERSIGHT OF THE SITE PREPARATION ACTIVITIES OF THE NUCLEAR POWER PLANT UNITS

Due to the geotechnical characteristics of the site, the construction of the new units of the nuclear power plant is preceded by so-called site preparation works, such as water delimitation works (slurry walls), soil consolidation and excavation of the delimited working area above the groundwater level and then down to the design level.

Paks II. Nuclear Power Plant Ltd. (hereinafter referred to as "Paks II. Ltd."), as the licensee, submitted to the HAEA the applications for construction permits for the excavation above the groundwater level (August 2021), the slurry wall, the soil consolidation (December 2022) and the excavation down to the design level (October 2023). The HAEA, as the construction

authority for the new nuclear power plants in Paks, assessed the license applications with the involvement of the relevant HAEA and external experts, with a special focus on the nuclear safety of the existing and operating nuclear power plant units (MVM Paks Nuclear Power Plant Ltd.). HAEA issued construction permits for all four applications for site preparation activities (October 2021; May, June 2022; November 2023), subject to the fulfilment of specific obligations and conditions. In most cases, the specified obligations and conditions had to be fulfilled by Paks II. Ltd. prior to the respective works, and the actual fulfilment was verified by the relevant HAEA experts. A permanent obligation of the construction activities, which is also included in the permits, is the reporting and continuous management of the activities by opening the OAH e-log of specific works according to the 1/2022 (IV. 29.) HAEA Decree, whereby the HAEA inspectors remotely supervise the construction works on a daily basis.

The actual works started with the excavation above the groundwater level of the planned Unit 5 to a depth of five metres and the construction of the slurry walls for two new units (5 July 2023), followed by the excavation above the groundwater level of Unit 6. HAEA inspectors, in addition to monitoring the construction e-log entries, also provided on-site supervision in the form of official inspections. In addition to its on-site inspections of the construction works, the HAEA also inspected the contractor (BAUER Magyarország Speciális Mélyépítő Kft.), which is the supplier of Paks II. Zrt. and the main contractor (JSC ASE), to verify the progress of the works and compliance with the permit. During the activities, the HAEA monitors and verifies through inspections that Paks II. Zrt. and MVM Paks Nuclear Power Plant Ltd. maintain the appropriate cooperation (information sharing, notification system) to ensure the nuclear safety of the operating nuclear power plant units.

On the 24<sup>th</sup> September 2024, following the completion of soil stabilization work in Unit 5, excavation to design level began, with depths of up to 23 meters in some places. At the same time as the excavation work on Unit 5, the consolidation work on Unit 6 is still ongoing. In

order to monitor the extensive construction work on site, HAEA conducts regular weekly inspections at the site.



*Construction site of the Paks II. Nuclear Power Plant with excavation to the design level of Unit 5 and soil consolidation work on Unit 6 on October 17, 2024. The photo was taken by Paks II. Ltd.*

Among the site preparation activities, slurry walls and soil stabilization are subject to the occupancy permit process required by HAEA in its construction permits, during which HAEA's technical experts and, if necessary, external technical experts review the adequacy of the plans for their intended purposes and functions.

## INTERNATIONAL COOPERATION

### THE 68TH GENERAL ASSEMBLY OF THE IAEA HAS CONCLUDED: HAEA HELD NUMEROUS PROFESSIONAL DISCUSSIONS

The delegation of the Hungarian Atomic Energy Authority, led by President Andrea Beatrix Kádár, participated in the 68th General Assembly of the International Atomic Energy Agency in Vienna from 16 to 20 September 2024.

On the sidelines of the annually held General Assembly, the HAEA delegation held a number of bilateral meetings with representatives of the nuclear authorities of the United Kingdom, Egypt, Finland, Croatia, Canada, Romania, France and Türkiye. A Memorandum of Understanding focusing on the information exchange and experience was also signed with the Federal Authority for Nuclear Regulation of the United Arab Emirates. The meetings enabled HAEA and its partners to review events of outstanding importance of the past year from a nuclear energy professional point of view and to evaluate on their ongoing nuclear cooperation and various issues related to legal regulation of the nuclear field.

The main focus of the discussions with the French and Finnish authorities lied in the overview of experiences gained in relation to the lifetime extension of nuclear power plants, while discussions with the nuclear authorities of the United Arab Emirates, Romania, Finland, Türkiye and Egypt focused on the exchange of experience with respect to the oversight of the construction of new nuclear power plant units and the negotiations with the Romanian, British, Canadian, Czech and Polish nuclear regulatory authorities focused primarily on the exchange of experience related to new nuclear technologies.

Furthermore, with the participation of the Finnish and Polish nuclear regulatory authorities Andrea Beatrix Kádár, President of the HAEA discussed within the framework of the traditional quadrilateral meeting held between HAEA and representatives of the Czech, Slovak and Slovenian nuclear regulatory authorities the current matters of common interest (including regulatory activities related to the new nuclear power plant units under construction and fuel licensing).

### VISIT OF AUSTRALIAN NUCLEAR REGULATORY DELEGATION

Geoffrey Bruce Shaw, Director-General of the Australian Safeguards and Non-Proliferation Office visited Hungary on 13 September 2024 at the invitation of the President of the Hungarian Atomic Energy Authority (HAEA).

During the meeting, the parties among other issues discussed the existing experiences on coordination between organisations involved in the handling of missing radioactive sources,

the revision of bilateral administrative agreement on provisions of the Intergovernmental Agreement Concerning Cooperation in Peaceful Uses of Nuclear Energy and the Transfer of Nuclear Material. On the basis of previous results the two sides also reviewed perspectives for further cooperation in research and development.

The visit resulted in signing of a Memorandum of Understanding regarding Cooperation on Nuclear Non-Proliferation, Safeguards and Regulation related to Peaceful Uses of Nuclear Energy.

As part of the programme, the delegation visited the Paks Nuclear Power Plant and the Visitors Centre of the facility.



## NUCLEAR EMERGENCY PREPAREDNESS

### HAEA ERO EXERCISE CARRIED OUT WITHIN THE FRAMEWORK OF THE „HUNEX-24“ EXERCISE

The "HUNEX-24" central defense and security administration exercise was carried out on October 7-8, 2024. The exercise was carried out under the guidance of the National Disaster Management Center (NDMC) of the Interdepartmental Coordination Committee for Disaster Prevention (ICCDP) and its relevant defense work committees (transportation, health, nuclear, agriculture), and it covered the entire defense administration task system.

National, regional and local operational task groups, as well as operational working bodies of regional and local defense committees, participated in the exercise. The Hungarian Atomic Energy Authority (HAEA) was also among the participating bodies as the operating organization of the Nuclear Defense Working Committee (NDWC) of the ICCDP.

The goal of the activity at NDWC is providing professional advice and supporting the proposal-making activities of the ICCDP NDMC for the preparation of the necessary operational decisions. The NDWC is a part of the ICCDP NDMC, which is operated as an operative working body of the ICCDP. It provides its support through the comprehensive analysis and evaluation of the nuclear, radiation and meteorological situation and the development of proposals concerning civil protection precautions.

The Central Preparatory Committee was established for the purpose of preparing and organizing the large-scale national exercise and the HAEA was also among its members. The exercise included both executive and real implementation elements. The scenario of the exercise, its organizational conditions, its participants, and the actual implementation elements were discussed at several preparatory meetings.

The exercise of the HAEA Emergency Response Organization (ERO) was carried out within the framework of the „HUNEX-24“ exercise. The Preparation, Conducting and Evaluation Plan of HAEA ERO's exercise was completed on the basis of the document "HUNEX-24 Exercise Conducting Plan" prepared by the Ministry of the Interior's National Directorate General of Disaster Management.

According to the scenario of the exercise, a satellite equipped with a nuclear reactor seriously malfunctioned. The custom-made experimental device was orbiting the earth, due to malfunction it left its orbit, and crashed into the territory of Hungary. After the impact, the satellite emitted gamma radiation and polluted the area of several counties.

During the exercise, members of the HAEA ERO participated in three shifts. From among the HAEA ERO staff, the Management Group was represented by the Crisis Manager, the Reporter

and the Emergency Officer on Duty, and the Radiological Group was represented by the Radiological Manager, and their work was carried out with continuous IT support.

Good practices, shortcomings and suggestions for improvement were also recorded in the Evaluation report of the HAEA ERO exercise. As a summary of the exercise, it can be said that the organizational goals set by the HAEA were reached during the exercise and the exercise was successful.

In addition to the exercise detailed above, the emergency preparedness specialists of the HAEA ERO participated in several other international (RODOS User Group exercise, INEX-6 exercise, ConEx-2a exercise, ECUREX exercise) and domestically organized exercises (ONER exercise based on the practice of the Paks Nuclear Power Plant) in 2024.

## **SUMMARY OF THE STATUS OF UKRAINIAN NUCLEAR FACILITIES**

The year 2024 brought unprecedented challenges for Ukraine's nuclear facilities. The ongoing war posed a direct threat to the country's most critical power plants, including the Zaporizhzhia Nuclear Power Plant (ZNPP), Europe's largest nuclear facility. Throughout the conflict, significant nuclear safety risks emerged, driven by the instability of power supplies to the facilities, repeated drone attacks, and the threat of infrastructure damage.

These events captured the attention not only of Ukraine but also of the international community, as maintaining nuclear safety is crucial not only for Ukraine but also for the region's population. The International Atomic Energy Agency (IAEA) has provided continuous monitoring and support to help protect Ukraine's nuclear facilities. The agency has offered professional recommendations and safety guidelines to manage the situation, with particular emphasis on the safe operation of these facilities and adherence to nuclear safety standards.

### **Drone Attacks and Artillery Dangers - April 2024**

In early April, a series of drone attacks targeted the ZNPP, posing a direct threat to nuclear safety. The IAEA, urging immediate action, called on the parties to exercise maximum restraint in military activities, particularly emphasizing adherence to the five fundamental principles of protecting nuclear facilities. To mitigate safety risks, all six reactor units were placed in cold shutdown mode by mid-April. Despite these measures, the military threat persisted, and on April 18, another attempted drone attack was reported near the facility's training center.

### **Increasing Military Presence - May-June 2024**

In May and June, IAEA's experts detected sounds of gunfire and drone presence in the immediate vicinity of the plant, which increased risks from military activity. Of particular

concern was the vulnerability of ZNPP's external power supply, which was severely damaged due to attacks on Ukraine's energy infrastructure, leaving the plant's power supply unpredictable. On June 23, the ZNPP reported to the IAEA that an external radiation monitoring station had been destroyed due to artillery shelling and fire. The damage to this station significantly impaired the ability to detect and measure radioactive emissions, further complicating efforts to maintain nuclear safety.

### **Life in Enerhodar and Local Infrastructure Challenges - July-August 2024**

In July 2024, several drones hit the ZNPP's area, fortunately without serious damage. However, the city of Enerhodar, where most plant staff live, suffered severe power and water shortages, significantly complicating daily life for personnel.

In August, a drone hit one of the plant's cooling towers, causing a fire, but the damage did not directly affect the safety of the six units. Intense fires that developed around the power plant further increased the risks and challenges affecting ZNPP's operation. The flames threatened the external power lines supplying the plant, further weakening power supply stability. Eventually, the facility had to rely on a single external power line, creating a critical situation for maintaining nuclear safety.

### **IAEA Attention and Emergency Drills - September-October 2024**

In September, IAEA Director General Rafael Mariano Grossi visited the Zaporizhzhia nuclear power plant to personally assess the damage caused by August's fires. IAEA experts then conducted simulated exercise scenario included a loss of coolant accident in unit 1, preparing for the safety challenges of such an event.

Power supply remained a critical problem, as the backup power line connection was interrupted several times during the month. This created significant nuclear safety risks, as the facility had to rely solely on a single external power source. Military activity in the area continued, further increasing the plant's security threats.

### **Maintaining Nuclear Safety**

The events of the past year highlight that maintaining nuclear safety in a war environment presents extraordinary challenges. IAEA attention and strict international cooperation are essential for ensuring future safety.

The Hungarian Atomic Energy Authority continuously monitors and evaluates information related to the Russian-Ukrainian conflict, particularly regarding Ukraine's nuclear safety situation. It follows communications from international organizations, primarily the IAEA, and informs the domestic population when necessary.