



## HUNGARIAN ATOMIC ENERGY AUTHORITY Nuclear Safety Directorate

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# RECENT DEVELOPMENTS IN NUCLEAR SAFETY IN HUNGARY

November 2010.



Autumn colors in the HAEA backyard

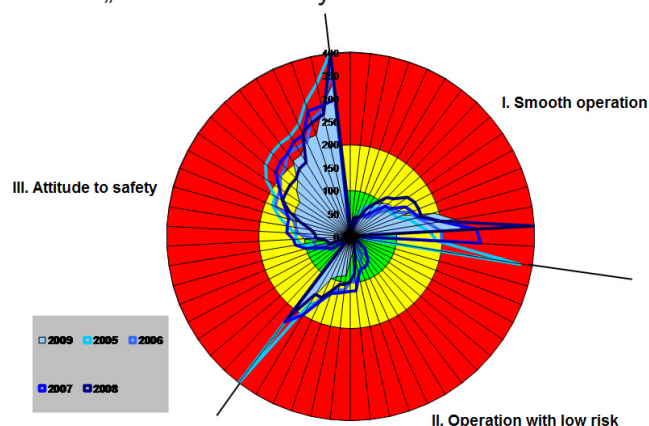
## General

### Safety Performance Assessment 2009

According to the several years regulatory practice the Nuclear Safety Directorate of HAEA has assessed the safety performance of the nuclear facilities in Hungary (Paks NPP, Interim Spent Fuel Storage Facility (ISFSF), Training Reactor of the Budapest University of Technology and Economics (BUTE TR), and Budapest Research Reactor (BRR)) for the year 2009.

The assessment is based on a system of safety performance indicators, which includes groups characterizing the smooth operation, the operation with low risk and the attitude to safety, respectively. The assessment also takes into account the safety related events and the experiences from regulatory inspections. The most important conclusion is that the nuclear facilities worked according to the respective rules also in 2009.

The indicators of the ISFSF and the BRR reflect a high standard similarly to the previous year. The safety performance of the BUTE TR improved significantly in comparison with the previous year. The Paks NPP has shown significant improvement in all the three main areas of assessment, nevertheless, there remained room for further developments in the areas of „Operation with low risk” and „Attitude to safety”.



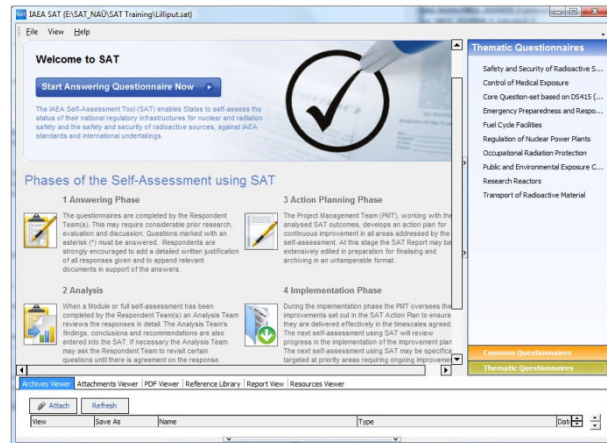
Circular diagram of NPP Paks safety performance

## HAEA internal

### 1. IRRS SAT workshop

The HAEA management has decided to perform a self-assessment using the SAT method and the tool developed by the IAEA for the Integrated Regulatory Review Service (IRRS). In September, a three-day workshop was held in the HAEA headquarters, where Ms. Adriana Nicic and Mr. Stephen Evans IAEA experts described the self-assessment process, the structure and the use of the SAT tool for the 15 participating HAEA staff members. The experts provided information on the organizational, technical and arrangement aspects of the project.

The self-assessment process consists of several stages. First small groups will be formed for the different topical areas to answer the SAT questions, then other groups will evaluate the answers. The proposed length of the self-assessment from the initial planning to the completion of the action plan is about 12 months.



SAT opening screen

### 2. Technical support agreements in 2010

The involvement of Technical Support Organizations (TSO) in the nuclear safety regulatory work is a must in the contemporary regulatory practice.

Based on regular technical support programmes of the recent years a network of technical support organizations assisting HAEA has been established. The most important organizations of the network are the KFKI Atomic Energy Research Institute, Nuclear Safety Research Institute, the Institute of Nuclear Techniques of the Budapest University of Technology and Economics (INT BUTE), the Hungarian Academy of Sciences Institute of Isotopes, the Pannonia University and the engineering company ETV-ERŐTERV Zrt.

In May 2010 the TSO agreement with the INT BUTE has been renewed. In September 2010 the TSO network has been extended by signing an agreement with the engineering office SOM System Ltd.

HAEA appreciate the work of the technical support organizations; their activity contributes to the fulfillment of the regulatory tasks at a higher level and consequently to the safe operation of the nuclear facilities.



Dr. József Rónaky HAEA director general and Mr. Miklós Ördögh, SOM System Ltd. sign the TSO agreement

### 3. HAEA open day

In 18th September HAEA opened the doors to the public in the framework of the Hungarian Cultural Heritage Days. In spite of the rainy weather the highest number of visitors entered the premises ever since HAEA takes part in this program: there were 190 visitors of the event between 2 PM and 6 PM, mostly



secondary school and university students, pensioners and families. The organizers prepared a variety of programs to give an impression on the work of HAEA. The visitors were guided around in groups in



on an exhibition where posters and mock-ups were shown and explained by experts. Finally a multiple-choice test could be filled by the volunteers and small gifts provided as rewards. The guestbook notes confirm the usefulness and necessity of such open days.



every hour. First introductory lectures were given on nuclear safety, nuclear security and emergency management, then the nuclear emergency centre has been introduced by a simulated exercise. The program continued



## Nuclear Power Plant Paks

### 1. Licensing of the new fuel introduced at Paks NPP

A new type of fuel assembly with improved parameters is being introduced at the Paks NPP. The enrichment of the new fuel has been increased and it contains burnable poison (Gd isotope). The increased enrichment enhances the economic efficiency of the fuel cycles while the application of the burnable poison compensates for the negative effects of the increased enrichment on the safety features of the reactors and the transport and storage devices. This change conforms with a world-wide tendency and at Paks the power up-rates of the units made it necessary.

In 2010 a test operation of 18 assemblies was completed. The test program was licensed in 2009. The preliminary use of the test assemblies was necessary for the validation of the reload design computer codes. As the test program was finished successfully, the Hungarian



Atomic Energy Authority issued the license of the general use of the new fuel. On this basis the first batch of the new fuel assemblies was loaded at Unit 4 in 2010. The results of a special inspection programs show that the behavior of the fuel assemblies is in agreement with the preliminary estimations and with the design requirements. The general use of the new fuel will be established gradually during the next four-five years.

## ***2. Extension of the operation licenses of the units no. 3 and 4 of Paks NPP up to the end of the designed lifetime***

The designed lifetime of the units of the Paks NPP is 30 years, which expire on December 31. 2016. and December 31. 2017. for Unit 3 and Unit 4, respectively. The Periodic Safety Review performed in 1996 resulted in operation licenses for these units valid up to the end of 2010.

In a licensing procedure, initiated by the PA Zrt. (Operator of the Paks NPP), the Hungarian Atomic Energy Authority (HAEA) has issued the new operation licenses. In the case of Unit 3 the approval of an 8% of power up-rate (to 500 MWe nominal power) was also issued.

In the licensing procedure the regional authority of the environment protection and the competent organization of the Police were involved as prescribed in the legal system.

The licenses are based on the evaluation of the report on the latest Periodic Safety Review performed in 2008. It was verified that if the revealed deficiencies are removed by executing the corrective measures as required by the authorities the safe operation of the units is rendered possible for a long period of time.

Lifetime extension of the units will be treated unit by unit in dedicated licensing procedures.



## ***3. Supervision of refueling outages***

The planned maintenance and repair activities together with fuel recharge are performed during the main outages of the units. The regulatory review during main outage covers the maintenance schedules, their execution and the monitoring of effectiveness of maintenance system.

After the main outage, the licensee has to submit a report to the HAEA on the main outage activities and fuel reload. The main outages started on March 26 at Unit 1, which outage was finished in 30,5 days. The main outages of Unit 4 and 2 were fulfilled in 59 and 30 days, respectively. During the main outage, the licensee carried out the necessary maintenances, reviews, tightness test and safety technical examinations of the reactor vessel and its internals, and the loading of new fuel for the next cycle. The restart after main outage is to be authorized by HAEA. The main outages and restarts of the units were continuously reviewed with on-site, and individual tests, on-line control and inspection according to an inspection plan.

On Unit 3 the maintenance activities started on September 25. The outage length was planned for 26 days. Finally the connection to the electrical grid took place on October 22.



*Replacement of low pressure turbine blades*

## Other Nuclear Installations

### 1. Interim Spent Fuel Storage Facility construction license

The Interim Spent Fuel Storage Facility (ISFSF) in Paks is operating with 16 vaults, and the construction of vaults 17-20 is in progress. The construction and commissioning of vaults continues module by module as the spent fuel is produced at the Paks NPP. The plan of the facility includes the construction of as much as 33 vaults.

The construction license of ISFSF expired in summer 2010. The operator, Public Radioactive Waste Management Ltd. (PURAM) applied for the renewal of the license which was assessed by HAEA on the basis of the updated version of Preliminary Safety Assessment Report. HAEA, together with the contributing authorities has decided to extend the construction license for 5 years, in compliance with the legislations, for the 17-33 modules. The construction of vaults 17-20 is done basically according to the technical solutions already used in case of vaults 12-16. There are minor technical changes for operational and manufacturing reasons which, however, practically do not affect the environmental impact of the facility. A more significant change is the number of spent fuel assemblies stored in the new vaults, which, in turn, is well covered by safety analyses.

### 2. Manufacturing for Interim Spent Fuel Storage Facility extension

The manufacturing of 2200 storage tubes has begun for individual storage of the spent fuel assemblies in the new extension of Spent Fuel Interim Storage Facility. The compliance with



Storage tube external welding control

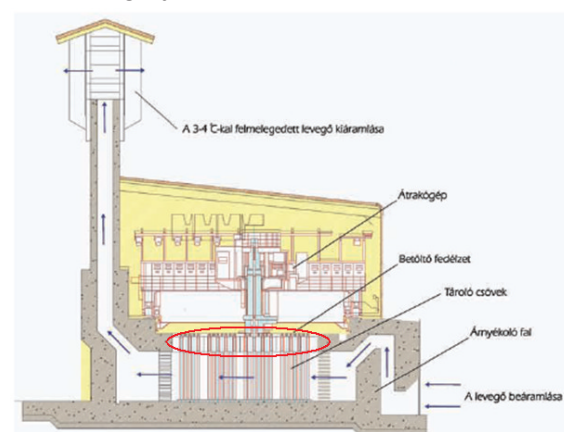


Storage tube internal welding control

the requirement of mechanical resistance against seismic impacts and of the environment protection during storage period is provided by welds made by automatic equipment. Before starting standardized production, the HAEA has thoroughly reviewed the preparedness of



Visual control of charge platform sections before coating



Charge platform sections marked by red on the facility scheme



manufacturer's experts and the suitability of the welding equipment. Compliance with the prescribed welding parameters was checked by a complete welding inspection following a pilot manufacturing.

The manufacturing of steel structure sections of charge platform structure that provide accurate positioning of storage tubes and radiation protection of attendants is in progress. The HAEA regularly reviews the fulfillment of requirements prescribed in design documentation, legislations and official licenses with a complex on-site examination before covering the steel structures partly by metal spraying and partly by painting.

### ***3. Repair of Budapest Research Reactor primary main gate valves***

During the preparation of the Budapest Research Reactor periodical primary pressure test the operator informed the regulatory body that deviations indications of internal leakage of main pipeline valves had been observed.



*The worn out valve sealing*

The same type seal could be obtained from the original supplier. The fixing of the main gate valve was done. The seal on the delivery side valve, the same type as on the suction side has not shown any leakage yet, but it was also replaced as a preventive maintenance. The pressure test was successfully performed after assembling the valves and refilling the pipelines. HAEA staff supervised the exploration of the failure, the repair process and the pressure test.

The two 400 mm diameter flap type main gate valve had worked almost 20 years without any failure. After emptying the pipelines and dismantling the suction side valve, a complete degradation of the inner plastic seal was realized. The seal ring having a rubber core was broken up to several fragments; the part in contact with the valve plate was missing in about 90%. The screws of the rim fastening the seal have slacked.



*Disassembled flap valve*

## **International co-operation**

### ***Training Courses on Nuclear Emergency Management***

The training project of the European Union titled Training Courses on Nuclear Emergency Management (TRANEM) is a continuation of the training courses that were carried out in 2005–2008 in the framework of the EURANOS project. The European Commission, Directorate-General for Energy and Transport, Directorate H, Unit of Nuclear Energy, Radiation Protection (TREN H.4) in late 2009 contracted the Hungarian Atomic Energy Authority to provide one-week training courses in nuclear emergency management during the period of 2010-2012. The aim of the contract is to give the authorities in each EU Member State and candidate countries an opportunity to send members of their staff for

training in order to improve knowledge of basic radiological and nuclear emergency management and the European arrangements in this field.

The first 5 day course was hosted by the Hungarian Atomic Energy Authority (HAEA) during the period of 13-17 September 2010 with the participation of 25 young or newcomer experts from 17 countries. The course activities included presentations and practical activities, as well as the course exercise. The TRACEX (TRANem Course EXercise) exercise was organized as a set of table top exercises for TRANEM training course participants at the CERTA emergency centre of the HAEA.

The course was implemented successfully achieving the expectation, as it was reflected in the evaluation by the participants. Based on the data of the daily evaluation forms, the technical content of the course was rated as an average 4.49; and for the administrative part the average rate was calculated as 4.37 in a scale of 1 to 5, where 1 was the weakest and 5 was the strongest mark. Based on the experiences the HAEA expects to further improve both the technical and the administrative part of the course arrangements and looks forward to receiving young and newcomer staff of the European institutions for the next TRANEM course in 2011.



*TRANEM course lecturers and participants*

## Event of Interest

### ***Actuation of one emergency diesel generator during outage of Unit 4***

On May 5, unit 4 was in cold shutdown state under refueling outage. Contractor workers were performing cleaning activity on a 6 kV non-vital unit switchboard which was not energized.



*Indication of energized state of the cubicle №19*

Two workers placed a double ladder between cubicles №20 and №19 and removed the cover plate from both cubicles; however a red and white plastic chain and labels indicated the energized state of the cubicle №19. One of the workers started to perform dust removal activities in the cubicle №20 while the other worker placed the cleaning spray can into cubicle №19 when all of the sudden he felt muscle jerking in his

right forearm and his colleague felt the same in his lower leg. They stopped the work and notified it to lead worker of contractors. The lead worker didn't turn to the installation supervisor for clarification of the situation but tried to convince that the workers' complaint was unjustified. The lead worker wanted to prove de-energized state of the switchboard with his 0.4 kV manual voltage tester and touched the buses of 'S' and 'T' phases and a short circuit occurred. The manual voltage tester exploded and he suffered burns on his face and hands. He was taken to hospital for treatment. The short circuit generated differential protection of 6 kV reserve bus and it caused the emergency diesel generator to start and the load sequencing program also actuated.



*The cubicle №19 following the event*

Theoretical training, on-the job training and competency test has been developed based on the lesson of this and the past events to prevent recurrence similar events. The event was rated on the INES scale as level 0.