HAEA NSD

HUNGARIAN ATOMIC ENERGY AUTHORITY

Nuclear Safety Directorate

H-1539 Budapest, P.O. Box 676,

Tel: +36 1 436-9881, Fax: +36 1 436-9883, e-mail: nsd@haea.gov.hu

RECENT DEVELOPMENTS IN NUCLEAR SAFETY IN HUNGARY

May 2009.

General

1. *Hungarian parliament approves Paks expansion*

In a 30 March vote, the proposal for extending the capacity of the Paks NPP was approved by 330 votes and opposed by six, with ten abstentions. Under Hungary's nuclear energy act, the government needs to obtain a preliminary conceptual approval from the parliament before taking specific steps leading to the construction of new nuclear capacity.

The proposal had been approved earlier in the day by parliament's environmental committee in a vote with 15 in support, one against and one abstention.

Hungary's Paks plant (Image: Paks NPP)

A senior energy ministry official, Tamas Zarandy, told the committee that the increase in the capacity of the Paks nuclear plant was necessary in order to secure the electricity supply and price predictability. He said that the expansion is also justified on environmental and employment grounds.

The parliament's economic committee also unanimously voted in support of the proposal earlier in March.

The Paks plant currently comprises four Russian-supplied VVER-440 pressurized water reactors, which started up between 1982 and 1987. Though originally 440 MWe gross, the units have been upgraded and will be modified further to give 500-510 MWe gross. In 2004, the parliament economic committee decided upon a 20-year life extension project for the four Paks units. The plant currently generates almost 40% of Hungary's electricity.

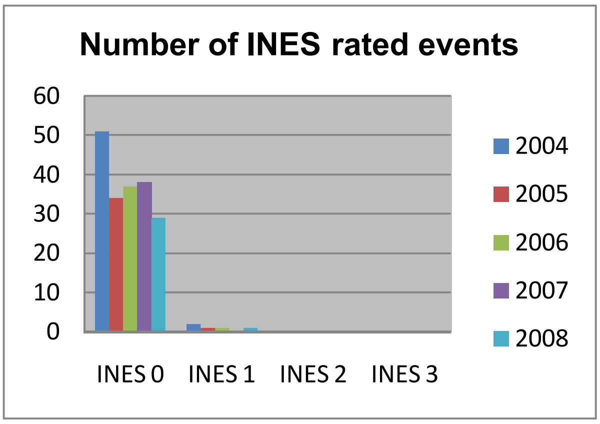
The construction of new reactors at the Paks site has been proposed in order to meet future electricity demand. In early 2009, the prime minister urged parliament to approve this, though foreign investment would be needed.

The commissioning, planning and implementation of the construction project is expected to take a minimum of six years. Therefore the overall period leading to construction will be at least 11 years.

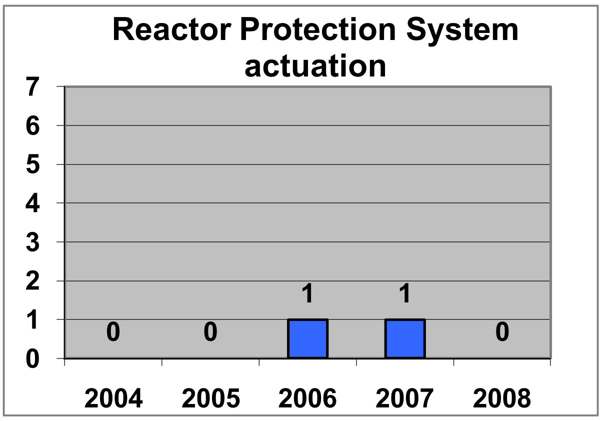
2. *Safety Performance of the Nuclear Installations*

- Paks NPP load factors:

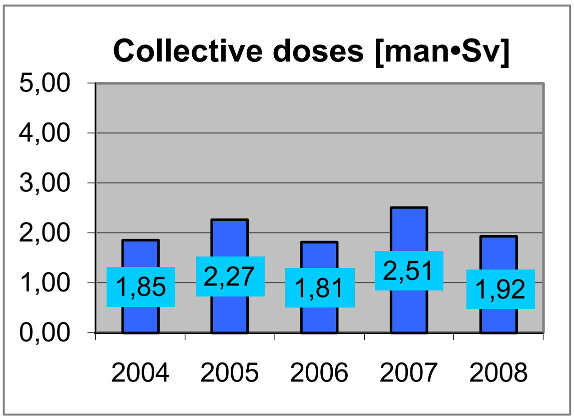
Unit 1	Unit 2	Unit 3	Unit 4
90,2 %	76,7 %	90,5 %	90,1 %



- 29 INES 0 and 1 INES 1 events occured in 2008.



- Reactor protection system was not actuated during power operation.



- The collective dose was below 2 man*Sievert in 2008.

The Nuclear Power Plant Paks, the Budapest Research Reactor and the Training Reactor operated according to the regulations.

3. Hungarian Nuclear Knowledge Basis

The nuclear society has to preserve and maintain the common knowledge gained during the years of the utilization of nuclear energy. The Hungarian Atomic Energy Authority has decided to prepare a national level knowledge management strategy for the further and future nuclear power generation, and for the related regulatory activities.

The first phase is the establishment of a knowledge basis related to the regulatory activities, based on a computer aided experience feedback system. The second phase is the establishment of the Hungarian Nuclear Knowledge Basis with the wide participation of the interested utilities, engineering companies, research institutes, institutions and authorities.

The information sources consist of four groups. The first group is the personal experience of the HAEA senior staff, which is to be collected by preparation of personal memories about reactor events, assessment activities, inspection reports, evaluated documents, and the personal annotations and comments. The personal memories will be transformed into common knowledge by systematic organization and structuring the individually gathered information pieces and by introducing it into a computerized database application.

The second group consists of the international level event reporting systems, such as the Incident Reporting System (IRS, IAEA-NEA), the Incident Reporting System for Research Reactors (IRSRR), International Nuclear and Radiological Event Scale (INES) and the domestic system of event investigations, such as the database of the Hungarian events.

The third group of information sources includes the policy making documents, standards and recommendations coming from the IAEA, NEA, organizations of EU, or VVER Forum, etc.

The fourth group is the knowledge gained from the reports of the research and development projects supporting the sustainability of nuclear operations or assisting the regulatory activities.

Computerized database applications are needed to empower the human intelligence with the data organizing, seeking, searching and visualizing functions. The results of the above listed information and knowledge collecting efforts are promoting the effectiveness of the regulatory activities, and the well grounded decision making.

Nuclear Power Plant Paks

1. Preparations to Lifetime Extension

The units of the Paks NPP have been put into operation between 1982 and 1987 with a designed lifetime of 30 years. The management of the power plant has decided on the extension of the units' lifetime by 20 more years in 2001. The lifetime extension was almost unanimously supported by the Hungarian Parliament in December 2005. Environmental impact analysis was prepared and submitted for public debate in 2006. Public hearings both in Hungary and in the neighboring countries (Austria, Romania, and Croatia) were organized.

Environmental approval was issued, and then challenged by environmentalist organizations. Final court decision reinforced the approval in November 2005.

The nuclear safety regulatory approval process requires a Program to be submitted by the NPP four years before the expiry of the operational license, latest. The Program needs to demonstrate either the suitability of the systems and system components for extended operation or, the process of safely ensuring it. The Program was submitted to HAEA in November 2008. For the evaluation of the Program, HAEA NSD has established a project involving about 75% of the inspectors in five topical review groups. The reviewing process is planned to take about six months and ends up with a regulatory resolution including the conditions and requirements imposed by the regulator on the Program.

2. *Power Uprate*

The Paks NPP has four VVER-440/213 type reactor units in operation, originally designed to produce 1375 MWth and 440 MWe each.

Former upgrades of the secondary circuits and turbines resulted in 460-470 MWe with an unchanged thermal capacity at each unit. About ten years ago an upgrade of the primary side was decided to increase the nominal power by 8% to 1485 MWth, resulting in cca. 500 MWe generated power. The power increase is due to an increase of the outlet primary coolant temperature by about 2,5 °C (changing unit by unit). This is reached mainly by a refined primary pressure regulation, an upgrade of the core control system and a new type of fuel assemblies. Additional modifications have been performed in certain technological components, e.g. the replacement of some of the MCP impellers and decreasing the initiating pressure value of the hydro-accumulators. The upgrading process has been completed at the units no. 4, 1 and 2 (in 2006, 2007 and 2008, respectively), while it is ongoing and the power is being increased stepwise at the unit no. 3, which is operating at a power level of 105% now. At this unit the power increase will be completed in 2009, during the next fuel cycle.

3. *Safety of nuclear fuel cycle*

The yearly refueling of the units in 2008 have been performed properly, according to the preliminary plans. No violation of safety has happened during the fuel operations.

The fresh and spent fuel have been handled without any problem and in accordance with the safety requirements.

The leak tests are finished for those sixty fuel assemblies having got over the cleaning before the cleaning tank incident in 2003. The measurement results have proven their intactness.

Some increase of radioactivity has been detected in Unit 4 primary water indicating leakage of a fuel assembly in the core. The low water activity requires no technical mitigation except permanent monitoring, but the leaking assembly has to be identified during the main overhaul in 2009 and it has to be taken out and be stored in proper conditions. The necessary processes and equipment are available to handle and store the leaking assembly at the Paks NPP.

4. Periodic Safety Review

Periodic Safety review of the power plant units is performed once in every ten years of operation. Previous reviews were held for two units at one time. The actual review has been performed for all four units of the Paks NPP. The scope of the review is defined in the Nuclear Safety Code and it is conform with the IAEA recommendations. The PSR was submitted in December 15, 2007. Altogether 32 members of HAEA NSD staff had participated in the assessment in 14 groups according to the main chapters of the Report. Besides the nuclear safety authority, a number of co-authorities had taken part in the process, including the environmental, health, disaster management, policing and mining authorities, and the local fire service.

HAEA NSD approved the Report in December 15, 2008 with the requirement of 169 safety enhancing measures in three importance categories. Most of these measures are required to fulfill in 2009, but some of them may be executed in a longer period of time.

HAEA NSD follows and controls the fulfillment of the measures and evaluates their results.

5. Renewal of operating licenses of Units 1 and 2 for the design lifetime

The design lifetime of each Paks NPP units is 30 years, which will expire in 2012 for Unit 1 and in 2014 for Unit 2. These units had operating licenses till the end of 2008 year on the basis of the previous Periodic Safety Assessment Review in 1996.

HAEA NSD has issued operating licenses for the entire remaining design lifetime.

Offices and departments other than HAEA NSD that had taken part in the license extension process are the National Public Health and Medical Officer Service, the regional Inspectorate for Environment Protection, Nature Conservation and Water Management, the Administration Department of the National Police Headquarter, the local Fire Department and the Directorate for Disaster Management of the county.

HAEA NSD reviewed the updated Final Safety Assessment Report and took into account assessment in the earlier Periodic Safety Assessment Report. The assessment's conclusion is that there is no risk endangering the units' safety till the end of the design lifetime in case of fulfillment of the prescribed corrective actions. Unit 3 and 4 have valid operating licenses till the end of their design lifetime from the beginning of their operation.

The licenses for extended operation will be issued in a separate process on the basis of applications unit-by-unit.

6. Events of interest: Breaching the containment hermetic liner during Iodine filter installation

A follow-up evaluation of the containment leakage results led the NPP staff to a possible leak source: during the installation of new Iodine filter units in 2007 the containment hermetic liner might have been breached. The filter frame was fastened to the floor by bolted joint, via drilling the hermetic liner. All four units were affected in the same way. The measured leakage has not shown a direct relationship with the drilling and the leakages are far from the allowable rates set in the Tech Specs.

The event did not have a significant safety risk. NPP is preparing for the necessary corrections.

One of the new Iodine filter units

Bolted joint on the filter frame foot

Other Nuclear Installations

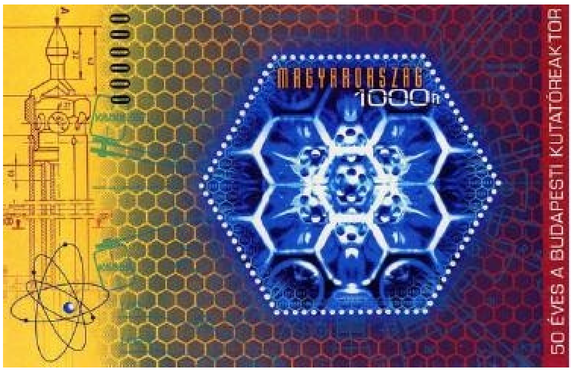
1. Celebrating the 50 years old Budapest Research Reactor

József Pálinkás, President of the Hungarian Academy of Sciences

The first research reactor of the country started its operation fifty years ago, on March 25, 1958 at the KFKI Atomic Energy Research Institute. Within the scope of the European Union's 6th and 7th Framework Programs, the NMI3 international cooperation has made it possible for dozens of users to carry out their research plans partly or entirely at the Budapest Research Reactor (BRR).The Atomic Energy Research Institute (AEKI) is an independent research institute of the Central Physics Research Institute (KFKI) since 1992. Its main function is to carry out basic and applied researches in reactor physics, thermo-hydraulics, nuclear fuel behavior, material science, informatics and chemistry as well as radiological protection, environmental researches and nuclear electronics. The BRR has started to operate at the thermal power of 2 MW. Its reconstruction started in 1986 and the reactor was reinstalled six years later with 30 years of planned lifetime. The research reactor is a neutron source, which is mainly utilized for isotope manufacturing, non-destructive material examination, basic researches (e.g. solid state physics) and education. The neutrons originating from the BRR having finally the power of 10 MWs could be used for the examination of different materials.

Szabolcs Hullán, HAEA Department Head

The use of the equipment is free for research scientists coming from national institutions and universities. The reactor equipments are continuously supplemented. Its efficiency was highly enlarged by the liquid hydrogen type cold neutron source installed in 2001. A celebration of the 50 years anniversary was held at the Hungarian Academy of Sciences (MTA) opened by MTA President Mr. József Pálinkás followed by congratulation speeches of two ministers of the Government, the representatives of the regulatory bodies – including the HAEA – and eminent scientist and professionals from home and abroad. A special postage stamp was issued by the Hungarian Post Office on the occasion of the 50 years anniversary (see the picture).



2. BRR fuel conversion

The change-over of the fuel elements of the Budapest Research Reactor to low enriched uranium fuel (LEU) has begun with the repatriation of the high enriched spent fuel stored at the Budapest Research Reactor Site. The HAEA has issued a modification license in principle and an acquisition license for the conversion and the fuel acquisition in 2007. Having these licenses the operator has made a contract with the Russian partner to manufacture and deliver the necessary amount of low enriched fuel. HAEA NSD will carry out quality control inspections during and after manufacturing the fuel at the vendor's facility.

New research reactor fuel assembly

The operator applied for modification license submitting the documentation which demonstrates the safety of the fuel conversion. The conversion will be performed gradually. For four transitional fuel cycles the reactor core will be built with mixed HEU and LEU fuel, with increasing ratio of the LEU fuel as the ratio of the HEU fuel is decreasing. The fifth fuel cycle will consist of LEU fuel only, this cycle will be regarded as a test operation. The conversion is expected to begin in 2009 and it will take about three years.

3. Spent Fuel Interim Storage Facility: fulfillment of the PSAR obligations, revision of the FSAR

Last year HAEA NSD issued a limited operational license for the Spent Fuel Interim Storage Facility which is supplemented by five new vaults. The license was issued on the basis of the Periodic Safety Assessment for the 11 old vaults operating since 10 years. The licensing basis for the 5 new vaults is the Final Safety Analysis. The validity of the unified license was limited till the end of 2009. The regulatory body obliged the operator to eliminate the observed

deficiencies and to report about it in the modified FSAR documentation thus underlying the issuance of an operational license valid for the officially allowed ten years long period of time. The required documentation arrived in March, 2009 and the regulatory body has started the assessment

4. Comprehensive inspection of the Spent Fuel Interim Storage Facility

According to the Annual Inspection Plan and the related regulations HAEA NSD carried out a comprehensive inspection in November 2008 at the Spent Fuel Interim Storage Facility, with the purpose of the inspection of the facility's main processes of operation and the management of safety.

The inspection did not discover such deficiency, which would endanger nuclear safety. There was no need for immediate action or intervention to the operation. The authority compiled an itemized and summarizing assessment report, which was sent to the licensee who prepared a plan for corrective actions. The regulatory body will check the performance of the planned actions.

5. LILW sent to the National Radioactive Waste Repository first time

The low and intermediate level radioactive waste (LILW) produced in the NPP up to now have been stored in the controlled zone of the plant. As this storage capacity was practically exhausted, the safe operation of the NPP could be assured only by shipment of the LILW to a suitable storage location. HAEA issued the licenses necessary for the shipment from the NPP and prescribed additional conditions regarding the information obligations. The Public Radioactive Waste Management Ltd. (PURAM) defined the acceptance criteria conform with the site characteristics and, after obtaining licenses from the authority, it was ready to accept and store safely the waste of the NPP in the National Radioactive Waste Repository (NRHT) newly installed in Bátaapáti. The first shipment of solid LILW left to the repository on December 2, 2008. Approximately 80 barrels of radwaste (one month waste production of the NPP) was shipped out from the NPP in 2008. These barrels have been temporarily put in the surface host building of the final repository, where they will later be put in nines into concrete containers and will be concreted. In this form they will be brought under surface to the final storage shafts.

International co-operation

1. VVER Forum PSA WG Workshop

The workshop of the VVER Regulators' Forum Working Group on Regulatory Application of PSA was held in Budapest, Hungary on February 25-27, 2009. Since 2003, at the first phase of its work the WG have created comparison analysis for predefined PSA initiating events in the VVER-440 reactors, and have elaborated the Risk-Informed Regulation Indicator System – RIRIS, which describes the status of preparedness of the VVER countries for the introduction of the risk-informed decision making at the regulatory body and at the operator levels. The second phase has been started in 2006, when the PSA WG continued the comparison of the models of the VVER-440 reactors for selected initiating events. The WG biannually have evaluated the RIRIS indicators and have prepared the comparison analysis in the VVER Forum countries for the following three expert fields: legal background, PSA models and tools, professional skills, which are the prerequisites for the application of the risk-informed decision making. At the meeting the participants have harmonized the report of the second phase, and they have assigned the aims and actions of the possible future continuation.

2. *National Competent Authority meeting*

After the Chernobyl accident the International Atomic Energy Agency (IAEA) initiated and established the Early Notification and Assistance Conventions, where the role and tasks of National Competent Authorities (NCA) were defined. In Hungary the Hungarian Atomic Energy Authority plays the role of an NCA. The IAEA organizes the biannual meeting of the above mentioned NCAs, where the participants can share their experiences gained during exercises or emergencies and can harmonize their approaches. For the coordinated execution of the activities the National Competent Authorities Co-ordination Group (NCACG) was formed, which works together with the IAEA Secretariat. The spring meeting of the NCACG was held in Budapest, Hungary on March 17-18, 2009. The aim of the meeting was to look over the activities of the regions, and to make preparations for the 2009 CA meeting in Vienna. The NCACG examined the possible cooperation between the differently developed regions, moreover the NCACG initiated to discuss the work up of the past radiological accidents at the upcoming CA meeting in Vienna.

The meeting of the NCAs of the Eastern European Region (EENCA) was also held in Budapest, Hungary 19-20 March 2009. The purposes of the meeting were to improve the cooperation between the NCAs of the Eastern European Region in the field of assistance and to make preparations for the NCAs July meeting in Vienna. Due to the economic crisis, from the 30 EENCA only 5 were represented, in addition the NCACG chair, an IAEA expert and the representatives of the African, Western European and the Asian region and Austria have participated at the meeting. The successful meeting has achieved its goals, the participants agreed that this kind of meetings should be continually organized biannually right before the general CA meetings.

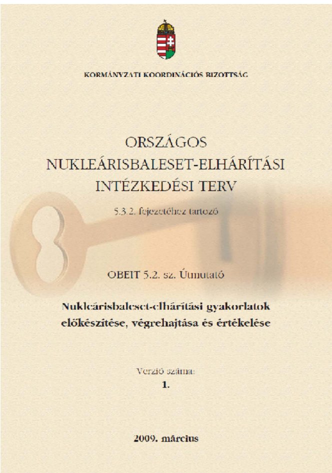
3. *WENRA meeting in Budapest*

The Western European Nuclear Regulators' Association (WENRA) has held its 2009 spring meeting in Budapest, hosted by HAEA. This was the first meeting where representatives from non-nuclear countries took part as official observers. The meeting offered an occasion to commemorate the 10th anniversary of the formation of WENRA. It was acknowledged that after ten years WENRA became a well recognized worldwide "trademark" in its field of activity. In order to keep WENRA memory it was suggested to compile a booklet commemorating WENRA history. Furthermore, a task force with participation of nine members was established to elaborate a proposal on future expectations from WENRA. It was also agreed that WENRA shall strive for closer co-operation with Armenia, Russian Federation and Ukraine. While the existing working groups on reactor safety and waste and decommissioning, respectively, have reported on their progress and plans, it was also proposed to widen the scope of work with issues related to research reactors. A special presentation from Netherlands has highlighted the complicated regulatory issue of a possible controversy between nuclear safety and medical isotope supply.

Emergency Preparedness

1. *New guidelines for the national emergency plan*

The uppermost level in the legal regulation hierarchy of nuclear emergency preparedness is represented by acts (Atomic Act, Act on Disaster Management, Act on National Defence). There are several government and ministerial decrees on the next level, as executive orders.


KORMÁNYZATI KOORDINÁCIÓS BIZOTTSÁG

ORSZÁGOS NUKLEÁRISBALESET-ELHÁRÍTÁSI INTÉZKEDÉSI TERV

5.3.2. fejezetéhez tartozó

OBEIT 5.2. sz. Útmutató

Nukleárisbaleset-elhárítási gyakorlatok előkészítése, végrehajtása és értékelése

Verzió száma: 1.

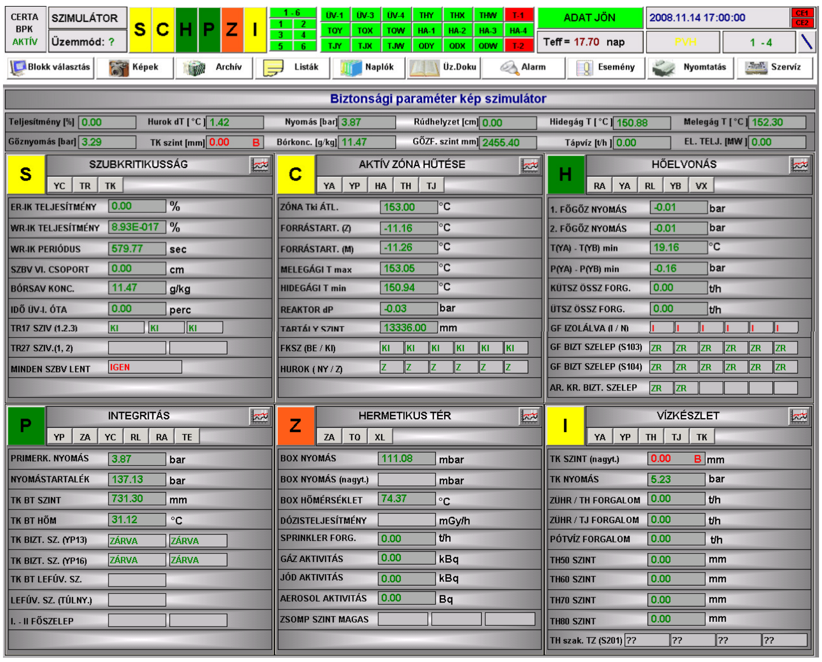
2009. március

In addition to laws, also the technical regulations are essential, which has been realized through the development of National Nuclear Emergency Plan. The high level Governmental Coordination Committee (GCC) has approved, while its chair issued this document. Each organization participating in the nuclear emergency management needs to develop its own plan in agreement with the national plan. However the methods and procedures recommended to apply and follow based on international best practice are needed to be specified, and the most appropriate way of it is a set of guidelines complemented to the National Nuclear Emergency Plan. These documents may be updated time-to-time as appropriate keeping track of accumulated experiences. The guidelines are prepared and agreed by the inter-organizational body also responsible for developing the national plan. The table below provides a brief summary of recently published or planned guidelines.

Mark	Title	Year of publication
3.1.	Critical tasks and resources	2009
3.2.	Organized assistance in defense	2010
4.1.	Alert degrees of national emergency system	2009
5.1.	Development and maintenance of nuclear emergency plans	2008
5.2.	Preparation, conduct and evaluation of nuclear emergency exercises	2009
7.1.	Decision on, introduction and implementation of urgent protective actions	2009
7.2.	Methodology of local response to radiological emergencies	2010
10.1.	Treatment of irradiated injuries (first aid, decontamination, transport and treatment)	2010

2. New CERTA VITA software

The CERTA VITA software operates in the HAEA's Centre for Emergency Response Training and Analysis (CERTA), as of the most powerful tool for evaluating the technological status of Paks NPP in an emergency situation. It was first developed in 1997 by the KFKI Atomic Energy Research Institute and has been operating since with high reliability. The program provides the possibility of keeping track of the primarily severe accident related technological data from the NPP, altogether approx. 600 per unit in each ten seconds. However its operating system and hardware basis became obsolete in the last 12 years, therefore a project was launched in 2008 to place the whole system on new platform (MS Windows instead of OpenVMS) and to replace its hardware to a serviceable one. The development was completed by the end of testing period on March 31, 2009 and as a result the system obtained new, modern design and was supplemented with new functions, besides we kept the existing reliability. CERTA VITA is mainly used for exercise purposes; however the possibility is available to check out operational data during normal operation as well.



Safety parameter display of the new CERTA-VITA design