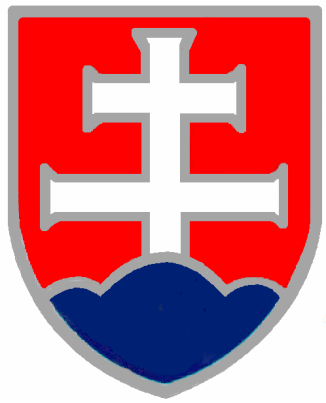
ANSWERS TO QUESTIONS ON NATIONAL REPORT OF THE SLOVAK REPUBLIC



COMPILED ACCORDING TO THE TERMS OF THE CONVENTION ON NUCLEAR SAFETY

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Answers to questions on National Report of the Slovak Republic

Slovakia is pleased to present to the State Parties of the Convention on Nuclear Safety (CNS) the Answers to questions received on the National Report of the Slovak Republic compiled according to the terms of the CNS (September 2001). Slovakia is ready to provide additional explanations to these Answers.

GENERAL

Q1-IRL: What is a typical training, examination, refresher-training etc schedule for Nuclear Installation operators and staff?

Answer:

A thorough description of a training process is provided in both National Reports of SR. An outline of licensed personnel training is given herein.

The typical basic training includes the following parts:

- *Classroom training - 22 weeks*
- *On-site training on NPP - 18 weeks*
- *Simulator training - 6 weeks*
- *Preparation for exam + exam for Certificate - 2 weeks*
- *On-the-job training - 5 weeks*
- *Written and oral license exam - 2 days*
- *The work under supervision as a practical part of the licence exam - 4÷8 weeks*

The typical continuing training includes following parts:

- *Classroom training in training centre - 1 week per 2 years*
- *Simulator training - 2 weeks per year*
- *Training and psychological relax - 2 weeks per year*
- *Classroom training at NPP - 2 days per 3 months*

Note:

- *Classroom training at training centre deals with nuclear physics, nuclear thermodynamics, thermo-mechanics, nuclear materials etc.*
- *Classroom training at NPP includes such training topics as:*
  - *Lessons learned from events occurred at NPP Bohunice or Mochovce and relevant events obtained from WANO and IAEA IRS,*
  - *Planned equipment's and procedure's changes/modifications,*
  - *Outage schedule, organisation and safety under outage conditions,*
  - *Radiation and safety protection,*
  - *Fire protection,*
  - *Industrial safety and safety culture,*
  - *Minimisation of radiation waste, etc.*

The typical initial training for other staff includes the following parts:

- *Classroom training - 6÷13 weeks*
- *On-site training at NPP - 6÷8 weeks*
- *Preparation to exam + exam for Certificate - 2 weeks*
- *On-the-job training - 2÷8 weeks*

Q1-US: Section 1.2 (page 11) discusses a review performed by a High-Level Work Group regarding shutdown of the NPP V1 units in 2006 and 2008. Section 2.1.3.1 discusses operation of NPP V1 "at least through the end of its designed service life." Has the decision been made to shut down NPP V1 units in 2006 and 2008? If so, what are the regulatory implications and are the regulatory requirements and resources in place to deal with the shutdown units?

Answer:

1. *The Slovak Government in its Resolution No 801/1999 of 14 September 1999 approved as realistic date of the shut down of NPP V1 units, year 2006 for unit 1 and year 2008 for unit 2.*
2. *The safety documentation relating to the shut down of NPP V1 units according to the act No 130/1998 on peaceful use of nuclear energy and according to the act No 127/1994 on environmental impact assessment (prior siting and start of decommissioning Environmental Impact Assessment is evaluated by Ministry of Environment in co-operation with ÚJD SR), is being prepared. The respective documentation includes mainly Updated Conceptual Plan for Decommissioning and Environmental Impact Assessment. In connection with NPP V1 shut down ÚJD SR expects that the budget of UJD will be subsidised. Atomic Act and specific regulations contain provisions for Decommissioning.*

Article 6

Q1-ROM: The existing reactors in Bohunice and Mochovce NPPs are VVER type (USSR-Russian design). The Report does not make the existent of using the initial design information.

- *Could you indicate where Slovak practices are applied and, in particular, highlight how they are different from Russian/USSR practices they replace?*
- *Who provide the safety analysis support services? These institution have access to Russian developed engineering and analysis tools or they developed their owns?*
- *What procedures they use to validate, verify and endorse the code, date and computations?*
- *How do results compare with Russian studies?*

Answer:

The Bohunice and Mochovce NPPs were built in the frame of the international co-operation of former Czechoslovak general constructor (Skoda Praha), Czechoslovak manufacturers of equipment and Soviet design and manufacturing organisations. The normative documentation and requirements in the area of nuclear engineering were for these reasons compatible. The original design documentation was available to the extent necessary for manufacturing and licensing of the NPPs. Former Czechoslovak regulatory body has issued, in addition to these standards, a set of Regulatory guides which were developed in accordance with IAEA standards and guidelines. In general, most of the initial design information which had been produced at the time of the NPPs design development was available. The design culture at that time did not require type of document currently referred to as "design basis" because the design practices in the Soviet nuclear industry were different from those in the western countries. In addition Energoproject Prague was the general designer of Bohunice and Mochovce NPPs with direct access to soviet design organisations. The former Ministry of Fuel and Power has established very comprehensive list of safety standards and norms from former Soviet Union, Czechoslovakia and IAEA as a basis for design, construction and commissioning.

In general, the legislation moves towards western and IAEA standards, which are reflected in new guides and requirements in the area of nuclear safety assessment and verification, which have been issued by the Slovak regulatory body in recent years. Safety analyses performed since approx. 1997 applies methodology and acceptance criteria defined in IAEA-EBP-WWER-01 "Guidelines for Accident Analysis of WWER NPPs", which was developed with support of design organisation Gidropress. The comparison of the Soviet design standards which were in force at the design stage of the VVER V213 reactors and of the US NRC General design criteria is available in IAEA TECDOC 742. It has been shown that in most requirements there is a good agreement.

The analytical safety support to our NPPs is provided mainly by the VUJE Trnava, which is a research and design organisation with long experience in safety assessment and verification. VUJE has collaborated with Soviet design organisations since the beginning of their activities. In the area of thermohydraulic safety analyses VUJE participated in verification of the Russian code Dynamika and applied this code for safety analyses until aprox. 1997. In recent years mostly western codes are used for safety analyses (Relap5, Athlet, Cathare, Melcor,…). The verification and validation of these codes is insured by the developers by co-operation of international code users, including VUJE Trnava. Very important role in this area has been played by the IAEA, e.g. in the frame of the RER/9/004 project. Several codes have been developed in the past in VUJE Trnava itself. These codes have been validated and approved by the regulatory body according to their requirements and legislation.

The data used for safety analyses have been gathered from the design documents and drawings, procedures and other relevant sources available to the NPP operators. Both Bohunice and Mochovce have developed detailed databases for safety analyses which are maintained and updated and have dedicated QA programmes.

The safety analyses performed by our organisations have been many times audited by IAEA missions and international expert groups. Their high quality has been proved, showing compliance with the international practices. Part of analyses has been performed for Mochovce and Bohunice V1 NPPs by western organisations (mainly Siemens and Framatome). In general, the available safety analyses correspond well with the licensing analyses that have been performed by the Russian organisations in the frame of application of new nuclear fuel by Mochovce and Bohunice V2 NPPs in 2000 – 2001. The original safety studies of VVER 440 reactors are not applicable any more due to adoption of more conservative and better-defined methodology, which is based on the IAEA guideline IAEA-EBP-WWER-01.

Q2-ROM: A safety review done by RISKAUDIT in 1998 was performed to compare NPP Mochovce safety level with units operated in western countries, after implementation of the Safety Upgrading Program of Mochovce NPP Units1, 2. What specific actions regarding nuclear safety are still outstanding and on what time scale will these be addressed?

Answer:

The safety-upgrading programme at NPP Mochovce was reviewed by IAEA mission in October 1998 (IAEA-RU-8081) and by GRS, IPSN, CIEMAT, ANPA and KFKI in the framework of Phare project. The conclusions are very positive. IAEA recommendations at IAEA-EBP-WWER 03 were fulfilled by realisation all of the Safety Measures (SM) except SM I&C 09 PAMS (Post accident monitoring system) and AA08 SPSA (Shut down PSA). Whole process has been under supervision of nuclear regulatory authority ÚJD SR.

In January 2002 a tender was carried out to select a supplier of PAMS (I&C 09). This outstanding PAMS issue is scheduled to be solved between 2002 and 2004 at both Units. Regarding the SPSA (AA08), works carry on, according to the contract, with expected finalisation in September 2002.

Q1-GER: The safety improvement programme for Bohunice 3 and 4 will be completed until 2008. According to PSA results, Bohunice 1 and 2 show a CDF probability of 2,56 x 10-5lyear. At present, this is about three times better than the calculated value for Bohunice 3 and 4 (7,36 x 10-5lyear). What are the main reasons for the better result?

Answer:

Main reasons are very well justified and implemented safety-upgrading programme by Consortium Siemens Germany and VUJE Slovakia. CDF $2,56.10^{-5}$ for Bohunice V1 plant is the figure for post reconstruction status of the plant. Original figure was $1,7.10^{-3}$. Gradual reconstruction was based on combination of deterministic and probabilistic approach. Safety goals were established for both areas. Regulatory body required that CDF have to be less than 10^{-4} per year. Based on pre-reconstruction PSA results recommendation for gradual reconstruction were

prepared. During whole reconstruction process (basic engineering, detail engineering) probabilistic evaluation, sensitivity analysis was performed too, to verify whether probabilistic goals are achievable, to eliminate all dominant contributors to CDF and to prioritise measures implemented. This was an important way to be able significantly decrease CDF at Bohunice V1 plant below required value.

$7{,}36.10^{-5}$/year value as of 2000 for Bohunice V2 plant is for pre-modernisation status of the plant, taking into account some measures already implemented (including implementation of symptom based EOP, modification of strainers at containment sump etc.). Original CDF of Level 1 PSA for unit 3 as of 1995 was $6{,}41.10^{-4}$/year. Main contributors to CDF ware taken into account in modernisation program. We expect, that after modernisation is finished, the CDF value will be even lower than at Bohunice V1 plant.

Q2-GER: Have been the PSA results of Mochovce NPP been compared to the Bohunice ones and analysed with regard to their contribution on the safety level? Have these results and the experience of operation of Mochovce 1st to an adaptation of the modernisation program of Bohunice?

Answer:

Mochovce PSA results are significantly affected by modernisation of the plant before start-up mainly in area of I&C and electric part but also in area of high-energy line breaks and residual heat removal systems, so it is difficult to compare the results.

However as an indispensable part of each task solved within V2 safety concept for modernisation and safety upgrading, a comparison with measures taken at Mochovce and Bohunice V1 safety upgrading program was done, to transfer knowledge and experience obtained within these programs to a highest possible extend.

Q3-GER: The recommended strengthening of the structure of the Bubble Condensers of Bohunice 3 and 4 have been already implemented?

Answer:

Based on the results of the PH 2.13/95, the project for the reinforcement of the tray level 1 and tray level 2 and the manhole door of the 1st -12th floors of the bubble condenser was developed. The implementation of measures, in accordance with the results of the project, will be performed during the outage in 2002. (see also Q3-AUT,Q1-FIN)

Q4-GER: Which additional information is requested by UJD to complete the regulatory review regarding full verification of the performance of the containment bubble condenser system for all design basis accidents?

Answer:

UJD SR issued the license for the start-up and operation of Slovak nuclear power plant Mochovce several years ago. The licensing process included careful national and international review of this NPP (IAEA mission, RISKAUDIT expert's group from France and Germany) to evaluate the status of plant safety enhancement, fulfilment of defined requirements and safety measures (implemented during NPP construction). The evidences submitted to the assessment of NPP safety and confirmation of the bubble condenser containment functionality has included results of analytical and experimental work performed in various countries (Germany, Russia, Slovakia) and in various experimental facilities (EREC, SVUSS - Bechovice, VUEZ - Tlmace, Siemens - Karlstein). UJD SR considers submitted evidences on NPP safety sufficient and currently, does not have any other requirements for the bubble condenser containment verification.

Safety upgrading of Bohunice V2 NPP is in progress. The scope of Bohunice V2 reconstruction is similar like those already implemented for Mochovce NPP. The Bohunice V2 reconstruction includes also reinforcement and additional anchorage of the bubble condenser construction.

Based on the proposals of Atomic Question Group (AQG) of the European Commission (EC), the utilities of Central European Countries has initiated to perform an additional set of experimental and analytical work to resolve on expert level all arising questions and to close lasting discussions on the verification of bubble condenser. UJD SR agrees with planned activities. The planned tests will extend considerably the range of break size of bubble condenser experimental investigation from a large break LOCAs to smaller breaks of LOCAs including steam line break inside the containment.

Bubble Condenser Steering Group at OECD/NEA (hereinafter BCSG) has been established to support a performance of the additional work to bubble condenser verification and to add to this work an international character. The BCSG consists of representatives of national regulatory bodies, European Union, and nuclear power plant operators. The main goals of BCSG are:

a) To provide a convincing evidence that V213 type of containment works during DBAs as designed;

b) To provide support for planning of new tests and interpretation of results;

c) To provide regular experimental results, which will be a basis for the validation of computer codes.

The first meeting of BCSG has been held in Paris, in December last year and second one in Budapest in February this year. No additional reinforcement of the bubble condenser based on this project is expected.

Reinforcement of the bubble condenser construction in Mochovce NPP has been already implemented in the construction phase and safety enhancement of NPP.

Safety upgrading of Bohunice V2 NPP is now in progress. A reinforcement and additional anchorage of bubble condenser construction, following the upgrading program, is foreseen during the NPP maintenance outage in 2002 year. This will

include reinforcement and additional anchorage of 1st and 2nd water tray floors and improving of sidewalls with main whole doors on all 12 floors of bubble condenser.

The implemented measures of bubble condenser reinforcement are based on the results of analytical and experimental work and international recommendations.

Q5-GER: How do operators and regulators assess the reliability of real-time risk monitoring? What is the current operational status of the real-time risk monitoring? Is it used as a routine tool for operational and safety decision making? If yes, for which activities?

Answer:

Real time risk monitors were developed for both plants Bohunice V1 and Bohunice V2. Risk monitor for Bohunice V2 plant was developed by US and Slovak companies. Real time risk monitor for Bohunice V1 plant was developed by Slovak company. Both Models passed trough very intensive V&V process. After discussion with regulatory body this model is used by nuclear safety department for evaluation of all changes in plant alignment (test, preventive and corrective maintenance etc.). Model is also used for verification of the maintenance schedule during refuelling outage from risk point of view and suggestions are prepared to minimise outage risk. At present time real time risk monitors are not used by the control room shift personnel for decision-making process. This will be possible after verification period and approval by regulatory body.

Delivery of full power Risk monitor for Mochovce NPP is in procurement phase with planned implementation by the end of 2003.

The same model of risk monitoring is available at the utility and regulatory body. Thus, the regulatory body has a possibility to perform its own evaluations. The used model is periodically updated to reflect the plant design and operational changes. Currently, the risk monitoring is in trial use.

Q6-GER: Has UJD developed specific guides or rules on the contents and format of procedures and schedules related to maintenance, test, and inspections?

Answer:

UJD SR developed safety guides for the elaboration of maintenance procedures and schedules.

On the other hand, UJD SR has approved the basic documents, which are related also to maintenance. They are:

- *Overall Quality Assurance Programme (it is elaborated for different stages of the plant, e.g. design, construction, operation), which also defines the maintenance policy and principles.*
- *Individual Quality Assurance Programmes which very strongly define all requirements for the quality of individual components and systems, including*

types, scope and intervals of maintenance, requirements for pre-service and in-service inspection, etc.

All these documents are approved by UJD decisions and licensee is obliged to incorporate all requirements for maintenance from these documents into maintenance procedures.

UJD has issued also several documents in the form of „regulatory guidelines" related to maintenance and in-service inspection (see National Report page 119).

Q7-GER: Is the real-time risk monitoring accepted as a basis for approval of the licensee's arrangements and schedules related to maintenance, test, and inspections?

Answer:

Currently, the risk monitoring is in trial use. There are not any official applications of risk monitoring till now for performing maintenance, tests and inspection at full power. However the riskmonitor is used by nuclear safety department for review of risk during annual refuelling outage. Several schedules modifications have been implemented based on riskmonitor assessment.

Q8-GER: The seismic re-assessment of the sites Bohunice and Mochovce is expected to be completed in 2003 (peak ground acceleration value of the respective sites). Depending upon the results, further upgrading measures could be necessary. Do you have already hints, whether additional seismic reinforcements could be necessary for Bohunice 3-4 and Mochovce 1-2?

Answer:

The seismic reassessment of the site Bohunice was completed in 1998 in accordance with 50-SG-S1 accepted by the IAEA mission in 18-20 November 1998. The special Technical Guidelines for seismic reassessment of NPP V2 were developed by the IAEA in 1999. According to this document, it was developed: floor response spectra; walk down of components and buildings and detailed Program for seismic reinforcement of buildings and components. Nowadays, the design development of buildings and components reinforcements started.

In accordance with the Building Act and the Building Order of the Slovak Republic geological and seismic surveys were carried out to set up parameters of seismic menace of Mochovce NPP. The outcome of the surveys is a set of spectrums for free field at the rock foot in connection with PGA = 0.1g for Mochovce 1-2. The results of the surveys are presented in the plants safety analysis reports. The resistance of Mochovce 1-2 was improved at PGA = 0.1g.In 1998 IAEA Inspection Mission "SIDAM 98" was carried out. It was aimed at the methodology used and the results describing parameters of seismic menace. The mission resulted in the conclusions and recommendations to specify geological and seismic data. These recommendations are gradually implemented in Mochovce and in co-operation with the Slovak Academy of Science with the expected date of completion in 2003.

The seismic monitoring network continuously monitors seismic activity of Bohunice and Mochovce surroundings.

Q9-GER: Is the equipment qualification of Mochovce NPP completed? If not, what are the main remaining issues?

Answer:

Qualification of Mochovce NPP equipment was finished in the middle of 2001 from the point of view of elaboration of qualification documentation for mechanical, electrical, I&C equipment and civil part. After that, equipment qualification tests were performed followed by replacement of not qualified equipment. Whole process of equipment qualification will be finished during outages in the year 2002.

Q1-FR: From the report it appears that the Bohunice V1 safety report after gradual upgrading has been issued in may 2001. Could the Slovak Republic give some information on the schedule of the review of this report by UJD?

Answer:

SAR was finished in January 2001. On the base of the results of the assessment was necessary to perform review of the SAR. Upon request of the utility (the Slovak Power Plants (SE, a. s., Bohunice NPP) of 7 May 2001, UJD SR reviewed the SAR (revision N^{o} 2) after the gradual upgrading of the Bohunice V1 NPP.

After reviewing the SAR, according to Act of National Council of the Slovak Republic No. 130/1998 Coll. (§ 15, art.4), on 20 July 2001 UJD SR issued its Decision N^{o} 144/2001 and approved operation of the Bohunice V1 NPP after the gradual upgrading.

Justification for the approval has been based on evaluation results of gradual upgrading and fulfilment of requirements of Decisions N^{o} 1/94 and N^{o} 110/94.

Q2-FR: Could the Slovak Republic indicate on what document was based the UJD decisions n°1/94 for granting approval for further operations of the NPP?

Answer:

Basically, there are three types of the documents.

The first - Bohunice NPP submitted to UJD Introductory Safety Analysis Report at the beginning of 1993. This document was reviewed by IAEA mission in July 1993 and served as safety concept for plant upgrading programme. The second is IAEA-TECDOC-640 Ranking of safety issues for WWER-440 model 230 nuclear power plants, IAEA Vienna, Austria, February 1992. The third type of documents is outcomes/conclusions of numerous IAEA and other international missions reviewing safety of Bohunice V1 NPP. These outcomes/conclusions are covered in minutes of the missions. Finally, there are results of UJD inspections carried out at Bohunice V1

by UJD inspectors. The findings of the inspections were presented in inspection protocols.

Q3-FR: Could the Slovak Republic give more information on the Bohunice V2 Upgrading and Safety improvement programme? In particular, does this program include measures to solve the generic safety problems of the VVER 213 design related to the auxiliary feedwater system, the protection against primary circuit overpressure, steam generator leakage, prevention of sump clogging?

Answer:

Basically, all identified WWER 440/213 generic safety issues as gathered and ranked in IAEA-EBP-WWER-03 document are addressed within the upgrading and safety improvement program. Solving of some most safety relevant issues was forwarded for this program, others will be dealt with according to schedule approved by the regulatory authority. Short Answer of specific questioned measures is given further.

1. *Primary circuit cold over pressurisation protection*

   The primary circuit of Bohunice V2 is protected against the high pressure using two pressurizer safety valves and one relief valve. This protection is proved by analyses to be sufficient.

   Protection against the cold over pressurisation is made within the Bohunice V2 Plant Safety Upgrading. It will be the part of a new RPS system. The protection will be redundant (2 redundancies).

2. *Leakage from primary to secondary circuit (into SG)*

   The leak tightness of horizontal SGs tubes, operated at the V2 plant, is magnificent. The number of plugged tubes is minimal and the regular annual inspection and monitoring of the tube wall thickness carried out on 2 of 6 SGs (i.e. each SG undergoes inspection every three years) validates that excellent matter of fact. Modification on the flange of SG primary collector is performed within the Bohunice V2 Plant Safety Upgrading (similar as already in place at Mochovce). The modification will assure that the leak from primary to secondary circuit will be comparable with the leak referred (related) to SG tube rupture.

3. *Protection against the sump strainer clogging of emergency makeup pumps*

   The issue has been resolved implementing (introducing) the new strainer construction (design) in the period of 1999-2000. Results of the PHARE 2.05/95 project were considered.

4. *The SG emergency feedwater system*

   The SG emergency feedwater system pumps are, according to the original design, placed out of the main technological building in independent (isolated) building (installation).

   Within rectification of the original design weak points, will be performed in the period of 2002-2004:

- *Removal of the SG emergency feedwater system (SGEFS) piping from the intermediate building +14,7 m (where the SGEFS piping might be jeopardised by the high energy piping whipping)*
- *Seismic reinforcement of the whole system to withstand defined level of seismic loads if any occurs.*

Q4-FR: After the present modernisation programmes, are periodic safety reviews planned during the operation of the plants?

Answer:

In the Slovak Republic the need for conducting a Periodic Safety Review for the Bohunice and Mochovce NPPs has been clearly recognised both by the utilities and the Slovak Nuclear Regulatory Authority (UJD SR). The PSR would be highly desirable both in the light of current trends in safety oversight practices and because of many benefits it is capable to provide. Requirements for periodic safety reviews are clearly stated in the Atomic Act. UJD SR prepared a regulation requesting the Slovak NPPs to develop a programme and determine a schedule for the implementation of the programme for periodic safety review. Draft of this regulation defines a scope and periodicity of PSR for NPPs operated in Slovak Republic. It is expected that this regulation will be issued in 2002.

(see also Q3-US)

Q1-JAP: In the national report, a lot of accomplishments of improvement programme for your own nuclear installation were indicated.1) Was there any opportunity to exchange and transfer those knowledge and experiences directly with other countries with similar nuclear installation, which was encouraged in the first review meeting?

Answer:

There is a number of opportunities to exchange knowledge and experiences with other countries with similar nuclear installations. The most important opportunities are within the International Atomic Energy Agency, WANO and opportunities within bilateral co-operation like with Japan within its International Invitation Program, Germany, France, Hungary, the Czech Republic, USA etc.

There are also a number of informal co-operation activities within the Forum of Regulators Operating VVER type Reactors or the co-operation between VVER operators (example Bubble Condenser trilateral initiative) and activities on of VUJE. All these and other co-operation activities contributed and will contribute also in the future to improve the safety of nuclear installations.

Q1-AUT: Will severe accident management procedures for the Bohunice V1 reactors be implemented? What is the envisaged schedule for the implementation?

Answer:

The development of severe accident management procedures for V1 could be started only after the full implementation of the new symptom based EOPs, which are under development and should be implemented by the end of 2003. The decision regarding the SAMG development will take into account the necessary continuity of both projects, the technical experience gained in the V2 SAMG project, current regulatory requirements, scheduling of inevitable hardware modifications and the time available for implementation of SAMGs in view of the strategic decisions regarding the V1 shutdown. (see also Q18, 22-GER,Q13-FR)

Q2-AUT: What is the status of the development of Severe Accident Management Guidelines for the Bohunice V2 and Mochovce reactors?

Answer:

The development of severe accident management procedures for both Bohunice V2 and Mochovce started based on the contract with Westinghouse Electric Europe in January 2002. Duration of this common project is 2 years. The envisaged schedule for complete implementation of SAMGs has not been defined yet and depends also on the scheduling of necessary hardware modifications to be specified during the SAMG development. The modifications with regard to hydrogen management necessitate additional containment analyses, which will be performed in the frame of V2 Modernisation project (containment analysis) in 2002. (see also Q18,22-GER,Q13-FR)

Q3-AUT: What is the status of the improvement of the bubble-condenser system at the Bohunice V2 reactor and at the Mochovce NPP?

Answer:

Based on the results of the PH 2.13/95, the project for the reinforcement of the tray level 1 and tray level 2 and the manhole door of the 1^{st} -12^{th} floors of the bubble condenser was developed. All corrective measures in accordance with the results of the project were performed at Mochovce Unit 1 and 2. The implementation of these measures at Bohunice V2 is scheduled for outages in 2002.

On the scope of practice (PH/TS/17, contract between Dukovany NPP, Bohunice NPP, Mochovce NPP, and Paks NPP) an OECD-NEA expert group was constituted to support the Project as a Steering Group (BCSG). Additional, supplementary analysis and tests are to be performed, to obtain complementary information on behaviour of Bubble Condenser. BCSG consists of representative's national regulatory authorities, NPP operators and European Union representatives.

The goal of the Steering Group is:

- *To prove ability of designed performance of the V213 type containment under DBAs conditions,*
- *To provide support for planning new tests and interpretations their results,*

- *To provide regular experimental results, which will serve as inputs for the validation of the calculation codes as best estimate.*

The project, prepared by the Dukovany, Mochovce, Bohunice and Paks NPPs utilities, contains proposal of tests and time schedule. Nowadays, proposals are specified. (see also Q3-GER, Q1-FIN)

Q4-AUT: What is the current status of the safety measures with regard to the Mochovce NPP, which have not been implemented yet?

Answer:

The safety-upgrading programme at NPP Mochovce was reviewed by IAEA mission in October 1998 (IAEA-RU-8081) and Riskaudit. The conclusions are positive. IAEA recommendations at IAEA-EBP-WWER 03 were fulfilled by realisation all of the Safety Measures (SM) except SM I&C 09 PAMS (Post accident monitoring system) and AA08 SPSA (Shut down PSA). Whole process has been under supervision of nuclear regulatory authority ÚJD SR.

In January 2002 a tender was carried out to select a supplier of PAMS (I&C 09). This outstanding PAMS issue is scheduled to be solved between 2002 and 2004 at both Units. Regarding the SPSA (AA08), works carry on, according to the contract, with expected finalisation in September 2002. (see also Q2-ROM)

Q5-AUT Which measures have been taken or are planned to ensure full independence of VUJE, the main technical support organisation to the regulatory body?

Answer:

The VUJE is private, commercial organisation, fully independent from the utility and regulatory body. Internal quality assurance system implemented at VUJE excludes a violation of independence.

The regulatory body (UJD SR) uses in the safety assessment of the supervised nuclear facilities services of International Atomic Energy Agency and an assistance of other regulatory bodies and their technical support organisations. Important is co-operation between the UJD SR and STUK (Finland), GRS (Germany), IPSN (France), US NRC (USA) and European Commission (projects financed from EC). In addition, the UJD SR has established Department for Safety Analyses and Technical Support. The department has been equipped and the staff has been trained under the international projects and co-operation (Swisslovak projects, CENS, etc.). The department performs independent safety analyses, review and assessment of NPPs safety for UJD SR.

Q2-US: (Section 2.3.2.1, page 33) The results of the Western European Nuclear Regulators Association (WENRA) review indicated that the safety level of Mochovce will be comparable to nuclear plants being operated in Western European reactors after completing residual work to confirm all parts of the safety analyses. Has the

confirmation of the safety analyses been completed and were any additional changes identified?

Answer:

Both, deterministic and probabilistic safety assessment has been performed to confirm that all requirements and safety goals are met. In 2000 and 2001 a completely new set of accident analysis was conducted in connection with the use of profiled fuel for the full range of initiating events according to IAEA-EBP-WWER-01. It has been proved that the plant is capable to cope with all DBA sequences and selected BDBA. Further effort is devoted to severe accident management. Additional analysis is to be performed for this very low probable scenario within the common project with Bohunice V2 for SAMG development,

An updated PSA Level 1 study of Mochovce NPP was performed to evaluate the contribution of safety improvement program to safety. The PSA model reflects all safety measures implemented to solve safety issues identified for this type of reactors. The study has shown a considerable decrease of CDF. No additional issues, which should be necessary to deal with further, were identified.

(see also Q2-ROM,Q4-AUT)

Q3-US: (Section 2.2.3, page 31) The report discusses the amendment of Bohunice V2 SAR every year to incorporate changes during the preceding year. Please discuss whether similar annual updates are expected for the Bohunice V1 and Mochovce SARs?

Answer:

Annual updates of Bohunice V1 and Mochovce SAR are performed in the same periodicity as on V2 (every year) to incorporate changes during the preceding year. This requirement is in NPP procedure valid for both NPPs. Results of the new analysis and studies concerning to internal and external hazards with impact to POSAR will be implemented in compliance with Safety Guide No 50-SG-O12 (IAEA) "PSR of operation nuclear power plant" and in accordance with requirements of Slovak nuclear regulatory authority (ÚJD SR) presented in POSAR revision elaborated 10 years after commissioning. (see also Q4-FR)

Q4-US: (Section 2.1.2, page 26, Section 2.2.2, page 26, and Section 2.3.2, page 33) The report discusses the PSAs performed. Section 4.5.3 of the 1998 report states that the regulatory body (UJD) requirements for safety upgrades are specified for individual reactor types and that the operator develops the safety upgrade programs. How do the regulator and operator use risk assessment data; for example in planning inspections, developing technical specifications, evaluating incidents, evaluating proposed design changes, prioritising safety upgrades?

Answer:

Slovak Regulatory Authority established probabilistic goals for both plants Bohunice V1 and Bohunice V2. To meet these criteria for Bohunice V1 plant it was necessary

to carefully analyse first PSA results and to prepare recommendation for upgrading process. PSA tool was also used during whole upgrading process for evaluation of the proposed measures, to prioritise implementation of the measures and to assure that probabilistic criteria will be met. Several important suggestions were done based on evaluation of proposed design changes. Similar procedure will be used for Bohunice V2 plant. Bohunice plant also prepared risk-based justification of the allowed outage time and surveillance test interval required by technical specifications. Regulatory body now evaluates the proposals. Real time risk monitors are used for evaluation of the changes in systems alignment and also for evaluation of the maintenance schedules for refuelling outage.

IPSART mission for PSA Level 1 at Mochovce NPP was performed by IAEA experts throughout November 12 – 21, 2002. Final report will be submitted by the end of March 2002. SPSA study has been developed and will be finished by the end of September 2002. Delivery of full power Risk monitor for Mochovce NPP is in procurement phase with planned implementation by the end of 2003. Before start up of Mochovce NPP unit 1 PSA Level 1 was developed without safety measures that were later implemented. After implementation of safety measures PSA level 1 model was upgraded and results were compared to see the benefit of safety measures in CDF.

Regulatory view:

Some essential reasons for incorporating risk-informed regulatory approach into decision making concerning safety issues in Slovakia are as follows: effective evaluation of alternative safety upgrading measures, demonstration of improvements in plant safety due to extensive plant modifications, effective improvement of plant safety with limited resources, evaluating and optimising allowable outage times in risk control.

Major breakthrough towards risk-informed regulation was issuing the Decision No.1/94 where UJD presented its commitment to use the results of PSA Level 1 in support of safety decision.

The Decision No.1/94 referred to the Gradual Reconstruction of Bohunice V1 NPP, where for the first time UJD requested operator to perform several analyses based on probabilistic techniques with regard to: the evaluation of impact of proposed modifications to the total plant risk at the level of core damage frequency, identification of major contributors to the risk followed by re-assessing the safety upgrading program, evaluation the possibilities of increasing reliability of emergency and vital power supply system.

As an example of using risk assessment data in developing technical specifications can be prolongation of allowed outage times (AOT) of motorgenerators as emergency power supply sources in vital power electrical systems of Category I. Based on probabilistic assessment, using PSA L1 model of the unit after the Gradual Reconstruction, prolongation of the AOT from original value of 8 hours, corresponding to basic risk increasing of 10^{-3} % up to 120 hours (corresponding to basic risk increasing of 0.14 %) had been proposed by national engineering company RELKO in co-operation with the licensee. In order to be consistent with UJD SR position, i.e. in all circumstances to keep up enough safety margins, the

AOT of 24 hours (basic risk increasing of 0.028 %, i.e. 5 times lower) was originally considered by UJD. Finally, with regard to current maintenance practice at the Bohunice V1 plant, the AOT of 36 hours has been permitted. Corresponding value of basic risk increasing is between 0.028 % and 0.084 %, what is the value approximately 2 to 5 times lower than the value of basic risk.

UJD SR has assigned to the utility justification of all the AOTs of components and systems permitted by the LCO including times determined for transition of NPP unit, when the limiting condition is not fulfilled, to an operational regime of higher number. The required assignment had to be based on performed by using PSA technology.

The assignment has been completed. Based on PSA models of both full power and shutdown of Bohunice 3, optimum AOTs and surveillance test intervals were gained for some selected components and systems of the NPP. The work was based on US Regulatory Guide 1.176 An Approach for Plant-Specific, Risk-Informed Decision Making: Graded Quality Assurance, US NRC, 1998. The outcome of the work was proposal for AOT changes of such systems as hydroaccumulators, HP/LP IS of ECCS, EWFS, essential service water, electric power output, station service load power supply system, emergency/vital electric power supply, ESFAS and some other systems. However, the results have not been applied to the current Technical Specifications so far.

As far as planning inspections is concerned, PSA results and risk-informed approach has not been applied so far.

Regarding the use of probabilistic approach in evaluating incidents, a "training study" was developed in the Technical Support and Safety Analysis Department of UJD SR, when this approach was used.

Q2-CZ: The nuclear regulator ÚJD SR authorised further operation of Unit 1 and 2 in Jaslovské Bohunice in 2001. While Slovakia is planning to join EU, the Slovak government has agreed to decommission both units in the period 2006 - 2008. What are the technical reasons for this decision of the Slovak government?

Answer:

Safety level of Bohunice V1 was significantly increased by accomplishing of safety upgrading program (so called gradual reconstruction). On UJD request, related to stipulation of Slovak Government's Regulation No. 302/1999 of 21 April 1999, IAEA Mission to Review the Results of the Gradual Upgrading at Bohunice WWER-440/230 NPP Units 1 and 2 took place in November 2000. The Mission's objective was to review the outcome of the gradual reconstruction, in particular whether the measures taken have been sufficiently oriented towards the relevant areas. Moreover, the mission obtained an overall picture of the safety improvement of the power plant through improving the efficiency of the main safety functions under operating and emergency conditions. The experts also evaluated the improved defence-in-depth concept of the power plant, which defines a new safety case. In addition to the evaluation of the gradual upgrading project, the experts also verified the operational safety. In both areas NPP V1 recorded an appropriate progress, as reflected in the achievement of balanced NPP security and safety precautions. In

their conclusions, the Mission stated: "The programme defines a new safety case (new design basis) which satisfies the Slovak National Requirements and goes in some areas beyond the IAEA recommendations for safety upgrading of WWER440/230 NPPs. In conclusion, all safety issues identified earlier by the IAEA have been appropriately addressed. Further work on safety is a continuous process which is needed to maintain a high level of safety." The Mission made some additional (supplementary) recommendations, such as completion of PSA for low power and shut-down conditions, accident management and severe accident mitigation programme, that go beyond the original recommendations of IAEA; they however represent recent development trends in the area of nuclear safety.

The Resolution of the Government No. 801/1999 on realistic shutdown of NPP V1 was issued on 14 September 1999, taking into account political circumstances of the EU accession process.

Based on the request of the operator SE, a.s., reviewing the Safety analysis report of V1 after gradual reconstruction and evaluating the safety of upgraded units in terms of the Resolution of the Government No. 202/2000 of 29 March 2000, the UJD SR issued permissions No. 144/2001 and 220/2001 for further operation of both units. A set of conditions and tasks is in enclosure of this permission. Among others - elaborate symptom based EOPs, perform Level 2 PSA study, elaborate and implement an action plan, including motivation of plant personnel to assure high level of nuclear safety till the end of plant operation.

For the time being, it is not believed, that there are technical or safety reasons for shut down of both units in the period 2006 – 2008.

Q1-SLO: National Repository of Radioactive Waste - UJD granted its approval for the commissioning in December 1999. What are the requirements for licensing of a National Repository of Radioactive Waste? Do you need a public approval?

Answer:

The licensing process for National Repository of Radioactive Waste has five principal steps. The permits for siting, construction, operation, repository closure and site release are issued by municipal environmental office on the basis of the act No 50/1976 on territorial planning and construction rules (so called civil act) and the permissions of ÚJD SR based on the act No 130/1998 on peaceful use of nuclear energy. The acts require preparation of the safety documentation for individual steps by the applicant.

The safety documentation includes for commissioning and operation of nuclear installations following documents:

- *for approval:*
    1. *limits and conditions of safe operation,*
    2. *nuclear installation commissioning programme, split into stages,*
    3. *quality assurance programme,*
    4. *on-site emergency plan,*

- *for review*
  1. *pre-operational safety analysis report,*
  2. *plan of physical protection,*
  3. *radioactive waste and spent nuclear fuel management plan,*
  4. *conceptual plan for decommissioning,*
  5. *programme of in-service inspection of equipment,*
  6. *selected operating procedures,*
  7. *test programmes for equipment and systems important to nuclear safety,*
  8. *evidence of special qualification of employees,*
  9. *evidence of readiness of nuclear installation for start-up,*
  10. *evidence of insurance or other financial cover,*
  11. *programme for radiation monitoring of the environment in the vicinity of the nuclear installation.*

Prior siting and start of decommissioning Environmental Impact Assessment is evaluated by Ministry of Environment in co-operation with ÚJD SR.

Public is involved in process of nuclear installation licensing through the act No 50/1976 on territorial planning and construction rules and through the act No 127/1994 on environmental impact assessment.

According to the act No 50/1976 community is the participant of siting process and the community decision is binding for construction office issuing the licence.

The act No 127/1994 sets up the responsibility of Ministry of Environment to evaluate the proposals for all new facilities, which can influence environment. The scope of the evaluation includes all new nuclear facilities. Direct and indirect impacts resulting from new activities to urban structure, health, living conditions and satisfaction of people including personnel are assessed.

According to the act 127/1994 both the community and public association are the participants of administrative process on the basis of which the decision on respective activity is taken.

Q2-SLO: Was that the only difference between NPP Bohunice A-1 and NPP Bohunice Units V1?

Answer:

As mentioned in article 1.1 of the second National Report of the Slovak Republic - page 9, both National Reports of SR (September 1998 and September 2001) have to be viewed as an integral whole. A description of all Slovak nuclear installations is given in chapter 2 of the first National Report of Slovakia. Therefore only a basic explanation of Bohunice NPPs is provided herein.

NPP A-1, currently under decommissioning, located at Bohunice site has a totally different design as NPP V1. Natural metal uranium has been used as fuel, heavy water as moderator and carbon dioxide as coolant. The reactor was designed for a gross electric output of 143 MWe.

NPP A-1 had been in operation since December 1972 till February 1977, when an operation accident occurred. Federal government of CSSR decided in 1979, to abandon the idea of restarting NPP A-1 operation, and started activities aimed at decommissioning the NPP. All spent fuel produced during the operation was transported from the site back to Russian Federation. Decommissioning program was approved by the UJD. First stage of it, scheduled till 2007, is described in the first National report of SR. According to article 2 of the Convention on Nuclear Safety, NPP A-1 cannot be considered to be a nuclear installation any more.

Four WWER-440 pressurised water reactors are located at the Bohunice site, thereof two WWER-440/V230 model known as V1 units (unit 1 was put into operation in December, 1978, unit 2 in March, 1980), and two WWER-440/V213 reactors known as V2 units (unit 3 was put into operation in August, 1984, and unit 4 in August, 1985). More detailed description of both plants is also provided in the first National report of SR.

Q3-SLO: WENRA Task Force Mission to NPP V1 A concern remains about the ability of the confinement to cope with the failure of a large primary circuit pipe work. If a solution can be found to this issue, the plant should reach safety level comparable to that of western European reactors of the same vintage. Is that the reason why the decommission for NPP V1 was approved?

Answer:

The Slovak Government in its Decree No 801/1999 of 14 September 1999 approved as realistic date of the shut down of NPP V1 units, year 2006 for unit 1 and year 2008 for unit 2. This Decree was issued, taking into account political circumstances of the EU accession process.

The safety level of the plant has been significantly increased by performing of the safety improvement program, defining a new safety case, the plant is able to cope with DBA LOCA 2 x 200 mm by conservative approach and BDBA - LOCA 2 x 500 mm by best estimate approach. Capability of the upgraded confinement, to cope with this safety case, has been confirmed by accident analyses conducted, satisfying Slovak national safety requirements. No additional technical modification in confinement design is foreseen up to now.

For further evaluation of the confinement behaviour upon accident conditions a Level 2 PSA study will be performed.

(See also Q2-CZ.)

Article 7

Q5-FR: Does UJD issue these authorisations or only consent or approve to their issue by an others body? What is the exact situation in the Slovak Republic?

Q6-FR: In the case UJD does not issue by itself the authorisations, how is it ensured that the safety requirement of the regulatory body remain in force and are not modified in the “regulatory process" (see paragraph 2.5 of the IAEA safety requirements GS~R-1, Legal and governmental infrastructure for nuclear, radiation, radioactive waste and transport safety)?

Answer:

The first step in licensing

The authorisations for the peaceful utilisation of nuclear energy are issued by UJD SR solely based on § 4 art. 4 of act No. 130/1998 Col. There are no other regulatory bodies participating in this process. The authorisation is necessary condition for every applicant to enterprise in the area of peaceful utilisation of nuclear energy. Every applicant has to meet requirements on his organisation established in the atomic act for the identified areas. The applicant has to provide for the technical, organisational, financial and QA conditions for performance of his activities when utilising nuclear energy. The authorisation is the binding condition for conducting of activities in the area of peaceful utilisation of nuclear energy. If organisation conducts activity in this area without authorisation it is considered violation of atomic act and UJD SR can fine this organisation up to 50 million of Slovak crowns according to the potential impact on the nuclear safety.

The second step in licensing

Regional office is main licensing body for sitting, commissioning and operation of nuclear facilities in SR according to the Civil law. The license is issued either to constructor (§ 14 of atomic act) or to operator (§ 15) who must be holders of authorisation from UJD SR. The license is issued by regional office but according to the act No. 130/1998 Col. license may be issued only based on permission of UJD, after assessment of safety documentation. The important part of the safety documentation is approved by UJD and the changes there must be approved also by UJD. The assessment and approval of safety documentation results to the UJD separate resolution including conditions binding for licensee. This resolution is issued directly to applicant and is necessary condition for further progress in the siting, construction and commissioning processes. The conditions of UJD cannot be avoided in the licensing process because the licensee is direct partner of UJD and regional office needs UJD positive statement to proceed with giving the final license. (see also Q3-JAP)

Q1-HU: The introduction to the Report at Paragraph 1.2 (page 9) says that implementation of the lifetime extension and upgrading of NPP V2 provided that such extension is efficient and effective." Does the Safety Regulation (in force in Slovakia) contain any conditions or requirements for renewal of operating licenses for NPPs?

Answer:

Operator is obliged to perform Periodic Safety Review in 10 years intervals.

Specific regulator decision is issued usually on behalf of periodic ISI program completion every four years.

According to Nuclear Law the operational licence validity can be extended based on operator request to regulator, evaluation of real status of components and complementary safety documentation.

Conditions or requirements for implementation of the lifetime extension are determined in Atomic Law No.130/1998, §16:

(1) The Authority can prolong validity of the permission, which was issued for the operation of nuclear installation, on the basis of the evaluation of the present state of the installation and on the basis of supplementary safety documentation.

(2) Application for prolongation of the operation period must contain supplementary safety documentation, which will be a supplement to the safety documentation (§15 section 2).

(3) Details related to the supplementary safety documentation, which must be submitted, when applying for prolongation of the operation period of the nuclear installation will be established by generally binding legal provision, which will be issued by the Authority.

At present a new regulation on safety related documentation of nuclear installations in accordance with §16 of the Act No.130/1998, which will contain details on this matter.

Q2-HU: Q2-Q3 Paragraph 2.2.3 (page 31) says "According to the Decision and in terms of the plant standards, above V2 SAR Revision No. 2 has to be amended every year, with changes introduced during the proceeding year to be incorporated" and Paragraph 4.5.7 (page 82) states: "Based on "Atomic Act" UJD works on the draft of a regulation on periodic nuclear safety review that will regulate intervals and the extent of comprehensive and systematic nuclear safety reviews during the operation of nuclear installations. By this the requirement for periodic safety review will get legal platform mandatory to all participants.

What are the regulatory requirements in force for updating of Final Safety Analysis Reports?

What is the status of the FSAR of the operating units?

Answer:

At present the regulatory requirements are based on the "Atomic Act" valid since 1998. This Act specifies the obligation for the operator to submit the authority prescribed safety documentation during each stage of unit construction including pre-

operational safety analysis report" (also used SAF or FSAR) before the Commissioning and operation of nuclear installations (§15).

The permission for unit operation is given by the regulatory decision with or without some conditions (including requirements for FSAR) at present.

The FSAR is reviewed (not approved) by the Authority, the permission for unit operation is given by the regulatory decision with or without some conditions (including requirements for FSAR).

The requirements for the updating of safety analyses reports are prescribed in UJD decision as follows.

Bohunice V1:

Permission for plant operation after gradual upgrading of NPP V1 was given by the regulatory decision based on the review of FSAR, Revision 2 taking into account the former authority comments.

Bohunice V2:

The permission for plant operation was given by the regulatory decision based on the review of submitted FSAR, Revision 2 after the improvements performed on these units according to the tasks involved in the regulatory decision No. 4/96. In this decision there is an obligation for operator to submit periodically the upgraded chapter 15 of SAR.

At present the review of the relevant part of FSAR is going on due to the use of profiled fuel assemblies at these units.

Mochovce 1,2:

The permission for plant operation according to the project lifetime was given by the regulatory decision after the review of submitted FSAR with updated relevant chapters due to use of the profiled fuel assemblies at both units. (see also Q4-FR)

Article 8

Q7-FR: What is the position of the Slovak Republic on the adequacy of the financial and human resources of UJD to fulfil its assigned responsibilities?

Answer:

UJD SR has its own plan for strengthening of its capability. This plan is based on experience of the past years of regulatory activities, international co-operation and missions of Western and IAEA experts such as International Regulatory Review Team (IRRT), which prepared recommendations for Slovak government in order to enhance UJD SR activity. The strategic capacity building plan for the period 2000 – 2003 takes into account expected changes in the economic and political environment and increasing responsibilities of the UJD SR due to new nuclear facilities operation. It focuses on areas of legislation enhancement, development of internal organisation and improvement of own experts activities, nuclear safety assessment and

inspection of nuclear facilities and steps for their implementation as well. The plan defines concrete steps to maintain and improve staff qualification, e.g. through special training and examination for nuclear safety inspectors. The UJD staff is frequently taking part in seminars, conferences and various types of training sessions and courses including language courses. The plan contains also measures for a newcomers training and retraining of current staff. Different parts of the plan are updated every year according to set priorities and available resources. According to the Atomic Act and related UJD regulation, personnel whose working activity has a direct impact on nuclear safety are subject to the examination of their special professional knowledge and skills. Examination is performed by the Examining Committee constituted by the Chairman of UJD and composed of representatives of UJD SR, NPPs, VUJE Trnava (Nuclear Power Plant Research Institute) and from Slovak Technical University. Based on passing the examination the UJD SR issues a certificate on professional skills for specific activity and given type of installation.

As of 31 December 2000 a total UJD SR staff reaches 82 persons, out of them 44 persons execute direct inspections of nuclear safety. As many as 77 percent of employees are university graduates and 21 percent received full secondary education. The position of UJD as a central state administration body assures its independence and own budget funded from the state budget. Requirements to increase necessary resources were put into the National programme for the adoption of the Acquis (2000, 2001) the UJD staff will be in 2002 increased by 5 persons. The UJD SR raise its technical support using also making full use of the possibilities to receive a foreign assistance though individual projects such as an independent small technical support group, which was created with the Swiss government assistance, and now continues its activity as a part of the UJD SR. In addition please see the Annual Report of UJD 2001.

Q8-FR: Could the Slovak Republic comment on the relative income levels of UJD staff and industry staff?

Answer:

Please see the document on "National Report of the Slovak Republic Answers to questions, Bratislava April 1999" page 15/60. Exact figures are not available.

Q2-JAP: As for the subsection of "Extension of the period of operation of nuclear installations"- What is the original period granted for operation? Is the extended period for the operation predefined or dependent on the actual condition of the facilities?

Answer:

Nuclear Steam Supply System operational lifetime was set for 30 years in the original design. However the operational lifetime of Reactor Pressure Vessel was calculated for 40 years.

There were calculated allowed numbers of typical operational cycles in the original design for key components. (e.g. - start-up of the unit from cold shutdown to hot

standby, load rejection etc.). The real values are summarised every year. Significantly lower values are obtained in comparison to design values.

Plant has installed a system to monitor specific loads in key points of components. The results are evaluated yearly. Significant margins are proved.

Formally the operation period is predefined. However the validity of operational licence can be extended. See Answer to the question Q1-HU.

*The program of lifetime assessment (**P**lant **L**ife T**i**me **M**anagement) was elaborated before start-up of NPP Mochovce. Critical components have been specified in this program include damage mechanism. In scope of the program will be known actual status of equipment. The decision on the life extension is pending on the results.*

Q3-JAP: As for the Licensing procedure illustrated in Fig. 3.1.3.1, Regional Office seems to play an important role in licensing.

1) How are the relationship among Regional Office and the state authorities/agencies managed in the process of assessment of environmental impact?
2) Who is the administrative decision maker in this Regional Office Is the UJD decision overridden by the decision of the Regional Office?
   If so, how can the Regional Office be responsible for the justification of the licenses decided based on the approval of relevant regulatory authorities?
3) What is the responsibility of the Regional Office?

Answer:

1. *Regional Office is main licensing body for sitting, commissioning and operation of all including nuclear facilities in SR according to the Civil law. License is issued by regional office but according to the act No. 130/1998 Col. license may be issued only based on permission of UJD, after assessment of safety documentation. (see National Report, September 1998 page 47)*
2. *The administrative decision-maker at regional office is a head of environmental section. Decision of the UJD cannot be overridden by decision of regional office because act No. 130/1998 Col. requires agreement of UJD SR as condition for issuance of license.*
3. *Regional Office is responsible for the hole process if licensing of nuclear facilities based on Civil law, other regulatory bodies issue statements based on other laws (No. 130/1998 Col., Law on health of people) and their agreement is condition of issuance of license. Responsibility is up to all participants at this process.*

Regional Office is responsible for co-ordination of the above-mentioned process and for issuance of final license document-resolution. (see also Q5,6-FR)

Q4-JAP: We are very impressed by the declaration by UJD Chairman about quality of tasks and the declaration by UJD management to support UJD internal quality system.

1) Please explain the outline of the UJD internal quality system.
2) How do you verify or evaluate that the quality of the tasks to be fulfilled by UJD?

Answer:

1. *Internal QA system (QAS) is in the stage of development. At the end of 2001 the chairman approved the quality manual QM. Quality directives (second level of QAS documentation), identified in QM are partially developed and rest will be developed by the end of June 2002. The following activity will be to perform of internal audit to verify the level development and implementation of QAS. The modifications of quality documentation, QAS and UJD activities based on the results of audit will be implemented during the rest of the year 2002.*

   The QM is based on the requirements of ISO 9001: 2000 and IAEA TECDOC1090. The QAS is developed for the set of the main and their supporting processes, which are necessary for the performance of UJD mission.

2. *The verification of UJD activities is performed by the system of internal inspections (planned annually) required by governmental rules and quality of the activities (conformance with the QAS requirements) will by also annually verified by the internal audits program.*

Q5-AUT: Which measures have been taken or are planned to ensure full independence of VÚJE, the main technical support organisation to the regulatory body?

Answer:

VUJE Trnava, a.s. is a private, commercial organisation, fully independent from the utility and regulatory body. Internal quality assurance system implemented at VUJE excludes a violation of independence.

The regulatory body (UJD SR) uses in the safety assessment of the supervised nuclear facilities expert services of the International Atomic Energy Agency and an assistance of other regulatory bodies and their technical support organisations. Important is co-operation between the UJD and STUK (Finland), GRS (Germany), IPSN (France), US NRC (USA) and European Commission (projects financed from EC). In addition, UJD SR has established Department for Safety Analyses and Technical Support. The department has been equipped and the staff has been trained under the international projects and foreign assistance Swisslovak projects and CENS. The department performs independent safety analyses, review and assessment of NPPs safety for UJD SR.

Q1-CZ: Do you plan to join nuclear and radiation regulatory bodies similarly to other countries?

Answer:

Some survey on the situation in the world has been made to evaluate the advantages of a joint nuclear and radiation safety authority. An independent audit of the state authorities in 2000 recommended to consider such an alternative, but finally this recommendation did not get further support.

Article 9

Article 10

Q3-ROM: Responsibility for safety should be allocated to the senior managers within the NPP operating organisation. How do these managers demonstrate their commitment to safety as an overriding priority to the regulator?

Answer:

Senior management of operating organisation SE, a.s. and NPPs demonstrate their commitment to nuclear safety in principle in three ways:

- *By the management methods used to manage processes (approach to safety)*
- *By the safety performance results of nuclear power plants*
- *By huge financial and human resources allocated to safety enhancement*

In subsequent part we describe some examples of NPP senior management commitment to nuclear safety:

1. *Utility senior management has issued inter alia the following basic policy documents on:*
   - *Nuclear and radiation safety policy*
   - *Quality policy*
   - *Human resources policy*
   - *Environmental policy*

   In the Nuclear and Radiation Safety Policy Statement senior management declare:
   - *Commitment to excellent performance in all activities important to the safety of the nuclear power plants*
   - *Emphasise that nuclear plant safety has the utmost priority*
   - *State that nuclear plant safety overrides the demands of production schedules*

2. *Annual goals and objectives including performance indicators are issued to provide plant personnel with specific goals to strive for. Results of these goals are trended, analysed and subsequently used to provide for corrective actions.*
3. *Nuclear plant safety is regularly an important agenda of plant management* meetings, reviewing safety performance of the plant every three months.
4. *Nuclear safety review committee is established at NPPs and headquarters level, which reports its findings and recommendations to plant management and the utility board of directors respectively.*
5. *The board provides appropriate financial, technical, material and human resources to ensure and enhance nuclear power plant safety. It can be demonstrated by financial resources, which were provided to Mochovce NPP safety enhancement and Bohunice V1 NPP reconstruction (details are in the national report). The board also approved to provide resources to the Bohunice V2 NPP modernisation project, which includes safety enhancement.*
6. *NPPs use internal quality and nuclear safety audits as the management tool to improve the quality of processes. The board review the results of internal audits.*
7. *NPP is open to the nuclear safety review by external experts. Different WANO and IAEA review missions (e.g. OSART, WANO peer etc., All missions carried out, are* listed in both National reports) were invited to the Bohunice and Mochovce NPP to review safety related issues and share experience.
8. *Relations between utility senior management and the regulatory body are open and co-operative. Each year we organise regular meeting between NPP board and ÚJD senior management, which deals with utility safety performance assessment, and discuss measures for safety enhancement.*

Similar meetings are organised also between UJD and NPP managers.

Q9-FR: Could the SE provide more information on the management of nuclear safety (as described in INSAG13)?

Answer:

Management of nuclear safety of the operating organisation SE, a.s. is defined, established and maintained well in line with features described in IAEA INSAG-13 "Management of Operational Safety in NPPs", although its establishment goes before 1999, when INSAG-13 was issued. Some aspects of management of NS were already addressed in chapter 4 of the first National report of SR from September 1998.

Management of NS is an inseparable part of the operator's QA system. As a part of it, already in 1997, board of directors adopted Nuclear and Radiation Safety policy, declaring its ultimate responsibility for nuclear and radiation safety matters. Main principles of NS, including first priority of NS to all other company interests, are set up in the policy too.

Subsequently, this policy has been enforced and disseminated within the licensee and NPP QA system. The primary responsibility is further discharged and described in written to all management levels covering all NS relevant activities and establishing an effective management system.

The system is subject of periodic review and updating, to ensure that it complies with all legislative requirements and requirements, regulations and decisions of the nuclear regulatory authority. It reflects contemporary IAEA standards, recommendations, guides and good international practice as well.

High attention is being paid to self-assessment (incl. indicators, internal and external audits, operating experience feedback etc.) and strengthening of safety culture. Among goals, annually set up by the plant management as a self-assessment tool, indispensable role plays goals related to safety performance. Being aware of important role of individuals in implementation of safety management system and to promote awareness of safety, the plant management launches regularly an annual action plan on safety culture. It comprises, among others, actions to be taken in the area of safety culture, tasks assignment, evaluation of indicators of SC etc.

Q10-FR: Are there (SE, a. s.) internal or external reviews or audits carried out for assessing the safety culture?

Answer:

Internal safety audits are important part of SE, a.s. self-assessment. Within safety audits, aspects related to safety culture (SC) are reviewed too.

Working groups on self-assessment of safety culture are created at the plant level, to co-ordinate activities on the field of SC, such as annual action plans on safety culture, questionnaires, definition and evaluation of indicators of SC, training courses on SC, etc.

Surveys of safety culture are used to be organised periodically, to assess attitude of staff to SC and level of safety culture in general. Plant personnel Answers in written questionnaires, comprising number of safety culture related questions. Outputs of questionnaires evaluation represent important input for drafting measures to be addressed within annual action plan on safety culture. For example, such survey was organised at Mochovce NPP in 1999 and a follow-up survey is being prepared for this year. Similar survey of SC at Bohunice NPP is scheduled for this year as well.

Other activity, where SC is being evaluated, is investigation of operating events. Special attention is paid to analysis of human performance within this process, among others, assessing adherence of personnel to safety culture principles too. An annual overall assessment of operating events is further performed. In case, some generic SC issues are identified, corrective measures are drafted and submitted to plant management for approval.

External audits of SC have not been performed yet. Regulatory authority UJD performs inspections to nuclear installations, some of them devoted to SC too.

Q11-FR: What are the safety indicators or the performance measures used by the Slovak Republic (by the regulator and by the operators)?
Are these indicators thought to allow an early identification of a possibly declining safety in order to take the appropriate countermeasures?

Answer:

The group of indicators contain WANO indicators too, which provide operators with quantitative level of ten key areas of nuclear safety and operational reliability. In the year 1998 the decision was made for setting up for particular performance indicators the numerical targets. As a general rule used at Slovak NPPs, the goals set for every upcoming year are stricter than the goals for the previous year.

Set of plant indicators is systematically assessed and the information regarding indicators of nuclear, radiation and operational safety is included into Quarterly / Annually Report on Nuclear and Operational Safety, which is a subject of discussion of regular meeting of Advisory Committee on Nuclear Safety. Conclusions made by the Advisory Committee on Nuclear Safety on the plant safety level are presented to the NPP management, which is responsible for providing appropriate information on findings to the UJD SR and another subjects as SE, a.s., NPP- Dukovany, Temelin, Mochovce, Paks.

Results of an assessment of WANO indicators / according to guide IG 19.1/ are quarterly sent to the WANO Centre in Moscow. The process of collecting the appropriate data, calculation of specific performance indicators as well responsibilities of particular NPP departments are strictly defined in appropriate Quality assurance documents.

The operators of Slovak NPPs actively contributed in the IAEA project TECDOC-1141 on development the framework of operational safety performance indicators, where three important aspects of plant operational safety were addressed - NPP normal operation, NPP emergency operation, and the attitude of NPP personnel towards safety. On this basis three key attributes were chosen that are associated with plants that operate safely: plants operate smoothly; plants operate with low risk; plants operate with a positive safety attitude. The existing PIs system (shortly described above) provides strong background for the upcoming PIs system (based on the IAEA framework) that is going to be released this year and is expected to fully replace the current PIs system.

UJD SR has addressed the performance indicator issue in its Decision No. 245/2001, concerning the regulatory requirements for licensee periodical reporting. According to the UJD SR Decision No. 245/2001 Quarterly and Annually Reports on Nuclear and Operational Safety should include: assessment of the operational indicators including chemistry index and fuel (reliability) index, assessment of radiation monitoring in the vicinity of the nuclear power plant, report on radioactive waste. The information required should be supplied to the regulatory authority within two month after counted period.

Currently at UJD SR the initiatives are undertaken for developing the system, which would provide for the regulator an objective tool to review nuclear safety and to evaluate its own activities and effectiveness. The Performance Indicators (PIs)

system under consideration is focusing on two main areas: safety of nuclear facilities and regulatory activities. The assessment of nuclear facilities is assumed to be covered by means of the upgraded IAEA PIs system adopted for Slovak NPPs environment and the assessment of regulatory activities is going to deal with implementation of Quality management principles. Experience gained during the UJD participation in the European Commission project aimed at alternative approaches to safety performance indicators as well as the information from similar projects of OECD/NEA and Finish regulatory body STUK will be applied.

UJD SR is going to focus on the following activities: selection of the set of indicators used by nuclear operators useful to the regulator; identification of goals, thresholds and performance bands; developing the guidelines for the use of PIs in relation to other regulatory activities and practices including inspection programme as an additional tool for assessing the level of nuclear safety of operating reactors; to define broader set of indicators needed to monitoring regulatory technical competence, promoting of safety culture, quality of standards, for auditing their own work, professionalism when dealing with operators, adequacy of regulatory judgement in evaluations and enforcement actions. Another important task is to define a set of appropriate indicators to inform the public - the amount and form of the information should be considered.

(see also the Answer on Q8-ROM)

Q4-SLO: UJD requires the applicants for license to take the appropriate steps by the operator's management,.. (to make) nuclear safety a priority.
What are these appropriate steps that the operator's management should take? Are the steps defined by a procedure or process description? Please, specify, and include an example.

Answer:

The appropriate steps are of two kinds

1. *Negotiations and generic letters*

   UJD requires from the operator's management to enforce within own organisation safety culture based on the IAEA recommendations in all safety related activities by means of regular meetings between UJD chairman and operator's management. Generic letters related to specific topics (example-generic letter requiring independent internal review of draft quality assurance programs, key UJD staff lectures related safety culture, nuclear safety and legislation organised regularly for operator's management).

   These activities are planed within the operative UJD acts-are issued by chairman's orders.

2. *Rulemaking*

   UJD includes into the regulations and safety guides requirements for awareness of nuclear safety importance (example-draft new quality assurance regulation includes requirement for development of quality policy taking into

account safety importance of operator's activities and requiring every operator's employee to be aware of safety importance of his activity). (see also Q3-ROM)

Article 11

Q4-ROM: What measures have been taken to assume the availability of sufficiently qualified staff at Slovak NPPs in their near and mid term future?

Answer:

The basic measure to assume the availability of sufficiently qualified staff in Bohunice and Mochovce NPPs is the continuous keeping staffs overflow in safety related positions and functions. The current system of personnel training, thoroughly described in the chapter four of the National report, will be improved by:

- *Increasing the level of both theoretical and practical training implementation of SAT principles*
  - *Specialisation focused on individual professions*
  - *Complexity of training in the view of training contents*
  - *Implementing of all training types in compliance with the needs of the quality assurance programme*
  - *Personnel retraining on design changes and improvements*
  - *Introducing new operational procedures*
  - *Increasing the level of self-assessment of safety culture indicators in the training area*

The formal training programs for on-site and on the job training were established updated for technicians, maintenance and field operator staff.

The simulators modification and training is performed in accordance with the Bohunice V2 Upgrading and Safety improvement programme.

The simulator and classroom training of NPP V2 operators was enlarged, comprising training on accident phenomenology and use of new symptom-based emergency operating procedures. For the time being, new symptom-based emergency operating procedures, including training materials, for NPP V1 personnel are being elaborated.

In September 2001, management of Bohunice NPP approved a proposal "Programme of staff stabilisation within the shutdown of NPP V1". In this programme, based on governmental decision on units shutdown, Bohunice NPP proposed from 3 till to 5 years salary compensation as a tool of staff motivation.

SE, a.s. keep very good relationship with Slovak Technical University in Bratislava (STU). Mechanical and Electric faculties had overcome some struggling years after political changes, when number of students studying nuclear engineering was quite low. For the time being, Slovak NPPs do not have problems recruiting qualified young people graduating at both faculties.

Moreover, the Electric faculty of STU on annual basis provides for a postgraduate study course on nuclear safety. It is devoted to retrain or enhance knowledge on nuclear safety issues of the personnel from nuclear industry - from operating organisation, regulatory authority, TSO, etc.

Q10-GER: Does the state fund for decommissioning of nuclear installations and treatment of spent nuclear fuel and radioactive waste provide sufficient financial means to cover the scheduled decommissioning of Bohunice-1,2?

Answer:

Based on the Act No. 254/1994 Coll., the State fund for Decommissioning of Nuclear Power Generating Facilities and Treatment spent nuclear fuel and radioactive wastes (SFL) has been constituted. Resources accumulated into SFL will be used for nuclear facilities decommissioning and storage, processing, and disposal of the radioactive waste relative to decommissioning of nuclear facilities. Owners of nuclear facilities are compulsory to pay the contributions to the fund. Up to January 2002 it was at the level 10 % of market electricity price produced in nuclear power plant. Based on an amendment of the above Act, since 1-st of January 2002 the contribution represents 350 000 SK for each MW of installed capacities of NPP and 6.8% of revenues gained from electricity produced by nuclear power plant.

From 1995 to 2001 Bohunice V1 NPP has delivered to the State fund account approx. 4,2 bil. SK. The terms of NPP V1 units decommissioning in 2006 and 2008 have been approved by Resolution of the Government No. 801/1999. Up to the approved terms Bohunice V1 NPP shall deliver to the State fund account next 4,0 bil. SK.

Based on "Conceptual plan of NPP V1 decommissioning" cost for decommissioning are estimated to approx. 14 bil. SK.

By Resolution of the Government on shutdown of V1, the State fund will be short of approx. 5,8 bil. SK, which are necessary to be covered by additional funds.

Note: Within the charges for NPP V1 decommissioning are not considered the charges for building of deep spent fuel repository.

Q11-GER: Has an action plan already been developed and implemented to ensure high operational safety for the remaining operating time of Bohunice-1,2?

Answer:

In the resolution No. 801/1999 of 14 September 1999, the Slovak Government approved the acceptability of the realistic date of the shutdown of NPP V1 in 2006 and 2008 respectively. On 29 November 2000, the Slovak Government reviewed the draft procedure of the shutdown of NPP V1 at Jaslovske Bohunice, including the solution to social and economic impacts thereof, and adopted Resolution No. 974/2000. In this Resolution Slovak Government obliged Ministry of Labour, Social Affairs and Family to develop Action plan within resolving the social and economic impacts of the shutdown of NPP V1 up to 30th June 2002.

Management of Bohunice NPP approved on 3 September 2001 a proposal "Programme of staff stabilisation within the shutdown of NPP V1". In this programme Bohunice NPP proposed, among other measures for staff stabilisation, a compensation of 3 to 5 years salary as a tool for staff motivation. Slovak Republic will be pleased to learn from experience of other countries, which decided for shutdown of their NPPs.

Q5-SLO: The strategic goal of the operator with respect to the finances include:

1) Preservation of a financially sound company
2) Raising long-term funds that correspond to the service, life of power sector projects. Does Slovenské elektrárne a.s. have a long-term financial programme of capability maintenance (external support, recruitment policy, R&D, etc.)?

Answer:

Regarding the service, maintenance and investment projects SE, a.s. has defined long-term programme, which have to be in compliance with the log-term plans of firm development and management strategy. By matter-of-fact plan activities the log-term financial programme is being specified.

Main priorities, large maintenance activities and investment projects have been scheduled in the long-term maintenance plan and the long-term investment plan for period of 10 years. The financial demands described there form the base of long-term financial plan.

Maintenance activities, all external supplies, supports and investment projects have been elaborated in more detail in the middle-term maintenance plan and investment plan for period of 3 years.

All maintenance activities, small repairs, actual supplies, detailed phases of projects are being scheduled in the annual plan. Based this, the annual exact and updated financial plan has been compiled. Financial plan covers also safety improvements of NPP Bohunice V2.

Article 12

Q5-ROM: The Report strengthens the importance of safety culture. Could you describe in more details the activity of the "special group for self-assessment of safety culture"? What safety culture parameters have been defined for the purpose of evaluation?

Answer:

Safety culture at SE, a. s. NPPs embodies a top to bottom approach to plant operation from a safety perspective as detailed in INSAG-4.

A lot have been done by the plant top management in the area of safety culture. The principles and features of safety culture were issued and discussed with managers

and with shift personnel at working meetings. Managers have explained and discussed the safety culture approach with their staff in order to improve the current state. Management commitment to safety culture can be seen through articles in plant newspapers written by managers, on regular meetings with middle managers and in discussions with staff within management field walk downs.

Safety culture was introduced under the logo SAMKO, what in Slovak language means: Stop - Think - Act - Review. Questioning of safety culture is introduced into regular training of the personnel in accordance with work approach QP-06-018. Management of NPPs launch "Safety Culture Action Plan" annually.

The responsible staff for Safety Culture Assessment has been established according to plant manager´s order in 1998.

The main tasks of this staff are following:

- *To elaborate an annual Safety Culture Action Plan;*
- *To perform surveys of Safety Culture (SC) evaluating actual attitude of staff to SC and drafting future measures to the management;*
- *To report to the plant manager results of evaluation of the Safety Culture Action Plans fulfilment and give recommendation for SC improvement;*
- *To assist in implementation of SC within the plant;*
- *To develop a set of SC Self-Assessment Indicators;*
- *To develop rules for SC Self-Assessment;*
- *To make recommendations for the system of Safety Culture Management*

Senior management annually (starting from 1995) establishes and provides to staff plant annual goals. The goals include numerical targets, which are used (from 1992) to measure plant performance. Plant goals are supported by department goals and tasks. Following OSART 1998 recommendations improvement in setting more numerical goals on the department level was reached. Plant performance including trends and fulfilment of plant goals is periodically assessed on senior management meetings and meetings with middle managers. Nuclear safety is an important agenda at top management meetings.

The plant performance and safety indicators are regularly evaluated and are used as a management tool for evaluation of plant performance and for initiating corrective actions if needed. In addition IAEA workshops of Safety Culture enhancement are regularly organised in Slovakia and IAEA lecturers provide presentations in post gradual courses of Slovak Technical University.

Q6-ROM: Which procedures have been developed to incorporate systematic root cause analysis of human-induced events into the event reporting system of Slovak NPPs?

Answer:

Slovak NPP use for root cause analysis of human-induced events the procedure Human Performance Enhancement System (HPES) developed by INPO in the year 1981. Systematic root cause analysis was incorporated into internal procedures. Procedures were worked out by experienced personnel, trained on root cause analysis methods at international training courses, meetings, seminars and workshops, organised by IAEA, WANO and nuclear regulatory authority UJD SR. In order to improve human performance there was developed additional internal procedure, which deals with individual and leader behaviour. Nuclear regulatory authority UJD SR issued in 2000 a regulation setting up rules for classification and reporting of operating events. In accordance with this regulation, specified events have to be analysed by root cause analysis.

Q7-ROM: What measures have been taken place to reduce the possibility of errors due to man-machine interfaces?

Answer:

Man-machine interfaces matters for human performance failure decreasing have been implemented systematically within modernisation projects of Bohunice and Mochovce units. Large number of improvements has been made in this area during last years. Most of them were implemented in the control rooms design, accessibility of manual operated equipment, implementation of computer-controlled systems, providing for computerised operator aids, etc.

Following improvements have been implemented at the NPP Bohunice V2 unites to decrease probability of human performance failures due to deficiencies in man-machine interface: modification of alarms and announciators in the control room for primary circuit, secondary circuit and auxiliary systems equipment; supplementing electric consumption unit supply mnemonic scheme with transparent alarms; installation of new reactor in-core monitoring system.

The design of Mochovce control room was developed by Siemens and all ergonomics aspects were taken into consideration as for example sound and light alarms, displays, controls, colour markings, panels layout, shape of gauges, readings, CR lighting, CR air climate system.

In cases, when event analysis reveals insufficient man-machine interface, corrective measures are taken to address identified weaknesses in ergonomics.

Ergonomics aspects are also considered at PSA studies, where human reliability is quantified.

In addition, all Slovak NPPs have full scope simulators used for operators training. Based on the training schedule approved by the regulatory authority, two weeks are devoted to practical simulator training annually.

Q12-GER: How has NPP Mochovce implemented safety culture and safety management? What are the criteria or indicators used? Which competencies and

experience has the self-assessment group? What is the experience with such an approach? Is it recommended to establish such a self-assessment group also in NPP Bohunice?

Answer:

The document "Safety Strategy" was issued as overriding document for safety management. Several documents have been issued for Safety Culture implementation (e.g. plant manger order "Safety Culture", The Rules for Safety Culture Self-Assessment, booklets (brochures) about of the SC for both operation and maintenance personnel, etc.). The set of plant specific indicators based on the INSAG-4 indicators has been elaborated.

The working group for Safety Culture Self Assessment has been appointed in year 2000. This group acts as plant manager advisory group.

Main tasks of the WG were following:

- *To develop a set of Safety Culture Self-Assessment Indicators (the indicators from INSAG-4 are too general);*
- *To develop rules for Safety Culture Self-Assessment;*
- *To make recommendation for the system of Safety Culture Management.*

Safety Culture Self-Assessment Working Group results are following:

- *The set of plant specific Safety Culture Indicators and specific Safety Culture Queries have been developed for all areas of INSAG-4*
- *An order of Plant Manager for Safety Culture Self-Assessment has been issued*
- *The rules for Safety Culture Self-Assessment have been approved by the Plant manager*
- *Pilot evaluation of Safety Culture Indicators has been performed*
- *Safety Culture Action Plan for year 2001 has been elaborated*
- *The repetition of the Safety Culture survey has been prepared for the year 2002 to compare Safety Culture level to results of initial survey.*

First results of the safety culture-self assessment for the year 2001 will be available in March of year 2002. It is not appropriate make general recommendation for establishing such self- assessment group in any other power plant. There is very close co-operation between Mochovce and Bohunice in the area of Safety Culture. In addition IAEA workshops of Safety Culture enhancement are regularly organised in Slovakia and IAEA lecturers provide presentations in post gradual courses of Slovak Technical University.

Q12-FR: Could the Slovak Republic (SE, a.s.) provide more information related to man-machine interface (indicators, aids to the operators)?

Answer:

NPP Bohunice V1

Original V1 plant main control room (MCR) design comes from former Soviet Union (primary part), the rest has been designed in previous Czechoslovak Republic. Only several automatic controllers (reactor power controller, turbine controller, steam generator level controller,) and one very simple computer supported MCR operators. Information about main plant parameters were collected by information system IVM and presented to MCR operators by either digital display or special scale devices. Scale devices located directly on MCR panels provided most information. All equipment has been controlled from MCR boards by control keys or switches. Some of information and control elements were located on non-operative (back) panels.

In 1992 the first process information system (TIS) was installed. It contributed to higher level of information collection and made the system more user friendly. It contained several new functions (graphs, diagrams, bar-graphs, special tables, files,...). This system has been continuously developed and at present time (2002) is a new version is going to be implemented.

Great MCR operator support has been added in the frame of gradual reconstruction. There were installed new control panels on MCR (Teleperm panels). All safety important equipment is controlled now from those new panels (including announciators), there have remained just control and announciators of non-safety - important equipment in the old cabinets. It makes easier for operators to determine importance of coming alarms. Signals from the new Teleperm system are processed and sent to new operator station in various form. It can provide graphs, records, trends, information about active thresholds in logical schemes, ... Similar tools have been implemented for several non-safety important equipment (turbine controller, generator excitation system, air-conditioning systems,...).

These systems are computer controlled and operator can receive all information from PC. New PAMS panels have been installed in MCR. Much information that was available only in non-operative cabinets of MCR (out of the immediate view of the operator) is now in operative part of MCR.

All described changes and modifications are reflected in the delivery of full scope simulator, which has been in operation since May 2001. It serves as an important tool to assure, operators obtain all practical skills, necessary for their performance.

NPP Bohunice V2

In order to improve information of operators and man-machine interface, some equipment has been installed:

- *Equipment for monitoring operation of turbines and providing information - BENTLY NEVADA.*
- *SCORPIO system, which monitors neutron physical parameters of the reactor and is capable of predicting the progress of parameters.*

Additional measures have been implemented in the area of light alarms at the main control room. There are no signal lamps on during normal operation mode. Operational documentation was also modified, it contains manipulation step-by-step

procedures, with information on anticipated equipment response. Procedures to test equipment functionality during operation have been developed. A signalling response procedure for control room operators was also developed.

Further upgrading of man-machine interface will be carried out through replacement of RPS and ESFAS during the planned major modification of the NPP in the near future.

Mochovce NPP

The design of Mochovce main control room (MCR) was developed by Siemens and all ergonomics aspects were taken into consideration as for example sound and light alarms, displays, controllers, colour markings, panels layout, shape of gauges, readings, MCR lighting, MCR air conditioning system.

In cases, when event analysis reveals insufficient man-machine interface, corrective measures are taken to address identified weaknesses in ergonomics. Ergonomics aspects are also considered at PSA studies, where human reliability is quantified.

The simulator training at three full-scope simulators (V1, V2 and Mochovce) plays an important role in decreasing probability of human failure

Q13-FR: Could the Slovak Republic (SE, a.s.) provide some information concerning the change from event oriented to symptom-based procedures?
What are the means for assessing the efficiency of the new system? Were problems already encountered?

Answer:

Symptom based emergency operating procedures (SB EOP) have been implemented on both Bohunice V2 and Mochovce NPPs. These procedures were developed based on Westinghouse approach. WOG generic guidelines were adapted to VVER V213 design within the contracts with Westinghouse Energy Europe Brussels. Validation confirmed efficiency of the developed procedures.

Small changes in SB EOPs are foreseen in line with introduction of SAMGs, which are scheduled to be developed by the end of 2003.

It was also decided to develop EOPs for V1 plant and implement them till the end of year 2003 within the contract with WEE Brussels. The verification and validation (V&V) of the developed parts of the procedures is continuously conducted by the plant staff at the full scope simulator. The final V&V at the simulator is scheduled as well. Operators are going to be trained thoroughly in terms of theoretical and practical training before implementing EOPs at the plant. The UJD carefully supervises the process (see also Q18, 22 –GER, Q10-AUT).

Q14-FR: Shutdown situations have particular features concerning human factors: are there specific measures (procedures) relating to shutdown situations?

Answer:

There are specific procedures for normal unit shutdown process. Procedures for abnormal conditions have been supplemented by sections dealing with abnormal shutdown conditions.

Special programs are elaborated only in specific cases, when all required activities are not covered in these procedures

Q6-SLO: "UJD Chairman appoints members of examination commission that verifies special professional competence of selected employees. The examination comprises written and oral part and also practical part for those whose working position is to be changed. ..." Please, could you describe how members of the Commission have been chosen, what are their knowledge profiles and experience, how many members does the commission comprise, what is the training program for the commission members and who assesses the performance of operators on the plant simulators?

Answer:

There is the examination commission for verification of special professional competence of selected staff of nuclear installations. This commission consists of chairman, two vice-chairmen, 14 executive members and approximately 10 members from each nuclear power plant. Total number of examination commission examiners is approximately 50. The members are selected from NPP experts, researchers, university lecturers, training instructors and UJD specialists. However, for a specific examination a group of 15 examiners is appointed.

An operator may take the licence examination only after passing through appropriate simulator training. The assessment of trainees is done by simulator instructors and a shift supervisor.

Qualification of instructors is assessed by the same examination commission as mentioned above (see also Q4-ROM).

Q7-SLO: Please describe the requirements and practice, of informing the regulator in the area of human factor performance. Was the human factor analysis for severe and Beyond Design Basis Accident performed? What are the main results or conclusions and what corrective measures were planned and established?

Answer:

Regulatory requirements for informing on events in the Slovak NPPs result from the Act No. 130/1998 and rules in detail are given in the UJD Regulation No. 31/2000. Nuclear operator has to follow the Regulation, the reporting form and reporting period. Human performance events are also covered by the reporting system.

Nuclear events are divided into 3 categories: anomalies, incidents and accidents. Operator notifies - reports the anomalies to UJD once a month. Operator is obliged to report incidents and accidents immediately after their occurrence, in 30 minutes at the latest. The UJD regularly checks adherence to their requirements.

Human factor performance in the operation of Bohunice V1, V2 and Mochovce is assessed continuously by in-depth analysis of root causes of operational incidents. This analysis is performed by the operational feedback group according to the established methodologies (HPES).

For the purpose of PSA V2 study a detailed analysis of human factor has been performed by US specialist (SAIC company) and the PSA models have been consequently upgraded. For shutdown PSA study, which was developed in the frame of PHARE project a similar analysis, has been performed. The experience gained in these studies has been applied in the improvement of the V1 PSA study.

The human factor analysis has been practically applied throughout the development of symptom based EOPs for V2 as well as after their implementation. The maintenance and upgrading of the EOPs reflects also the experience collected in plant simulator exercises and training of operators.

The human factor considerations are fully applied in severe accident management guidelines development, because the project is based on PSA Level 1 and PSA Level 2 results, which involve the human factor aspects. The project makes use of experience of Westinghouse NPP operators and represents the state of the art approach. This applies also to the treatment of the human factor issues. (See also Q10,11-FR,Q8-ROM).

Article 13

Q13-GER: The upgrading program of Bohunice-3,4 is aimed to prolong the service life of the plant, too. Which measures are implemented to ensure the lifetime quality of components?

Answer:

All measures applied to material of Systems, Structures & Components (SSCs) at Bohunice-3,4, dealing with the diagnostics and monitoring of degradation, are in accordance with the AMES programme. The PLIM issues are involved in:

- *Lifetime Monitoring and Evaluation of selected SSCs in terms of fatigue usage factor trends,*
- *Extended Surveillance Specimen Programme for RPV (radiation embrittlement monitoring and assessment),*
- *Special Corrosion Loop for Monitoring of Reactor Coolant Piping Corrosion,*
- *Erosion-Corrosion Monitoring is carried out on selected primary and secondary piping of the plant,*
- *Monitoring of SGs materials corrosion,*
- *Equipment Qualification.*

Q15-FR: The 1999 report does not mention a Quality Assurance Program before 1990. Could the Slovak Republic indicate how the quality of the construction is assessed? In particular, has the Slovak Republic a complete documentation on the results of the controls performed during the construction, and if it is not the case, does the Slovak Republic plan to perform, as indicated in INSAG 8, supplementary testing or non-destructive examination?
Is there a program to collect and analyse the events concerning quality in order to implement a continuous improvement?

Answer:

NPP Bohunice V1

Several kinds of equipment control have been performed during V1 construction. All main components have been checked after delivery according to original documentation and a protocol was issued as a result. In the construction period the quality of construction has been assessed according to a special program developed by VUJE (program of pre-commissioning inspections). It concerned all main components as reactor, pressurizer, steam generators, main circulating pipes, valves, etc. Protocols were issued on the inspections as well. After construction completion final pressure tests were performed, which confirmed quality of the construction. Results of all of the inspections, tests and non-destructive checking were issued in protocol form. This documentation is still archived in the plant. Based on the experience learned during construction period a plant standard MN-24 has been developed. It deals with equipment inspections and examinations. There is described in this document the whole methodology how to perform the test, which method to use, description of the method, frequency of inspections, assessment and processing of the results, scope of tests.

Based on this standard an inspection program is performed each year. For each equipment described exact schedule exists on when, how, and what to check. Then, a protocol is issued on each inspection. The protocol is archived for specified time period in the plant. A system for event analysis and feedback implementation has been developed in Bohunice plant. All events are sorted out based on their importance into several groups. Those ones that are considered important (not only from safety point of view) are treated in the following way: Responsible shift supervisor (the event occurred on his shift) writes an event report and sends it (together with supplementary documents) to the feedback group. This group performs root cause analysis of the event and prepares comprehensive report for event investigation committee. This committee approves the report and takes some corrective measures. Those measures can be reflected in operational documentation, in equipment design, in modification of inspection system… All lessons learned from events are regularly presented during shift retraining. Close attention is paid to ageing management. It is monitored on several levels. Assessment of the safety important equipment life is done continuously on individual units after the end of each fuel cycle. Materials of austenitic type are monitored from corrosion-erosion damaging mechanism point of view; loss of the wall thickness and defects at carbon and ferrite steel are monitored as potentially critical points. Concerning reactor pressure vessel (RPV), neutron flux influence on the RPV material and its resistance against brittle fracture has been evaluated using special

computer code. Possible material failures of main primary components are also monitored using Leak Before Break concept. The above mentioned facts with very conservative margins of safety design ensure high operational reliability and safety.

At the beginning of the nineties, a large number of missions inspected Bohunice V1 plant from the safety point of view (design reviews, OSART, ASSET,…). Recommendations from their conclusions have been implemented in the program of V1 gradual reconstruction that significantly improved the plant safety level. After the reconstruction, a mission of IAEA experts reviewed the safety upgrading programme achievements in November 2000. No deficiency, which could limit design operation lifetime, was discovered.

NPP Bohunice V2

V2 NPP was designed and built in compliance with valid legislation of that time. In order to obtain permission for operation, test required by this legislation had to be performed. The results are stored in the power plant archive.

For the purposes of equipment inspection, procedure MN 14 "Procedure for operational inspection at V2" is used. It specifies programme of operational periodic non-destructive controls of material, welding joints and buttering of selected equipment.

Events at the power plant are dealt with by an Event committee of V2. Its main goal is to ensure analysis of operational events having an effect on operational safety and reliability of equipment and based on this to apply corrective measures, which would prevent occurrence of the same events, eventually measures that improve safety and reliability.

Quality assurance program in construction phase of Mochovce NPP (i.e. before 1990) was based on Decree No. 5/1979 of the former Czechoslovak Atomic Energy Commission and was developed in 1981. Component Quality Assurance Programmes (CQAP) for qualified items were developed. Inspections and testing of classified items during the construction were performed according to this CQAP. The inspections and tests records were part of the contractual documentation, which was deliver to customer during taking over the equipment or civil structures. The inspections and tests were divided into stages (manufacturing, construction, commissioning). Results of every stage were documented and evaluated. Positive evaluation of previous stage was condition for starting the next stage. Results from whole construction phase were evaluated and documented in the Pre-operational Safety Report. That report was submitted to UJD during the licensing process.

In 1990 the new Decree No. 436/90 of the Czechoslovak Atomic Energy Commission was issued. It requires quality system implementation and documentation in accordance with the international practice.

The plant event investigation committee at NPP Mochovce is established. The committee evaluates and analyses all events of the plant and also the events from other relevant NPPs. Heads of respective departments propose corrective or preventive actions aimed at organisational changes, technical improvements and/or training of personnel as results of the analyses.

Q8-SLO: In 1999 the maintenance division org. SE EBO received the certificate ISO 9001. Is it planned to revise the duality system according to the new standard ISO 9001:2000?

Answer:

Within the Quality Assurance Programme of Bohunice NPP Maintenance division, the re-certification audit was performed in 2001. The new quality system certificate in accordance with ISO 9001:2000 has been received in March 2002 from Det Norske Veritas.

Article 14

Q8-ROM: What are the safety performance indicators you use for measuring the safety level of operation?

Answer:

Usage of performance indicators (PIs) in Slovak NPPs goes to very beginning of their operation in early 80-ties. The system is well established and driven by specific internal licensee QA procedures. The group of indicators contain WANO indicators too, which provide operators with quantitative level of ten key areas of nuclear safety and operational reliability. In the year 1998 the decision was made for setting up for particular performance indicators the numerical targets. As a general rule used at Slovak NPPs, the goals set for every upcoming year are stricter than the goals for the previous year.

Set of plant indicators is systematically assessed and the information regarding indicators of nuclear, radiation and operational safety is included into Quarterly / Annually Report on Nuclear and Operational Safety, which is a subject of discussion of regular meeting of Advisory Committee on Nuclear Safety. Conclusions made by the Advisory Committee on Nuclear Safety on the plant safety level are presented to the NPP management, which is responsible for providing appropriate information on findings to the UJD, and to another organisations, e.g. SE, a.s., NPP Dukovany, NPP Temelin, NPP Mochovce, and NPP Paks.

Results of an assessment of WANO indicators (according to the guide IG 19.1) are quarterly sent to the WANO Centre in Moscow. The process of collecting the appropriate data, calculation of specific performance indicators as well as responsibilities of particular NPP departments are strictly defined in respective Quality assurance documents.

The operators of Slovak NPPs actively contributed to the IAEA draft of TECDOC-1141 on development of the framework of operational safety performance indicators, where three important aspects of plant operational safety are addressed: NPP normal operation, NPP emergency operation, and the attitude of NPP personnel towards safety. On this basis, three key attributes are chosen, that are associated with safely operated plants: plants operated smoothly; plants operated with low risk, plants operated with a positive safety attitude. The existing PIs system (shortly

described above) provides strong background for the forthcoming PIs system (based on the IAEA framework), that is going to be released this year and is expected to fully replace the current PIs system.

UJD addressed the performance indicators issue in its Decision No. 245/2001, concerning the regulatory requirements for licensee periodical reporting. According to this UJD Decision, Quarterly and Annually Reports on Nuclear and Operational Safety should cover assessment of the operational indicators including chemistry index and fuel (reliability) index, assessment of radiation monitoring in the vicinity of the nuclear power plant, and report on radioactive waste. The information required should be supplied to UJD within two month.

Currently at UJD the initiatives are undertaken for developing the system, which would provide for the regulator an objective tool to review nuclear safety and to evaluate its own activities and effectiveness. The Performance Indicators (PIs) system under consideration is focusing on two main areas: safety of nuclear facilities and regulatory activities. The assessment of nuclear facilities is assumed to be covered by means of the upgraded IAEA PIs system adopted for Slovak NPPs environment and the assessment of regulatory activities is going to deal with implementation of Quality management principles. Experience gained during the UJD participation in the European Commission project aimed at alternative approaches to safety performance indicators as well as the information from the similar projects of OECD/NEA and Finish regulatory body STUK will be applied.

UJD is going to focus on the following activities: selection of the set of indicators used by nuclear operators useful to the regulator; identification of goals, thresholds and performance bands; developing the guidelines for the use of PIs in relation to other regulatory activities and practices including inspection programme as an additional tool for assessing the level of nuclear safety of operating reactors; to define broader set of indicators needed for monitoring of regulatory technical competence, promoting of safety culture, quality of standards, for auditing their own work, professionalism when dealing with operators, adequacy of regulatory judgement in evaluations and enforcement actions. Another important task is to define a set of appropriate indicators to inform the public - the amount and form of the information should be considered. (see also Q11-FR).

Q9-ROM: How is guaranteed that staff who monitor safety are not influenced by production needs?

Answer:

Plant management declared its commitment to excellent performance in all activities important for the safety and declared that nuclear safety has the utmost priority overriding the aspects of production or project schedules by the following policy statements (inter alia):

- *Nuclear and radiation safety policy*
- *Quality policy*
- *Human resources policy*

- *Environmental policy*

The independence on production of staff that monitors safety is assured by organisational structure of the NPP. Nuclear safety department and supervision department are organised under technical support division, which is independent on production division. Independence of nuclear safety and emergency response management department of SE, a.s. at headquarters level, is increased by reporting directly to the director general.

Besides of these regular organisational units advisory committees exist at plant or headquarters level, such as nuclear safety committee, technical committee and operational events committee. These committees review and evaluate plant nuclear safety relevant activities and suggest corrective measures. Their independence is strengthened by membership of external experts, such as universities, research institutes etc. On the base of UJD operational assessment results is possible to confirm that nuclear safety is the priority of operational personnel.

Q10-ROM: What arrangements are there to ensure that the station Safety Analysis Report is update following plant modifications, result of research or revision of standards?

Answer:

The requirement to maintain the V2 NPP SAR Chapter 15 Safety analyses as a living document has been issued by the Slovak regulatory body by the Decision No. 4/1996. The periodicity for incorporating important new analyses into SAR is 1 year. This requirement has been incorporated in the Bohunice NPP QA procedure for writing and upgrading of SARs, which is common for V1 and V2 and establishes rules for maintaining the SARs. The current structure of SAR is in accordance with the guideline US NRC RG 1.70. The incorporation of new safety analyses provides for the assessment of safety from the current point of view, applying up-to-date standards and reflecting state of the art of the safety research.

In general, up to now the SARs of V1 and V2 have been completely rewritten with periodicity lower than 10 years in the frame of different safety upgrading and modernisation projects or based on explicit requirements of the former Czechoslovak and Slovak regulatory authorities. For Bohunice and Mochovce NPPs 10 years periodicity of overall rewriting of SARs is to be applied as a minimum periodicity also in the future.

The Bohunice and Mochovce QA procedure for modification control establishes requirement for elaboration of safety reports (preliminary SAR and final SAR) for all modifications / installations of safety related equipment. The rules for communication with regulatory body and later incorporating of approved new parts into current version of SARs as well as requirements related to format and content are defined in the QA procedure for writing and upgrading of SARs. Slovak legislation required to performed Preliminary SAR before each implementation of modification on safety and safety related systems.

Q14-GER: Is it foreseen to develop regulatory requirements or recommendations for on-site Accident Management measures, additional instrumentation and other equipment for prevention and mitigation of severe accidents?

Q15-GER: Will the regulatory body follow recent IAEA requirements (NS-R-1 "Safety of NPP: Design", NS-G-1 "Safety Assessment and Verification for NPP" and promote the implementation of technical measures to level 4 of defence-in-depth, namely prevention and mitigation of core melt?

Answer to both questions:

A stringent national legislative basis (acts, regulations) exists for emergency planning. Implementation of Accident Management (hereinafter AM) is based on common understanding of operator and regulator. The regulator specifies requirements for AM in regulatory decisions. The requirements follow the IAEA recommendations. Implemented AM measures include, e.g., establishment of emergency response centres, installation of post accident monitoring system, radiation monitoring,…). The SAMGs are in development. In addition, the operator and regulator prepare studies and participate in international projects on severe accident mitigation and prevention.

Q17-GER: Which kind of severe accidents and containment vulnerabilities have been identified and which scenarios are the worst considered with respect to fuel element integrity and containment function?

Answer:

The VVER 213 (Bohunice V2 and Mochovce) design vulnerabilities to severe accidents have been thoroughly studied in the PHARE 4.2.7a/93 project: VVER440/213 Beyond Design Basis Accident Analysis and Accident Management

The key project tasks were:

- *Identification and selection of accident sequence classes*
- *Analysis of BDBA severe accident to determine vulnerabilities*
- *Analysis of preventive AM measures and validation of EOPs*
- *Development of mitigative AM measures for severe accidents*
- *Development of MAAP4/VVER input decks for Bohunice, Dukovany and Paks*
- *MAAP4/VVER code qualification and validation the frame of the project enveloping BDBA and Severe Accidents without operator actions have been studied in order to:*
- *Identify and classify BDBA and severe accident sequences*
- *Gain an understanding of behaviour of the VVER 440/213 units during BDBA and severe accidents*
- *Determine which severe accident phenomena are important for the design*

- *Understand and rank vulnerabilities and challenges to containment and other fission product retaining boundaries*
- *Provide a sound basis for the investigation of the preventive and mitigative accident management measures performed in the subsequent stages of the project*

Due to absence of Level 2 PSA at that time, the project was based on Level 1 PSA and introduced specific definition of plant damage states. Altogether 23 representative scenarios enveloping plant behaviour in severe accidents have been analysed and vulnerability areas have been identified:

High vulnerability

- *High pressure melt ejection – cavity overpressurisation and possible door if the vessel fails at high pressure*
- *Hydrogen – indications are that highly flammable mixtures can occur and that DDT and detonations cannot be completely ruled out*
- *Early containment failure due to debris thermal attack of the reactor cavity access door.*

Medium vulnerability

- *Long term MCCI (although in the absence of accident management early failure would occur first for these cases)*
- *Failure to isolate the containment*

Low vulnerability

- *Slow over pressurisation*
- *Debris dispersal and associated challenges such as direct containment heating.*

The limiting event with minimum time margin to core damage is the LB LOCA with complete failure of all 3 trains of ECCS – app. 30 min.

Q18-GER: Is core melt considered as a possible scenario requiring the implementation of mitigative measures to cool a destroyed core and to prevent containment failure?

Answer:

The development of Severe Accident Management Guidelines (SAMG) for Bohunice V2 and Mochovce started in January 2002. The guidelines will be consistent with Westinghouse approach and will extend the accident management into the mitigative area. The response to core damage sequences, including those with severely damaged core are a constituent part of the guidelines. The guidelines contain strategies to protect the containment as an ultimate boundary to the plant environment.

For Bohunice V1 new symptom based EOPs are being developed since 2001 and should be implemented by 2003. After the completion of the V2 SAMG project development of SAMG for V1 is under consideration, taking into account the regulatory body requirements at that time. These SAMG will apply the same philosophy as for V2 and contain mitigative measures and protective measures for containment function.

Q16-FR: The recent level 1 PSA study for Bohunice V1 has been completed for low power and shutdown situations. lt indicates that the frequency of core and fuel damage is comparable with CDF for power operation before the implementation of design and procedure improvements. To reduce CDF, an extension of operating procedures for normal and emergency of shutdown unit has been recommended. In 2000, the study was updated to changes performed in Bohunice V2 units. Is the implementation of this recommendation included in the UJD requirements?

Answer:

The emergency operating procedures are symptom based and cover all operational modes (full power as well as shutdown). Operating procedures are part of licensing process and have to be submitted to UJD SR for review (Atomic Act No. 130/1998, §15). Following our legislation, the operating procedures have to be periodically updated to reflect actual design, operation and available knowledge. There is no need to issue special UJD requirements for the utility to improve or complete the operating procedures.

Q17-FR: Are the results of PSA level 2 for power and shutdown at the reference Bohunice -V2 unit 3 available?

Answer:

Yes, the results of PSA Level 2 study are available. For the time being, to transfer its results to a best possible way, the study is undergoing an independent expert review within a separate subcontract of the ongoing SAMGs development project.

Q18-FR: The recent level 1 PSA study for Bohunice V1 has been completed for low power and shutdown situations. It indicates that the frequency of core and fuel damage is comparable with CDF for power operation before the implementation of design and procedure improvements. To reduce CDF, an extension of operating procedures for normal and emergency of shutdown unit has been recommended. In 2000, the study was updated to changes performed in Bohunice V2 units. Could the Slovak Republic indicate the main lessons learned?

Answer:

The question is somewhat confusing because of mentioning two different power plants (V1 and V2). Slovakia assumes that the question is limited to V1 NPP.

Results of low power and shutdown PSA for Bohunice V1 NPP are not available yet. The study is under completion, with expected finalisation in the middle of 2002.

As mentioned already in Q14-FR at V2, there are specific procedures for normal unit shutdown process. Procedures for abnormal conditions have been supplemented by sections dealing with abnormal shutdown conditions. The CDF reduction presented from PSA study from 2000 results mainly from two aspects - implementation of SB EOPs and modification of strainers at ECCS suction to prevent their clogging by debris from equipment inside containment.

Q19-FR: Does the Slovak Republic plan to use this study (PSA) to improve the management of severe accidents?

Answer:

The development of Severe Accident Management Guidelines (SAMG) and identification of possible strategies for management of severe accidents is generally based on knowledge gained in the frame of the PHARE 4.2.7a project (see Q18-FR) and information gained during the development of V2 Level 2 PSA (2000-2001). For this reason the PSA studies are considered as basic tool for development of both preventive and mitigative accident management.

Q20-FR: The report states that a Shutdown Riskmonitor has been in trial operation at the nuclear safety department, and its use is expected mainly for planning and co-ordination of works during outages of Bohunice V2 units. Does the risk methodology lead to improve the Technical Specifications during shutdown situations?

Answer:

NPP Bohunice prepared proposal for modification/optimisation of technical specifications based on evaluation of the risk. The proposal was sent to UJD. After discussion between NPP and UJD, it was agreed that proposed changes would not be approved as a whole. Risk based methodology, complemented by the deterministic one, can be accepted in specific cases for justification of mainly temporary changes to Technical Specifications.

Q21-FR: Results from Mochovce NPP PSA level 1 for power operation, after the full implementation of the safety improvement programme confirmed considerable decrease of CDF, but were not published pending their evaluation by IAEA experts. Could the Slovak Republic now provide the lessons learned from this study, including those resulting from the assessment of low power and shutdown conditions?

Answer:

An updated PSA Level 1 study of Mochovce NPP was performed to evaluate the contribution of safety improvement program to safety. The PSA model reflects all safety measures implemented to solve safety issues identified for this type of reactors. Considerable decrease of CDF has been achieved. IPSART mission

reviewing PSA Level 1 was performed by IAEA experts throughout November 12 – 21, 2001. Final report will be available in 2002.

The results of the PSA Level 1 study are available. However, one point is clear - the study identified no additional issues, which should be necessary to dealt with further.

SPSA study is being developed and should be finished by the end of September 2002.

Q6-AUT: What is the schedule for implementation of the regulation concerning the requirement to perform Periodic Safety Review for Slovak nuclear installations?

Answer:

UJD SR has submitted draft of regulation concerning the requirement to perform Periodic Safety Review for approval to the Legislative Committee of the Government of the Slovak Republic in January 2002. Implementation of the regulation is anticipated in 2002.

Q9-SLO: UJD requirements for WWE -440V230 NPP V1 safety improvement, for WWER-440/V213 NPP V2 safety improvement, for safety improvement of WWER -440/V213 at NPP Mochovce. Please could you specify which safety improvements have been asked for and what is the expected quantitative effect of these improvements (CDF changes etc.)?

Answer:

UJD requirements for WWER-440/V230 NPP V1 safety improvement

Bohunice NPP V1 safety improvement program was based on the Preliminary Safety Analysis Report for so called "Gradual reconstruction of V1 Bohunice NPPs." In 1994 the UJD issued the Decision No.1/94 and Decision No. 110/94, where the conditions of further operation of V1 NPP after 1995 until the end of the service life were determined. The Decision No.1/94 contained 59 requirements for additional safety improvements, which had to be gradually implemented within 1998-1999. Regulatory requirements covered by the Decision No.1/94 were divided into five subject-oriented parts. In each part the UJD set the measures for safety improvement, fulfilment of which was the condition for further operation of NPPs.

***In the first part** the required measures for preserving the integrity of reactor coolant system (RCS) including the analysis of reactor pressure vessel integrity were set.*

***In the second part** there were measures aimed at safety improvement of core cooling systems under operating conditions and under accidents (transients).*

***The part three**, cooling the core under LOCA conditions, contained the requirements for improvement the core cooling systems. The system had to be able to manage a new level of maximum design basis accident (DBA), i.e. the double-ended rupture of a pressurizer surge line with the diameter of 200 mm, and/or a partial rupture of RCS piping with the equivalent diameter of 200 mm at the most unfavourable point (the original DBA was set as the rupture of RCS piping equivalent to diameter of 32 mm).*

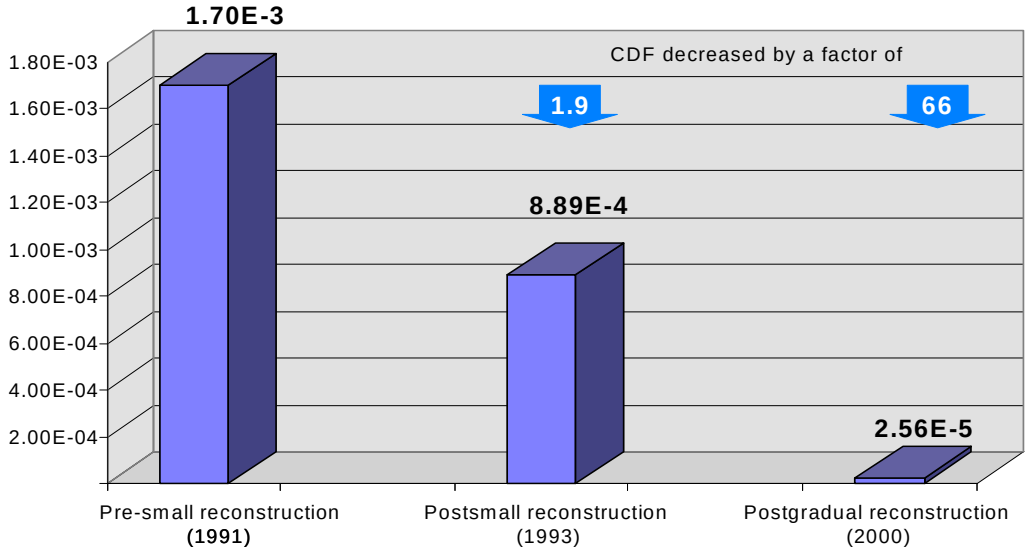
The safety analysis shows, that the V1 plant is able to cope also BDBA of 2x500 mm rupture.

***In the part four** there are contained the required measures for safety improvement of confinement (hermetic zone), first of all by increasing confinement tightness and by demonstration its integrity under intended accident with coolant leakage.*

***The last part** of the requirements was aimed at safety improvement of NPP support systems as essential service water, electric power supply and instrumentation and control system (I&C).*

The development of Decision No.1/94 resulted also from recommendations for safety improvement, given in the IAEA-TECDOC-640 Ranking of safety issues for WWER-440 model 230 nuclear power plants, IAEA Vienna, Austria, February 1992. The outcomes and conclusions from numerous IAEA and other international missions reviewing safety of Bohunice V1 NPP, which are covered in minutes of the missions as well as results of UJD inspections carried out at Bohunice V1 by UJD inspectors had also been used when developing the Decision. The findings of the inspections were presented in inspection protocols.

Gradual improvement of safety is represented in the following diagram:



<u>UJD requirements for WWER-440/V213 Bohunice NPP V2 safety improvement</u>

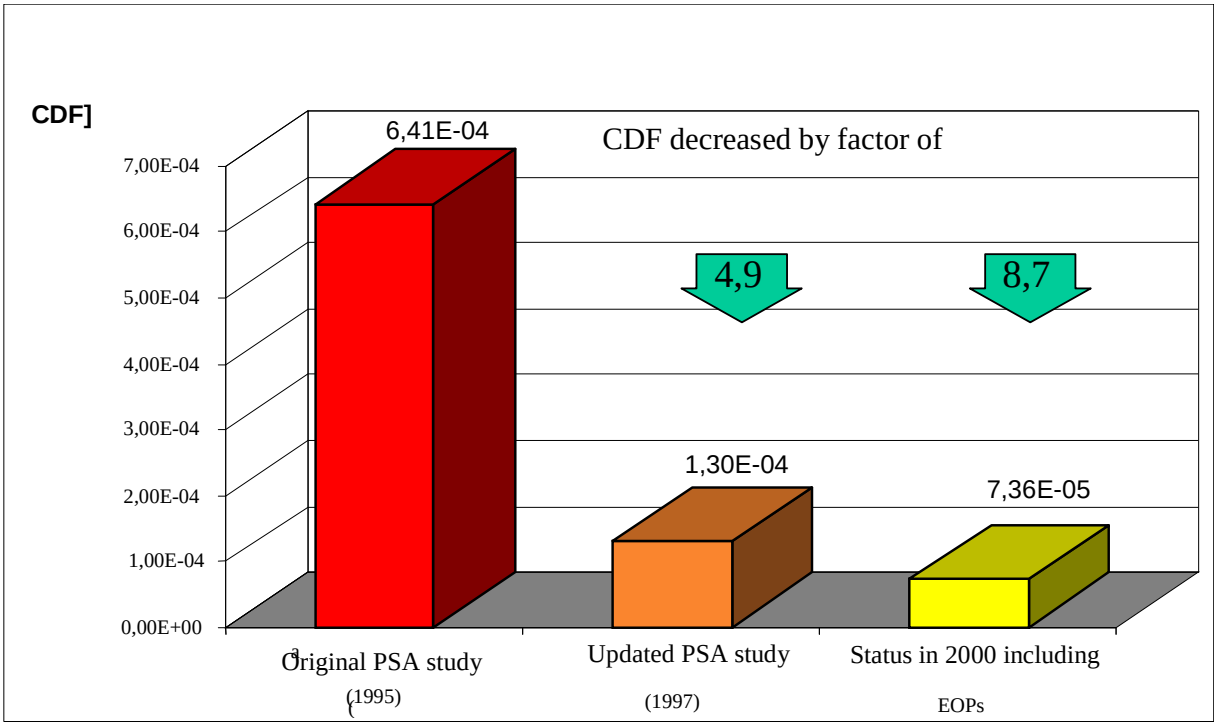
*The UJD responded to the situation resulting from Safety Analysis Report (SAR) after ten years of operation by issuing the Decision No. 4/1996, which contains required measures for safety improvement divided into three parts. **The first part** contained the requirements for updating SAR after ten years of the plant operation. The SAR as one of the fundamental documents demonstrating the plant safety was updated in accordance with the real as-built state and according to the present level of knowledge, first of all in the field of elaboration safety analyses of higher quality. The requirements for updating the SAR were determined by the UJD based on the*

results of the IAEA mission in 1994, PSA analyses, the analyses performed at VUJE Trnava (Slovak national design, engineering and research company), and on the analyses carried out by UJD specialists. The requirements for the updating the SAR focused, besides the general requirements, first of all on components integrity on pressure boundary of primary circuit, seismic assessment, safety analyses, supplementary safety analyses, limits and conditions of operation.

***The second part** covered technical requirements for safety improvement of the emergency systems and support systems with impact on the plant safety. Further, in this part there were also determined requirements for developing a concept for modernisation of I&C system. The Decision covered also management requirements to improve the state of operational documentation, procedures for equipment testing and the accident management plan.*

***By the third part** of the Decision the operator was obliged to conduct periodical assessment of the plant safety according to the regulation, which is being prepared now by UJD. The requirements and measures of the Decision are divided in terms of their fulfilment into short-term and long-term ones. The short-term requirements/measures covered control and management measures and requirements for the SAR updating. The long-term measures represent the requirements for developing the objectives, the concept and the programme of the safety improvements, which is at present in stage of preparation and elaboration.*

Gradual improvement of safety is represented in the following diagram:



Note: CDF from Shutdown PSA study: 6,44E-04 / reactor year

<u>UJD requirements for safety improvement of Mochovce WWER- 440 V 213 NPP</u>

Mochovce NPP safety improvement program was based on the In-Defence in depth Protection concept, and its objective was to verify and demonstrate the fulfilment of

"general principles of nuclear safety" as defined in the IAEA document INSAG-3 and INSAG-12. This approach is deterministic in nature; it however is also combined with the probabilistic approach in accordance with the technical safety objective as defined by INSAG-3:

- *The frequency of serious reactor core damage should be less than 10^{-4} per year of reactor operation. The application of safety principles should bring this value down to 10^{-5} per year.*

The operator of the plant developed a set of 87 technical specifications for safety measures (TSSM), with taking into account specific measures, which were identified by the RISKAUDIT and SIRNM Reports and experience with Bohunice V2 and NPP Dukovany units. These were implemented under the " Mochovce NPP Nuclear Safety Improvement Program".

AREA	RANK III		RANK II		RANK I		NOT RANKED	
	TSSM	IAEA	TSSM	IAEA	TSSM	IAEA	TSSM	IAEA
General	*1*	*1*	*2*	*2*				
Reactor core			*1*	*1*				
Component integrity	*1*	*1*	*4*	*4*	*1*	*1*		
Systems	*2*	*2*	*12*	*12*	*3*	*3*		
Instrumentation & Control			*8*	*8*	*2*	*3*	*1*	
Electrical power supply			*2*	*2*	*3*	*3*	*2*	
Containment	*1*	*1*	*3*	*3*	*1*	*1*	*1*	
Internal hazards	*2*	*2*	*4*	*3*	*3*	*3*		
External hazards	*1*	*1*	*1*	*1*	*1*	*1*		
Accident analyses			*5* *SM AA08*	*5*	*8* *SM AA10*	*10*		
Operation							*11*	*13*
TOTAL 87	***8***	***8***	***42***	***41***	***22***	***25***	***15***	***13***

Definitions of safety issue categories according to IAEA

Category I *Deviation from recognised international practices. Remedial measures are advisable.*

Category II *Safety significant problems. In-depth protection weakened. Remedial measures are needed.*

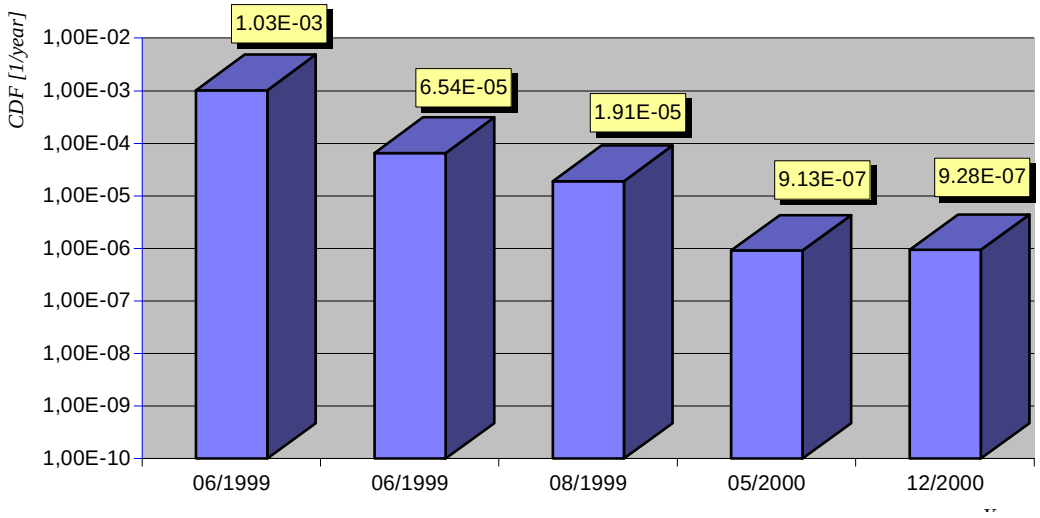
Category III *Problems of high safety significance. In-depth protection is insufficient. Immediate remedial measures are to be taken. Temporary measures may be necessary.*

Category IV *Problems of highest safety-related importance. In-depth protection is unacceptable. The issue requires immediate intervention and substitution measures have to be immediately taken until complete resolution of the problem.*

Probabilistic safety review (Level 1 PSA study and Shutdown PSA) was also a part of the NPP Mochovce safety improvement program. Based on the results of the analyses already conducted within the PSA studies for NPP Mochovce, it could be stated that:

- *The achieved probability of a damage to reactor core of Mochovce NPP is 1.03*10^{-3} per year operation without consideration of Feed&Bleed (FB)*
- *The achieved probability of a damage to reactor core of Mochovce NPP is 6.54*10^{-5} per year operation with consideration of F&B*
- *The achieved probability of a damage to reactor core of Mochovce NPP is 1.91*10^{-5} per year operation with consideration of F&B and new set of EO (event oriented) EOPs*
- *The achieved probability of a damage to reactor core of Mochovce NPP is 9.13*10^{-7} per year operation with consideration of F&B and new set of SB (symptom based) EOPs*
- *The achieved probability of damage to reactor core of Mochovce NPP is 9.28*10^{-7} per year operation with consideration of F&B and new set of SB EOPs and external hazards.*

Based on the above facts, the safety-related objective of the Mochovce NPP safety improvement program from the aspect of core damage, a value lower than 10^{-5} per year was achieved. IPSAR mission confirmed the presented numbers.



Article 15

Q11-ROM: In the year 2000, the collective effective dose per Bohunice NPP V1 unit was higher than the average CED achieved at PWR units in 1997-1999 and much higher than the CED for Bohunice NPP V2 or Mochovce NPP. Could Slovak

Republic indicate what measures are taken to limit or reduce exposure levels resulting from normal operation at NPP V1?

Answer:

The collective effective doses during the normal operation when reactor is on power are negligible in comparison to the CED during the outages. The NPP attitude to the optimisation is the same for normal operation as well for the outage periods. No work is allowed without the authorisation (permission). Firstly for each job the individual and collective dose calculation should be done. Then those values are compared with the optimisation criteria. When the criteria are exceeded the corrective measures should be incorporated into the working procedures. The work is allowed when the ALARA committee approves the job.

One has to have in mind that quite high values of CED at Bohunice V1 between 1996-2000 are given and justified by high number of employees and subcontractors personnel involved in planned unit outages, extended due to gradual reconstruction program. Large volume of works had been accompanied with execution of this backfitting program, finished in 2000.

In 2001 CED per Bohunice V1 unit dropped down to 629 mSv, which is well below PWR average value in 1998-2000 1030 mSv.

Q12-ROM: What about the measures in case of accident releases?

Answer:

The emergency plan and adequate procedures are elaborated for such a kind of nuclear event. The emergency committee starts working immediately. The measures in case of increased releases are twofold. If the limits determined in technical specification are exceeded, than activities to find a source of releases start immediately. When the source has not been found, the reactor must be shut down.

The measures in case of real accident are based on the evaluation of the status of physical barriers (fuel integrity, primary circuit integrity, containment integrity) and readings of both on-site and off-site radiation monitors. First measures in case of real accident are aimed to warn the inhabitants of the surroundings, to stop the further releases and to perform the protective measures – sheltering and using the iodine prophylactics. All activities are described in Site Emergency Plan and associated documents.

Q10-SLO: There has been no case of irradiation limits being exceeded for any SE, a.s. employee or contractor for the said period. Please, specify an average, individual occupational dose for both NPPs.

Answer:

The average individual occupational exposure in 2001 was: Bohunice V1 – 0,69 mSv, V2 – 0,13 mSv and Mochovce 0,36 mSv.

Q11-SLO: The scope of the monitoring is set by monitoring program that at the same time sets minimum numbers and types of media to be monitored. Are there any environmental impacts found as a result of the environmental monitoring programme? Is there any dose constraints set by the regulatory authority for exposure of the public in the vicinity of the NPPs due to radioactive releases?

Answer:

Yes, the environmental monitoring in the surroundings revealed several times the presence of radioisotopes generated by Bohunice NPP in the form of aerosols. The isotopes ^{110}Ag, ^{137}Cs and ^{60}Co, that were found, represented the negligible impact to the NPP surroundings. The Slovak law specifies the highest exposure to the member of critical group that can be caused due to the NPP radioactive gas discharges and liquid effluents, which is 250 microSv/year.

The environmental monitoring program was approved by State health authority. Results of the monitoring are periodically (quarterly and yearly) evaluated, analysed, verified, reported and archived. The reports are sent to State health institute and local authorities. Data, which exceed statistical criteria, are examined, re-sampled, re-analysed, re-checked in order to positively confirm value higher than natural background. During time period of Mochovce NPP operation, there has been never positively detected any man-made nuclides as impact of release or operation from NPP Mochovce.

Article 16

Q13-ROM: The Report describes the emergency planning. What organisation is responsible for the INES level determination?

Answer:

According to the decree No. 31/2000 the operator of nuclear facility has a duty to report any event on its facility to UJD, and, if appropriate, with preliminary INES rating. The final rating according to the INES scale is then done by UJD.

Q19-GER: Is it foreseen to verify the planned emergency arrangements through full scope exercises on a regular basis?

Answer:

The full scope exercise of the nuclear facility has to be performed according to the Decree No. 245/1999 on Emergency Planning once a year at least and it is done. Nuclear Regulatory Authority participates in such a kind of exercises usually in the role of inspector.

National level full scope exercises are planned according to a common directive of Ministry of Interior, Ministry of Health and Nuclear Regulatory Authority once per

three years. This duty is set down also in the National Emergency Plan, issued in 2001.

Lower level exercises at the nuclear installations are performed twice a year at least.

An assessment of the exercises is sent in written form to the UJD.

Q22-FR: What are the criteria used to enter in an emergency situation? What are the criteria used to define the different measures to protect the public (sheltering, evacuation and iodine distribution)?

Answer:

Criteria used to enter in an emergency situation are very similar to those used in EU countries. Slovak legislation reflects and applies recommendations of relevant IAEA The criteria (both immediate and follow-up) used to initiate intervention measures for the public protection (sheltering, evacuation and iodine prophylactics) are given in national legislation, namely in the regulation of Ministry of Health on requirements on ensuring of radiation protection. They are based on evaluation of an average averted effective or equivalent dose to an occupation group, within a given time span. Averted effective or equivalent dose is that fraction of effective or equivalent dose, which the individuals would not be exposed to, in case the intervention measures are taken. Precise values and corresponding protective actions to be taken are listed in an appendix of this regulation.

Q23-FR: Are the operator's on-site emergency plans approved by UJD?

Answer:

Yes. According to the "Atomic Law", No. 130/1998, the operator has a duty to prepare the on-site emergency plan and to submit it to UJD for an approval. Details and the contents of the on-site emergency plan are set down by the UJD regulation No. 245/1999.

Q24-FR: It is indicated that the emergency zone is 30 km around Bohunice and 20 km around Mochovce. Could the Slovak Republic explain the reason of the differences between these two sites? Could the Slovak Republic indicate if these zones are divided in smaller zones where different protection measures of the public are planned?

Answer:

The emergency zones (30 km) around Bohunice site were designed and approved by the former CSKAE (Czechoslovak Atomic Energy Commission) experts for NPP A1 with HWGCR reactor before its commissioning. The conservative approach has been taken to determine the emergency zones. The distance of the zones were not changed neither for NPP V1 nor for NPP V2 during the construction, commissioning and commercial operation. Later CSKAE confirmed distance of emergency zones also for NPP V 1 and NPP V2.

Based on the analysis of the potential radiological consequences the emergency planning zones (20 km) around the Mochovce site were designed and approved also by CSKAE, which were also adopted by UJD legal documents.

The emergency planning zones are divided into three zones (circles) as well as 16 sectors (22,5°per one sector) in accordance to TEC -DOC 953.

***Precautionary Action Zone** is designed up to 5 km. It is pre-designated area where urgent protective actions are pre-planned and they will be implemented immediately upon declaration of „General emergency".*

***Urgent Protective Action Zone** is designed up to 10 km. The urgent protective measures are implemented based on the meteorological conditions and monitoring results for wind direction sectors. The „Key Hole" principle is applied for 5 sectors e.g. if there is wind direction for sectors 3 the protective measures are taken for two sectors at the left side (1 and 2) and two sectors at the right side (4 and 5).*

***Long Term Protective Action Planning Zone** is up to 30 km. It is the area where preparations for effective implementation of protective actions to reduce the long-term dose from deposition and ingestion should be developed in advance.*

Q1-UKR: How often does the country conduct national training on response to radiation emergency (with all responsible bodies involved)? What document regulates the periodicity of such national training?

Answer:

According to the National Emergency Plan for Nuclear and Radiation Accidents which was issued in 2001 each three years the national emergency exercise with all responsible bodies involved should be organised.

According to the Directive No. CO-187/374 on off-site emergency planning, issued by UJD, Ministry of Interior and Ministry of Health and published in Official Bulletin a large off-site exercises organised by local authorities involving operator, local authorities, legal persons and legal entities in the NPP region should be organised also in three years period. Targeted exercises on this regional level should be organised in co-operation with nuclear facility operator each year.

Q2-UKR: What is the present official status of the RODOS system and what are perspectives of integrating the RODOS system into the national response system?

Answer:

The RODOS system in Slovakia is under development and adaptation to national conditions. This process is supported by R&D activities co-ordinated by VUJE, Trnava, including the strategy for integration into national arrangements and plan. The current version (updated regarding the actual version published by FZK) is tested in pre-operational mode; the operational level is expected to be reached in 2004.

Q1-CHR: What is the policy and practice regarding the Iodine profilaxy? What are the priorities and foreseen measures for distribution of iodine profilaxy?

Answer:

Iodine prophylactics have been distributed to all members of public in the emergency zone (this zone is defined by legislation). Their application will be recommended to the public in an affected zone by regional emergency commission in a case of an accident with release of radioactive substances from NPP to the environment, upon meeting defined legal criteria for initiation of intervention measures.

Iodine prophylactics have been distributed in the vicinity of NPPs to the population. They are applied immediately by occupancy, upon decision and notification of the regional emergency commission. In case of an NPP accident with release of radioactive substances in the environment, no additional distribution of iodine prophylactics is necessary.

Expiration time of iodine prophylactics is five years. After elapsing this time, iodine prophylactics are replaced by new ones.

Q2-CHR: What are the main issues of the new Act on Emergency and the Act on an integrated rescue system? What are the new provisions in respect to the already existing Acts?

Answer:

The main issue of the new Act on Emergency and Act on an Integrated Rescue system is establishing of the regional dispatch centres which will operate 24 hours a day. There is also one advantage that only telephone number will be used to set up the response organisations in any kind of emergency or threats.

Q7-AUT: What is the schedule for finalising the Act on Emergencies and the Act on an Integrated Rescue System? Moreover, what are the main provisions of these Acts?

Answer:

Ministry of Interior and the Ministry of Environment were responsible for preparation of these two Acts. They have been recently approved by the Parliament of the Slovak Republic.

Q8-AUT: What is the status of the National Emergency Plan?

Answer:

The National Emergency Plan for Nuclear and Radiation Accidents was prepared and submitted for an approval to the Slovak National Emergency Commission for Radiation Accidents (NECRA). The National Emergency plan was reviewed and approved by NECRA in December 2001.

Q5-US: (Section 4.7.7.3, page 98) The report discusses international exercises that Slovakia has participated in. Please discuss any improvements made in emergency preparedness plans and activities as a result of participation in national and international exercises.

Answer:

Improvements made in emergency preparedness plans

- *A new Emergency plan of Nuclear Regulatory Authority was issued based on lesson learned the first set of exercises and mini exercises (domestic and international)*
- *Lesson learned were taken during approval process of On-Site Emergency Plans and Off-site Emergency plans, mainly related to exercise performance issues, communication among organisations, exercise preparation, personnel training programs and exercise evaluation*

Improvements made in emergency activities

- *Based on INEX international exercise series, improvements were made in areas of communication, public information and exchange of information*
- *Related to IAEA exercises, IAEA EMERCON forms were applied also for national level exercises and communication with IAEA emergency unit was improved*
- *Based on RODOS international exercises, enhancement was provided in domain of evaluation and exchange of radiological issues and protective countermeasures in urgent and late phases of accidents*
- *Related to other European international exercises, mainly exchange of meteorological information and co-operation on regional level (Middle and East Europe countries) was improved*
- *Concerning to domestic exercises, the attention was given to the exercise scenarios improvement, to SW and HW in emergency centres and to warning and notification systems upgrade*
- *Domestic and international exercises helped markedly in update of training*

Q12-SLO: "Such drills (refers to separate emergency drill) are organised regularly at yearly intervals ... The most recent collaborative drill.... was organised in October 1997."
How are drills scheduled? (for "how long in advance does the schedule exist, are separate emergency drills each year for each of the two NPP's, what is the frequency of collaborative drills)?

Answer:

- *Emergency drills (means exercises) are scheduled by the end of the year for the next year and this program of exercises is approved by UJD by the end of February.*
- *There are separate exercises for Mochovce and Bohunice NPPs yearly*

- *National emergency plan, which was issued in 2001, define the frequency (3 years) of Collaborative drills.*

Article 17

Q14: Are there programs (in emergency plans) for site parameters surveillance in order to prove the suitability of the design bases in relation with those site factors with greater uncertainty?

Answer:

The emergency response covers all site factors that are of relevance. The uncertainty of the parameters is treated in the frame of analytical background of the programs. The factors that refer to the normal operation are in principle treated in the conservative manner which means that the uncertainties in parameters are enveloped with sufficient margins and correspondence has to be monitored on regular basis (typically in Limits and Conditions). In the area of severe accidents analyses the uncertainties are treated with lower conservatism and instead of conservative mostly representative values should be applied. The formal uncertainty analysis is currently generally limited to licensing analyses.

Q25-FR: In the WENRA report, October 2000, it is indicated that the evaluation of the seismic characteristics of the Mochovce site will be completed in 2001 and, depending on the results further upgrading could be necessary. Could the Slovak Republic give more information on this subject?

Answer:

In accordance with the Civil Act and the Civil Regulation of the Slovak Republic geological and seismic surveys were carried out to set up parameters of seismic menace of Mochovce NPP. The outcome of the surveys is a set of spectrums for free field at the rock foot in connection with PGA = 0.1g for Mochovce 1-2. The results of the surveys are presented in the plant safety analysis report. The resistance of Mochovce 1-2 was improved on PGA = 0.1g.

In 1998 IAEA Inspection Mission "SIDAM 98" was carried out. It was aimed at the methodology used and the results describing parameters of seismic menace. The mission resulted in the conclusions and recommendations to specify geological and seismic data. These recommendations are gradually implemented in co-operation with the Slovak Academy of Science in Mochovce with the expected date of completion in 2003.

The seismic monitoring network continuously monitors seismic activity of Mochovce surroundings. (see also Q8-GER,Q9-AUT)

Q26-FR: For the Bohunice NPP, could the Slovak Republic give more information on the modifications decided to upgrade the seismic resistance of buildings and structures d? Has a qualification programme of components been implemented?

Answer:

The seismic reassessment of the site Bohunice was completed in 1998 in accordance with 50-SG-S1 accepted by the IAEA mission in November 1998. The special Technical Guidelines for seismic reassessment of NPP V2 were developed by the IAEA in 1999. According to this document, it was developed: floor response spectra, walk down of components and buildings and detail Program for seismic reinforcement of buildings and components. Nowadays, a design of reinforcements of buildings and components is being developed. A qualification programme of components has been implemented. (see also Q8-GER)

Article 18

Q20-GER: Digital I&C is already used in Bohunice-1,2. Which requirements and procedures are used for licensing of digital I&C? How was the digital I&C certified? What is applied regarding digital I&C qualification and proof of incorporated technologies?

Q21-GER: Does UJD perform special monitoring for digital I&C in order to verify the regulatory approach.

Answer to both questions:

Within the "Gradual Safety Upgrading" of Bohunice V1 NPP, unit 1 and 2 (with WWER 440/230 reactors) the original safety I&C systems were replaced or upgraded on the basis of digital TELEPERM XS system platform which was specially developed and qualified for functions important to safety in nuclear power plants. For subfunctions in the actuation section and in the operational I&C system, the proven ISKAMATIC system was used. The following functions were assigned to the TELEPERM XS system:

- *Reactor trip (RTS)*
- *Actuation of active engineered safety features (ESFAS)*
- *Reactor power limitation (ROM)*
- *Reactor power control (ARM)*
- *Diesel control system*
- *Neutron flux instrumentation*
- *Control interface and priority control*
- *Control room equipment (partially)*

- *Accident monitoring systems (PAMS)*

Stages of Safety I&C System Upgrading

Upgrading of the safety I&C system began with Unit 2, and was performed in stages:

1991/92 Feasibility study

1994/95 Basic engineering

12/97 Replacement of instrumentation system and installation of TELEPERM XS without hook up of the actuation (open loop operation)

08/1998 Replacement of the control interfaces and priority control, and hook up to the TELEPERM XS system

01/1999 Recomissioning of Unit 2 with the new I&C system

As for the Unit 1, new TELEPERM XS based safety I&C systems were installed likewise in stages and after recomissioning in June 2000 the Unit 1 was put into operation with new safety I&C system.

A. Requirements and procedures used in licensing of digital I&C

Approach of UJD SR to licensing of digital safety I&C systems can be characterised as combined approach that is application of domestic regulation together with the requirements and criteria of international accepted standards. The most significant act by which licensing process (not only for I&C) is governed and controlled is the Act No. 130 of April 1998 on the peaceful use of nuclear energy.

Specific regulatory requirements and procedure applied in licensing process of digital safety I&C:

- *Design Specification Requirements for the Safety I&C Systems are contained in UJD Decision 1/94: Upgrade of the Reactor Protection System RPS (Reactor Trip and ESFAS)*
- *1 E Qualification of I&C hardware*
- *Redundancy 2 x 100 % as a minimum*
- *Reliability of $<10^{-5}$/demand for Reactor Trip*
- *Reliability of $<10^{-3}$/demand for the ESFAS*
- *Separation of the RPS from the control parts of I&C*
- *Routing of RPS output signals to appropriate panels in the Main Control Room (MCR)*
- *Separation of the Emergency Control Room (ECR) from MCR*
- *Safety classification and categorisation of I&C Functions, Systems and* Equipment according to IEC 1226
- *Identification and Ranking of applicable Codes and Standards.*

UJD determined and approved a set of applicable Codes, Standards and Safety Guides (IAEA, IEC standards, IEEE Standards, KTA) for design and development of

digital safety I&C. Software design, development and production was documented in accordance with the requirements of IEC 880.

- *Evidence of Comprehensive Testing by manufacturer (Type tests of HW and SW modules, Plant independent System test, Factory Acceptance Tests (FAT))*
- *Verification and Validation of design process and testing by independent Assessor (IV & V). The main contractor for performing IV&V was NPP Research Institute Trnava, a.s.*
- *Comprehensive Site Commissioning Tests, including testing of new I&C in real on* site condition during open loop operation (parallel to existing I&C).
- *Review of the safety documentation was performed by UJD and also by independent assessor. The results of tests were evaluated by an independent assessor.*

Safety documentation of I&C modernisation project consisted mainly from:

- *Design Concept Documentation*
- *Basic Engineering Documentation*
- *Safety Analysis Reports (PSAR, FSAR)*
- *Reliability Analysis*

B. Qualification and certification of digital TELEPERM XS based I&C

Hardware and software of TELEPERMS XS are qualified for use in NPP safety systems by type testing of HW and SW modules, by plant independent test and by FAT tests. The certificates of type testing were submitted to UJD and to independent assessor who was responsible for evaluation of test results.

UJD performs monitoring and supervision of digital safety systems

During each outage a predefined set of functional tests of safety I&C system is performed and the results are submitted to review at UJD prior to restart of reactor units. The software modifications are performed according to strict procedure and have to be approved by UJD. In accordance with an approved inspection plan, UJD personnel take part in in-service testing of the safety systems.

Q27-FR: Does the design of Slovak plants include some specific features relating to severe accident management in order to reduce, as indicated in INSAG 12, the probability of large releases requiring short-term off-site response?

Answer:

In the frame of the development of SAMGs (scheduled for 2002 - 2003) the state of the art knowledge of the V213 vulnerabilities and the spectrum of possible mitigative strategies (those included in generic Westinghouse SAMGs and also the in-vessel retention strategy applied by Loviisa NPP) will be reorganised and reassessed. The PHARE projects 4.2.7 Beyond Design Basis Accident and Accident Management, Filtered Venting and Hydrogen Control of Containment (No 2.06 and 2.07) and

results from ongoing Concerted Utility Review of VVER-440 Safety Research Needs (VERSAFE project within 5-th Euratom Framework Program) represent most important input information for development of SAMG strategies. Follow-up optimal cost-effective design upgrading specifications will be developed. Specifically, this will be crucial for high design vulnerabilities that represent early releases categories, such as high pressure melt ejection (reliable RCS depressurisation means), hydrogen management tools (igniters, recombiners, inertisation of the atmosphere, reliable spraying of the containment) and debris thermal attack of the cavity access door (application of the core in-vessel strategy by external cooling of the reactor pressure vessel upon severe accident).

Q1-FIN: Are there still open issues to validate the operation of WER 440/213 bubble condenser containment? Please provide us with a short summary and status of these activities.

Answer:

There are nuclear power plants of WWER-440/V213 type with bubble condenser containment operated in Central European Countries (Hungary, Czech Republic and Slovakia). Safety of those plants was significantly increased in the frame of international co-operation and assistance of West European Countries in recent years. Internationally recommended safety measures have been implemented (or are going to be implemented in the near future) and all safety issues related to the bubble condenser containment and its related systems could be considered resolved.

UJD issued the license for the start-up and operation of Slovak NPP Mochovce several years ago. The licensing process included careful national and international review of this NPP (IAEA mission, RISKAUDIT expert group from France and Germany) to evaluate the status of plant safety enhancement, fulfilment of defined requirements and safety measures (implemented during NPP construction). The evidences submitted to the assessment of NPP safety and confirmation of the bubble condenser confinement functionality has included results of analytical and experimental work performed in various countries (Germany, Russia, Slovakia) and in various experimental facilities (EREC, SVUSS - Bechovice, VUEZ - Tlmace, Siemens - Karlstein). The UJD considers submitted evidences on NPP safety sufficient and currently does not have any other requirements for the bubble condenser containment verification.

Safety upgrading of Bohunice V2 NPP is in progress. The scope of Bohunice V2 reconstruction is similar like those already implemented for Mochovce NPP. The Bohunice V2 upgrading includes also reinforcement and additional anchorage of the bubble condenser construction.

Based on the proposals of Atomic Question Group (AQG) of the European Commission (EC), the utilities of Central European Countries has initiated to perform an additional set of experimental and analytical work to resolve on expert level all arising questions and to close lasting discussions on the verification of bubble condenser. UJD SR agrees with planned activities. The planned tests will extend

considerably the range of break size of bubble condenser experimental investigation from a large break LOCAs to smaller breaks of LOCAs including steam line break inside the containment.

Bubble Condenser Steering Group at OECD/NEA (hereinafter BCSG) has been established to support a performance of the additional work to bubble condenser verification and to add to this work an international character. The BCSG consists of representatives of national regulatory bodies, European Union, and nuclear power plant operators. The main goals of BCSG are:

- *To provide a convincing evidence that V213 type of containment works during DBAs as designed;*
- *To provide support for planning of new tests and interpretation of results;*
- *To provide regular experimental results, which will be a basis for the validation of computer codes.*

The first meeting of BCSG has been held in Paris, in December last year and second one in Budapest in February this year. (see also Q3-GER,Q3-AUT)

Q9-AUT: What is the status with respect to seismic characterisation of Bohunice V2 and Mochovce NPP?

Answer:

In accordance with the Civil Act No. 50/1976 Coll. as amended geological and seismic surveys were carried out to set up parameters of seismic menace of Mochovce and Bohunice NPPs. The outcome of the surveys is a set of spectrums for free field at the rock foot in connection with PGA = 0.1 g for Mochovce 1,2 and PGA = 0.34 g for Bohunice 3,4. The results of the surveys are presented in the plants safety analysis reports.

The IAEA Inspection Mission "SIDAM 98" was carried out in 1998. It was aimed at the methodology used and the results describing parameters of seismic menace. The mission resulted in the conclusions and recommendations to specify geological and seismic data. The review conclusions and consequently Slovak Authorities accepted the Bohunice site seismic characteristics. Those were confirmed again in 2001 within the licensing of Bohunice V1 NPP after completion of the reconstruction. For Mochovce site, additional site investigations and improvement of seismo-tectonic model had been recommended. New, updated Mochovce site seismic characteristics are in development. They should be available in 2003.

The seismic monitoring network continuously monitors seismic activity of Mochovce and Bohunice surroundings.

The seismic qualification of all equipment at the NPP Bohunice for current design peak ground acceleration value was completed. The seismic qualification of almost all equipment (except a few items, which qualification is in the process) at Mochovce 1,2 units was completed at the time of start of operation.

(see also Q8-GER,Q25-FR)

Article 19

Q22-GER: Do clear arrangements exist for transition of emergency operating procedures to severe accident management guidelines?

Answer:

The Mochovce, V2 and V1 EOPs have been/are being developed in collaboration with Westinghouse Electric Europe and are based on generic Westinghouse approach. This approach includes guidance for design basis and beyond design basis accidents to prevent core damage. The guidance for mitigative measures in case of accidents that developed into severe accidents is included in SAMGs. Generic SAMGs have also been developed by Westinghouse and therefore an exact interface between both sets of procedures will be established, based on symptoms measurable in the control room. The SAMGs are used by the Technical support centre staff therefore the transfer of information and responsibilities has been defined very clearly. Within the project running, SAMGs specific for Mochovce and Bohunice V2 are being developed keeping features of generic Westinghouse SAMGs.

Q23-GER: Is there sufficient engineering and technical support from the NPP vendor, equipment suppliers, for Bohunice-1,2 (plants built to earlier standards) in the areas of operation, maintenance, test, surveillance?

Answer:

NPP Bohunice 1,2 was constructed in years 1972-1980. Main supplier of primary part was former Soviet Union, other systems were delivered by companies from previous Czechoslovak Republic. Relationships between the NPP and suppliers corresponded to plant organisation and the time period. After plant commissioning all activities, which are in western countries under responsibility of supplier, took over maintenance division (incorporated directly in plant body). In several cases has been supplier support based on long-term contract, in most cases all-corrective and preventive maintenance is covered by Bohunice maintenance division. Specific demands have been solved by short-term contract with appropriate supplier.

Since beginning of Bohunice 1,2 operation very important engineering support has been provided by VUJE Trnava, a.s. (Nuclear Power Plant Research Institute). All important calculations related to safety analyses, environmental impact studies, and safety documentation have been developed by the company. VUJE also performes initial and periodical training including simulator training of all NPP staff. Concerning operational area, VUJE has provided engineering support at upgrade of operating procedures. Situation has changed slightly since gradual backfitting of NPP Bohunice 1,2 (1994-2000). The Company Siemens as a main supplier of design and technology during gradual reconstruction and their subcontractors has signed a long-term contract on services for new and modified plant equipment. Similar contracts with Siemens subcontractors (ABC Klima, PPA Control, EZ-Elektrosystémy,..) were negotiated for equipment installed by subcontractors.

Q28-FR: Could the Slovak Republic give more information on the capability of the Ageing, Management Programme to predict and detect degradations at Bohunice units 3-4?

Answer:

The Plant Life Management (PLIM) strategy in SR is aimed to comply with the intent of the Ageing Management European Strategy (AMES) programme. The Ageing Management Database is at the stage of kick-off actions and it is going to be launched soon within the Research Technical Programme, supported by the utility and the SR government, focused on the AMP issues related to the state-of-the-art approach to AMP Monitoring. Moreover, there is an intention to implement the Database at the plant-specific conditions and to start to fill the database with the current PLIM referring data (records of operation, maintenance, technical support, chemistry regimes etc.). The Slovak Republic would appreciate information on PLIM from the French partner, as the French Republic has more nuclear installations operated for the longer time than in Slovak Republic. (see also Q13-GER)

Q29-FR: Paragraph 5.3.4 of the 1999 report enumerates the various tasks (14) of the technical support and safety units that are parts of the licensee's organisational divisions related to the organisation and co-organisation of the divisions with Regulatory Authorities in the field of nuclear and technical safety. Could the Slovak Republic clarify which of the above tasks that are safety relevant require the approval of the Regulatory Authorities after issuing the license for commercial operation according to the Act of the National Council of the Slovak Republic n°130/1998?

Answer:

The tasks mentioned in this question concern 14 issues (I to XIV), specified in section 5.3.4 Technical Support of Operation (National Report of the Slovak Republic, September 1998).

I. The Protection of the employees and the public against ionising radiation in NPP surroundings by applying the ALARA principles is established on the legislative basis, what is included in the Act No.130/98. The operator must assure that exposure of employees and other persons to ionising radiation of nuclear installation is kept below the set limits during all operational states and activities and at the lowest reasonably achievable level. Changes made after the issue of license can be performed only after approving them by UJD and by the Ministry of Health of the Slovak Republic (Act No. 470/2000).

II. The internal and external radiation monitoring, and personal dosimetric monitoring belong to safety documentation, which is necessary for the approval of the operation. In the event it becomes necessary to deviate from this documentation, this may only be done with prior consent from UJD. The operator also needs the approval of the Ministry of Health of the Slovak Republic.

III. The approval of UJD is not needed for the pre – design documentation, and it is not supported by the Act No. 130/1998. The UJD does not enter into the

approving processes until a request of the (future) operator supported by the Act is submitted to UJD. The approval of UJD is required in the case of any changes and modifications in nuclear installations, which could influence nuclear safety.

IV. *The approval of UJD is necessary in case of changes/modifications of operating procedures for all safety related nuclear installation equipment; this equipment has been specified.*

V. *The Act No. 130/1998 regulates nuclear safety conditions and official inspection to monitor nuclear safety at operation of nuclear installations. UJD issues authorisations for the sitting, planning, building, importation, commissioning, operation and reconstruction of nuclear installations, as well as their decommissioning. The approval of UJD is necessary in any case of safety related design and operational regime changes/modifications.*

VI. *All relevant issues of events occurred at nuclear facilities are based on legislative basis, i.e. the Act No.130/98, which defines categorisation of the events (basically 3 types of them: breakdowns, incidents which cause minor damage, accidents causing serious damage of the nuclear installation), investigation of their causes and the way of informing the public. As a matter of course, the licensee has set up the relevant feedback from lessons learned and backfittings, monitoring and considering events occurred at foreign NPPs as well (WANO database, IAEA IRS). The Act also specifies the general responsibilities of nuclear operator and also nuclear material carrier.*

VII. *The Act No. 130/1998 does not cover any obligations of operator to submit a PSA study to UJD and any other legislative documents, which would commit the operator to do, so do not exist so far. However, PSA studies of Bohunice V1, Bohunice V2 as well as Mochovce NPPs have been developed, though UJD formally does not currently approve any PSA studies. In a new regulation on safety documentation based on the Act, the obligation of the operator to submit PSA studies (both full power and shutdown) is included. The regulation should be issued in 2002.*

VIII. *UJD approves in-service inspection programs and based on the Regulation of the (former) CSKAE No. 436/1990 also the list of selected (qualified) safety related equipment. A formal UJD approval of surveillance programs is not necessary.*

IX. *Keeping records on nuclear materials is obligatory for the licensee. UJD approves calculations of fuel loading and fuel cycle strategies.*

X. *According to the "Atomic Act" No. 130/1998 UJD approves the documents listed in the §15. if it is necessary to deviate from the documentation during operation, it may only be done with a prior permission from the Authority.*

Any design changes occurring during the operation or decommissioning of a nuclear installation with impact on nuclear safety must be submitted by the operator to the Authority for approval.

Throughout the period of operation, including provisions for decommissioning, the operator must perform comprehensive and systematic evaluation of nuclear

safety and take steps to eliminate any deficiencies identified. During operation, the evaluation, including safety analysis, is performed at intervals and in a scope established by generally binding legal regulations. So called regulation on periodic safety review to be issued by UJD in the near future.

XI. *UJD approval of technically oriented projects of international co-operation is not necessary.*

XII. *Fire protection of NPPs in Slovakia is fully in competence of Ministry of Internal Affairs, Section of Fire Protection. Fire protection is regulated by the relevant act and regulations, which are in competence of the Ministry. Nevertheless, UJD by means of the site inspectors and inspections themselves aimed at safety related systems verify the state of the fire protection in relation to nuclear safety.*

XIII. *Information flow control system (including liaison with the UJD and other regulatory bodies) in Slovak NPPs belongs to Quality Assurance Programme, which is approved by the UJD. The QA programme is a part of safety documentation of the NPP and it is approved by the UJD including any changes/modifications of the documentation.*

XIV. *The UJD approves management and co-ordination of NPP internal emergency plans.*

Emergency plan for protection of the public and emergency transport procedure are only reviewed by the UJD.

Q5-JAP: 5.3.6.says solid radioactive waste generated is not yet transported outside the nuclear installation. while National Repository of Radioactive Waste was granted its approval for commissioning in Dec. 1999 as described in 2.7 (page 42).

Is there any reason that the National Repository is not accepting the Radioactive Waste from nuclear installations?

Answer:

ÚJD SR issued the decision with permission for Mochovce repository in December 1999. The commissioning of Bohunice treatment and conditioning centre with radioactive waste conditioning technologies (preparing waste packages for disposal) started in April 2000 and by the end of 2000 only 7 concrete containers were disposed of in the repository.

So the comment to the picture 5.3.9 on the page 109 of National report reflects the situation when the solid RAW generated were stored at nuclear facilities (end of 2000).

The National repository is designed for solid and solidified low and intermediate level radioactive waste mainly from nuclear installations. Currently there are 198 containers of RAW stored.

Q10-AUT: What is the status with respect to the implementation of symptom-based emergency operating procedures at Bohunice V1, taking also into account confinement function preservation?

Answer:

Contract for development of V1 symptom-based emergency operating procedures was concluded with Westinghouse Energy Europe and significant portion of work was already done (with EOP implementation by the end of 2003). Currently development of function restoration guidelines is progressing within this project and special attention is paid to confinement preservation. No additional technical modification in confinement design is foreseen up to now. (see also Q18,22-GER,Q13-FR)

Q6-US: (Section 5.3.2, page 102) The report does not explicitly discuss performance indicators, however, the operator safety department prepares quarterly and annual reports on the status of nuclear safety for plant management. These reports include the number of L&C changes made, time during which limit conditions were not met, duration of safety systems not available, and L&V violations. Does the regulatory body review these reports to determine if regulatory action is needed and are these, or other, performance indicators used by the operator and the regulator?

Answer:

The operators use WANO performance indicators and many of their own indicators, which have only informative character.

UJD internally looks at and reviews quarterly and annual reports of NPP operators on safety of the plants under operation. Safety indicators, which are used by the operator, are of informative nature for UJD. The internal conclusions from the safety report reviews (and feedback from them) are used by the UJD when setting next year annual inspection plans as one of the sources of incentive. The regulatory authority defines its own actions on the basis of daily or unscheduled reports from site inspectors and NPP operators. In the case of L&C violations, the regulatory authority sets up investigation teams of inspectors. Their actions result in protocols on inspection findings with relevant backfitting measures and their deadlines assigned.

UJD monitors by means of its inspectors NPP daily operational records also with respect to L&C allowed draw down, L&C violations and also time during which L&C were not met as well as duration of safety systems unavailability. In case of violation of L&C, according to inspection manual, the team inspection is organised to investigate the violation reason and to assign measures to operator.

Performance indicators (PIs) system in Slovakia is well established– it has been working since 1980 and is driven by the Quality Assurance documents elaborated by the licensees. PIs system currently used is structured for monitoring the area of nuclear, radiation and operational safety.

WANO indicators are important part of indicators framework, which provide operators with quantitative level of eight key areas of nuclear safety and operational reliability.

In 1998 the decision was made for setting up numerical targets of particular performance indicators, which are optimised according to the operational schedule for the upcoming year, mainly with regard to the planned shutdown duration. After careful considering all aspects mentioned before, there is a strong effort, that the goals set for every upcoming year are stricter than the goals for the previous year.

The set of plant indicators is systematically assessed and the information regarding indicators of nuclear, radiation and operational safety is included into Quarterly or Annual Report on Nuclear and Operational Safety. This is a subject of discussion in regular meetings of Nuclear Safety Committee, that is an advisory body to the plant manager. Conclusions on the plant safety level made by the Committee are presented to the NPP management, which is responsible for providing appropriate information on findings to the UJD, to the headquarters of the utility SE, a.s., to other Czech and Slovak NPPs and Decommissioning of Nuclear Installations and Spent Fuel and Rad-waste Management (a subsidiary of SE, a.s.). Based on plant reports, an annual summary report on nuclear and radiation safety of nuclear installations is further elaborated and submitted to the Nuclear Safety Committee, management, board of directors and supervisory board of SE, a.s. Latest data of WANO indicators are quarterly reported to the WANO Centre in Moscow. The process of collecting the appropriate data, calculation of specific performance indicators as well responsibilities of particular NPP departments are strictly defined in appropriate Quality assurance documents.

The operators of the Slovak NPPs actively contributed in the IAEA project (described in TECDOC-1141) aimed at developing the framework of operational safety performance indicators, where three important aspects of plant operational safety were addressed – NPP normal operation, NPP emergency operation, and the attitude of NPP personnel towards safety. On this basis three key attributes were chosen that are associated with plants that operate safely: plants operate smoothly; plants operate with low risk; plants operate with a positive safety attitude. The upgraded PIs system (based on the IAEA framework) is going to be released this year and is expected to fully replace the current PIs system, which has been improved and incorporated into the new framework at the greatest possible range.

Regarding the regulatory requirements for licensee periodical reporting, according to the UJD Decision 245/01 the information required is supplied to the regulatory authority within the Quarterly and Annually Reports on Nuclear and Operational Safety within two months after counted period. Some of performance indicator values supplied to the regulatory authority, which might be of interest of the public, as for example the number of operational events, number of scrams or collective radiation dose are included into the UJD Annual Report (yearly evaluation of the UJD SR activities), which is submitted to the government and available to the public at the UJD Internet web site.

Currently at the UJD the initiatives are undertaken for developing the system, which would provide for the regulator an objective tool to review nuclear safety and to evaluate its own activities and effectiveness. The PIs system under consideration is focusing on two main areas: safety of nuclear facilities and regulatory activities. The assessment of nuclear facilities is assumed to be covered by means of the upgraded IAEA PIs system adopted for Slovak NPPs environment and the assessment of

regulatory activities is going to deal with implementation of Quality management principles. Experience gained during the UJD participation in the European Commission project aimed at alternative approaches to safety performance indicators as well as the information from similar projects of OECD/NEA and Finish regulatory body STUK will be applied.

UJD is going to focus on the following activities: selection of the set of indicators used by nuclear operators useful for UJD; identification of goals, thresholds and performance bands; developing the guidelines for the use of PIs in relation to other regulatory activities and practices including inspection programme as an additional tool for assessing the level of nuclear safety of operating reactors; to define broader set of indicators needed to monitoring regulatory technical competence, promoting of safety culture, quality of standards, for auditing their own work, professionalism when dealing with operators, adequacy of regulatory judgement in evaluations and enforcement actions. Another important task is to define a set of appropriate indicators to inform the public - the amount and form of the information should be considered. (see also Q8-ROM)