



## 2. Regulatory Aspects of NPP Nuclear Safety

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### 2.1 Nuclear Regulatory Authority (ÚJD) Status

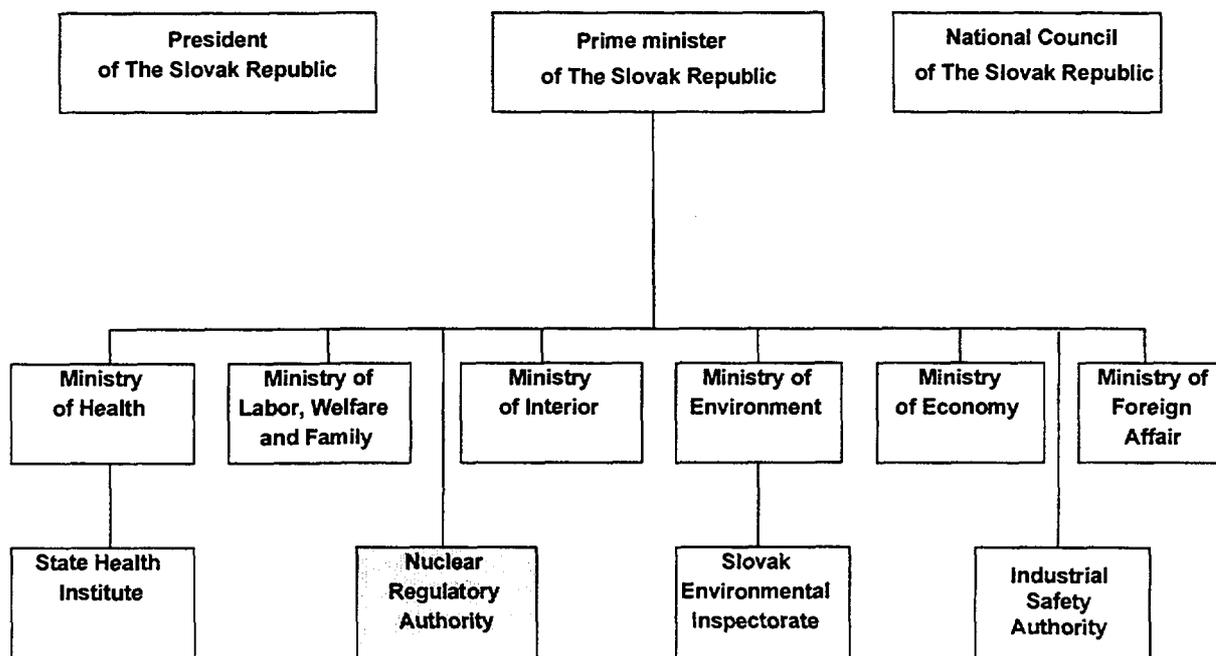
#### 2.1.1 Legal status of the ÚJD

Act 2/1993 of the Slovak Republic National Council positions the ÚJD as an Executive Authority of the Slovak Republic for the area of nuclear safety supervision, whose responsibilities and tasks are listed and whose chairman „is appointed and recalled by Slovak Republic Government“.

ÚJD is an independent, central, state authority with an independent budget (see figure on page 11). Act 2/1993 specifies the responsibilities and tasks of ÚJD. It is responsible for State supervision of nuclear safety of nuclear installations, including supervision on handling of radioactivity wastes, spent fuel and further stages of the fuel cycle, as well as of nuclear materials including their accounting and control. It is responsible for the review of nuclear energy use programs goals and of the quality assurance supervision, as well as for commitments of the Slovak Republic under international agreements in the field of nuclear safety and radioactive waste management.

National Council of the Slovak Republic passed, on April 1, 1998 Act 130/1998 Coll., On Peaceful use of nuclear energy, (Atomic Act). The Act sets criteria for safe use of nuclear energy exclusively for peaceful purposes, in accordance with international agreements signed by the Slovak Republic. It also contains provision setting financial compensations for nuclear accidents. Pursuant to Act 130/1998 Coll., the ÚJD exercises state supervision of nuclear safety of nuclear installations.

*Structure of regulatory authorities*



### 2.1.2 Reporting line of the ÚJD

As stated in Act 2/1993 the Chairman of ÚJD is reporting directly to the Prime Minister and the whole Government.

ÚJD attends and participates in meeting of the Council of Ministers when the agenda of this Council includes a topic concerning nuclear safety. By resolution of the Government, ÚJD has to present a report on the safety of nuclear installations and its own activities to the Council of Ministers at least once a year. ÚJD has to present reports to the committee of environment of the Parliament as well. According IRRRT mission (International regulatory review team IAEA) a reporting line to the Prime Minister and the whole Government, Parliament, with effective access to these levels, ensures the statutory independence requested by internationally approved principles is considered as good practice.

## 2.2 Nuclear Safety Legislation

### 2.2.1 Acts in the field of state supervision

The legal structure for the regulation of nuclear safety consists, on the one hand, new laws adopted since independence, and on the other regulations, adopted prior to the creation of the Slovak Republic.

The legal system can be categorised as follows :

- The Constitution is the highest basic law and is enacted by the Parliament;
- Acts are basic laws specifying principles in various areas and are promulgated by the Parliament. As one of the basic laws, the Atomic Act governs the peaceful use of atomic energy in the Slovak Republic;
- Regulations are rules issued by central governmental authorities (e.g. ministries) to pose firm requirements for the implementation of Acts and are approved by the Government;
- Decrees are subordinate to different Acts and are formulated by the Government;
- Regulatory Guides contain specific requirements and recommended approaches to facilitate the fulfilment of relevant requirements and are published by the regulatory bodies;
- Internal guides are internal rules for the management of activities of the Regulatory body and to create basis for the internal QA-system.

International conventions and agreements which were ratified by the Parliament and by the President are to be included just behind the constitution and have power as a law.

Act No. 130/1998 „on the peaceful use of nuclear energy and on alterations and amendments to Act No. 174/1968 Zb. on State supervision of work safety as amended by Act of the National Council of the Slovak Republic No. 256/1994 Z. z.“ governs the design, siting, construction and operation of nuclear installations in the Slovak Republic and lays down their licensing system; it provides that the ÚJD is the licensing authority of nuclear installations from nuclear safety point of view.

Act No. 2/1993 identifies the responsibilities and tasks of the Nuclear Regulatory Authority and specifies its independent status in nuclear safety matters. It lists the ÚJD different activities, including State supervision of nuclear materials (safeguards), in accordance with the Treaty on the Non-Proliferation of Nuclear Weapons and responsibility for the early notification of nuclear accidents (Decision No. 121/1987).

Act No. 127/1994 of the National Council governs the mandatory environmental impact assessments and authorises the Ministry of Environment to evaluate all proposals for the construction of nuclear installations, which might have an adverse effect on the environment.

The former Czechoslovakia did not have legislation dealing specifically with nuclear third party liability, but the Civil Code applied to especially dangerous activities. This legislation is covered in Act No. 130/1998.

Act No. 254/1994 and Decree No. 14/1995 establish a State Fund for decommissioning of nuclear power plants and the management of spent and radioactive waste arising from their decommissioning. The Act was adopted by the Parliament on 25 August 1994. It entered into force on 1 January, 1995.

The Fund, which is considered a separate legal entity, is managed by the Ministry of Economy, which appoints the Fund's Director. The Ministry has also set up a Steering Committee made up of seven members, experts in the fields of nuclear energy, health, environmental protection, economy and public administration to provide advice on the distribution of funds. The ÚJD chief inspector is member of steering Committee. The Fund is financed by several means including, contributions by nuclear power plant operators, bank and State funding, and other sources.

Act No. 290/1996 on the Safety of the Health of the Population lays down the requirements for radiation protection based on the ICRP and IAEA standards in this area.

The current legislative framework for the State control of exports and imports of nuclear materials and sensitive items, such as dual use items, is provided by, Act No. 547/1990 on the management of some special substances and their control and by Regulations No. 50/1990 and 505/1992. The latter also deals with dual use items.

Act No. 547/1990 specifies that the Ministry of Economy is the authority with jurisdiction to issue export-import licenses for nuclear materials and other sensitive items, while the official contact point for international bodies with non-proliferation regimes such as the Nuclear Suppliers Group or the Zangger Committee is the Nuclear Regulatory Authority.

Act 130/1998 replaced together with its implementing regulations the former Act 28/1984. It complements former legislation in the sphere of radioactive wastes, decommissioning, periodic safety assessment, third party liability, emergency preparedness and authorisations for use of nuclear energy. The Act and regulations are based on internationally accepted principles of nuclear safety and corresponds to a sufficient extent, with the reciprocal legislation of European Union.

### **2.2.2 Regulations and guides**

The basis of the regulations derives largely from the former Czechoslovakia. The following regulations are in force :

#### The CSKAE Decrees No.:

- 2/1978 on the assurance of nuclear safety in designing, approving and performing constructions with nuclear power installation;
- 4/1979 on the general criteria for the assurance of nuclear safety in siting constructions with nuclear power installations;
- 6/1980 on the assurance of nuclear safety in commissioning and operation of nuclear power installations;
- 8/1981 on the testing of facilities for transport and disposal of radioactive materials;
- 9/1985 on the assurance of nuclear safety of research nuclear installations;

- 28/1987 on the recording and control of nuclear materials;
- 67/1987 on the assurance of nuclear safety during nuclear waste management. It lays down the basic technical and organisational requirements for ensuring nuclear safety and the elimination of releases of radioactive materials into the environment in the course of radioactive waste management. It also specifies mandatory procedures on radioactive waste management for authorities, organisations and their staff involved in the design, commission, operation or decommissioning of nuclear facilities. In this respect it specifies the basic safety requirements for all steps of radioactive waste management, such as the collection, segregation and storage, the treatment and conditioning and finally, the disposal of rad-waste. The Regulation furthermore stipulates the requirements for the documentation on safety when they are presented with the application of licenses for siting, construction and operation;
- 100/1989 on the physical protection of nuclear installations and nuclear materials;
- 191/1989 establishes the way, terms and conditions for the evaluation of special professional abilities of selected personnel from nuclear installations;
- 436/1990 on the quality assurance of selected equipment with regard to nuclear safety of nuclear installations.

NUSS Codes are widely used in regulatory activities. All Agency's Standards and Guides are also used and implemented in the licensing process.

#### The ÚJD Decrees :

- List of special (dual-use) materials;
- Maximum quantities of nuclear materials excluded from Vienna convention.

A draft of new 14 Decrees are currently being prepared under the responsibility of ÚJD. Adoption is expected in 1999.

## **2.3 Organisation and resources of the ÚJD**

### **2.3.1 Structure and Organisation**

Under the control Chairman there are two branches :

- Branch of nuclear supervisory Policy and international co-operation which comprise three divisions and whose director general is also the Vice Chairman of ÚJD;
- Branch of nuclear safety assessment and inspection activities which comprises four divisions and whose director general is at the same time in position of Chief Inspector of Nuclear Safety.

Two additional divisions are under the direct control of the Chairman :

- Division of Administration and Human Resources;
- Division of Safety Analysis and Technical Support which has been created with the support of the Swiss-Slovak co-operation project.

The ÚJD staff is composed of 44 inspectors, 22 experts and 16 administrative supports.

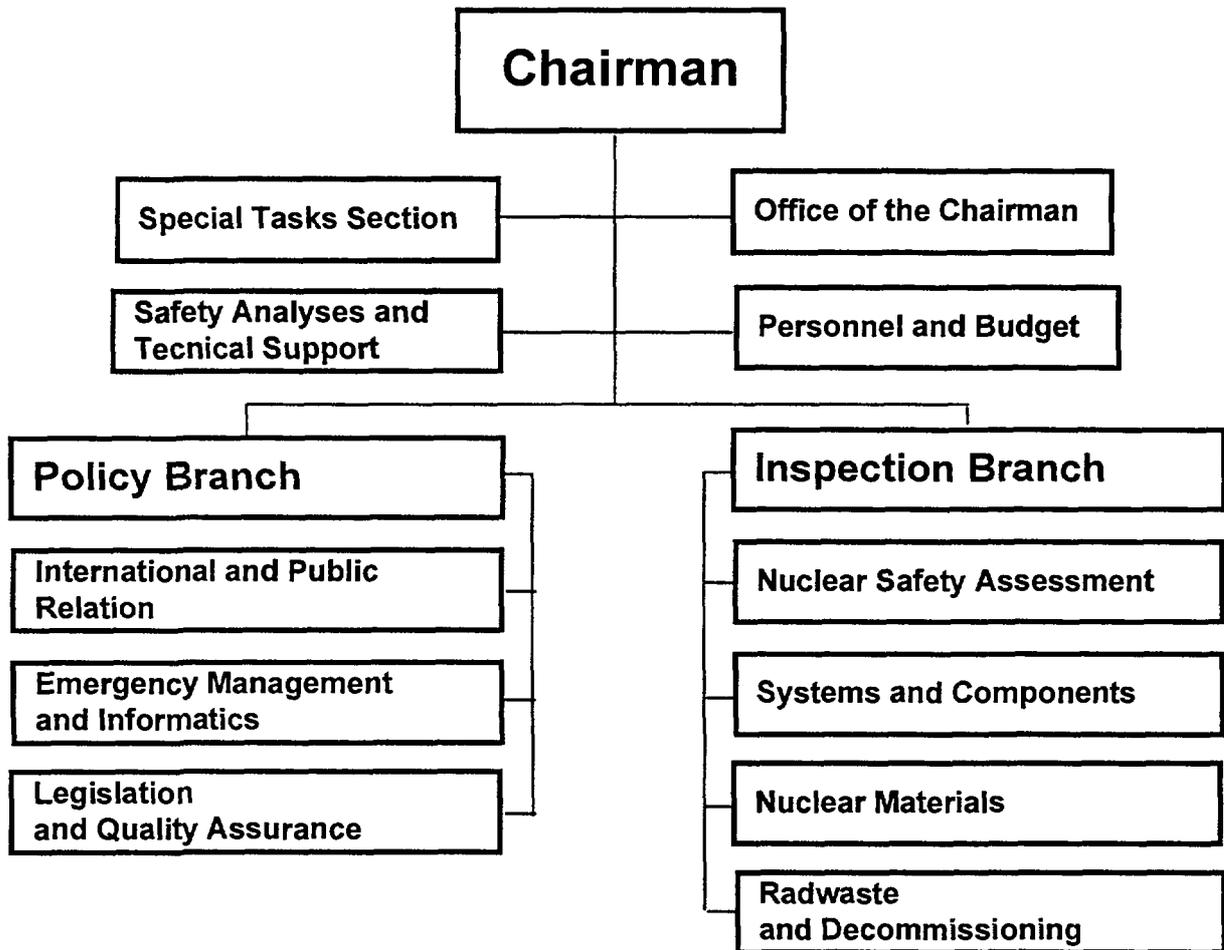
The „Branch of Nuclear Supervisory Policy and International Co-operation“ comprises:

- Division of International and Public Relations;
- Division of Emergency Management and Informatics;
- Division of Legislation and Quality Assurance.

The „Branch of Nuclear Safety Assessment and Inspection Activities“ comprises:

- Division of Inspection and Assessment of Nuclear Safety;
- Division of Inspection and Assessment of Systems and Components;
- Division of Nuclear Materials;
- Division of Radioactive Wastes.

The overall structure of ÚJD is described in following figure.



Due to this structure and organisation, assessment activities are mainly performed in the two first divisions of the Branch of Nuclear Safety Assessment and Inspections Activities with contribution from Division of Legislation and Quality Assurance, the Division of Emergency Management and Informatics and from the Division of Safety Analysis and Technical Support.

### 2.3.2 Training

At present, staff members of ÚJD complement their varying degrees of experience and expertise dependent upon their background and the specific discipline they are covering. Each individual in the ÚJD has a formalized job description which specifies academic requirements as well as experience necessary. There is a documented training system to develop new employees.

The present staff has also utilized to a large extent training through various international assistance programs. The most important training's were provided by IAEA, US NRC, Switzerland, Japan, UK, Finland, Germany, France and Canada.

The ÚJD inspectors are serving as experts in various types of missions and supports e.g. IAEA, OSART China, Spain, IRRRT Ukraine, Safety review Hungary, Czech Republic, Bulgaria, Kazakhstan, Armenia, Lithuania and as well as members of US NRC and EC missions for regulatory bodies support in various countries.

### **2.3.3 Financial resources**

For budget preparation, ÚJD has to discuss directly with the ministry of finance responsible for the state budget. The draft budget is then assessed by the Committee for Environment of the Parliament, approved by the Government and finally approved by the Parliament as part of the Act of the State budget.

The budget contains resources for salaries, operation, IAEA technical co-operation fund, science and development and external technical support. Part of the budget for salaries and external technical support has been increased each year.

## **2.4 Role and responsibilities of ÚJD**

ÚJD is responsible for regulating, licensing and supervising of nuclear installations as well as for preparation of acts, regulations and guides and for public information's.

Pursuant to Act 130/1998 the ÚJD exercises state supervision of nuclear safety of nuclear installations in the following areas: (chapter 6, § 31, 32)

- a) grant and withdraw authorisation to legal and natural entities in the sphere of utilisation of nuclear energy;
- b) issue and withdraw a permits for receiving and utilisation of nuclear materials, management of rad-waste and spent fuel, import or export of nuclear or special materials, transport of nuclear materials, decommissioning of nuclear installations., change of purpose of nuclear installations and re-import of --waste;
- c) issue permission for construction, design changes commencement of commissioning programmes, operation and life extension of nuclear installations;
- d) approve limits and conditions, programmes for commissioning, containers for rad-waste and nuclear material transport, training programmes, quality assurance systems and requirements, and on-site emergency plans;
- e) order transfer of nuclear materials, management of rad-waste where the originator is not known and reduction in the output or shutdown of a nuclear installation or discontinuation its construction or use of nuclear materials or rad-waste management;
- f) verify the professional qualification of selected employees,
- g) support, within its competence, international co-operation in the sphere of use of nuclear energy including commitments arising out of international agreements and conventions and co-ordinate co-operation with IAEA;
- h) ensure that the public is informed of incidents and accidents, accidents outside the Slovak Republic, serious deficiencies identified during inspections and the enforced corrective measures.

The ÚJD performs the State supervision of :

- a) nuclear safety at nuclear installations;
- b) management of radioactive waste and spent fuel;
- c) nuclear materials, special materials and equipment;
- d) physical protection of nuclear installations, nuclear materials and rad-waste from nuclear installations;
- e) emergency planning.

## 2.5 Inspections and enforcement

### 2.5.1 Policy and Objectives

The broad objective of the nuclear safety inspection program is to exercise supervision and control of nuclear facility safety in discharging the ÚJD responsibility for regulating the safe use of nuclear energy. ÚJD also has the responsibility for the supervision of radioactive wastes that originate from nuclear installations and for repositories for the various categories of radioactive waste. Control over the safe utilization of atomic energy, as well as nuclear material control and accounting, the quality of selected equipment and instrumentation, and review of the objectives of the nuclear power development program are all encompassed by state regulation and then executed by ÚJD.

The Branch responsible for inspection activities is located at Trnava, Slovakia and is situated approximately fifty (50) kilometers from the Headquarters office in Bratislava. Safety inspections are carried out continuously within the resident inspector program and also throughout the various stages of construction and operation including commissioning, installation of equipment operation, quality assurance, personnel qualification, maintenance, testing, surveillance, emergency preparedness and decommissioning.

### 2.5.2 Inspection Function

The methods used to discharge the responsibilities of Act 130/1998, are inspections and review and assessment. The overall inspection function is managed by a Chief Inspector and consists of three facets:

- a) routine inspections conducted by the resident inspectors located on site at Bohunice and Mochovce;
- b) special inspections conducted in accordance with an approved inspection programme and procedures, from both Trnava and Bratislava;
- c) team inspections conducted as a result of certain types of abnormal events and to verify other activities such as unit start hold points during commissioning. Inspectors are not only situated in Trnava, but in the Bratislava office as well. The bulk of the inspection however is co-ordinated and conducted from Trnava.

The site inspection office at Bohunice is staffed with three inspectors one assigned to the A-1 NPP - under decommissioning, and two inspectors assigned to the operating facilities. The Mochovce site is currently staffed with two resident inspectors. These inspectors all live in the vicinity of the site. At Bohunice, the work load is distributed between two inspectors with assignment at Unit 1 and Unit 2 and assignment at Units 3 and 4. These two residents perform nuclear safety inspections and meet daily with the A-1 inspectors as well.

At Mochovce the work load is distributed between the two site inspectors with the predominate focus on Unit 1 in operation and Unit 2 which is scheduled for commissioning in 1999 with less emphasis on the Units 3, 4. These inspectors are responsible for the conduct of the routine inspection program. They are supported by other inspectors from all disciplines from a combination of qualified inspectors in both the Trnava and Headquarters office. The Regulatory Authority presently is authorized a total of 44 inspectors to perform inspections. Last year ÚJD performed a total of 135 inspections in discharging its safety responsibilities. In reality this number of inspections was larger if one included a number of discrete inspections conducted under the resident program. The overall inspection function is sophisticated and provides coverage to all areas of nuclear safety and other related inspection requirements.

### **2.5.3 Inspection Methodology and Organization**

ÚJD has developed a complex and sophisticated inspection programme to carry out its inspection duties; conduct routine and daily inspections; and perform special inspections governed by the approved inspection programme and event oriented activities. This programme is consistent with accepted international practices using a western approach to conducting inspections in a structured and methodical manner.

The overall site inspection programme other than that conducted by the resident inspectors, is an announced programme. Plant management is informed prior to the inspection, to assure that necessary personnel will be available on site to conduct the activity and to prepare any advanced material documentation having it available for ÚJD review. Frequently, the residents will participate in the inspection as well. All such inspections begin with a formal meeting held with the plant management and findings are always discussed prior to leaving the site.

The inspection programme is based on inspection procedures and covers the following broad areas:

- commissioning and operation
- training and qualification
- performance indicators
- maintenance
- surveillance testing
- plant modifications
- fire protection, radiation protection, radioactive releases
- physical security
- fuel management
- rad-waste management
- emergency preparedness
- quality assurance
- safeguards
- decommissioning

To use and effectively manage this programme, ÚJD has made a number of improvements in the process with respect to inspection activities. These include implementation of a now highly developed annual core inspection programme that is maintained in a computerised format, use of a plant issue matrix or data base of inspection findings and revised inspection procedures, based on practical experience gained, for the areas discussed above. This includes a new procedure for commissioning of Mochovce that was issued in February 1998.

#### **2.5.4 Reporting of ÚJD Site Inspection and Experience Feedback**

The site inspectors at Bohunice and Mochovce report verbally to the office in Trnava (Division of Nuclear Safety and Assessment) to advise them on plant operational status significant activities and of any events or potential problems that may exist.

All site inspectors and other inspectors also issue "protocols" which are written documents addressed to the utility. These document discrepant conditions and areas of concern and are issued as appropriate, and dependent upon the findings of the inspections. Inspectors generally have 14 days to issue a written protocol by internal procedures. In addition, the site inspectors complete a monthly written inspection report which is provided to management in the Trnava office.

On a weekly basis ÚJD division management meets as a group at the Headquarters office in Bratislava, with the Chairman, Vice Chairman and Chief Inspector. All significant issues are discussed in this forum and additional decisions made as necessary at these meetings. The Chairman and Chief Inspector also meet daily in Trnava, which is an effective method for communicating issues and developing solutions and for office continuity and consistency.

ÚJD keeps the original documentation and inputs information into its recently implemented computer data base and plant issue matrix which will assist in the analysis of findings and statistics. This phase of experience feedback is still being developed and will become of increased use. Protocols issued by all inspectors are also processed and entered into the computer data base. The annual core inspection programme along with the results is also maintained in a computerised format which is user friendly. The approach permits a modification of the inspection plan based on analysis of the inspection findings (carried out currently by management), observations of the site inspectors, incorporation of plant performance indicators and to some extent the results of safety assessment (periodic safety review). This latter item is also just developing. The ÚJD approach is consistent with processes and effective international practice.

#### **2.5.5 Enforcement**

The statutory powers that are available to ÚJD inspectors and management are described in the current Act 130/1998, in various articles. The existing laws provided for the right of access to nuclear site, the right to inspect and investigate and the right to take enforcement action including monetary civil penalties. Specific rights of the inspectors are also addressed.

The authority to take immediate actions is delegated by the ÚJD Chairman who designates this formally, to those individuals who are qualified inspectors. Those individuals have the authority to write the first level or protocol of enforcement (requirements) in a formal report and effect corrective actions on the spot. Such findings are always discussed with the appropriate level of plant management and the written document is signed by the inspector and normally reviewed by his supervision. Additional Level II, Level III and Level IV findings with increased levels of safety significance may be issued, signed by the Director of the relevant Division, the Chief Inspector and the Chairman respectively. These are sent to their counterparts at the utility. The exercise of normal enforcement actions is carried out in a structured manner. While an inspector does not have direct authority to shut down a plant the regulatory body possesses such authority, to order power reduction or shut downs. This is established in the law. Lower level enforcement actions do not carry the right of appeal. Other actions can be appealed with the legal system (courts) rendering the final decision.

### 2.5.6 Penalties

The Act and regulations define a range of civil penalties which ÚJD can take in the case of violations of sufficient severity. These penalties are generally consistent with international regulatory practice. The financial monetary penalties may vary up to a maximum of 50 million Slovak crowns under the act. The Act is structured to provide monetary penalties in a 3 tiered process and presently also includes a provision to impose monetary penalties against individuals. The Act provides Monetary civil penalties against individuals only in the event of concealment of information and refusal to co-operate with regulatory authorities.

The inspection approach, process, performance, assessment and inspection guidance are considered as good practices of IRRRT mission.

## 2.6 Licensing of major plant upgrades and backfitings

As a rule, safety upgrading measures for WWER 440 reactors have generally been oriented towards improving reliability, redundancy, single failure concept (in particular with respect to V-230 reactors), and physical separation of safety systems.

Lists of safety-related imperfections the treatment of which is included in the safety upgrading program for specific reactor types have been a result of recent developments in the field of primary circuit integrity, assessment of events at nuclear installations, results of beyond-design basis accident analyses etc.

ÚJD uses deterministic approach to effectively manage the safety upgrading process, in particular to improve the safety of emergency systems (independence, redundancy). PSA for specific reactor is used to prioritise the individual safety improvement measures, in particular those which may contribute most to the core damage.

Safety upgrade related requirements are partially linked to the probability of accidents. Acceptance criteria set forth by ÚJD for emergency analyses are generally expressed in terms of acceptable radiological consequences which differ according to the probability of the initiation event. In addition, conservative or so-called best estimate procedures were described for emergency analyses. Best estimate procedures are only accepted for accidents with the least probability of a specific initiation event (below  $10^{-6}$ ).

An additional principle applied by ÚJD in the safety upgrading process is the limitation of the operation duration of nuclear power plant units by issuing only approvals for operation for specified period of time; this enables the management of the safety measure implementation process. This procedure has so far only been applied with respect to NPP Bohunice V-230 reactor units.

### 2.6.1 ÚJD Requirements with Respect to NPP Bohunice WWER 440/V-230 Units

The safety upgrading program for V-230 type reactors was first started in 1985 based on recommendations from the former Soviet Union. Main attention was paid to embrittlement of reactor pressure vessel and to seismic upgrading.

Based on a review of the nuclear safety of reactors V-230, Czechoslovak Atomic Energy Commission (CSKAE), the predecessor of ÚJD, by CSKAE Resolution No. 5/1991, defined measures to upgrade the safety (known as „Small Reconstruction“), in response to the safety shortcomings identified. The „Small Reconstruction“ was completed in 1993. It focused on the most urgent safety aspects, in

particular on the tightness of the confinement, seismic upgrading, reactor vessel integrity, emergency sources of electric supply, reliability of steam generators feed water systems, the application of „leak before break“ principle, on the reduction of fire risk and the capacity of the fire extinguishing equipment, etc. The implementation of the mentioned safety-related measures was a condition for the licensing of further operation.

Being established in 1993, ÚJD took additional measures to upgrade V-230 reactor safety. Based on the inception safety report for so-called „Gradual Reconstruction of V-1 Units“, ÚJD issued Resolutions No 1/94 and 110/94 in 1994, which regulated the conditions for further operation of V-1 units until the end of the designed life cycle. ÚJD Resolution No.1/94 contained additional 59 safety measures to be gradually implemented within 1996-2000.

ÚJD Resolution 1/1994 had five topics-based parts. In each of them, ÚJD prescribed measures to upgrade safety level; any further operation of the power plant would be conditional on the implementation of those measures.

Part one took measures to maintain primary circuit integrity including analyses of the integrity of reactor pressure vessel. Part two contained measures focusing on a safety improvement of the reactor core cooling systems during the operation and accidents. Part three, reactor core cooling during LOCA, set forth conditions for an improved core cooling to manage a new level of design basic accident, i.e. when a primary circuit pipe of the diameter of 200 mm ruptures (the original design basic accident only considered the rupture of a primary circuit pipe of a diameter equivalent to 32 mm), as well as 500 mm diameter main primary pipe ruptures using best estimate approach. Part four contained measures to improve the safety level of confinement, in particular by improving its tightness, efficiency and demonstrating integrity upon LOCA. Part five focused on an improvement of the safety level of auxiliary systems of the nuclear power plant such as service water, electric supply, and instrumentation & control system.

Resolution No. 1/1994 was also based on recommendations for safety level upgrading contained in IAEA documents developed as a part of the TECDOC 640 document: Ranking of Safety Issues for WWER 440/230 Reactors. Because of the extent of the project, the deadlines for the measures to be implemented have been spread over the period of five years. ÚJD Resolution No.110/1994 complemented CSKAE Resolution No. 5/1991 and ÚJD Resolution No.1/1994, by defining conditions to be met by operator to obtain license for further operation of the respective unit. The license validity has been restricted to one year.

In assessing the safety level of nuclear power plants, results of probabilistic safety analyses (PSA) have been used since 1995; they are also used to assess the benefits of suggested safety improvements. Preliminary safety analysis report for gradual reconstruction and IAEA experts meeting for its evaluation were the basis for ÚJD resolutions.

### **2.6.2 ÚJD Requirements with Respect to NPP Bohunice WWER 440/V-213 units**

New safety-related requirements for V-213 have arisen from the outcomes of periodic safety reviews, operation-related experience, PSA analyses and recommendations of international missions.

ÚJD responded to the situation following the Safety Report After 10 Years of Operation by issuing the Resolution No. 4/1996 which contained measures to upgrade safety in three parts. Part one contained measures concerning the completion of the safety report after 10 years of operation. The safety report, as a basic document providing evidence for the safety level of the nuclear power plant, was updated according to the actual state-of-the-art condition of the plant, in particular with respect to better safety

analyses. Measures to complete the safety report were taken by ÚJD based on the IAEA 1994 Mission, PSA analyses conducted by Nuclear Power Plants Research Institute, Trnava, and analyses developed by ÚJD staff. Requirements to complete the safety report in addition to general issues, also concerned the integrity of components at the primary circuit pressure limit, seismic review, safety analyses, additional safety analyses, limits and conditions.

Part two identified technical measures for safety upgrading of safety systems and auxiliary systems of safety relevance. This part further specifies requirements with respect to the development of a modernisation concept for the instrumentation and control systems. The resolution also contains organisation-related measures to improve operation documentation, regulations for tests of equipment and emergency planning. This procedure prescribed by ÚJD shall maintain the required safety level of the nuclear power plant.

Part three prescribed the operator to periodically review the nuclear power plant safety following the schedule developed by ÚJD. From the aspects of their deadlines, two types of measures were distinguished: short-term measures including organisation-related measures, and completion of the safety report. Long-term measures represent requirements concerning the specification of objectives, development of concept and safety upgrade program.

Annex to Resolution No. 4/1996 contained ÚJD comments on the individual chapters of the Pre-Operation Safety Analysis Report. Program for safety upgrading has been developed by utility based on ÚJD resolution No. 4/1996.

### **2.6.3 ÚJD Requirements with Respect to NPP Mochovce WWER 440/V-213 units**

The construction of the nuclear power plant Mochovce started in 1984 when the former Czechoslovak Atomic Energy Commission (CSKAE) approved, by Resolution No 23/1984, the issuance of the building permit for NPP Mochovce, based on a review of the safety documentation pursuant to Act No.28/1984 Coll.

The construction of NPP Mochovce was suspended in 1990 due to unclassified issues concerning the instrumentation and control system and also due to lack of funds needed for the completion of the construction. The construction of the two first units was resumed in 1996 after both above mentioned difficulties have been resolved.

After 1989, NPP Mochovce used own means and assistance of international expert missions to make a number of steps to reassess the safety of the original NPP design.

Several international missions<sup>1</sup> were invited to NPP Mochovce since 1994 to review the nuclear power plant safety level. The document „Technical Specification of Safety Measures“ (TSSM) was developed based on the recommendations of the international expert missions (IAEA, RISKAUDIT, EdF) in 1995. The document has become a basic reference for the development of the safety upgrade program for NPP Mochovce. Terms of reference for design amendments have been developed based on TSSM, and they have been implemented even before the commissioning of the NPP. The amendments mainly concern design adjustments in response to the most serious faults identified upon the safety review of the original project.

The numbers of measures included in TSSM (87) corresponds to the numbers of measures stated by the IAEA document „Safety Issues and their Ranking for WWER 440, Model 213 NPPs“, IAEA-EBP-

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<sup>1</sup> IAEA Safety Review Mission, 1994, RISKAUDIT Mission 1994, EdF Safety Improvement Mission, 1993

WWER-03. All the measures suggested by RISKAUDIT<sup>2</sup> have been included in the 87 measures which represent a more comprehensive understanding of the safety level. The difference in the numbers of measures shown in RISKAUDIT report and TSSM is due to a different structure of both materials. The TSSM document, similarly as that of IAEA, distinguishes between three categories of safety upgrading measures based on their safety relevance.

The role of ÚJD is to assess the level and the status of the NPP safety and the degree to what the NPP meets the requirements and recommendations of the national and/or accepted international regulations and standards. Based on such a review, ÚJD approves the license to be issued by the Building Authority (District Environmental Office).

ÚJD has consistently monitored and reviewed the implementation of safety upgrading measures since the time of their formulation. Operator is responsible to submit monthly reports on the implementation of those measures. With respect to category three measures which are not fully realised prior to the start of operation, ÚJD shall require satisfactory substitution measures to be taken prior to the start of operation. Such substitution measures shall be assessed and controlled by ÚJD. All the original measures aimed at safety upgrading shall remain a precondition for approval of commercial operation. In other words, any category 1 measures, even if of less safety relevance, will have to be implemented by or during the first fuel reloading on unit one.

The most comprehensive review of the implementation level of safety-related measures was conducted by ÚJD prior to the approval of the first fuel loading. Another comprehensive review was performed prior to approving the commercial operation.

#### **2.6.4 ÚJD Requirements with Respect to Periodic Safety Reviews**

The results of the periodic safety review of the operated V-230 and V-213 reactors prescribed by CSKAE and subsequently by ÚJD are: (1) requirements were put forward to complete the safety reports to match the format usual in developed countries, (2) requirements were set up for safety upgrade of nuclear reactors, (3) requirements were set up for safety upgrade of reactors under construction, and (4) requirements were set up for systematic periodical safety reviews of all nuclear reactors in Slovakia. The requirements concerning periodical safety reviews were prescribed by ÚJD in the safety instructions on Periodical Safety Reviews developed on the IAEA safety guide 50-SG-012 as well as based on experience from the contents and application of periodical safety reviews in developed countries.

#### **2.6.5 Licensing of sub-contractors providing services to the licensees**

According to the Act 130/1998 an authorisation from ÚJD is required for activities concerning nuclear energy utilisation. This requirement applies to all organisations providing safety related services (for example design, repairs, overhauls, construction, reconstruction, safety upgrading, testing).

#### **2.6.6 Licensing of modifications**

According to the Act 130/1998 an approval from ÚJD is required for implementation of any safety related modifications during construction, operation and decommissioning. The ÚJD has already established good practices for evaluation and approval of the safety related modification. The licensees shall submit to ÚJD design modification, safety assessment and quality assurance program.

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<sup>2</sup> RISKAUDIT Report N<sup>o</sup> 16, July 1994

Implementation is possible only after ÚJD approval. The scope of safety related modifications is defined in regulation 436/1990.

Review and assessment of documentation including QA program are carried out by the ÚJD staff itself or with support by an independent organisations such as research institutes which are not involved for preparation of documentation. Approvals and decisions of the ÚJD contain usually a set of conditions. Fulfilment of these conditions are for licensees obligatory.

### **2.6.7 Safety analysis reports**

Important role for each NPP within nuclear safety assessment process play safety analyses reports (SAR). These reports are produced basically by the main supplier which can have contractors for working-out of some parts of SAR. Licensee is responsible to submit SAR to the ÚJD. Current status of SAR in Slovak Republic is following.

SAR for the Bohunice V-1 Units after small reconstruction (1993) prepared by Nuclear power plant research institute (VÚJE).

SAR for Bohunice V-1 Units for gradual reconstruction prepared by VÚJE.

Preliminary SAR after basic engineering of V-1 reconstruction prepared by VÚJE and Siemens.

SAR after gradual reconstruction of V-1 is under preparation by VÚJE and Siemens and subcontractors.

Updated SAR for Bohunice V-2 Units after 10 years of operation has been elaborated by VÚJE with its subcontractors.

Pre-operational SAR for NPP Mochovce has been elaborated by SKODA from Czech Republic with co-operation of VÚJE, Energoprojekt Praha. A chapter 15 accident analysis has been elaborated by Electricité de France and Siemens.

## **2.7 International co-operation and improvements of effectiveness**

### **2.7.1 Membership of nuclear organisations**

The Slovak Republic joined the International Atomic Energy Agency (IAEA) on 27 September 1993. In addition ÚJD is member of following international organisations and groups:

- Forum of regulators countries operating VVER reactors;
- CONCERT – group of western, central and eastern European regulators;
- NUSAC – nuclear safety assistance co-ordination EC DG XI – G24;
- NERS – network of regulators with small nuclear programmes.

ÚJD is exchanging information with IAEA and OECD/NEA. In addition ÚJD has bilateral co-operation with: NRC (USA), HSK (Switzerland), NII (UK), GRS (Germany), DSIN, IPSN (France), JAERI, JEPIC, MITI (Japan), AECB (Canada), STUK (Finland), SKI (Sweden), SONS (Czech Republic), GAN (Russia), HAEC (Hungary), NAEA (Poland), ANRA (Armenia), NRA (Ukraine), VATESI (Lithuania), Bulgaria Regulatory Authority, Austria ministry of environment.

The overall policy of the ÚJD have been based on following principles:

- openness and transparency of nuclear safety;

- usage of best world – wide experience and practices at the establishment of the regulatory supervision function.

Enhancement of regulatory effectiveness can be characterised as „forced enhancement“ due to:

- assessment of regulatory effectiveness have been based on external experts, which essentially supported self-assessment activities of the ÚJD. More deep developments of methods of self assessment are elaborated at present time;
- enhancement of ÚJD regulatory function have been intensively supported by IAEA, EC and some western developed countries mainly USA, Switzerland and Japan.

Several missions have been conducted for ÚJD activities assessment and support.

- a) EC exploratory mission focused on the regulatory system (24 recommendations);
- b) IAEA TC Project SLR/9/005 – Model project for Slovakia (1994 – 1997) „Strengthening of the nuclear regulatory authority“. 42 tasks have been included for review and support, 40 expert missions conducted and 234 recommendations proposed;
- c) EC Phase – RAMG assistance program to ÚJD (1998 – 1999) with goal transfer of western European regulatory methodology and practices to the ÚJD with 5 technical tasks;
- d) EC Phase TSO Projects, assistance to the ÚJD, particularly at:
  - licensing of Bohunice V-1 Units;
  - licensing of Bohunice V-2 Units;
  - licensing of Mochovce NPP.
- e) Assistance of developed countries mainly training of the ÚJD staff (US NRC, UK, HSK – Switzerland, Japan, AECB Canada, DSIN France, GRS, Germany, STUK – Finland);
- f) Since 1996 ÚJD has continued in the systemic development of activity in the group of safety analysis and technical support in compliance with the SWISSLOVAK project funded by the Swiss Government. The project is a part of financial and expert assistance from Switzerland for promotion of socio-economic reforms in the countries of Central and Eastern Europe. The main goal of co-operation is to provide assistance in creating and training a group of specialists for safety analyses. The assistance is managed through the Swiss regulatory body. Within this project several training courses, working meetings and seminars were organised and funded. Last year these activities focused on enhancement of skills of the group members in using software which serves as analytical tools for assessment of nuclear safety. The group was getting acquainted with the methodology of performing safety analyses and using results of analyses for assessment of nuclear installation safety. Several training courses were dedicated to processes and methods for verification of safety technical documentation, as well as handling over experience and knowledge in the area of nuclear safety. Currently this group is actively working and developing its capability. Implementation of SWISSLOVAK project brought a significant strengthening of credibility and independence of UJD as a state regulator, and that is not only in Slovakia, but also in the eyes of professional public on the international level. The group of specialists provided UJD an independent analytical support in deterministic and probability safety assessment. It focused mainly on calculations and analyses of thermal-hydraulic, physical and chemical processes in nuclear energy installations. It also performed parametric and sensitivity analyses for selected transitional processes and model accidents. The group participated on review of safety documentation and on evaluation of draft measures to improve safety of nuclear installations in Slovakia, which were sent to UJD by the operator.

Independent analytical support in 1998 was focusing mainly on verification of the pre-operational safety report of EMO NPP, operational safety analysis reports of V-2 Units and verification of the

proposal for reconstruction of the containment of V-1 Units. Verifications of safety documentation focused primary on review of completeness of initiation events under consideration, applied safety criteria, adequacy of entry data and models, as well as overall quality of submitted documentation. The initial and marginal conditions of models were also checked. Suitability of applied methodology and computer programs was evaluated, achieved level of their verification, adequacy, correctness and interpretation of results of safety analyses. UJD recalculated and checked representative thermo-hydraulic, neutron-physical and radiological safety analyses. Results of these independent safety analyses were evaluated with regard to the set criteria and were used for safety review of EMO NPP, V-1 Units and V-2 Units in licensing process. Verification was made in co-operation with foreign partner organisations and in co-operation with the IAEA. It proved that the checked safety analyses are prepared in compliance with the established practice, according to recommendations of UJD and the IAEA. A high, internationally accepted safety level of EMO NPP was confirmed.

Group of safety analyses and technical support with its technical and human potential has contributed also to preparation and the course of national and international prevention and emergency exercises. Within the emergency staff, UJD has its members represented in the group for reactor safety and protection against radiation.

g) International missions and their main results.

The list of international missions and their main results are as attachment of this document.

## 2.8 Achievements of ÚJD

The following achievements of ÚJD have been reached based on several international assistance project and enthusiasm of the ÚJD staff:

- statutory independent regulatory authority
- recruited and trained staff
- internal management system supported by internal regulations (11+3)
- introduction of new legislation (Atomic Energy Act - 1998. regulations (15) 1998/99, guidelines)
- well defined licensing process of nuclear facilities
- authorisation of sub-contractor providing services licenses
- licensing of operational personnel
- increasing quality of review and assessment during the licensing process
- elaborated regulatory inspection and enforcement functions
- improved emergency preparedness, equipped and functional emergency operating facility
- improved public information
- continuing safe operation, by the utility, and modernisation of two WWER 440/230
- and two WWER 440/213 nuclear power plant units at Bohunice
- successful and safe commissioning and operation of WWER 440/V213 unit, by the utility, at Mochovoce
- safe operation and modernisation, by the utility, of spent fuel interim storage and waste management facilities
- the completion of waste disposal facility
- the decommissioning of prototype reactor at Bohunice Slovakian experts are used by IAEA for other counties