The Czech Republic

National Report

under the

The Convention on Nuclear Safety

Revised 2013

PAGE INTENTIONALLY LEFT BLANK

Table of Contents

Introduction

This Report is the National Report of the Czech Republic prepared for the purposes of a review by the parties to the Convention on Nuclear Safety. This Report has been elaborated with the objective to describe fulfillment of obligations arising from the Convention by the Czech Republic up to April 30, 2013. The structure of the National Report is based on recommendations approved at the preparatory meeting of parties to the Convention in September 1995 and published as "Guidelines Regarding National Reports under the Convention on Nuclear Safety".

By the above-mentioned date the Czech Republic had two operating nuclear installations covered by the Convention on Nuclear Safety – both operated by the ČEZ, a. s.:

Dukovany Nuclear Power Plant (Dukovany NPP) with four reactor units of VVER 440/213. The units were commissioned in the following years as follows (years in brackets are the dates of issue of final inspection approvals according to Building Act)

Unit 1 - 1985 (1988)
Unit 2 - 1986 (1988)
Unit 3 - 1987 (1989)
Unit 4 - 1987 (1990)

and

Temelín Nuclear Power Plant (Temelín NPP) with two reactor units VVER 1000/320. Both units were put into operation in accordance with the Atomic Act in 2004.

The National Report reports on the state of implementation of individual Articles of the Convention and considers the two above-mentioned nuclear installations, which is supplemeted by information on the preparation of the new units in Temelín NPP.

Nevertheless, the basic philosophy and principles of nuclear safety assurance applied to these two nuclear power plants have been correspondingly applied also to the other nuclear installations in the Czech Republic – three research reactors, Interim Spent Fuel Storage Facilities in Dukovany and Temelin NPPs and Radioactive Waste Repository. The last two nuclear installations are, with regard to their nature, subject of evaluation under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

Above and beyond obligations arising from the Convention on Nuclear Safety, information on research reactors is included in the Annex 8.

PAGE INTENTIONALLY LEFT BLANK

List of Abbreviations

ALARA	As Low As Reasonably Achievable
AOP	Abnormal Operating Procedure
AOT	Allowed outage time
AQG	Atomic Questions Group
ASSET	Assessment of Safety Significant Events Team
Atomic Act	Act No. 18/1997 Coll., on Peaceful Utilization of Nuclear Energy and Ionizing Radiation, as amended
BCEQ	Bubble Condenser Experimental Qualification
CDF	Core Damage Frequency
ČEZ, a. s.	Business name of the Czech utility - joint stock company ČEZ, a. s.
ČSKAE	Czechoslovak Commission for the Atomic Energy
EDU	Dukovany NPP
EC	European Commission
ENAC	European Nuclear Assistance Consortium (8 Western European Nuclear Design and Engineering Companies)
EOPs	Emergency Operation Procedures
EU	European Union
ETE	Temelín NPP
FDF	Fuel Damage Frequency
GMF	Group of European Municipalities with Nuclear Facilities
HPES	Human Performance Evaluation System
HZS	Fire Rescue Service
IAEA	International Atomic Energy Agency
ICRP	International Commission for Radiation Protection
INES	International Nuclear Event Scale
INPO	Institute of Nuclear Power Operators
INSAG	International Nuclear Safety Advisory Group
IPPAS	International Physical Protection Advisory Service
IPSART	International Probabilistic Safety Assessment Review Team
IPERS	International Peer Review Service
IRRT	International Regulatory Review Team
ISO	International Standard Organization
LBB	Leak Before Break
LERF	Large Early Release Frequency
LTO	Long Term Operation
IAEA	International Atomic Energy Agency
MCP	Main Coolant Pump
MCR	Main Control Room

MSK-64	Medvedev Sponheuer Karnik (seismic intensity scale)
NUREG	Nuclear Regulation
OECD-NEA	Nuclear Energy Agency within the Organization for Economic Cooperation and Development
OPIS	Operations and Information Center
OSART	Operational Safety Review Team
PHARE	Technical Assistance Program organized by the European Commission
PLIM	Plant Life Management
PRIS	Power Reactor Information System
PSA	Probabilistic Safety Assessment
PSR	Periodic Safety Review
PWR	Pressurized water reactor
QARAT	Quality Assurance Review Assistance Team
SALTO	Safe Long Term Operation
SAMGs	Severe Accident Management Guidelines
SG	Steam Generator
SPSA	Shutdown Probabilistic Safety Assessment
SÚJB	State Office for Nuclear Safety
SÚJCHBO	National Institute for Nuclear, Chemical and Biological Protection
SÚRAO	Radioactive Waste Repository Authority
SÚRO	National Radiation Protection Institute
SW	Software
TLD	Thermoluminescent Dosimetry
TPS	Technical Advisory Group
ÚJV Řež a. s.	Nuclear Research Institute in Řež, a.s.
US NRC	US Nuclear Regulatory Commission
VVER	Type identification for pressurized water reactors designed in the former Soviet Union
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators Association
WPNS	Working Party on Nuclear Safety

1. Existing nuclear installations - Article 6 of the Convention

Each contracting party shall take appropriate steps to ensure that the safety of nuclear installations at the time the Convention enters into force for that contracting party is reviewed as soon as possible. When necessary in respect to the Convention, the contracting party shall ensure that all reasonably practicable improvements are urgently made to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be outlined to shut down the nuclear installation as soon as practically possible. The timing of the shutdown may take into account the general situation in energy production and potential alternatives, as well as the social, environmental and economic consequences.

1.1 Description of the current situation

1.1.1 Existing nuclear installations in the Czech Republic as defined in Article 6 of the Convention

At present there are four VVER-440/213 reactor units in Dukovany NPP and two VVER 1000/320 reactor units in Temelín NPP operated in the Czech Republic. Geographic locations of both the Czech nuclear power plants are shown in Fig. 1-1. Technical data of both NPPs and main changes in their designs to date can be found in the Annex 1 of this National Report.

Since early 1990s, nuclear safety level has been reassessed in the form of analysis carried out by licensee or state supervision (for example, see Chapter 9 hereof on Article 14 of the Convention), or external independent assessment within the framework of international missions. This particularly involves the IAEA and WANO missions as well as nuclear safety assessment within the framework of accession of the Czech Republic to the European Union.

The IAEA missions compare the safety level achieved with the IAEA recommendations and international practice in the area in question. The conclusions of the missions contain a set of recommendations and suggestions for further safety enhancement. The WANO missions indicate mainly the areas of “good practice”, where the applied approach exceeds the current practice.

1.1.2 Dukovany NPP

1.1.2.1 Overview of nuclear safety assessments performed and their main conclusions

Nuclear safety assurance level at Dukovany NPP has been assessed continuously.

IAEA mission

<u>OSART:</u>
First OSART mission took place in September 1989 and a re-assessment Re-OSART mission followed in November 1991. The objective of the missions was to complement assessment of the nuclear power plant with the field of maintenance control and implementation, and subsequently to check on the implementation of possible remedial measures. The conclusions from both of the missions at Dukovany NPP were favorable and additional proposals were

annexed to the final report for further improvement of nuclear safety assurance. These proposals were gradually implemented [1-1], [1-2].

Another OSART mission took place in 2001. The power plant control areas, personnel quality, equipment and order condition were evaluated at a high standard, and the working procedures and regulations area was evaluated as average. Fulfillment of the Recommendations and proposals resulting from this mission was checked by the Follow-up OSART mission in 2003. The mission team found that Dukovany NPP personnel performed an exhaustive analysis and its solution of operational safety enhancement exceeded in many cases the extent of original recommendations from the team. In respect to solution of findings included in the original report, the power plant made great progress and the team classified many of these findings as fulfilled [1-3].

The most recent OSART mission took place in 2011 (see Annex 3). The areas of Training and Qualification, Radiation Protection and Chemistry Operation, Maintenance, and Emergency Preparedness were evaluated very well. [1-28]

<u>ASSET:</u>
The ASSET mission took place in October 1993 in order to verify the event prevention system, the so-called "operational events feedback". This mission was followed by another ASSET mission in 1996 to evaluate the event prevention system based on the plant's self-assessment. Conclusions from both missions rated very favorably the standard of nuclear safety assurance at the power plant [1-4], [1-5].

<u>Safety Issues:</u>
A mission evaluating Safety Issues was organized in 1995 in order to assess specific design solutions of the Dukovany NPP units in connection with safety recommendations identified by IAEA in general for VVER-440/213 units in 1994-1995. The mission appreciated the approach of Dukovany NPP to the implementation of safety recommendations [1-6], [1-7].

<u>IPERS:</u>
The IPERS mission took place in 1998, focusing on first level PSA study, in order to assess the study and propose specific recommendations for its improvement. The final report contained 57 recommendations. All recommendations were analysed in detail in the course of the next three years and adopted recommendations were included into the PSA model and documents.

<u>IPPAS:</u>
The IPPAS mission was organized in 1998 in order to evaluate the implementation of the principles of physical protection of nuclear installations into the Czech law and the practice of physical protection as such. In addition, by request of SÚJB, the national system of physical protection of nuclear materials and nuclear installations was assessed, and the existing practice in the field of physical protection in the Czech Republic and the international recommendations were compared.

<u>SALTO:</u>
In 2008, based on the invitation of the State Office for Nuclear Safety of the Czech Republic, mission Peer Review was implemented. The mission was focused on Safe Long Term Operation (SALTO) that was to review the programs/activities of Dukovany NPP. The mission assessed the activities performed by the power plant concerning SALTO and control of ageing of systems, structures and components important to safety. For preparation of longterm operation of Dukovany NPP, the mission defined 11 Suggestions and 12

Recommendations in 19 subareas [1-19]. The subsequent mission in 2011 evaluated their solution (see Annex 3).

WANO mission

WANO Peer Review:
A mission took place for the first time in 1997 in order to verify the systems and working procedures by INPO criteria. The following fields were verified: Organization and Control, Operation, Maintenance, Technical Support, Personnel Training, Chemistry, Radiation Protection, Emergency Planning and Operational Experience Feedback.

The mission appreciated Dukovany NPP and presented, in six fields, seven strong points from Dukovany NPP as an inspiration for other power plants. Another Peer Review WANO mission took place in 2007. The conclusion from the mission was also favorable and the team found no fundamental safety-important deficiencies.

Further mission WANO Peer Review took place in 2007. The following fields were checked: Organization and Control, Operation, Maintenance, Technical Support, Radiation Protection, Operational Experience Feedback, Chemistry and Personnel Training and Qualification. Of these eight fields, the mission drafted 7 Good practices, 3 Strong points and 12 Fields for improvement [1-20].

Subsequent mission WANO Peer Review took place in 2009. Its purpose was to check the method and status of solutions to the Fields for improvement drafted in 2007. Three fields for improvement were evaluated as resolved, eight fields were classified with satisfactory progress and one field was evaluated as being settled with a small progress [1-21].

The most recent mission WANO Peer Review took place in 2012 and was focused on the safe operation of power plant and special attention was given to SOERs (Significant Operating Experience Report), in particular to those recently issued in connection with the events occurred in Fukushima Daiichi NPP [1-22] (see Annex 3).

Assessment by EU

WENRA**:**
In 2000 the Western European Nuclear Regulators Association performed an assessment of nuclear safety in the EU candidate countries. The assessment of Dukovany NPP resulted in the following: the safety culture is sufficient, safety evaluation and document verification, i.e. periodic safety reviews, are performed using procedures comparable with Western practices.

AQG:
In 2001, an assessment of nuclear safety level of nuclear installations in the candidate countries was performed by WPNS group established at the AQG in connection with preparation for the EU enlargement. The report drawn up by this group in relation to Dukovany NPP recommended to the Czech Republic to submit a report on measures adopted in order to complete assessment of complete verification of the bubbler system behavior at units 1 – 4 for all design accidents. Verification of the bubbler system was completed towards the end of 2003 within PHARE projects and the joint project of the consortium of Bohunice, Dukovany, Mochovce and Paks nuclear power plants. Work executed within the projects proved functionality of the bubbler systems of all Dukovany NPP units for all design accidents.

SÚJB evaluated report of the consortium together with the results of the OECD-NEA BC

(Bubble-Condenser) Steering Group Activity Report and accepted conclusions included in these reports. Based on SÚJB inspection focused on present condition of all subsystems of the containment system, their qualification and maintenance documents as well as on present status of all modifications prepared and implemented by the power plant based on BCEQ projects results, SÚJB considers the updated demonstration of Dukovany NPP containment system availability to carry out its function during the accident and after the accident throughout design life span of the power plant sufficient, for all design accident types.

<u>ENSREG:</u>
In 2011, so-called "Stress Tests" were carried out at Dukovany NPP according to the ENSREG specification – focused review of safety margins of NPPs in connection with the events that occurred at the Fukushima NPP, i.e. extreme natural events seriously endangering safety functions and leading to severe accidents. This review included:

- Evaluation of NPP response to a set of extreme situations and their possible concurrence.
- Evaluation of preventive and mitigating measures selected on the basis of defense-in-depth philosophy: initiating events, subsequent loss of safety functions, severe accidents management.

Results of Stress Tests were summarized in the Final Report[1] [1-23] and through the National Report of the Results of Stress Tests of Czech Nuclear Power Plants[2] [1-24] submitted to experts appointed by ENSREG for assessment.

As the second phase of independent safety assessment of NPP, the so-called "Country Review" was carried out at SÚJB in Prague and at Dukovany NPP between 26th and 29th March 2012.

Results of the focused review of safety margins and resistance of NPP, required by the European Council, confirm efficiency and appropriateness of before adopted decisions to implement measures resulting in improved resistance of the original design. No issue was identified which would require an immediate action. The power plant is capable to manage safely even highly improbable, extreme emergency situations, without a risk for the surrounding areas. Based on the results of Stress Tests, an action plan to improve safety was drawn up for both Czech NPPs (see Annex 9). This includes a number of corrective measures, some of which were proposed before the event that occurred at Fukushima NPP and the Stress Tests confirmed their appropriateness.

Other activities

<u>Technical audit:</u>
A technical audit, Internal and external, was held at Dukovany NPP in 1993-1995.

The goal of the <u>internal technical audit</u> was to map the current status of the systems, structures and components of nuclear power plant units. That was evaluated using two approaches – first level PSA study and using a deterministic approach with the employment of Final Safety Analysis Report, related studies and analysis. The internal audit was performed by the plant's specialists of the licensee (ČEZ, a. s.), and the resulting output was an overall evaluation of the individual units, including proposal of modernization efforts relating to nuclear safety,

---

[1] *http://www.cez.cz/edee/content/file/energie-a-zivotni-prostredi/dukovany/zaverecna-zprava-zt-edu.pdf*
[2] *https://www.sujb.cz/fileadmin/sujb/docs/dokumenty/National_Report_Revision_1_for_web_1.pdf*

reliability and operation economics.

The goal of the external technical audit was to evaluate independently the level of nuclear safety assurance at nuclear power plant units in agreement with international standards and generally recognized nuclear safety principles. The assessment was performed within the PHARE PH 4.2.9 program by a consortium of West European companies – ENAC – using the methodology for periodic safety review of nuclear power plants issued by IAEA as Safety Series (SG-012) in cooperation with SÚJB. The final report contains a set of recommendations focusing particularly on enhancement of the so-called "defense in-depth", and methodical procedure.

PSR:
SÚJB conditioned the obtainment of approval for operation of Dukovany NPP units by performing Periodic Safety Review (PSR) in the extent specified in the IAEA Safety Guide No. NS-G-2.10. The first review was performed in 2005 – 2006 resulting in requirements for specific measures to enhance the level of safety assurance. The second review will start in 2013 and end in 2014. Results of this review will serve as a basis of an application for a permit for operation after 2015 (after 30 years of operation).

The licensee ČEZ, a. s. utilizes other instruments (probabilistic and deterministic) to monitor continuously and to evaluate periodically the nuclear safety of nuclear installations. These instruments are described in chapter 9.1.2.

1.1.2.2 Implemented and planned measures to improve the standard of nuclear safety

First implemented measures to enhance nuclear safety were executed within the "Back-fitting of Dukovany NPP" project. This project was created as a response to the first analyses after putting the units into operation and the first findings from the Chernobyl accident under Government Decree No. 309/1986.

The Czech Republic proceeded to this step as a number of other countries, despite the fact the Chernobyl reactor had had entirely different physical and technical parameters than the pressurized water reactors installed at Dukovany NPP. The project of the "Back-fitting" was completed in 1990; its implementation started in 1991 and was completed in 1996.

The assessment of equipment condition and international activities in 1992-1997 (see Chapter 1.1.2.1) resulted in MORAVA "Equipment Renovation Program" elaborated as a set of requirements on modification of Dukovany NPP equipment, ensuring safe, reliable and economical operation. The program is not closed in terms of time and subject, and is updated on an annual basis.

A subgroup of activities with direct relation to fulfillment of SÚJB and IAEA requirements was selected from the MORAVA program. This subgroup is called Modernization Program and its most important project is the "I&C Renovation" – replacement of safety-important parts for digital systems, which is performed in parts during unit outages.

At Units 1 - 4, the renovation of Instrumentation and Control Systems of the parts important to safety is fully implemented. The implementation of renovation of unit equipment of Instrumentation and Control Systems with the utilization of up-to-date control facilities was commenced at Unit 3 in 2009 with the deadline of completion in 2013. The implementation at the other units is executed in the following time intervals: Unit 1 – 2011 - 2015, Unit 2 – 2012 - 2015, Unit 4 – 2010 - 2014.

Total list of important modifications is included in Annex 1.

The National Action Plan drafted on the basis of the LTO project and Stress Tests is a new stage of further enhancement of safety level. For its scope see Annex 9.

1.1.3 Temelín NPP

1.1.3.1 Overview of nuclear safety assessments performed and their main conclusions

Assessment of the original design at Temelín NPP performed by Czech and Slovak specialists has been under way since the beginning of its construction. After 1989, the demand for construction of 4 Units was re-evaluated, and particularly, the level of nuclear safety assurance was assessed, taking into account experience from Western nuclear power plants. This assessment was carried out in the form of international missions aimed at independently assessing the original design and other aspects of the construction from the viewpoint of internationally recognized standards.

IAEA mission

<u>Site Safety Review, Design Review:</u>

A mission aimed at evaluating the site safety took place in April 1990 and the mission focused on evaluation of safety systems, core design and safety analyses was held at the turn of June and July 1990. Final reports from the missions [1-8], [1-10] included partial recommendations supposed to contribute to nuclear safety enhancement. The recommendations were applied both in the form of changes of and amendments to the design and within the organization of the construction and preparation for future operation.

<u>OSART:</u>
The Pre-OSART mission took place at the turn of April and May 1990 and it focused on practice in power plant construction and on preparation for safe operation [1-9].

Another OSART mission was held in 1992. The main conclusion of the mission was that in spite of a large number of recommendations from the previous mission the power plant had made sufficient progress in addressing findings formulated by the previous mission [1-11].

At the beginning of 2000, further mission Pre-OSART took place at Temelín NPP and full OSART mission took place in February 2001. Follow-up OSART mission took place in 2003– see Annex 3 to “The Czech Republic National Report 2004“.

The most recent mission OSART took place in November 2012 and examined 9 areas: Organization and Control, Operation 1, Operation 2, Maintenance, Technical Support, Feedback, Chemistry, Radiation Protection and Accident Management. [1−25] (see Annex 3).

<u>QARAT:</u>
The QARAT mission, held in 1994, aimed at verifying the quality assurance area. The group of experts confirmed distinct development in this area [1-12].

<u>LBB Application Review:</u>
Missions on LBB analysis took place in 1993, 1994 and 1995 at Temelín NPP. All missions concluded that LBB methodology was successfully applied at Temelín NPP in compliance with world practices, and that postulated fractures in deterministic analysis are unlikely to occur.

<u>Safety Issues:</u>
A mission evaluating Safety Issues identified by the IAEA for nuclear power plants with VVER-1000/320 type reactors [1-15] was held in 1996. The mission evaluated the plant's

upgraded design, implementation of previously proposed alterations and its preparedness for operation, including issue of compatibility of the original Russian design with proposed and implemented changes, which included the implementation of modern Western technology.

In general, the mission very highly commended the licensee, ČEZ, a. s., that they had spent a significant effort to improve the Temelín NPP's design [1-16]. The mission emphasized that the combination of Eastern and Western technology in the Temelín NPP design was very carefully considered. In the mission's opinion, in some cases such a combination of Eastern and Western technologies resulted in a significant improvement of the safety assurance level in comparison with international practices.

A follow-up mission of the same type took place in 2001. The status of each safety issue for VVER 1000/320 units as specified by IAEA can be found in Annex 2.

<u>IPERS, IPSART:</u>
IPERS – a mission on the PSA study took place in 1995 and 1996. The mission concluded that Temelín NPP carefully adopted PSA methodology and the results confirmed, in spite of conservative assumptions, a high level of power plant safety. In 2003, the IPSART mission reexamined the previous verifications and focused in detail on updated models of probabilistic safety assessment of the current design and operation of the power plant. A six-fold decrease in occurrence of the event resulting in reactor core damage was declared by means of these new probabilistic assessment models for internal initiation events.

<u>Fire Safety:</u>
A mission focused on fire protection took place in 1996. It was stated that substantial improvements were made in compliance with international trends of fire protection [1-14].

<u>IPPAS:</u>
A mission was organized in 1998 and focused on the field of physical protection assurance in the construction period. The mission further monitored the implementation process of physical protection technical system, safety analysis preparation and overall concept of the method of physical protection assurance. The experts appreciated the level of physical protection and its licensing. Final assessment proved that the system meets the international requirements in full.

A Follow-up mission took place in 2002. The objective of the mission was to assess the final state of Temelín NPP physical protection assurance on the level of operated nuclear installation, and as the case may be, present to Temelín NPP recommendations or proposals resulting in improvement of the physical protection system.

The mission concluded that technical support of Temelín NPP perimeter is implemented in an outstanding manner, the physical protection system is highly integrated and systematic approaches were used and are still used in implementation of the physical protection system. The physical protection system of Temelín NPP is on the level of the best Western installations and the personnel providing the physical protection system are qualified and professional.

<u>Preparedness and Commissioning Review mission:</u>
This mission took place in 2000. The objective was to assess operational practices in the field of Management, Organization and Control, Operation, Maintenance and Commissioning. The mission concluded that the systems are handed over and under control of operating organization in condition suitable for power plant commissioning.

Site Seismic Hazard Assessment:
A mission took place in 2003 and resumed partially the mission held in 1990. It was stated that local seismic monitoring network was built in linkage to the recommendations in the vicinity of Temelín NPP. The mission concluded that acceleration value of 0.1 g for seismic level (SL2) is an adequate value for Temelín NPP.

WANO mission

WANO Peer Review:
A mission took place for the first time in 2004 and the following fields were verified: Organization and Control, Operation, Maintenance, Technology, Radiation Protection, Operational Experience, Chemistry and Fire Protection. The WANO team classified Temelín NPP as having a good operation safety enhancement program, good and experienced personnel, and found no fundamental safety-important deficiencies [1-17].

A Follow-up Peer Review WANO mission took place in 2006. Out of 13 fields for improvement from the previous mission, six fields were assessed as completed in full and seven fields were assessed as fields with satisfactory improvement, but with uncompleted activities. At the same time, the mission submitted its proposals for further continuation in such fields [1-18].

The most recent mission WANO Peer Review took place at Temelín NPP in November 2011. The reviewed areas included, but were not limited to: radiation protection, emergency planning and personnel preparedness. Experts appreciated the high professionalism of personnel and the achieved safety level of power plant. The mission WANO summarized its findings in the form of 17 recommendations for improvement and 3 good practices for other NPP operators all over the world [1-26] (see Annex 3).

Assessment by EU

WENRA:
The assessment of nuclear safety in the EU candidate countries was carried out in 1998 and 2000. The following is included in the assessment report: the program for Temelín NPP safety enhancement is the most comprehensive one ever used for VVER-1000/320 units, international cooperation has significantly influenced safety improvements (design, operation, safety approvals) and development of safety culture at the plant, combination of Eastern and Western technologies has been successfully handled.

The process of combining Eastern and Western technologies was also evaluated by the ENCONET Consulting Company (Austria). The conclusion has been similarly favorable as that by WENRA.

AQG:
Two recommendations were included in the AQG report in relation to Temelín NPP: assure assessment proving sufficient protection against high-energy pipe break and potential subsequent damage to steam line and feedwater piping (short-term priority), and inform on measures to complete the proof of reliable function of important by-pass valves to atmosphere and safety valves at dynamic load with steam-water mixture flow. A report on implementation of these recommendations, which were adopted, was submitted to the EC in November 2002.

The high-energy pipe break protection is based on combination of extremely low probability of a sudden break of the pipeline under normal or abnormal operation conditions or in seismic event, application of French "super pipe" concept (that precludes sudden pipe break for the area from containment penetration to anchoring point), 100 % qualified ultrasonic inspections, corrosion-erosion monitoring program, etc. Whip restraints are installed at certain points in accordance with recognized Western standards. Computer programs used for assessment are validated in full.

Reliable function of important by-pass valves to atmosphere and safety valves for the case of occurrence of two-phase steam-water medium, i.e. qualification of respective valves, was demonstrated, in accordance with international standards, by creating new qualification set of knowledge. The principle is based on assignment of the valve under review to the group of valves of the same manufacturer and with comparable characteristics that were tested for full scope of required parameters.

<u>ENSREG:</u>

In 2011, the so-called "Stress Tests" were carried out at Temelín NPP according to the ENSREG specification – focused review of safety margins of NPPs in connection with the events that occurred at the Fukushima NPP, i.e. extreme natural events seriously endangering safety functions and leading to severe accidents. This review included:

- Evaluation of NPP response to a set of extreme situations and their possible concurrence
- Evaluation of preventive and mitigating measures selected on the basis of defense-in-depth philosophy: initiating events, subsequent loss of safety functions, severe accidents management

Results of Stress Tests were summarized in the Final Report[3] [1-27] and through the National Report of the Results of Stress Tests of Czech Nuclear Power Plants[4] [1-24] submitted to experts appointed by ENSREG for assessment.

As the second phase of independent safety assessment of NPP, the so-called "Follow-up fact finding visit ENSREG" was carried out at Temelín NPP between 10th and 12th September 2012.

Results of the focused review of safety margins and resistance of NPP, required by the European Council, confirm efficiency and appropriateness of before adopted decisions to implement measures resulting in improved resistance of the original design. No issue was identified which would require an immediate action. The power plant is capable to manage safely even highly improbable, extreme emergency situations, without a risk for the surrounding areas. Based on the results of Stress Tests, an action plan to improve safety was drawn up for both Czech NPPs (see Annex 9). This includes a number of corrective measures, some of which were proposed before the event that occurred at Fukushima NPP and the Stress Tests confirmed their appropriateness.

Other activities

<u>Consultants meeting</u> on the Temelín NPP design changes held at the IAEA Headquarters in 1994 in Vienna [1-13].

Study conducted by the ENCONET Consulting company on compatibility of Eastern and Western technologies – "The Temelin NPP Compatibility Study", 1996.

Positive environmental impact assessment of Temelín NPP by Technical University in Vienna

[3] http://www.cez.cz/edee/content/file/energie-a-zivotni-prostredi/temelin/zaverecna-zprava-zt-ete.pdf
[4] https://www.sujb.cz/fileadmin/sujb/docs/dokumenty/National_Report_Revision_1_for_web_1.pdf

(Atominstitut) in August 2001 .

PSR:

SÚJB conditioned the obtainment of approval for operation of Temelín NPP units by performing Periodic Safety Review (PSR) in the extent specified in the IAEA Safety Guide No. NS-G-2.10. The first review was performed in 2008 – 2010 resulting in requirements for specific measures to enhance the level of nuclear safety assurance. Results of this review served as one of the basis of an application for a permit for operation after 10 years of operation.

The licensee ČEZ, a. s. utilizes other instruments (probabilistic and deterministic) to monitor continuously and to evaluate periodically the nuclear safety of nuclear installations. These instruments are described in chapter 9.1.2.

1.1.3.2. Main changes in the design and other measures for the enhancement of nuclear safety implemented as a result of the analyses

Based on assessments mentioned in Chapter 1.1.3.1, technical improvements were proposed, implementation of which assured attainment of Western NPP standards for Temelín NPP. Recommendations were implemented in the form of amendment to the Basic and Detail design. The following may be mentioned as supporting improvements:

- Replacement of the I&C system, including its new design,
- Replacement of the nuclear fuel, including a new core design,
- Replacement of the original radiation monitoring system, including its design,
- Replacement and supplementing of the diagnostic system,
- Replacement of original cables with fire-proof and non-propagating fire ones,
- Significant changes in the electric part.

Total list of important modifications is included in Annex 1.

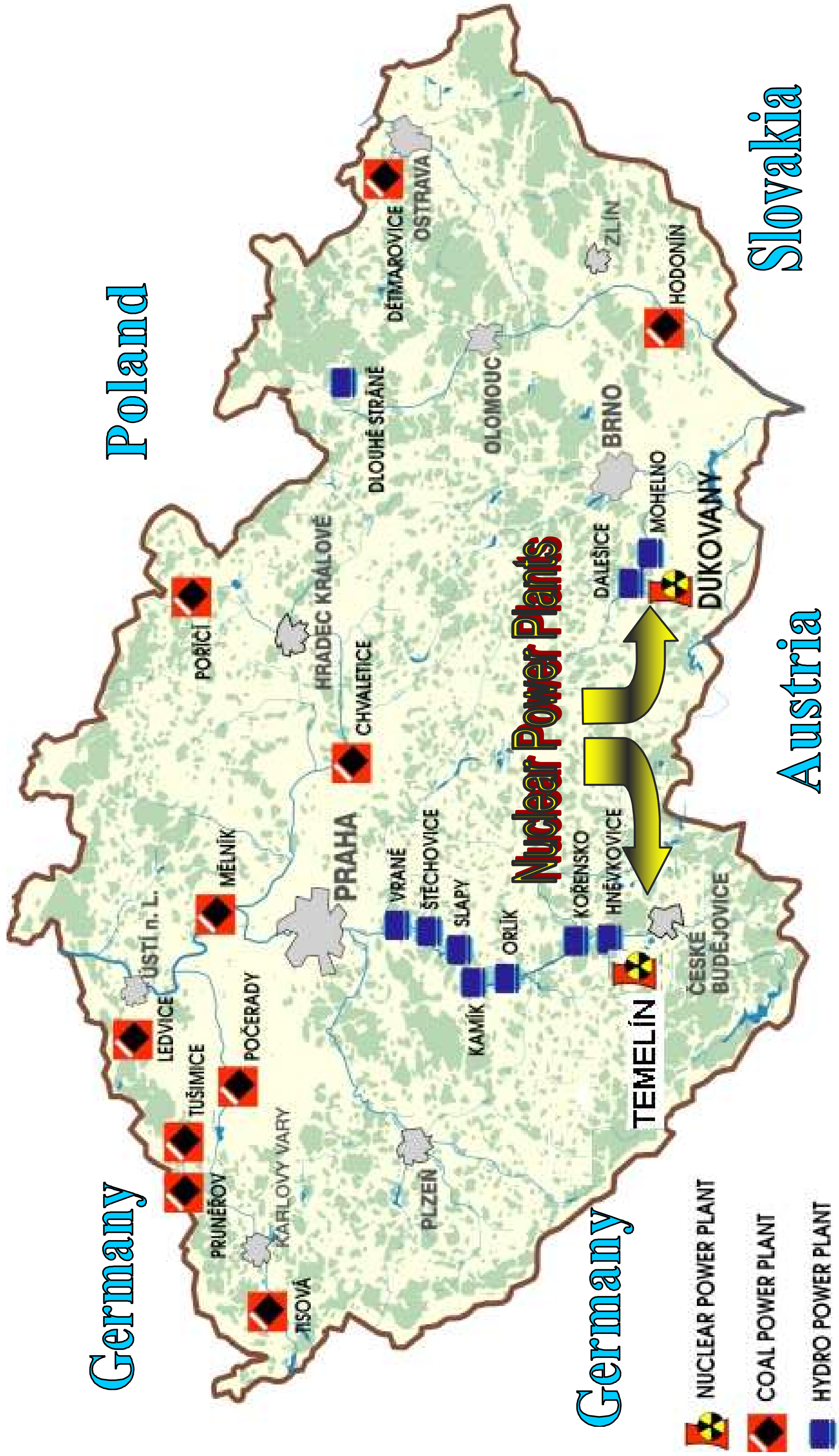
The National Action Plan drafted on the basis of the Stress Tests is a new stage of further enhancement of safety level. For its scope see Annex 9.

1.2 Statement on the implementation of the obligations concerning Article 6 of the Convention – position of the Czech Republic on the current status of nuclear safety and future operation of the nuclear installations

All the above-mentioned studies and analysis positive prove that the level of nuclear safety provision at Dukovany NPP and Temelín NPP units is high and in compliance not only with current requirements valid in the Czech Republic but also with internationally accepted practices.

The nuclear safety status has been systematically reviewed and evaluated from the viewpoint of the latest scientific and technical knowledge. Necessary activities are planned and implemented so that the current status is maintained or further improved in the future. By reasons provided in this chapter it is evident that the requirements resulting from Article 6 of the Convention are fulfilled.

Fig. 1-1 Map of the Czech Republic indicating the Temelín and Dukovany NPPs.



2. Legislative and Regulatory Framework - Article 7 of the Convention

1. *Each contracting party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.*
2. *The legislative and regulatory framework shall provide for:*

(i) the establishment of applicable national safety requirements and regulations;

(ii) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a licence;

(iii) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences;

(iv) the enforcement of applicable regulations and of the terms of licences, including suspension, modification or revocation.

2.1 Description of the current situation

2.1.1 Development of national legislative and regulatory framework

The legislative and regulatory framework for the nuclear energy industry in the Czech Republic has had a relatively long history. Its beginnings, dating back to second half of 1970s, are connected with the construction and operation of the first nuclear power plants with VVER reactors in former Czechoslovakia.

The next stage of the development of state supervision is connected with the establishment of the independent state Czech Republic at the turn of 1992–1993. The Act No. 21/1993 Coll. established the State Office for Nuclear Safety (SÚJB), which took over, from January 1, 1993, an office to carry out the state supervision of nuclear safety in the Czech Republic. Development of a new Act began practically at the same time, with the objective to comprehensively re-codify utilization of nuclear energy and ionizing radiation and, in particular, to address issues insufficiently regulated by then, e.g. radioactive waste management, liability for nuclear damages, emergency preparedness etc.

2.1.2 Valid legislation in the area of utilization of nuclear energy and ionizing radiation

The Atomic Act was approved by the Czech Republic's Parliament in January 1997. The Atomic Act entrusted execution of the state administration and supervision of peaceful utilization of nuclear energy and radiation practices to SÚJB and redefined the scope of its competency and powers.

The Atomic Act has defined conditions for peaceful utilization of nuclear energy and ionizing radiation, including the activities requiring SÚJB licence. An extensive list of obligations of the licensees includes, among other items, obligations relating to their preparedness for a radiation accident.

In the area of radioactive waste management, the Act entrusted responsibility for final disposal of all radioactive wastes to the state and ordered to the Ministry of Industry and Trade of the Czech Republic to establish a new governmental organization for the purpose – the

Administration of Radioactive Waste Repositories. Activities of the Administration shall be funded from the so-called "nuclear account" whose main income is represented by payments from radioactive waste producers.

The Atomic Act transferred into the Czech legal system a number of obligations resulting from the Vienna Convention on Civil Liability for Nuclear Damage and Joint Protocol relating to the Application of the Vienna and Paris Conventions, to which the Czech Republic acceded.

Since 1997 the Atomic Act has been amended several times. The most significant amendment was performed by the Act No. 13/2002 Coll., which was particularly adopted in connection with the preparation of the Czech Republic for accession to the European Union, aimed at enabling the implementation of obligations arising from newly concluded international treaties. In connection with this Act, which became effective on July 1, 2002, the respective SÚJB Decrees were amended. The provisions related to radiation protection were amended in particular by reason of assuring the compatibility with the respective European directives. Another significant amendment was performed by Act No. 253/2005 Coll., in connection with harmonization with international regulations in the field of technical safety. Last amendment of the Atomic Act was performed by Act No. 227/2009 Coll.

Other amendments were, among other things, affected by the adoption of Directive of the European Council No. 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations and creating a common harmonized framework in the area of nuclear safety after more than 50 years of existence of the European Union or its legal predecessors. This directive refers to the Safety Fundamentals set out by the International Atomic Energy Agency as a general framework for implementation of this directive.

This amendment also set a new method of SÚJB financing – fees for expert activities carried out by the State Office for Nuclear Safety were set for applicants for certain licences and certain licensees. Such fees are paid by the applicant once in relation to the application submitted to issue certain licences or the licensee pays, on a regular basis (yearly), the so-called maintenance fees so that the licence is to remain in force.

Such administration fees represent a contribution to the payment of SÚJB costs associated with the issue of such licences and with the state supervision over activities carried out by such licensees. It is estimated that the fees in the proposed amount will cover up to 60% of the envisaged budget of the State Office for Nuclear Safety. However, in the case of issuing licences to construct a significant nuclear installation, this proportion can increase, for instance, to more than 70%.

The abbreviation "Atomic Act" used hereinafter is used for quotation of Act No. 18/1997 Coll., as amended.

The Atomic Act authorized the SÚJB, and in strictly defined cases other bodies of the state administration, to issue a set of related implementing regulations, which are listed in detail in Annex 5, such as the following:

- ***SÚJB Decree No. 146/1997 Coll.,*** specifying activities directly affecting nuclear safety and activities especially important from radiation protection viewpoint, requirements on qualification and professional training, on method to be used for verification of special professional competency and for issue authorizations to selected personnel, and the form of documentation to be approved for the licensing of expert training of selected personnel, as amended by the SÚJB Decree No. 315/2002 Coll.,

- ***SÚJB Decree No. 215/1997 Coll.,*** on criteria for siting nuclear installations and very significant ionizing radiation sources,
- ***SÚJB Decree No. 106/1998 Coll.,*** on nuclear safety and radiation protection assurance during commissioning and operation of nuclear facilities,
- ***Government Order No. 11/1999 Coll***., on emergency planning zone,
- ***SÚJB Decree No. 195/1999 Coll.,*** on basic design criteria for nuclear installations with respect to nuclear safety, radiation protection and emergency preparedness,
- ***SÚJB Decree No. 307/2002 Coll.***, on radiation protection, as amended,
- ***SÚJB Decree No. 318/2002 Coll.,*** on details of emergency preparedness of nuclear installations and workplaces with ionizing radiation sources and on requirements on the content of on-site emergency plan and emergency rule, as amended by the SÚJB Decree No. 2/2004 Coll.,
- ***SÚJB Decree No. 319/2002 Coll.,*** on performance and management of the national radiation monitoring network, as amended by the SÚJB Decree No. 27/2006 Coll.,
- ***SÚJB Decree No. 185/2003 Coll.,*** on decommissioning of nuclear installation or workplaces of category III or IV,
- ***SÚJB Decree No. 193/2005 Coll***., sets the list of theoretical and practical areas forming the education and preparation content required in the Czech Republic for the performance of regulated activities belonging to the competence of SÚJB,
- ***SÚJB Decree No. 309/2005 Coll***., on assurance of technical safety of selected equipment,
- ***SÚJB Decree No. 132/2008 Coll.,*** on Quality Assurance System in carrying out activities connected with utilization of nuclear energy and radiation protection and on Quality assurance of selected equipment in regard to their assignment to classes of nuclear safety.

A list of the above-mentioned decrees is provided in the Annex 5, and a complete text of the Atomic Act, including its implementing decrees is available at the SÚJB web pages[5].

In 2000 the so-called "Emergency legislations" were adopted, a list of which, together with other legal regulations ensuring implementation of the Atomic Act, is provided in the Annex 5.

The legislative framework is concluded with recommendations and guidelines published since 1978 by SÚJB in a special non-periodic series of publications: "Safety of Nuclear Installations - Requirements and Guidelines". A total of 55 documents (guidelines, translations of IAEA recommendations, etc.) were issued in this series of publications in 1994 – 2007. The follow-up stage was the preparation of new or amendment of older guidelines aimed at incorporating the requirements of WENRA reference levels, which was completed in 2010.

The new Atomic Act and its implementing regulations are currently being prepared. This preparation is not primarily driven by the need to set completely new legal relations, but rather to supplement and mainly to specify the existing legal regulations on the basis of experience obtained from fifteen-year application of the Atomic Act (and related legislation) and with the use of the above mentioned new recommendations of international institutions and other new knowledge, both process knowledge and expertise. The enabling provisions of the existing Atomic Act require a thorough adjustment to create the implementing legal regulations.

[5] *www.sujb.cz*

Approval process, inspections and enforcement of compliance with the regulations

The basic legal standard governing the approval process for nuclear installations includes, in addition to the above-mentioned Atomic Act and Act No. 342/2006 Coll., the Building Act, as amended, effective as from January 1, 2007.

Other most important legal regulations related to this area are in particular Act No. 500/2004 Coll., on administrative proceedings, as amended; Act No. 552/1991 Coll., on state inspection, as amended; Act No. 100/2001 Coll., on environmental impact assessment as amended; Act No. 106/1999 Coll., on free access to information, as amended and Act No. 123/1998 Coll., on free access to environmental information, as amended as well as other legal regulations.

According to the Building Act, the issuance of key resolution for all installations with nuclear facilities, i.e. planning and site decision, is entructed to the Ministry of Regional Development. The Ministry of Industry and Trade is now entrusted with the issuance of other resolutions (construction permit, operation licence and decommissioning permit).

Provided the related procedure involves interests protected by special regulations, such as nuclear safety or radiation protection, the department of planning and building control shall decide in cooperation with or based on an approval from the respective state administration bodies protecting such interests. A respective state administration body shall condition its approval upon fulfillment of conditions specified in its resolution issued in agreement with the special act entitling the body to do so. The bodies include in particular:

- technical inspection bodies dealing with conventional safety, including safety of pressure components and electric systems,
- regional and municipal authorities in respect to fire safety, waste management, water consumption and effluents discharge,
- Czech Environmental Inspection – in respect to air pollution,
- Local body in charge of public health protection in respect to industrial safety in agreement with Act No. 258/2000 Coll., on public health protection, as amended.

Section 110 paragraph 2 of the Building Act directly imposes liability upon the operator to present binding approaches to respective departments of planning and building control according to special regulations, in this case of the Atomic Act.

The Atomic Act establishes activities for which a licence issued by the SÚJB is required. Apart from the main activities - siting, construction and operation, there are a number of other activities, e.g. the SÚJB licences for individual stages of nuclear installation commissioning, for reconstruction or other changes affecting nuclear safety, for discharge of radionuclides into the environment, etc. More detailed information is provided in chapter 3.2.2.

Act No. 100/2001 Coll., on Environmental Impact Assessment, as amended, impose the obligation to assess installations from the viewpoint of their impact on the environment (the so-called “Environmental Impact Assessment”), within a separate procedure preceding the licensing procedure. This procedure involves the affected municipalities, authorities and the public represented by individuals as well as civil associations. The Ministry of the Environment is the relevant authority responsible for the issuance of an opinion concerning the environmental impact of the nuclear power plant.

Inspection activities to be performed by the SÚJB are defined in detail in Section 39 of the Atomic Act, as well as in Act No. 552/1991 Coll. on state inspection, as amended.

Instruments applied to enforce the legislative requirements are regulated by Sections 40 and 41 of the Atomic Act. The SÚJB is authorized to require the inspected person to remedy the situation, to perform technical checks, inspections or functional ability tests and to impose penalties for violating obligations established in the Atomic Act.

In case there is a risk of delay, the SÚJB is authorized to impose the obligation to reduce the power output or to suspend operation of the nuclear installation. Issues of alteration, cancellation and cessation of a licence are regulated by Section 16 of the Atomic Act, which authorizes the SÚJB to restrict or to suspend performance of the licensed activity if the licensee has failed to fulfill the obligations thereunder.

More details of the legislation mentioned above and the licensing procedure below, are described later, particularly in chapters 9, 10, 11, 12, 13 and 14.

2.1.3 Multilateral international treaties and treaties with IAEA

The following international treaties signed by the Czech Republic (or the former Czechoslovak Socialist Republic and later the Czech and Slovak Federal Republic) are a part of the valid Czech legislation in the given area:

- The Convention on the Physical Protection of Nuclear Materials (in Vienna on October 26, 1979, communication of the MZV No. 27/2007 Coll.).
- The Convention on Early Notification of a Nuclear Accident (in Vienna on September 26, 1986, communication of the MZV No. 116/1996 Coll.).
- The Convention on Assistance in the Case of a Nuclear or Radiation Accident (in Vienna on September 26, 1986, communication of the MZV No. 115/1998 Coll.).
- Nuclear Safety Convention (in Vienna on June 17, 1994, communication of the MZV No. 67/1998 Coll.).
- Vienna Convention on Civil Liability for Nuclear Damage (in Vienna on May 21, 1963, ratified, communication of the MZV No. 133/1994 Coll., adjust by communication of the MZV No. 125/2000 Coll.).
- The Joint Protocol relating to the Application of the Vienna and Paris Conventions on Liability for Nuclear Damage (in Vienna in 1988, ratified, communication of the MZV No. 133/1994 Coll.).
- The Protocol on Amendment to the Vienna Convention on Civil Liability for Nuclear Damage (in Vienna on September 12, 1997, signed by the Czech Republic in June 18, 1998, however it has not been ratified yet). By virtue of Act No. 158/2009 Coll., the Czech Republic adapted the amount of liability of the operators and state guarantees to this protocol.
- The Comprehensive Nuclear Test Ban Treaty (has not became valid as yet, the Czech Republic's Government Order No. 535/1996).
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radiological Waste Management (in Vienna on September 30, 1997, UV No. 593/1997, ratified on March 26, 1999).
- The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) (Decree by the MZV No. 61/1974 Coll., of March 29, 1974).

- The Convention on Supplementary Compensation for Nuclear Damage (in Vienna on September 12, 1997, the Government Order No. 97/1998, signed by the Czech Republic, however has not been ratified).
- The Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, February 25, 1991, ratified on February 26, 1991, Decree by the MZV No. 91/2001 Coll.).
- The Convention on Korean Energetics Development Organization (KEDO) – letter of the MZV on acceptance of the Agreement of March 9, 1995 and of the supplemental Protocol of 1997 by the Czech Republic dated January 27, 1999; the Czech Republic became a member on February 9, 1999.
- The Agreement between the Czech Republic and the International Atomic Energy Agency on Safeguards, based on the Treaty on Non-proliferation of Nuclear Weapons (in Vienna on September 18, 1996, through communication of the MZV No. 68/1998 Coll.).
- The Supplemental Protocol to the Agreement between the Czech Republic and the International Atomic Energy Agency on Safeguards, based on the Treaty on Non-proliferation of Nuclear Weapons (in Vienna on September 28, 1999, through communication of the MZV No. 74/2003 Coll.).
- Adapted supplemental Agreement on Technical Assistance provided by the International Atomic Energy Agency to Government of the Czech and Slovak Federal Republic (in Vienna on September 20, 1990, through communication of the MZV No. 509/1990 Coll.).

The obligation to inform about significant events relating to nuclear safety is also established in the bilateral agreements entered into by the Czech Republic or its predecessors.

2.1.4 WENRA

Early in 2006, the WENRA released results of the work of two working groups – Reactor Harmonisation (RHWG) and Wastes and Decommissioning (WGND). The RHWG group prepared the harmonization study in the field of nuclear safety of nuclear installations, which encompassed comparison of national legislation with the so-called reference safety levels. The reference levels in 18 subject areas for NPP design and operation were based on new, partially modified, IAEA recommendations (Safety Standards) for this area. This comparison showed that these requirements are formulated in the overwhelming majority of the countries in documents on the operative level, e.g. in decisions, permits, etc., however, not directly in legally binding documents of act and decree types.

The objective of WENRA is to complete the harmonization of national legislation with reference levels by the end of 2010. In April 2006, the SÚJB established a working group to analyze the current state in detail and draw up a draft Action Plan, which was presented in WENRA session. Thus, the work on national legislation harmonization is in progress in compliance with this plan including preparation of SÚJB safety instructions.

The SÚJB experts actively participated in the work of both WENRA working groups, and the SÚJB representative presides over the WGWD (Working Group on Waste and Decommissioning). The Czech Republic took over the presidency of the WENRA for three years on November 10, 2006.

2.2 Statement on the implementation of the obligations concerning Article 7 of the Convention

A system of the described legal documents – acts, decrees, governmental orders, international treaties and intergovernmental agreements by its nature and contents meets the requirements established in paragraphs 1 and 2 of Article 7 of the Convention.

3. Regulatory Body - Article 8 of the Convention

(i) Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 8, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities;

(ii) Each Contracting Party shall take appropriate steps to ensure effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.

3.1 Description of the current situation

3.1.1 Mandate and competence of the regulatory body

The SÚJB was established through the Act No. 21/1993 Coll., passed by the Czech National Council as a central authority of the state administration of the Czech Republic. In agreement therewith after the dissolution of the Czech and Slovak Federal Republic, the SÚJB assumed power and competency of the former ČSKAE in respect to the state supervision of nuclear safety and nuclear materials. In July 1995 the Czech Republic's Parliament extended the SÚJB competence to include issues of protection against ionizing radiation. As a result Czech Regulatory bodies in charge of nuclear safety and radiation protection have merged and the SÚJB has become an integrated state administration body which carries out the state supervision for the whole area of the utilization of nuclear energy and ionizing radiation.

Since July 1, 1997 the competence of the SÚJB has been defined by the Atomic Act according to its Section 3:

(1) State administration and supervision of the utilization of nuclear energy and ionizing radiation and in the field of radiation protection shall be performed by the State Office for Nuclear Safety (hereafter referred to as "SÚJB").

(2) SÚJB

a) shall carry out State supervision of nuclear safety, nuclear items, physical protection, radiation protection, emergency preparedness and technical safety of selected equipment and shall inspect the adherence to the fulfillment of the obligations arising out of this Act;

b) shall monitor non-proliferation of nuclear weapons and carry out state supervision of nuclear items and physical protection of nuclear materials and nuclear installations;

c) shall issue licences to perform practices governed by this Act and shall issue type-approvals for packaging assemblies for transport and storage of nuclear materials and radioactive substances given in an implementing legal regulation, ionizing radiation sources and other products;

d) shall issue authorizations for activities performed by selected personnel;

e) shall approve documentation, programs, lists, limits, conditions, methods of physical protection assurance, emergency rules and, subject to discussion with the relevant Regional Authorities and relevant Municipal Authorities of Municipalities with extended *competence of compatibility with off-site emergency plans, on-site emergency plans and their modifications;*

f) shall establish conditions, requirements, limits, maximum permitted levels, maximum permitted levels of radioactive contamination of foodstuffs, guidance levels, dose constraint, reference levels, diagnostic reference levels, exemption levels and clearance levels;

g) shall establish the emergency planning zone and, if applicable, its further structuring, and shall approve delineation of the controlled area;

h) in accordance with an implementing legal regulation, shall establish requirements on emergency preparedness of licensees, and shall inspect their fulfillment;

i) shall monitor and assess the exposure status and regulate exposure of individuals;

j) shall issue, register and verify personal radiation passport; related details shall be set out in an implementing legal regulation;

k) shall provide information to municipalities and Regional Authorities concerning radioactive waste management within their territory of administration;

l) shall control the activity of the National Radiation Monitoring Network, the functions and organization of which shall be set out in an implementing legal regulation, shall provide for the functioning of its head-office, and shall provide for the activities of an Emergency Response Center and for an international exchange of information on the radiation situation;

m) shall establish State and Professional examination commissions for verification of special professional competence of selected personnel, and shall issue statutes for these commissions and specify activities directly affecting nuclear safety and activities especially important from the radiation protection viewpoint;

n) shall maintain a State system of accounting for and control of nuclear materials and data and information in accordance with international agreements binding on the Czech Republic, and shall set out requirements for accounting methods and inspection thereof in an implementing legal regulation;

o) shall maintain a national system for registration of licensees, registrants, imported and exported selected items, ionizing radiation sources, and a record of exposure of individuals;

p) shall ensure, by means of the National Radiation Monitoring Network and based on assessment of a radiation situation, the availability of background information necessary to take decisions aimed at reducing or averting exposure in the case of a radiation accident;

r) shall approve a classification of nuclear installation or its components and nuclear materials into appropriate categories, from the physical protection viewpoint;

s) shall perform the function of the national authority for an international verification of a comprehensive ban of nuclear tests;

t) shall ensure international co-operation within its sphere of competence and, in particular, shall be an intermediary of technical co-operation with the International Atomic Energy Agency, and within its sphere of competence shall communicate information to the European Commission or, if applicable, to other bodies of the European Union;

u) shall decide on assurance of handling nuclear items, ionizing radiation sources or radioactive wastes have been treated inconsistently with rules of law, or where the detrimental condition is not being removed;

v) shall be obliged to give out information according to special legal provisions and once a year to publish a report on its activities and submit it to the Government and to the public;

w) shall establish technical requirements to assure technical safety of selected systems, structures and components;

x) upon agreement with the administration office, shall inspect the activity of the authorized persons;

y) shall exercise the opinion on development policy and planning documents from the viewpoint of safety and radiation protection in activities related to nuclear energy utilization and in activities resulting in exposure.

In 2005, the competence of the SÚJB has been extended pursuant to amendment of the Atomic Act by including the competence of the surveillance of technical safety of special-designed systems, structures and components for nuclear installation (see letter w) and x) above). Special-designed systems, structures and components for nuclear installations may be used on their assessment by legal person entrusted for this purpose by procedure according to special legal regulation.

The competence of the SÚJB has been further extended by Act No. 19/1997 Coll., to include state administration and inspecting of the ban on chemical weapons and by a similar amendment governed by the Act No. 281/2002 Coll., in respect to the ban on biological weapons.

3.1.2 Rights and responsibilities of the regulatory body

Section 9, paragraph 1 of the Atomic Act establishes the following conditions for the utilization of nuclear energy and ionizing radiation:

(1) A license issued by the SÚJB is required for:

a) siting of a nuclear installation or radioactive waste repository;

b) construction of a nuclear installation;

c) particular stages, laid down in an implementing legal regulation, of nuclear installation commissioning;

d) operation of a nuclear installation;

e) restart of a nuclear reactor to criticality following a fuel reload;

f) reconstruction or other changes affecting nuclear safety, radiation protection, physical protection and emergency preparedness of a nuclear installation or category III or IV workplace;

g) particular stages of decommissioning of a nuclear installation or category III or IV workplace to the extent and in the manner established in an implementing legal regulation;

h) discharge of radionuclides into the environment to the extent and in the manner established in an implementing legal regulation;

i) ionizing radiation sources management to the extent and in the manner established in an implementing regulation;

j) radioactive waste management to the extent and in the manner established in an implementing legal regulation;

k) import or export of nuclear items or transit of nuclear materials and selected items;

l) nuclear materials management;

m) transport of nuclear materials and radioactive substances laid down in an implementing legal regulation; this licence does not relate to the person performing the transport, or to *the carrier, unless he is simultaneously the shipper, or consignor or consignee;*

n) professional training of selected personnel (Section 18 paragraph 5);

o) re-import of radioactive waste originated in the processing of materials exported from the Czech Republic;

p) international transport of radioactive wastes to the extent and in the manner established in an implementing regulation;

r) performance of personal dosimetry and other services significant from the viewpoint of radiation protection to the extent and in the manner established in an implementing regulation;

s) adding of radioactive substances into consumer products during their manufacturing or preparation or import or export of such products.

Other provisions of the Atomic Act define:

- conditions to be fulfilled before a licence is issued (Section 10),
- probity and professional competence of the applicant for a licence (Sections 11 and 12),
- application for a licence (Section 13),
- SÚJB administrative procedure (Section 14),
- licence particulars (Section 15),
- alterations, cancellations and cessation of licence (Section 16).

Execution of the state supervision of peaceful utilization of nuclear energy and ionizing radiation is governed by Chapter 6 of the Atomic Act, which comprises:

- supervising activities of the SÚJB (Section 39),
- remedial measures (Section 40),
- penalties (Sections 41 and 42).

Thus, the Atomic Act, together with Act No. 552/1991 Coll., on state inspection, as amended, which generally governs procedure of the state administration bodies when performing inspection activities, provides the SÚJB with corresponding power and competency for execution of the state supervision. The SÚJB checks whether the bodies which obtained a licence in accordance with Section 9, paragraph 1 observe the requirements of the Atomic Act and other relevant regulations. Inspection activities of the SÚJB are governed in detail by Section 39, paragraph 1 of the Atomic Act.

The SÚJB inspection staff is nuclear safety and radiation protection inspectors appointed by the Chairperson of the SÚJB. They work at the SÚJB Headquarters and directly at the sites of Dukovany and Temelín nuclear power plants, as well as in the Regional Centers (see Chapter 3.1.4). Within their inspection activities, the inspectors and also the Chairperson of the SÚJB are particularly authorized to:

- enter at any time facilities, installations, operational areas, territories and other workplaces of inspected persons where activities related to nuclear energy utilization or radiation practices are carried out,
- check on the compliance with requirements and conditions of nuclear safety, radiation protection, physical protection and emergency preparedness and inspect the nuclear installation conditions, adherence to the limits and conditions and operational procedures,

- demand evidence of fulfillment of all set obligations for the provision of nuclear safety, radiation protection, physical protection and emergency preparedness of a nuclear installation and to perform measurements and collect samples at the premises of inspected persons, such as are necessary for checking the compliance with the Atomic Act and other regulations issues on its basis,
- verify professional competence and special professional competence under the Atomic Act,
- participate in investigations of events with an impact on nuclear safety, radiation protection, physical protection and emergency preparedness, including unauthorized handling of nuclear items or ionizing radiation sources.

The SÚJB inspectors shall be authorized, depending on the nature of the identified shortcoming, to:

- require the inspected person to remedy the situation within a set period of time,
- charge the inspected person to perform technical inspections, reviews or testing of function condition of the installation, its parts, systems or its assemblies, if necessary for verification of nuclear safety;
- propose a penalization.

The SÚJB is authorized, in the event of a hazard arising from delay or an occurrence of undesirable situations with an impact on nuclear safety, radiation protection, physical protection and emergency preparedness, to issue a provisional measure imposing on the inspected person the obligation to reduce the power output or suspend operation of the nuclear installation, suspend an installation of components or systems of nuclear installations. Further it is authorized to prohibit the handling of nuclear items, ionizing radiation sources or radioactive waste, or impose on the inspected person to suffer the imposition of management by another person, at the expense of the inspected person.

The SÚJB is entitled to cancel the licence if its holder ceases to fulfil the conditions decisive for its granting or if the holder does not fulfil his duties stipulated by the Atomic Act or if he does not eliminate the shortcomings detected by the SÚJB by the deadlines determined by the SÚJB. In addition, the SÚJB is entitled to cancel the licence if its holder applies for the cancellation in writing and he proves that he has assured nuclear safety and radiation protection.

Violation of a legal obligation established in the Atomic Act may be fined by the SÚJB with a penalization up to the amount specified in Section 41 and in agreement with the rules specified in Section 42. The binding procedures for inspection activities are set forth in the SÚJB internal regulations.

3.1.3 Position of the regulatory body within the state administration structure

The SÚJB is an independent central state administration body in the field of nuclear safety and radiation protection. Within its power and competency the SÚJB is responsible neither to the Ministry of Trade and Industry nor to the Ministry of the Environment. The statute of the SÚJB within the state administration structure is shown in Fig. 3-1. The SÚJB has its own budget approved by the Chamber of Deputies of the Parliament of the Czech Republic as a part of the state budget. The SÚJB is headed by a Chairperson appointed by the Government of the Czech Republic. Since 1984 the SÚJB (theretofore ČSKAE) submits regular annual reports on results of its activities to the Government of the Czech Republic.

3.1.4 Structure of the regulatory body, its technical support, material and human resources

For 2013, the SÚJB has established 203 posts attributed, of which approximately 2/3 are occupied by nuclear safety and radiation protection inspectors. The approved budget of the SÚJB costs for 2013 amounts to approximately CZK 354 million (approximately EUR 13.7 million), of which CZK 323 million (approximately EUR 12.5 million) is allocated to performance of the SÚJB functions and CZK 31 million (approximately EUR 1.2 million) is allocated to development programmes of the Office. In the current conditions of the Czech Republic, material and human resources are sufficient for fulfilment of the basic functions imposed by the Atomic Act.

The organizational structure of SÚJB is shown in Fig. 3-2, and it consists of:

- Deputy for Nuclear Safety, including Nuclear Safety Assessment Section with conception Unit and Analytical Support Unit and Feedback Unit. Nuclear Installation Inspection Section with System Inspection Unit and two Units of Site Inspectors (at Dukovany NPP and Temelín NPP) and Spent Fuel and Radwaste Management Unit;
- Deputy for Radiation Protection, which includes Exposure Regulation Section including National Sources Unit and the Regional Center in Hradec Králové and Record and Irradiation Assessment Unit, Radioactive Sources Section including the Regional Centers in Prague, Plzeň, Ústí nad Labem,and Ostrava, Radiation Protection of Fuel Cycle Section including the Regional Centers in Kamenná, České Budějovice and Brno;
- Deputy of Management and Technical Support, which includes International Cooperation Section, Financial Section with Accounting Unit, and Office Bureau, Legal Unit and Non-Proliferation Supervision Section including Non-proliferation of Nuclear Weapons Unit, Non-proliferation of Chemical Weapons Unit and Non-proliferation of Biological Weapons Unit;
- Emergency Response Center;
- EU Cooperation Division;
- Internal audit and Financial Supervision;
- Director for Security Affairs;
- Advisory Board of SÚJB Chairperson;
- Secretariat of SÚJB Chairperson.

Moreover, contributions to public research institutions established by the SÚJB are financed from SÚJB budget. These include the National Institute for Nuclear, Chemical and Biological Protection (SÚJCHBO, v. v. i.) and also the National Radiation Protection Institute (SÚRO, v. v. i.) from 1st January 2011. As a public research institute, this Institute was formed by transforming from the original organizational body of the state. SÚJCHBO, v. v. i. primarily provides expert and technical support to the SÚJB in the area of chemical and radiation safety; SÚRO, v. v. i. provides expert and technical support in the area of radiation protection. In 2013, the planned volume of financial contributions to these two institutes amounts to CZK 71 million (EUR 2.7 million).

Advisory groups made up of independent experts have been used since 1998 to provide expert support to the SÚJB in respect to nuclear safety and radiation protection.

3.1.5 Relations between the regulatory body other state administration bodies

It is obvious from the above-listed legislative documents and the state administration structure in the Czech Republic, that power and competency of the SÚJB are sufficient to perform the state supervision of nuclear safety and radiation protection. At the same time the scope of powers assigned to the SÚJB does not clash with that of any other state administrative body.

3.1.6 Independent assessments of the national regulatory body

Chapters 2 and 3 hereof describe the changes in the supervisory and legislative framework introduced in the second half of 1990s. After their completion and full implementation in the Czech Republic the International Atomic Energy Agency were requested to independently assess results of the said efforts. The assessment was performed by two IRRT missions, which reviewed the SÚJB in January 2000 and in June 2001.

The first review was a reduced-scope inspection mission focusing mainly on SÚJB activities relating to the licensing procedure for Temelín NPP. The inspection team drew the following conclusions from the mission:

- there is a clearly defined legislative framework in place for Temelín NPP licensing and the SÚJB is required to issue a licence for each defined key stage throughout the construction and acceptance period;
- the SÚJB has established requirements as the state regulatory body in respect to the level of nuclear safety assurance at Temelín NPP and has adopted a flexible approach to assure that the adopted inspection and assessment criteria are fulfilled;
- the SÚJB has a previously established plan of inspections applied by its inspectors who check on and confirm that the licensee is commissioning the plant in agreement with the conditions specified in the respective licences;
- experience and assistance of regulatory bodies from West European countries and the USA have been employed to develop an appropriate state regulatory system in respect to licensing, supervision, assessment and inspecting of Temelín NPP.

Members of the reviewing team handed over several recommendations to the SÚJB whose implementation might further strengthen performance of the state supervision. All suggestions and recommendations concern the long-term development of the SÚJB and arise from current methodical procedures and the achieved results.

The second mission performed a full-scope review of state supervisory activities in peaceful utilization of nuclear energy and ionizing radiation. Twelve experts from nine countries (Germany, USA, Great Britain, Finland, Slovenia and Switzerland plus observers from Austria and Armenia) carried out a detailed review of all aspects of state supervisory activities performed by the SÚJB under the Atomic Act, including supervision of nuclear safety, radiation protection, emergency planning and transports of radioactive materials.

According to the results presented by the experts in a final report from the mission, the experts concluded that both the legislative framework and execution of the state supervision of peaceful utilization of nuclear energy and ionizing radiation were at a very good standard, on par with worldwide accepted practices.

In respect to the position of the regulatory body in the state administration structure, the experts highlighted the fact that the SÚJB was independent not only "de jure" but also "de facto". The experts naturally also worded specific recommendations whose implementation may further increase the standard of supervision in the Czech Republic. The recommendations focused on, for example, emergency preparedness practicing and further development in utilization of probabilistic assessment methods in nuclear safety. It was expressly stated, however, that these recommendations were mostly intended for the long-term development of the SÚJB.

The resulting reports from both IRRT missions have been published on SÚJB website. The IRRS mission is planned for November 2013.

3.2 Statement on the implementation of the obligations concerning Article 8 of the Convention

Independent position of the SÚJB, as a regulatory body within the state administration structure of the Czech Republic, its power and competency, financial and human resources fully conform to Article 8 of the Convention.

Fig. 3-1
Statute of the State Office for Nuclear Safety within the State Administration

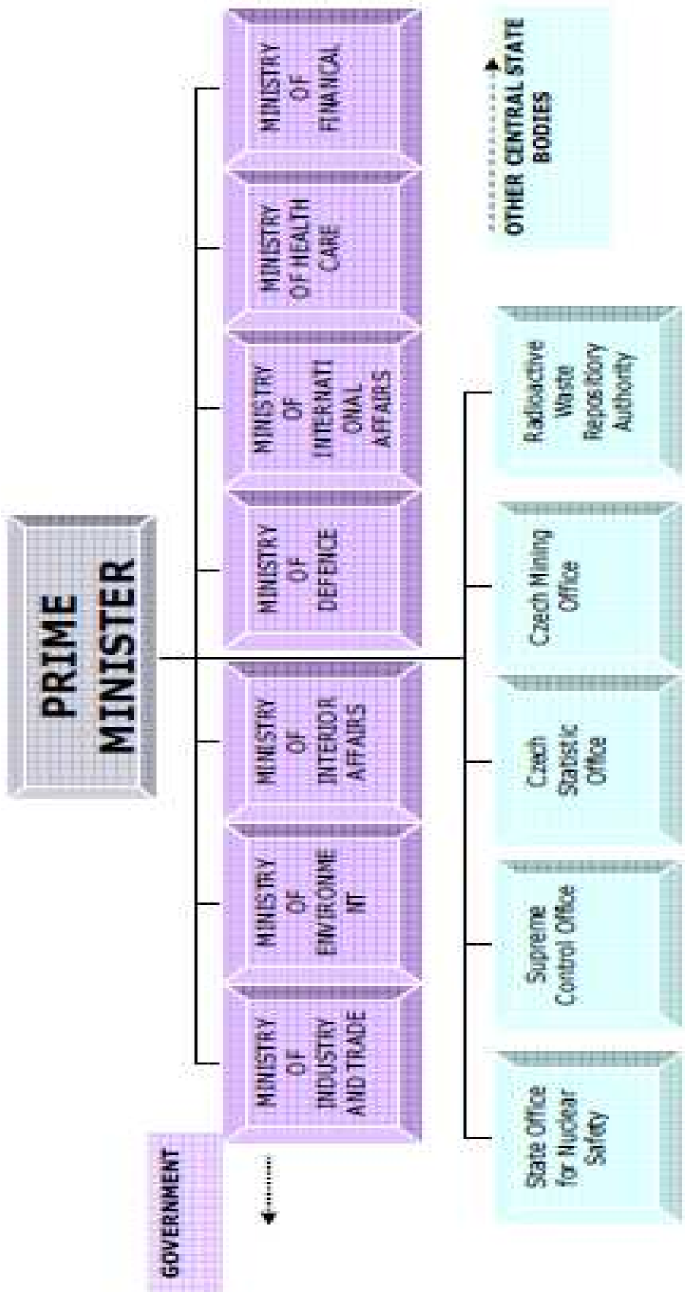
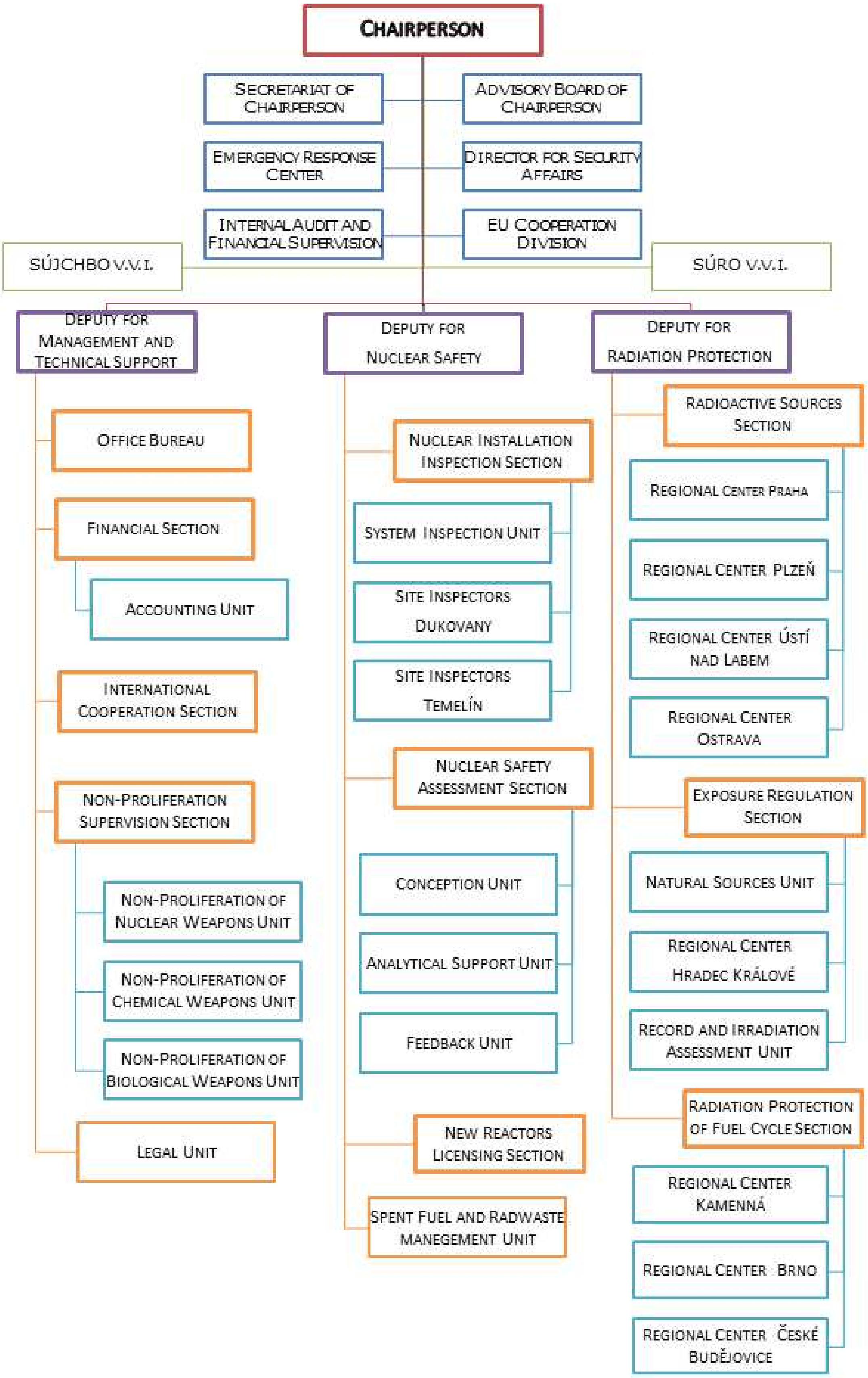


Fig. 3-2 Organizational Chart of the State Office for Nuclear Safety



4. Responsibilities of the Licensee - Article 9 of the Convention

Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.

4.1 Description of the current situation

In accordance with the current legislation of the Czech Republic represented particularly by the Atomic Act, the principle of responsibility of a licensee for nuclear safety of a nuclear installation has been broken down into a number of partial responsibilities, which together represent the over-all responsibility of a licensee for nuclear safety.

These partial responsibilities are specified particularly in Section 17 and Section 18 of the Atomic Act. The basic obligation of the licensee is to provide for nuclear safety, radiation protection, physical protection and emergency preparedness of its nuclear installation, as defined in paragraph 1, letter a) of Section 17, which prohibits transfer of responsibility for nuclear safety to any other person. The obligation of the licensee to provide technical safety is defined in paragraph 1 letter m) of Section 17. Other provisions subsequently define necessary obligations in respect to the nuclear safety assurance, e.g.:

- systematically assess and maintain nuclear safety and radiation protection, applying the most advanced tools of science and technology,
- comply with technical and organizational conditions of safe operation, with the conditions of the licence and approved quality assurance programs,
- investigate, without any delay, any violation of those conditions and take remedial measures and measures preventing repeated occurrence of such situations,
- report, without any delay, about events important for nuclear safety.

One of the main tasks of the state supervision of nuclear safety is monitoring of fulfillment of and adherence to the above-mentioned requirements. The rights of inspectors of nuclear safety and radiation protection are defined, as mentioned above, in Section 39 of the Atomic Act. In agreement therewith, the inspectors check on compliance with the requirements for and conditions of nuclear safety, radiation protection, physical protection, emergency preparedness and technical safety and inspect the nuclear installation conditions, adherence to the Limits and Conditions and operating procedures and demand evidence of fulfillment of all established obligations.

Dukovany NPP and Temelín NPP are owned by the ČEZ, a. s. which has, as a licensee, the primary responsibility for nuclear safety of its nuclear installations. The licensee has its own inspection system in place to check the fulfillment of requirements of the Atomic Act. In accordance with the Quality Assurance Program and other documents of the licensee, the check of observance of the duties laid down in the Atomic Act is ensured.

Based on the system, in case of an event affecting nuclear safety, radiation protection, physical protection, emergency preparedness and technical safety, the events importance for nuclear safety are registered and investigated by the licensee, and remedial measures are introduced to prevent their repeated occurrence. The licensee shall immediately communicate these events to the SÚJB for supervision of nuclear safety. Non-significant safety related events are also the subject of investigation and in such cases the investigation results, including the adopted remedial measures to assure that the events are not repeated, are subsequently transmitted. The whole process is regularly and systematically evaluated and monitored by the SÚJB inspectors.

The level of nuclear safety, radiation protection, physical protection and emergency preparedness is continuously assessed using the system of internationally comparable indicators. The safety assurance is also subject to the external independent mission, for example performed by the IAEA and the WANO. Results of the IAEA assessments, in which the state supervision does not take part are transmitted and discussed with the SÚJB.

The licensee continuously verifies and updates all documents, which represent the basis and condition for issuance of the licence, in particular the Safety Report and safety analyses. These updates are submitted to the SÚJB for appraisal on a regular basis.

To assure continuous supervision and complex awareness of the state supervision of nuclear power plants, and to perform the de facto continual inspection activities, personnel of the state supervision of nuclear safety are permanently present at Dukovany NPP as well as at Temelín NPP – the so-called "resident inspectors".

As a part of cooperation with similar nuclear power plants currently in operation Dukovany NPP and Temelín NPP have an agreement with the Slovak plants – Bohunice NPP and Mochovce NPP. Based on the agreement there a periodic exchange of experience and knowledge associated with operational audits is performed by the partners, similar to the WANO Peer Review, or the OSART.

Another important obligation of the licensee mentioned in the Atomic Act is their liability for nuclear damage caused by operation of their nuclear installations (Section 33 of the Atomic Act).

4.2 Statement on the implementation of the obligations concerning Article 9 of the Convention

Current legal provisions dealing with the basic responsibility of licensees for nuclear safety in their nuclear facilities are defined in accordance with the requirements introduced in Article 9 of the Convention.

5. Priority to Safety - Article 10 of the Convention

Each Contracting Party shall take appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.

5.1 Description of the current situation

5.1.1 Principle of priority to nuclear safety in the Czech legislation

The principle of priority to nuclear safety has been incorporated into the Atomic Act. Chapter 2 of this Act establishes general conditions for the performance of activities related to the utilization of nuclear energy. Section 4, paragraph 3 of the Act unequivocally establishes that:

"Whoever performs practices related to nuclear energy utilization or radiation practices shall proceed in such a manner, that nuclear safety and radiation protection are ensured as a matter of priority."

The above-quoted principle is contained in all legal regulations, which are related to the Atomic Act in the Czech legal system and break down into details its basic requirements (see Chapter 2).

5.1.2 Implementation of principles established in the legislation

ČEZ, a. s. strategy in the area of nuclear safety, priority to the safety principle, safety culture

In accordance with the valid legislation as well as the international obligations of the Czech Republic, the ČEZ, a. s. accepts responsibility for safety assurance at its nuclear power plants, personnel and public protection, and environmental protection. In order to fulfill this responsibility, the company undertook to create and further develop conditions with sufficient human and financial resources, effective management structure and control mechanisms.

Safety requirements for nuclear installations are given top priority in the company and these requirements exercise decisive influence on all its commercially strategic priorities and main objectives (long-term as well as short-term) focused on operationally safe and reliable power and heat generation.

Safety strategy adopted in the ČEZ, a. s. focuses on continuous fulfillment of basic safety goals and nuclear safety principles (included in the internal control documents of the company in accordance with the international standards, experience and recommendations and in accordance with the valid legislation of the Czech Republic) with maximum use of safety culture principles and quality assurance requirements. To achieve the strategy goals, all employees were and still are acquainted with this strategy in detail.

The company keeps developing the conditions for fulfilment of the above safety obligations (strategic goals) in compliance with Safety and Environment Protection Policy and Quality Policy of the ČEZ, a. s. internally drafted and declared by the decision of the Board of Directors of the company.

Target fulfilment of the obligation of superior position of the requirements for safety and environment protection to the requirements of production as well as fulfilment of the obligation concerning continuous improvement of safety culture (as an integral part of company culture) also includes yearly updated strategic tasks of the Chief Executive Officer and Managing Director of Production Division of the ČEZ, a. s. as well as the tasks of the Action Plan for improvement of safety culture determined for the period 2009 - 2011 by Chief Operation Officer of the ČEZ, a. s.

The basic framework of the powers and responsibilities and the method of assurance of the activities performed for fulfilment of all safety obligations within the company, are defined by the Rules “Organization structure, the role and powers of particular departments“ and “the manual of integrated management“ along with related Directive “Safety Management of ČEZ, a. s.“ The above control documents describe, in terms of organization and process, control mechanism of activities in the fields with performance of activities important to nuclear safety.

One of the tools for systematic assessment of the level of nuclear safety is a set of indicators, which characterize trends of the nuclear safety level and the radiation protection level in nuclear power plants during the past week, month, year. Through the regular evaluation safety reports, the company's managers thus obtain the feedback for assessment of safety requirement implementation success-rate.

To solve the most significant (principal) safety issues related to the operation of nuclear installations, advisory bodies of Chief Operation Officer and Production Manager operate on the top management levels of the ČEZ, a. s. Selected representatives of the decisive special departments and joint sections of the company as well as invited specialists and visitors, they work in the advisory bodies (Committee on the Safety of ČEZ, a. s. Nuclear Installations and Committee on the Production Section Safety). The basic function is to evaluate the safety level of nuclear installations and to identify the topical and potential safety related problems together with their assessment and subsequent recommendation for optimal solution proposals.

Company ČEZ, a. s. implements its adopted strategic tasks focused on the formation of company culture, an increase in efficiency, innovations, renovation of units and construction of new units gradually in order to improve the level of management and to make economy of power plant operation more efficient with simultaneous fulfilment of the requirement for maintenance of at least the same safety level. This process, affecting significantly the organizational and personnel areas, proceeds in a controlled way further to an exhaustive analysis and assessment of possible impact of the prepared change upon the operation safety.

A separate comprehensive assessment has been developed for each planned change (according to requirements of the "Categorization and safety assessment of organizational changes within ČEZ, a. s" The proposed changes (their safety related assessment) are submitted to the state regulatory body for appraisal before their implementation. All approved implemented changes are always subject to an exhaustive safety related analysis in the specified intervals.

Supervision of nuclear safety

The Atomic Act defining the "priority to safety" principle represents for the SÚJB a basic legal document for the performance of the state supervision of nuclear safety and radiation protection. As described in Chapter 3, all SÚJB activities, its organizational structure and work procedures are governed by the said principle. The independent position of the SÚJB within the state administration, as well as the fact that it is funded directly from the state budget, guarantees sufficiently its main purpose.

Within the scope of its authority and competence, the SÚJB performs checks on observation of the "priority to safety" principle, as established by the Atomic Act, in the course of all activities related to the utilization of nuclear energy and performed by other subjects. All organizations which participate in design, manufacturing, construction and operation of nuclear power plants are subject to the SÚJB inspections, which assess especially the management approach to safety related issues and how individuals performing safety related activities are motivated in respect to this issue.

5.1.3 Communication with the general public

The ČEZ, a. s. has been making substantial efforts on a long-term basis to establish friendly and mutually beneficial relationships with the towns, municipalities and population in the vicinity of the power plants. These relationships are based on mutual confidence and honesty, and the public has thus the opportunity to make sure of fulfillment of safety priority during operation of nuclear power plants in the Czech Republic.

Dukovany NPP – Communication with the general public

In the region of Dukovany NPP, representatives and residents of municipalities living in the plant's vicinity and the general public have been allowed to inspect the plants premises, including both spent nuclear fuel interim storage facilities, their questions and comments have been answered.

Important tools in this effort are as follows:

- An Information Center of the plant visited by nearly 30,000 people each year, including those coming from abroad and systematic cooperation between the plant and elementary and secondary schools and universities.
- A Civil Safety Commission, made up of qualified and trained mayors, representatives and citizens, and representatives of local associations of municipalities. The Civil Safety Commission is authorized to independently inspect the nuclear power plant and inform the public, has its own website[6] and receives daily reports from a shift engineer at Dukovany NPP. At least four sessions of the Civil Safety Commission are held every year to continue to systematically educate the members of the Civil Safety Commission in nuclear area and discuss the current situation at Dukovany NPP and in nuclear area.
- Several years ago, good practice of the Civil Safety Commission inspired Slovakia to establish OIK and in 2013, the uranium mining site in the Czech Republic, the Bystřice microregion, to establish another local Civil Safety Commission. All such civil initiatives cooperate with each other.
- Mayors from the vicinity of Dukovany NPP resumed their activities in the GMF European Association organizing municipalities and towns where the nuclear installation is located[7].
- A new initiative “Nuclear Regions of the Czech Republic” was established to protect the interests of citizens and municipalities at political and interest fora of the European Union and the Czech Republic. In 2013, the initiative is headed by

[6] *www.obkjedu.cz*
[7] *www.gmfeurope.org*

Vítězslav Jonáš, former mayor of the municipality of Dukovany and senator for the district of Třebíč.

- There is a website[8] available to the public. The following domains work on social networks: “ČEZ Lidem”, “Kde jinde”, “Pro jádro”, “Třetí pól” and other domains with energy and nuclear topic.
- The public in the region is regularly informed about the current situation at the nuclear power plant through the printed periodical publication “Zpravodaj”, which is distributed by the power plant with a print run of 40,000 issues to every household within 20 km from the power plant. This Dukovany NPP publication has its own electronic and web-based version[9] [10].
- Creating and strengthening relations between the power plant and its vicinity include strong economic aid to municipalities, improvement of the conditions of life and support of various social organizations and institutions in the form of donations and advertising activities.
- The immediate foreign-country-oriented cooperation with crisis units of the country of Lower Austria neighboring to the region of Dukovany NPP is reduced, but it is possible to follow up the past activities at any time.

Reliable operation of Dukovany NPP and the above mentioned activities bring the expected result. Support of the development of nuclear energy in the Czech Republic was 72% after the accident in Japan and increased to 74%. The total of 92% of the population within 20 km from Dukovany NPP wants modernization and long-term operation of Dukovany NPP.

Temelín NPP – Communication with the general public

Important group exchanging information on an intensive basis is made up of mayors of 32 municipalities within 13 km of emergency planning zone around Temelín NPP. Apart from personal contacts, the power plant organizes annually 5-6 working meetings with the mayors in the presence of power plant and ČEZ, a. s. company management. At the meetings, the mayors acquire information on operation of units, their safety or power plant plans for further period. A part of the communication with elected representatives includes visits of power plant premises and ČEZ, a. s. organizes 1-2 a year, orientation tours to other nuclear installations in the Czech Republic and in Europe. The communication with elected representatives of the South Bohemian region is carried out in a similar way.

The Information Center of Temelín NPP, which has been operating since 1991 and which moved to renovated little castle Vysoký Hrádek in 1997, is used to inform the general public and especially schools. Modern methods of presentation such as 3D projection, interactive models, etc. are used therein. Technical equipment in the Information Center enables preparation of "tailor-made" programs for individual groups of visitors. The Information Center is visited by more than 30,000 people each year, with approximately 6 % visitors from foreign countries.

The Prime Ministers of the Czech Republic and Austria concluded a completely super-general agreement on the exchange of information between both states in the matter of the Temelín operation in December 2000 in Melk. A number of expert negotiations took place on the basis of this agreement and Temelín NPP also sends daily reports on its operation to the Austrian

[8] *www.cez.cz*
[9] *www.aktivnizona.cz*
[10] *www.zpravodajedu.cz*

party, which are presented in Czech, English and German language also on the ČEZ a. s. website.

The representatives of media receive daily information about operation; also meetings with journalists and press conferences concerning important topics are held. A very frequent method of communication is to enable coverage just from the power plant. At least thirty newspaper reports take place a year. Daily communication, in particular with the representatives of regional editorial offices, is assured by press officer.

Bulletin “Temelínky” has been issued for 19 years already in an edition of 23 thousand copies and is, 8 times a year, distributed to every household in 32 municipalities of the emergency planning zone. Since 2000, the brochure in the form of a calendar has been issued including the instructions for behaviour in case of an extraordinary event in the power plant and distributed once in two years to the population in the surroundings of power plant.

5.2 Statement on the implementation of the obligations concerning Article 10 of the Convention

The principle of priority to safety, as established in Article 10 of the Convention, has been complied with in the Czech Republic.

6. Financial and Human Resources - Article 11 of the Convention

1. *Each Contracting Party shall take appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.*
2. *Each Contracting Party shall take appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.*

6.1 Description of the current situation

6.1.1 Financial provision of nuclear safety enhancement at nuclear installations in the course of their operation

The Atomic Act establishes as one of the general conditions that any person performing or providing for practices related to nuclear energy utilization, shall have an implemented quality assurance system to the extent and in the manner set out in an implementing regulation (Section 4 paragraph 8). This is the SÚJB Decree No. 132/2008 Coll., on Quality Assurance System in carrying out activities connected with utilization of nuclear energy and radiation protection and on Quality assurance of selected equipment in regard to their assignment to classes of nuclear safety. Quality Assurance Programs for the activities being licensed shall be approved by the SÚJB.

Documentation of the licensee's – ČEZ, a. s. – quality assurance system includes the commitment to arrange for sufficient financial resources available for assurance of the safe operation of the company's nuclear power plants. This commitment is included in the company's Organization Rules. In connection with ČEZ, a. s. Safety an environmental protection policy, the provision of sufficient resources for assurance of nuclear safety and personnel protection as well as environmental protection has been described in detail in the relevant control documents.

Safety maintenance and enhancement in the nuclear power plants operated by the ČEZ, a. s. are performed in the controlled manner. Financial planning (strategic plan, business plan and annual budget) is carried out in compliance with the Group Management System of ČEZ, a. s.

As for projects (specific actions), business plans and project plans subject to approval at the division management and company management levels of ČEZ, a. s. are particularly prepared, according to the Signature Rules of the company and further the individual projects are incorporated into the company budgets for the relevant year. Funding of the individual projects is provided from the company’s unrestricted sources.

6.1.2 Provisions for assurance of financial and human resources for the decommissioning of nuclear installations and management of radioactive waste generated during their operation

Radioactive waste

The management of radioactive wastes, including those generated at nuclear power installations, is regulated by Section 4 of the Atomic Act (Sections 24 – 31). The Section 24 stipulates:

"An owner of radioactive waste or other natural person or legal person managing the assets of an owner in such a manner that radioactive waste is generated (hereinafter referred to as "generator") shall bear all costs associated with its management, from its time of origin to its disposal, including monitoring of radioactive waste repositories after their closure, and including the necessary research and development activities."

Further, the Section 25 and Section 27 paragraph 2 of the Atomic Act establishes as follows:

"Under the terms of this Act, the State guarantees safe disposal of all radioactive waste, including monitoring and supervision of repositories after their closure."

"Generators shall allocate to their own debit financial provisions to cover expenses for disposal of radioactive waste which have been arising or will arise".

Financial means to be used to cover costs associated with radioactive waste and spent fuel storage are, in accordance with the Atomic Act, deposited by the waste generators to an account held with the Czech National Bank, the so-called "Nuclear Account". The amount and method of payments to the Nuclear Account are determined by the government of the Czech Republic through its regulation. The Nuclear Account, which is part of the state financial assets, is administered by the Ministry of Finance. The funds on the Nuclear Account may only be used for the purposes specified by the Atomic Act.

The Radioactive Waste Repository Authority (SÚRAO) was founded as the organizational body of the state by the Ministry of Industry and Trade to carry out activities related to radioactive waste disposal. Activities of the Radioactive Waste Repository Authority are carried out under the government approved statute, budget and annual, three-year and long-term plan of activities. To cover the activities of the Authority, the Ministry of Finance transfers financial means from the Nuclear Account to a separate account of the Authority on the basis of the government approved plan of activities of the Authority and its budget. Such funds together with the income from Authority operations are subject to annual settlement to the Nuclear Account.

Radioactive waste management in nuclear power plants of the ČEZ, a. s. is executed by separate organizational departments (their activities also include the issue of cold waste, decontamination and technical issues concerning decommissioning) integrated into Safety Section in Production Division. The training of personnel is executed within uniform training system (see also subsection 6.1.3).

Decommissioning

The basic obligations of a licensee as specified in Section 18, paragraph 1, letter h) of the Atomic Act include the obligation to evenly create financial reserves for the preparation and actual decommissioning of nuclear installations. The amount of this reserve shall be established based on the decommissioning technology approved by the SÚJB and based on the estimate of the costs for given decommissioning technology verified by Radioactive Waste Repository Authority. The method of creating reserves is governed by a separate legal regulation issued by the Ministry of Industry and Trade of the Czech Republic. The creation of reserves is controlled by Radioactive Waste Repository Authority. Currently, proposals for the decommissioning method have already been approved for Dukovany and Temelín NPPs and the Spent Fuel Storage Facilities (Interim Spent Fuel Storage Facility Dukovany, Spent Fuel Storage Facility Dukovany and Spent Fuel Storage Facility Temelín). Monetary reserves for decommissioning are created in compliance with legal regulations for all nuclear facilities operated by the ČEZ, a. s. The funds for decommissioning of nuclear installations are kept on a blocked account and can only be used for preparation and implementation of decommissioning.

The issue of decommissioning documentation preparation is assured at the licensee - ČEZ, a. s. by permanent multi-job work team consisting of the experts of Production and Administration Division whose knowledge and experience can be utilized in preparation of decommissioning. In terms of organizational system, the team members are the representatives of the following departments: Fuel Cycle, Safety, Central Engineering and Analytical Support of Production Division. The team covers technical, financial, investment and organizational issues of decommissioning including the issue of assurance of the relevant human resources. Establishment of the team and all activities performed in this field are executed in compliance with the requirements for quality assurance adopted within the ČEZ, a. s. and included in quality assurance programme for nuclear activities.

Insurance

The Czech Republic joined the Vienna Convention on Civil Liability for Nuclear Damage and the Joint Protocol relating to the Application of the Vienna and Paris Conventions in 1995 (published in the Collection of Laws under No. 133/1994 Coll.).

In the period 1994-1997, this field was covered by government declaration (guarantee). In 1997, the Atomic Act came into effect stipulating liability of the operators of nuclear facilities for incurred damage and imposing the duty to take out an insurance (Articles 32 - 38) upon the operators. By virtue of Act No. 158/2009 Coll., the liability of the operator of the major nuclear facilities increased from original CZK 6 billion (approx. EUR 232 million) to CZK 8 billion (approx. EUR 309 million). The operator is now obliged to take out nuclear facility operation damage liability insurance in the minimum limit CZK 2 billion (approx. EUR 77 million).

On 18th June 1998, the Czech Republic, which actively participates in international negotiations in this field, signed amended Vienna Convention (Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage) and also a new Convention on Supplementary Compensation for Nuclear Damage). It has not ratified these international instruments yet. By virtue of Act No. 158/2009, the Czech Republic adapted the amount of liability of the operators and state guarantees to this protocol.

6.1.3 Rules, regulations and provision of resources for qualification, basic training and regular training (including simulator training) of the personnel whose activities have impact on nuclear power installations safety

Legislation

The Atomic Act sets forth conditions under which nuclear energy and ionizing radiation may be utilized.

The Section 17, paragraph 1, letter i) of the Atomic Act introduces the following general obligation to the licensee:

"Entrust performance of the specified activities only to such persons who fulfil conditions of special professional competence and are physically and mentally sound, and for persons performing sensitive activities under a specific legal regulation verify their competence in respect to security in a manner laid down in a specific legal regulation".

According to Section 18, paragraph 1 the licensee is also obliged to:

"Provide a system of training and verification of competence of personnel in accordance with the importance of the work they perform".

Preconditions for performance of activities directly influencing nuclear safety are established by the provision of Section 18, paragraph 3 of the Atomic Act. Such activities may only be performed by persons, who are physically and mentally fit, with professional competence verified by the State Examining Board and to whom the SÚJB has granted an authorization for the concerned activities, upon an application by the licensee.

Professional training of the selected personnel of nuclear installations may, according to Section 9, paragraph 1, letter n) of the Atomic Act, be organized by a physical or legal entity only based on a respective licence granted by the SÚJB. Documentation required for the issuance of such a licence is listed in an Appendix to the Atomic Act.

The SÚJB Decree No. 146/1997 Coll., as amended by the SÚJB Decree No. 315/2002 Coll., in compliance with the quoted provisions of the Atomic Act, specifies activities with immediate impact on nuclear safety and activities particularly important for radiation protection, requirements for qualification and professional training, method of verification of special professional competence and authorization process of the selected personnel, as well as the format of required documents to obtain a licence for training of selected personnel.

The above-mentioned legal regulations have been complemented with the Safety Guide BN JB-1.3 [6-1] issued in December 2010 by the SÚJB, covering professional education and training of personnel for the performance of work activities (positions) at Czech nuclear installations. The Guide specifies criteria and provides methodical guidelines for management and execution of training of employees of nuclear installation operators and employees of legal and physical entities whose activities (positions) at nuclear installations are important for nuclear safety, with the objective to minimize risks caused by human failure.

SÚJB Decree No. 193/2005 Coll., establishes the list of theoretical and practical fields of knowledge that is contained in the education and training required in the Czech Republic for the performance of controlled activities falling within the authority of the SÚJB.

Application of legislative requirements to the holders of licences for operation or construction of nuclear installations

The only guarantor of personnel training, from the Atomic Act viewpoint, within the ČEZ, a. s. is the NPP Training section, which is a part of the Personnel Training Centre section within the Production division. The main purpose of this section is to perform professional training of personnel for both power plants and training on individual entry to NPP for external suppliers. The section is also, in accordance with the internal control documents of the company, responsible for the fulfilment of a concept, strategy and system of professional training of personnel in the area of nuclear activities in the ČEZ, a. s.

Within the meaning of personnel training the activities are carried out in three training and educational centers (in Brno,at Dukovany NPP and at Temelín NPP), which are incorporated in the NPP Training section in terms of organization.

The respective managers at all management levels are responsible for the professional competence (qualification) of their subordinates. Principles governing the process of personnel professional training in respect to nuclear activities are described in the internal instruction.

NPP Training section, as a guarantor of the process, permanently keeps, in accordance with the provision of Section 9, paragraph 1, letter n) of the Atomic Act, the validity of the SÚJB licence for the training of nuclear installations personnel as well as of selected personnel of workplaces with ionizing sources.

The concept of qualified personnel training of ČEZ, a. s.

The objective of personnel training is to assure that each individual of nuclear power plant possesses necessary knowledge, skills and habits required for achieving, maintaining and developing the relevant professional competence. The fulfillment of this objective is verified by examinations and, for selected functions, formally confirmed by authorizations issued by the employer to perform the concerned activities. For each position the requirements for education, professional experience, health and psychical fitness, probity and especially for continued professional training of the personnel, before they start to perform their respective activities are established.

The personnel training system at the NPP is closely related to the system of education in the Czech Republic. A significant proportion of employees are university graduates or technical high school graduates. For this reason the training process at the nuclear power plant focuses on provision of additional special knowledge in the area of nuclear installations, acquisition of practical professional knowledge and skills necessary to perform the work concerned. Special attention is paid to the units' main control rooms operators, shift and safety engineers, operation and inspection physicists (selected personnel). Their training is always concluded with examinations before the State Examining Board (for more details on the State Examining Board see Chapter 7).

The *personnel training* as a process consists of *specific training (which is* further divided into *basic training* and *regular training)* and *professional training.*

The process of personnel training starts with recruitment and hiring. New workers are always selected according to the criteria established in the internal control document "Personnel Selection". The selection process includes verification of health and mental fitness of the employees for their future positions.

The training consists of professional and effective training of NPP personnel and suppliers. The responsible department puts the personnel training system into practice, implements this system and evaluates the given process. The department is fully responsible for application of new training techniques and means in order to improve the efficiency of personnel training.

The Human Resources Development section administers the central files of personnel qualification maintained for each work activity performed at all departments of the nuclear power plant.

Basic, periodic and professional training of personnel of ČEZ, a. s.

The purpose of *basic training* is to acquire or to improve specific professional capability necessary for performance of a given work activity. The basic training is obligatory for each employee who performs a work activity important for nuclear safety or radiation protection. The basic training shall be provided to all new employees and to the employees trained for different work.

The employees are assigned to one of the training groups according to their work activity and professional specialization. From the viewpoint of nuclear safety the five following groups are defined, for:

- management,
- selected personnel,
- employees of engineering departments,
- shift and non-shift operating personnel,
- maintenance personnel.

From the viewpoint of radiation protection, three groups are defined in agreement with SÚJB Decree No. 307/2002 Coll., on radiation protection:

- selected personnel,
- radiological personnel,
- other employees.

The preparation is executed according to approved training programs drafted in co-operation between the guarantor of preparation (Preparation Department of NPP) and particular departments of NPP. The minimum duration of the basic preparation meets the requirements of SÚJB Decree No. 146/1997 Coll. The forms of the basic preparation are determined based on training program, preparation group, specialization and qualification requirements of qualification catalogue as follows:

- theoretical/classroom training,
- secondment at the nuclear power plant,
- training at a full-scale simulator,
- examination to obtain a Certificate,
- training for a specific position,
- examination to obtain an Authorization,
- authorization for a work activity.

The individual mutually linked-up parts of theoretical and practical training are combined into modules, and the whole duration of the basic training varies from 6 to 88 weeks, depending on the type of work to be performed after training.

A specific form of the basic preparation is also the preparation for a change in work activity (re-qualification) that is the same as the basic preparation defined by training programs prepared in compliance with the requirements of SÚJB Decree No. 146/1997 Coll.

Periodic training serves to maintain, update or deepen specific professional competence of an employee as required to carry out his/her work. Each employee who performs an activity important for nuclear safety or radiation protection is obliged to undergo periodic training.

The forms of periodic preparation are determined based on training program, preparation group and qualification requirements as follows:

- theoretical/classroom training (training days, training dealing with industrial safety, fire protection, emergency preparedness, an access to controlled area, training in physical protection etc.),
- training at a full-scale simulator,
- training and examination to renewal of Authorization.

Total duration of particular forms of periodic preparation differs according to the type of work activity and the minimum duration meets the requirements of SÚJB Decree No. 146/1997 Coll. and it ranges from several hours to two weeks (simulator) a year according to the type of work activity.

The purpose of *professional training* is to maintain, update, deepen or improve the specific professional competence of an employee as required to carry out his/her work. Each employee whose work involves nuclear installations is obliged to undergo the professional training. The exposure to professional training is very important for employees who perform activities important for nuclear safety or radiation protection since the training represents a precondition for continuing validity of the Authorization. Duration of this form of training depends on the type of work activity and may be carried out as a one-off training or long-term course.

Training of Dukovany NPP personnel at a simulator

A full-scope simulator VVER 440 is used for basic and periodic training of Dukovany NPP personnel – a replica of the main control room or a full-scope display simulator, both situated directly at the power plant site.

The replica-type simulator is a high-fidelity copy of the operating personnel workplace in the main control room, with all counters and operating panels, including all instrumentation and information system screens placed therein. The simulation of technology, technological processes as well as the control and management system is performed on a modern system based on SILICON GRAPHICS computers using simulation software supplied by the GSE and OSC companies.

The simulator also includes a separate workplace for the instructors, with the so-called instructors station, from which the instructors control the simulator and manage the training (set-up the initial reactor condition, enter defects of the equipment and on operator's request simulate manipulations performed on the real unit by the operating personnel etc.). Communication between the training main control room staff and the instructor is via a closed circuit telephone line. The instructor has also camera system with recording device at disposal as well as a multiple-function classroom for evaluation of the training and theoretical part of teaching.

For training there is a display version of the simulator at disposal. In this version, the results of computational model are represented in virtual form of the main control room on computer screens. Within the I&C System Renovation and Design Margins Utilization projects, the models on both simulators are gradually updated in such a way that both re-qualification training of operative personnel for newly implemented systems and periodic training for the personnel of particular units before and after upgrading will be assured. The training is organized in such a way that most courses will be executed at a full-scale simulator .

Training of Temelín NPP personnel at a simulator

The concept of training provided to the qualified personnel at Temelín NPP essentially follows the pattern used at Dukovany NPP.

The training of Temelín NPP personnel is performed at a full-scale VVER 1000 simulator on the site.

The workplace of operators has been designed identically with the real main control room and the construction part of the simulator hall has been adjusted accordingly. The simulation of technology and technological processes is performed on a modern system based on Silicon Graphics computers. The information and control system of the simulator for operators is a customized WDPF system supplied by the Westinghouse Company. This company also supplied counters and panels, including instrumentation, for the full-scale simulator; identical counters and panels are used in the main control room.

The same as at simulator VVER 440, here the training is also controlled from the instructor station and the communication and recording device is also available. A part of a full-scale simulator is also a multiple-function classroom used for the needs of theoretical teaching and training evaluation.

A display version of the VVER 1000 simulator has also been developed at the Temelín site, which is currently used both for training and for engineering purposes.

Organization and provision of training at simulators

The operating personnel training at simulator runs according to the time schedule harmonized with the operations needs in accordance with the programs approved by the SÚJB, including examinations at the simulator.

Training instructors at the simulator at both sites are highly qualified personnel of the NPP Preparation section having minimum experience as a unit shift supervisor or control room supervisor and supplementary educational knowledge. The same as control operative personnel, the instructors also have their training program of periodic preparation of training instructors at a simulator whose regular participation is helpful for keeping their knowledge and skills up-to-date.

Scenarios of all training activities in the given course are prepared, tested and approved for training implementation. The scenarios cover the following operating modes of the power plant reactor building technology:

- unit start-up from cold state to nominal power,
- unit operation at various power output levels,
- unit shutdown from the nominal power to cold state,
- liquidation of error conditions of the unit,
- liquidation of emergency conditions of the unit.

Scenarios of training tasks also contain a list of used and related documents, time requirements for the training, general and specific objectives of the training, description of the unit’s initial state, brief theoretical description of the task, lecture scenario (description of the progress of task processed in tabular form), task analysis (instructions for training evaluation and records). Valid operating procedures are available at the simulator personnel workplace to solve tasks to the same extent as in the real main control room.

When using simulators the main focus of attention is on the simulator-based training of main control room personnel and shift engineers of Dukovany NPP and Temelín NPP. However, the simulators are also used for special training of personnel of the Technical Support Centers, reactor physicists and other personnel of operating and technical departments.

Simulators are also successfully used for validation of operating procedures, preparation of tests for emergency exercise simulation and for other analytic activities.

Professional training provided to employees of external suppliers

The process of personnel training in the case of employees of external suppliers is, as well as that of the plant's own personnel, comprised of basic, periodic a professional training. Requirements for the professional competence of external personnel depend on the ČEZ, a. s. needs for providing activities, especially activities related to maintenance and repair of the equipment. The system is based on fundamental assurance of professional qualifications by the supplier, completion of professional training in accordance with the ČEZ, a. s. requirements.

Types of training obligatory for individual employees are established by relevant international recommendations. Detailed requirements for each type of training are specified in the internal control documents. The external suppliers are required to have their training system and qualification assurance described in their own documents, including a method to prove fulfillment of requirements for the professional competence.

Evaluation of training

Evaluation of training and verification of personnel capability is a precondition needed to establish efficiency and effectiveness of the training programs used for individual forms, stages and types of training. Results of such evaluations provide a feedback through which the contents and scope of the professional training are modified aimed at improving its effectiveness. The basic information sources used for a systematic evaluation of the professional training include direct verification of personnel knowledge and evaluation of the standard of training processes by managers, trainees and instructors.

6.2 Statement on the implementation of the obligations concerning Article 11 of the Convention

The provision of financial and human resources for nuclear safety assurance in the Czech Republic is in compliance with the requirements established in Article 11 of the Convention.

7. Human Factors - Article 12 of the Convention

Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.

7.1 Description of the current situation

7.1.1 Methods for prevention, determination and correction of human errors

Legislative requirements

The Atomic Act establishes in Section 17, paragraph 1, letter b), as one of the general obligations of a licensee, the obligation to:

"Assess in a systematic and comprehensive manner the fulfillment of conditions set in Section 4, from the aspect of the current level of science and technology, and ensure that the assessment results are put into practice".

This requirement of the Atomic Act is further specified in the SÚJB Decree No. 106/1998 Coll., on nuclear safety and radiation protection assurance during commissioning and operation of nuclear facilities, in which the Section 14 imposes upon the licensees the obligation to review and modify the operating procedures so that they conform to the current level of science and technology, and at the same time reflect the operational experience and practice. The assessment of human factor impacts on operation safety is one of the basic components of the process.

Assessment of human factor impact at Temelín NPP and Dukovany NPP

The monitoring of human factor impact on the occurrence and development of operational events is performed by the Temelín NPP and Dukovany NPP Feedback departments and is in accordance with the relevant common control documentation valid in both NPPs. The human factor is understood as a significant safety element and permanent attention is paid to its possible failure. The purpose of human factor evaluation is to assess the level of various human behaviour impacts on performance of activities related to technological process as well as on safe operation of the nuclear power plant. The importance of the human factor as a significant matter in safety is taken into account in the methodology of the evaluation of operational events and their importance according to the INES scale.

The results of regular assessments of operational events in individual nuclear power plants have proven that a significant proportion of these events were caused by one or another form of human failure, either directly, and operator's error during performance of particular activity or human failure in other fields (documentation, design, etc.).

Within execution of the analyses of operational events at which investigation process the human factor impact during performance and/or control of activities was identified, the human performance impact analysis is executed. The procedure of human performance impact analysis is executed according to methodology HPES (Human Performance Evaluation System). The approach to execution of human performance impact analysis is based on the principle Blame - Tolerant Policy, on the contrary, it is necessary to create the atmosphere for open communication for final investigation of the causes of inappropriate behaviour of the staff. The evaluation of human factor contribution is executed for improvement of human behaviour (performance) in relation to gaining of own experience. Its purpose is not to punish the staff for unwilling mistakes; detected causes of inappropriate behaviour of the staff are understood as the benefit for further improvement of NPP operation reliability and safety. The staff involved in detection of the causes of human failure are trained in using methodology HPES. The human factor impact is monitored within all departments of NPP and supplier organizations.

Employees involved in the investigation of the causes of human failure have been trained in ASSET (Assessment of Safety Significant Events Team) and HPES methodologies. The human factor impact is monitored within all departments of NPP and supplier organizations.

The causes of human failure are assessed and confirmed by the Failure Commission at the plant (each NPP has its own Commission). Based on the respective analysis corrective measures are imposed aimed at effectively ensuring that the same deficiencies in human behavior do not repeat thus eliminating repetitive events.

One of the means for human failures prevention are training days regularly organized for selected categories of NPP shift and non-shift personnel. These training days include information on selected operational events, based on specialization of the trained personnel and with regard to the cases of human failure.

Obligatory psychological examination is applied for selection of personnel with the minimum risk of failures caused by carelessness or negligence.

To minimize the human factor impact in the course of performing activities the NPP has been continuously developing a system of operating procedures to guide each operator and warn about potential risks, while providing absolutely unambiguous description of activities. Selected manipulations are described in the form of check-lists. When setting the safety systems into the emergency mode the method of independent inspection is applied.

Human failure causes, including evaluation of trends of human factor impact, are in both NPPs regularly evaluated in the annual reports on operational events, together with factors contributing to human failure. For the purposes of continuous evaluation of human factor performance and its comparison in time, human performance indicator was created that is counted as the rate of weighted actual and criteria results from identified direct causes of human factor impact upon the events.

7.1.2 Role of the regulatory body in the human factor assessment

The SÚJB also systematically monitors the impact of human and organization performance on the operational safety. Conclusions of the plant's so-called "Failure Commission" are discussed at regular meetings. In this respect, the SÚJB particularly reviews whether the events with contribution of human and organizational erroneous actions were investigated in sufficient detail, whether corrective actions address determined causes so that recurrence of the events is prevented and whether such corrective actions are implemented in the proper and timely manner. In particular cases, a special inspection related directly to a certain event with significant contribution of human and organizational factors can be carried out. The SÚJB further evaluates separate reports sent on an annual basis, which include the trend analysis of events with contribution of human and organizational factors by selected aspects.

The field of human factor is also a separately evaluated element within PSR.

A system of verification of special professional capability for selected personnel of nuclear installations is instrumental in the prevention of human error occurrence. In accordance with the Atomic Act (see SÚJB competence in chapter 3.1) the SÚJB shall establish for this purpose a state examining board and identifies activities with immediate impact on nuclear safety. Verification is carried out in form of an exam before the state examining board.

This exam consists of examination at a simulator, theoretical written and oral part, and a practical part, including examination at a simulator. The state examining board may decide to skip the practical part or to allow the so-called integrated test (oral examination is directly linked to examination at a simulator) in the case of authorization renewal. A failed exam may be repeated by the applicant within a 1 - 6 months period whereby the specific date shall be determined by the state examining board. Under a respective implementing regulation an individual who has successfully passed the exam in front of the state examining board is granted a selected personnel authorization by the SÚJB for a period of 2 to 8 years.

7.2 Statement on the implementation of the obligations concerning Article 12 of the Convention

The requirements under Article 12 of the Convention, on evaluation of possible human factor impact on operational safety over the whole service life of nuclear installations, are complied with in the Czech Republic.

8. Quality Assurance - Article 13 of the Convention

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programs are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.

8.1 Description of the current situation

8.1.1 Quality assurance legislation

The Atomic Act establishes general conditions for the performance of activities related to the utilization of nuclear energy, radiation practices and actions to reduce radiation exposure. The provisions of Section 4 paragraph 8 establishes as follows:

"Any person performing or providing for practices related to nuclear energy utilization or radiation practice, except the activities according to Section 2 letter a) paragraphs 5 and 6, must have an implemented quality assurance system, to the extent and in the manner set out in an implementing regulation, aimed at achieving the required quality of a relevant item, including tangible or intangible products, processes or organizational arrangements, with respect to the importance of this item from the aspect of nuclear safety and radiation protection. The implementing regulation shall set basic requirements for quality assurance of classified equipment with respect to their safety classification".

Statutory instrument is SÚJB Decree No. 132/2008 Coll. regulates in detail:

- the requirements for quality system in execution or assurance of the activities related to the utilization of nuclear energy or radiation activities,
- the requirements for the substance of quality assurance programs,
- the criteria for classification and division of selected facilities into safety classes,
- the basic requirements for quality assurance of selected facilities with regard to their classification into safety classes and
- the scope and the method of preparation of the list of selected facilities.

Pursuant to Section 13, paragraph 5 of the Atomic Act, a license to be issued by the SÚJB for specified activities in the utilization of nuclear energy and ionizing radiation shall be conditional upon an approved quality assurance program for the licensed activity (see chapter 3.1.2).

8.1.2 Quality assurance strategy of the licensee - ČEZ, a. s.

Quality assurance strategy was already a part of the first concept of business activity approved by General meeting of the company in July 1995 that enabled to direct business activities of the company and to create the conditions for sustainable and successful development of the company.

The system is designed in such a way that assurance of the processes and activities important in terms of nuclear safety or radiation protection will be executed in a controlled and organized manner and completely pursuant to the Atomic Act and its implementing decrees including SÚJB Decree No. 132/2008 Coll. The requirements of quality system are applied by means of a graduated approach according to the importance of particular processes and items for nuclear safety and radiation protection.

The system is in compliance not only with legislative requirements (SÚJB Decree No. 132/2008 Coll.) but also it is harmonized both with generally recognized criteria standards ISO (ISO 14001, ISO 27001 and program Safe Business) and with specific recommendations of IAEA (GS-R-3).

In 2010, ČEZ, a. s. became a signatory to the **Quality Charter of the Czech Republic** and thus adopting its commitments. Fulfilment of the commitments of the Charter was supported by the ČEZ, a. s. in October 2010 by founding a specialized section of the Quality Council of the Czech Republic called **Quality in Energy**, of which ČEZ, a. s. is a manager and founding member.

The **Quality and Management System** department directly managed by the Executive Director (directly by the Director General as of 1 January 2012) was created as of 1 January 2011, which aims to:

- Build up, evaluate and continuously improve the management system of ČEZ, a. s., whose fundamental element is performance fully in compliance with safety,
- Lay down the requirements for quality and management system within the activities processes in ČEZ, a. s.,
- Propose the principles of quality and management system,
- Coordinate improvement and development of the principles of quality and management system in ČEZ, a. s. and reflect these principles in ČEZ Group,
- Define control mechanisms of ČEZ, a. s. and check whether the principles of quality and management system are fulfilled and whether they are functional,
- Verify the efficiency of the integrated management system in regard to the requirements laid down, in particular according to Section 3 of Decree of the State Office for Nuclear Safety No. 132/2008 Coll.

The Board of Directors of ČEZ, a. s. announces its **Safety and Environmental Protection Policy** and **Quality Management Policy.**

The **Safety and Environmental Protection Policy** was approved by the Board of Directors of ČEZ, a. s. and issued as order of the Director General with effect from 1 May 2010. It includes chapters with titles representing strategic pillars of this policy:

- We place the protection of human life and health before other interests.
- We promote the safety and environmental protection as an integral part of management.
- We comply with the legal regulations and public commitments, and take the recognize practice into account.
- We continuously improve the level of safety and environmental protection.
- We regularly assess, prevent and eliminate risks or reduce their impact to the acceptable level.
- We make sure that an installation meets the technical, safety and economic requirements on a long-term basis.
- When selecting and evaluating suppliers, we take into consideration their approach to safety and to the environment.
- We openly and efficiently communicate safety-related topics.

- We provide sufficient qualified and motivated employees and suppliers.
- We manage key knowledge.

In September 2010, the Board of Directors of ČEZ, a. s. approved the **Management Quality Policy** defining the main principles of perceiving quality for all employees. The management of ČEZ, a. s. sees the quality as compliance with the following principles:

- We apply partner and customer approach.
- We plan in compliance with our strategic objectives.
- We standardize and describe our best practice.
- We implement work tasks flawlessly and the first time.
- We carry out checks and respond immediately to any weaknesses.
- We make decisions on the basis of knowledge of things and open facts.
- We make improvements and we make changes flexibly and safely.

To fulfil the Management Quality Policy, the correct setting, evaluation, documentation and improvement of the management system, including internal processes, are required. In 2011, the **Integrated Management System** project was completed and evaluated. The ČEZ Group assists to meet the ever-growing requirements for quality and safety requirements for supplies, products and services, and creates conditions for efficient process and line management in all areas.

The ČEZ Group declares compliance with and high level of safety, environmental protection and quality through the certificates obtained and regularly renewed. All nuclear, conventional and hydroelectric power plants of the ČEZ, a. s. are long-term holders of the ISO 14001 certificate and Safe Enterprise. The certification processes apply also to foreign companies within the ČEZ Group.

In 2011, the Quality and Management System department, directly subordinate to the Director General, providing the strategic management with feedback for management system was established in ČEZ, a. s. to guarantee the commitment to and demonstrate the involvement of management in introduction, evaluation and continuous improvement of activities.

The Safety Inspectorate department of ČEZ Group was established to provide the strategic management with feedback over compliance with the requirements in the area of safety.

8.1.3 Quality assurance programs for all nuclear installation service life stages

For verification of introduced quality system for granting the SUJB licence pursuant to Article 9 paragraph 1 letters a) - g), letters i), j), l), n) and r) of the Act No. 18/1997 Coll. for activities permitted by the SÚJB, the documents of the type of quality assurance program are prepared.

Quality assurance program has the character of licence document whose contents substance is stipulated by Articles 10 and 11 of SÚJB Decree No. 132/2008 Coll. The document describes quality system of the licensee (ČEZ, a. s.), affected processes and activities including the processes and activities performed as the supplier as well as necessary documented procedures relating to the relevant licensed activity determined in Act No. 18/1997 Coll.

In compliance with the provisions of Article 13 paragraph 5 of the Atomic Act, ČEZ, a. s. has quality assurance programs approved by the SÚJB for permitted activities for particular life stages of respective nuclear facility.

The preparation, review, approval, recording, archiving including execution of revisions of quality assurance program within ČEZ, a. s. are described by the methodology Preparation of quality assurance program and Change/reconstruction of quality program.

The top document the Manual of integrated management system describing quality system is also Quality assurance program for permitted activities pursuant to the Atomic Act, Article 9, paragraph 1, letters d), e), f), i), j) and n), i.e. for:

- operation of nuclear facility or workplace of category III. or IV.,
- restart of nuclear reactor to criticality,
- execution of reconstruction or other changes affecting nuclear safety, radiation protection, physical protection and emergency preparedness of nuclear facility or workplace of category III or IV,
- management of ionizing radiation sources in the scope and in the manners stipulated by implementing statutory instrument,
- radioactive waste management in the scope and in the manners stipulated by implementing statutory instrument,
- expert preparation of selected employees,

and verifies fulfilment of the requirements of SÚJB Decree No. 132/2008 Coll., on quality system in execution and assurance of the activities related to the utilization of nuclear energy and radiation activities and on quality assurance of selected facilities with regard to their classification into safety classes in quality system of ČEZ, a. s.

8.1.4 Application and evaluation of quality assurance program efficiency

Management system of ČEZ, a. s. is focused on application and extension of process approach to management and it consists of the basic areas of management, the areas of management and processes. The basic areas of management are logically classified into the groups – the areas of management. For each area of management, the guarantor of the basic area of management determines the guarantor of the area of management. The guarantors of the basic areas of management are also members of strategic management of ČEZ, a. s., in line management structure.

Particular areas of management and processes are interconnected via interfaces that are defined by the products provided by one area of management (process) to another area of management (process). These interfaces utilize (internal and external) customer-supplier principle. Respective guarantors are responsible for the condition of set interfaces. Checking system is set for implementation of checking activities within the process.

The requirements of management system for documenting and description of the elements, levels and forms of management within ČEZ, a. s. description of functional duties, responsibilities and powers, line structure of the company and assurance of efficient planning, operation and management of processes and activities are supported by the system of documents with its structure and classification into the groups and types of documents.

The method of management is described in the Organization Rules of ČEZ, a. s. and in a set of control documents defining, in addition, the control mechanisms and determining the indicators for evaluation.

Strategic management is responsible for the introduction, use, evaluation and continuous improvement of management system, i.e. it is responsible for the fact that the duties, tasks and powers related to quality, environment and safety management system are within ČEZ, a. s. determined, documented and communicated in such a way that they support efficient management.

The Quality and Management System department, directly subordinate to the Director General, has been established in ČEZ, a. s. to guarantee the commitment to and demonstrate the involvement of management in introduction, evaluation and continuous improvement of activities, which provides the strategic management with efficient feedback in the following matters:

- Development coordination, the introduction and maintenance of determined parts of management system as well as its evaluation and continuous improvement,
- Reporting concerning management system performance including its effect upon safety and safety culture and any needs for improvement,
- A solution to any potential conflicts within management system processes.

Each employee is responsible for quality of his/her work. The staff executing checking and verifying activities have sufficient powers to be able to identify non-conformances and to require their correction, if necessary. All staff of the company is entitled to make proposals for improvements and modifications of quality system.

ČEZ, a. s. assures development and strategy of management of human resources in such a way that the staff whose labour performance affects safety, quality, environment etc. will be competent based on their acquired education, training, skills and experience. The staff education in the field of quality is graduated and focused on understanding of quality system and all necessary tools and methods enabling its improvement.

Within the company, so-called “graduated approach” is introduced, especially in relation to safety and subsequently to economy.

In case of occurrence (identification) of non-conformance having impact on nuclear safety, radiation protection, physical protection and emergency preparedness, a “conservative approach” is always applied to minimize risks, even at the expense of potential economic losses.

Management system includes efficient mechanisms for identification of its non-conformances and their effective correction. Where stipulated by legal regulations and agreed requirements with external involved parties, a specific procedure for correction of the types of non-conformances determined in these external inputs is applied.

The effectiveness and efficiency of management system is monitored and evaluated within checking system based on the principle of systematic and periodic execution of comparison with predefined requirements, expectations and objectives determined in a sufficient scope and depth. Based on the evaluation and analysis of achieved results, possibly the analysis of the data detected in checking activities, objective conclusions are drawn resulting in the proposals of efficient corrective measures and the proposals of preventive measures.

Within checking system, the following degrees are applied:

- internal checking system
- independent evaluation
- management system review

Internal checking system has cross-sectional character. It represents necessary feedback in control process and due to its provided information it has a significant effect upon decision-making process. It represents all activities of executives by means of which the executives detect whether achieved results comply with planned ones. It is understood as review of reliability performance and efficiency of management at all management levels for the purpose of continuous improvement. The methods of internal checking system include mainly “self-assessment”.

Independent evaluation including analytical activities is applied where it is required by generally binding regulations (an effect upon nuclear safety, radiation protection, engineering safety etc.) or where this is purposeful.

The methods of independent evaluation include customer audits and quality, environment and industrial safety audits, supervision of execution of activities, evaluation by external experts (“peer“) and technical reviews.

The employees executing independent evaluations are classified into organization structure of ČEZ, a. s. in such a way that it will be assured that they do not have any direct relation to evaluated activities. If any conflict of interest in relation to the subject-matter and specification of evaluation can be expected, a particular employee is not authorised to execute independent evaluation.

The management system review is executed in regular intervals at two levels, i.e. both at the level of certified area of management (the Environment and Industrial Safety) and at the level of ČEZ, a. s. for the field of management system. A part of the review is also review of policies and objectives.

The management system review report is prepared by Quality Management Department as the background paper for review executed by strategic management with regard to determined policies and objectives once a year.

Based on the review results, strategic management decides concerning the measures related to:

- efficiency improvement of management system and its processes and the need for execution of changes in management system,
- the needs for sources,
- a possible need for a change in policies, objectives, target values or another management system element in compliance with the obligation of continuous improvement.

8.1.5 Current quality assurance practices applied by the state regulatory body

The SÚJB, in accordance with Section 39 of the Atomic Act, checks compliance by the licensees with the Atomic Act, including the quality assurance requirements mentioned above. Whenever it is deemed necessary, the inspection activities are extended to include the subcontractor. The inspection activities focus both on the system and on the quality assurance of particular selected systems, structures and components. SÚJB unit primarily performing this activity is the Nuclear Installation Monitoring Section (see Organizational Chart of the SÚJB, Fig. 3-2).

In compliance with the Atomic Act SÚJB approves quality assurance programs for nuclear installations dealing with:

- siting,
- design,
- construction,
- individual stages of commissioning,
- operation,
- start-up after refueling,

- reconstruction and other changes with a potential impact on nuclear safety, radiation protection, physical protection and emergency preparedness,
- decommissioning,
- management of ionizing radiation sources
- radioactive waste management,
- radioactive material management,
- training of selected personnel,
- performance of personal dosimetry and other services important from radiation protection point of view.

In accordance with the Atomic Act an approved quality assurance program is one of the preconditions for the issue of a licence for the activities specified in Section 9, paragraph 1 (see chapter 3.1.2). Criteria for the assessment of quality assurance programs are established in SÚJB Decree No. 132/2008 Coll. and other binding regulations and standards.

The SÚJB also approves the List of Selected Systems, Structures and Components, a document listing items important from the viewpoint of nuclear safety, divided into three safety classes in accordance with the criteria specified in Appendices to SÚJB Decree No. 132/2008 Coll., which are in accordance with IAEA criteria.

To issue a licence for a nuclear installation siting the SÚJB shall consider the following, as part of the Initial Safety Report:

- quality assurance assessment for the siting,
- quality assurance method in the preparation for construction,
- quality assurance principles for the following stages.

To issue a licence for the construction of a nuclear installation the SÚJB shall consider the following, as part of the Initial Safety Report:

- quality assurance method in the preparation for construction,
- quality assurance method in the construction implementation,
- safety assurance principles for the following stages.

For the approval for first fuel loading, the SÚJB shall consider quality evaluation of the selected items, as part of the Final (Pre-Operational) Safety Analysis Report.

8.2 Statement on the implementation of the obligations concerning Article 13 of the Convention

The current legislation of the Czech Republic and its practical application guarantee that quality assurance programs are developed and implemented, making sure that all specified requirements for all safety related activities will be fulfilled over the whole period of the service life of a nuclear installation. The requirements specified in Article 13 of the Convention are fully complied with.

9. Safety assessment and verification - Article 14 of the Convention

Each Contracting Party shall take appropriate steps to ensure that:

(i) comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;

(ii) verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

9.1 Description of the current situation

9.1.1 Licensing proces and associated analyses during the project's individual stages (siting, design, construction, operation)

The licensing process legislative framework is defined by Act No. 183/2006 Coll., on Spatial Planning and Building Rules (the Building Act), the Atomic Act and their implementing decrees.

In the case of a nuclear installation construction, the Building Act establishes a three-stage procedure for its permitting (site decision, construction permit and final inspection approval). The Ministry of Regional Development exercises the competence of a building office to issue a site decision (siting) pursuant to Section 13 paragraph 2 of Act No. 183/2006 Coll.

The construction permit and operating licence (permanent operation) – are issued by the department of planning and building control of the Ministry of Industry and Trade. Their resolutions are conditional upon positions issued by specialized regulatory bodies, including the SÚJB. The department of planning and building control of the Ministry of Industry and Trade can issue the operating licence only with the approval of the municipal department of planning and building control competent to issue the site decision, which verifies observance of its conditions; the approval is not an administrative action. If neither site decision nor site approval is issued, the opinion of the municipal department of planning and building control on compliance of designed site with projects of regional planning shall be sufficient. For more information see chapter 2.1.2.

The Atomic Act establishes the way of utilization of nuclear energy and ionizing radiation, as well as conditions for the performance of activities related to the utilization of nuclear energy and radiation practices. A precondition for the performance of such activities is a licence issued by the SÚJB with an administrative procedure, which is independent of the above-described procedure required under the Building Act. The Atomic Act explicitly forbids launching siting, construction, operation and other activities at nuclear installations, requiring the licence issued by the SÚJB, before the respective licence becomes legally effective. For more details see chapter 3.1.2.

That means that the approval procedure, besides the three-stage process mentioned above, also includes a number of other partial licences issued by the SÚJB in accordance with the Atomic Act during different stages of the service life of a nuclear installation.

According to the provisions of Section 17 of the Atomic Act, the licensee shall verify nuclear safety during all stages of the installation's service life (in the scope appropriate for the particular licences), asses it in a systematic and comprehensive manner from the aspect of the current level of science and technology, and ensure that results of such assessments are translated into practical measures. The verification/assessment shall be documented. The content of the documentation is specified in the Appendix to the Atomic Act. Safety assessment is, in compliance with the Atomic Act, reviewed by the SÚJB, both analytically and within its inspection activities. Details concerning the safety related documentation preceding construction of a nuclear installation, preceding its commissioning and during its operation, are described in Chapters 17, 18 and 19 of the Article.

The implementing decrees complement the Atomic Act to establish basic criteria for nuclear safety assessment of a nuclear installation during different stages of its service life.

The following are particularly concerned:

- ***SÚJB Decree No. 215/1997 Coll.***, on criteria for siting nuclear installations and very significant ionizing radiation sources,
- ***SÚJB Decree No. 106/1998 Coll.***, on nuclear safety and radiation protection assurance during commissioning and operation of nuclear facilities, which defines and establishes particularly the following:
    - individual stages of commissioning,
    - requirements for the content of the commissioning programs,
    - requirements for the contents of Limits and Conditions for safe operation.
- ***SÚJB Decree No. 195/1999 Coll.***, on basic design criteria for nuclear installations with respect to nuclear safety, radiation protection and emergency preparedness,
- ***SÚJB Decree No. 309/2005 Coll***., on assurance of technical safety of selected equipment

    This decree defines the following:
    - method of determination of selected equipment specifically designed for nuclear installation,
    - technical requirements for assurance of technical safety of selected equipment in production and in operation,
    - procedures for consideration of the compliance of selected equipment specifically designed for nuclear installations with technical requirements,
    - method of assurance of technical safety of selected equipment in operation.
- ***SÚJB Decree No. 132/2008 Coll.***, on Quality Assurance System in carrying out activities connected with utilization of nuclear energy and radiation protection and on Quality assurance of selected equipment in regard to their assignment to classes of nuclear safety.

As described below, practical application of the requirement to perform systematic and comprehensive assessment of a nuclear installation to check on its continual compliance with its design, applicable safety requirements in the valid national legislation and with Limits and Conditions includes in particular:

- systematic monitoring of nuclear and technical safety (supervision, inspections, tests),
- deterministic evaluation of nuclear safety (Final Safety Analysis Report),
- probabilistic safety assessment (so called "living" Probabilistic Safety Assessment Study and its application-Safety Monitor).

9.1.2 Continual monitoring and periodic assessment of safety of nuclear installations

Continuous monitoring of safety of the Dukovany NPP and Temelín NPP performed by the licensee focuses in particular on the observation of the Limits and Conditions for safe operation.

This activity is performed both by personnel of the departments responsible for performance of such activities (self-assessment process) and by specialists of the safety departments at both NPPs, who are independent of performed activities and are not responsible for them (independent supervision). Personnel of the safety departments are responsible for independent verification of the fulfillment of test completion criteria during operation and after maintenance, before equipment after maintenance is ready for operation.

Inspections of compliance with additional requirements are executed during outages, dealing with the progress of works and manipulations on technological equipment. The inspections are executed by the personnel of the implementation departments and safety departments of both NPPs as well as by the managers (management system review) of departments whose personnel or, if applicable, contractors, carry out work during the outages of units.

The information on safety assurance is presented both in the text part of monthly and annual safety reports of NPP and graphically in the form of indicators. The latter form uses indices containing information about safety systems reliability, conditions of certain equipment in general, environmental impact of NPPs operation and about compliance with the established principles for the given area (fire protection, industrial safety).

The Safety Monitor, version 3.5a, is used to monitor the operational risk level of all units of ČEZ NPPs depending on current equipment configuration. This tool is used at Temelín and Dukovany NPP, cumulative and point-in-time risk may be evaluated or pre-calculated by using this tool depending on currently valid or intended NPP technology in given instant of time or during given period of time.

This tool is also used to evaluate the time schedules of all outages for risk level optimization at least two months prior to implemented outage, and to evaluate real or intended changes in time schedule during outage. Original and actual course of the risk is analyzed after outage completion in order to optimize maintenance activities in terms of unit configuration during outage.

Emergency Operating Procedures (EOPs) and Severe Accident Management Guidelines (SAMGs) were developed and implemented at both NPPs within the accident management program. Inspections are executed every year in this field, focused on quality and the status of implementation of this control documentation and the status of implementation of technical measures for mitigation of consequences of such accidents.

EOPs are symptom-based procedures followed by the operating personnel of the main control room in case of emergency situation solving up to the onset of core damage. EOPs were developed in 1994-1998, verified and validated by 2000, and implemented in 1999 at Dukovany NPP and in 2000 in case of Temelín NPP. The revisions of EOPs are executed in a systematic manner depending on executed modifications of Dukovany and Temelín NPPs.

In 2009, a set of emergency procedures was completed with the documents (manuals) intended for members of the Technical Support Centre for the cases where the support of the main control room in the use of EOPs is required.

The Severe Accident Management Guidelines are symptom-based structured guidelines for selection of appropriate strategy for mitigation of accident with fuel meltdown on the basis of current state of the unit. SAMGs as well as EOPs and the above mentioned manuals were developed for Temelín and for Dukovany NPPs by NPP personnel in co-operation with Westinghouse Energy System Europe company on the basis of so-called generic guidelines for severe accident management. SAMGs were completed at both power plants and issued in 2004 as a set of operating procedures. The validation of SAMGs is in case of both power plants executed by means of selected validation analyses demonstrating a proper selection of strategies and helpful for optimization of some of their aspects. In 2012, SAMGs were completed with the chapters for limiting the consequences of severe accidents, which would occur during outages of units, i.e. mainly those states when reactor is open, as well as guidelines for severe accidents, which would occur in spent fuel storage pool.

A gradual increase in resistance of the units to severe accidents is executed at both NPPs, within Accident management program controlled jointly for both NPPs.

The personnel of both NPPs involved in mitigation of the accidents are regularly trained in the use of EOPs and SAMGs. The exercise of members of Technical Support Center concerning the use of SAMG instructions takes places regularly and it is controlled by the staff of company Westinghouse.

The information describing the level of nuclear and technical safety, radiation protection, fire protection and industrial safety is evaluated periodically (weekly reports on the nuclear safety status and monthly and annual reports on the status of safety in the Dukovany NPP and Temelín NPP) and discussed on the individual control levels within ČEZ, a. s. The unavailability of the individual components with impact on nuclear safety is monitored monthly. Results of this monitoring are submitted in the form of operational indicators into the power plants information system network.

Impact of individual component unavailability on nuclear safety is assessed using the immediate value of the Core Damage Frequency as well as a cumulative risk value, which are a product of the Core Damage Frequency and the duration of the component unavailability.

Deterministic nuclear safety assessment (Final Safety Analysis Report)

The results of nuclear safety assessments at individual units are in compliance with the original and current legislation documented in the safety reports.

The validity and topicality of Final (Pre-operational) Safety Analysis Report of Dukovany and Temelín NPPs is the basis for issue of the licences both for continuous operation and for startup after outage including refuelling.

Final Safety Analysis Report of Dukovany NPP and Temelín NPP is regularly updated (always the following year as at the end of the 1st quarter for Dukovany NPP and as at the end of the 1st half-year for Temelín NPP, changes in Final Safety Evaluation Report for the past year are submitted to the SÚJB).

Final Safety Analysis Report of Dukovany NPP and Temelín NPP is prepared according to the requirement of US NRC RG 1.70, and it verifies the assurance status of nuclear safety of the units at Dukovany site and Temelín site in terms of state of the art and experience in the hitherto operation.

The modifications that have an effect upon safety and that change the preconditions used in Final Safety Analysis Report shall be approved by the SÚJB prior to their implementation. This procedure was confirmed for both power plants by a joint agreement between the SÚJB and ČEZ, a. s. The responsibilities of particular departments of power plant in evaluation of impacts of the modification upon particular processes are determined in the relevant control documentation.

Deterministic evaluation of nuclear safety (Periodic Safety Review)

At Dukovany and Temelín NPPs comprehensive safety level inspections are executed in regular ten-year intervals designated all over the world as Periodic Safety Review (PSR). These inspections are executed fully in compliance with the requirements of IAEA instruction NS-G-2.10. PSR evaluates fourteen areas (Power Plant Project, Actual Status of Systems, Structures and Components, Equipment qualification for ambient conditions, Ageing, Deterministic Safety Analysis, Probabilistic Safety Assessment, Potential Internal and External Risks, Operational Safety, Feedback from operation of other nuclear installations, and science and research results, Organization and Control, Quality Systems and Safety Culture, Procedures and Regulations, Human Factor, Emergency Preparedness, Radiological Environmental Impact).

The results of evaluation are stated in final reports of all evaluated areas and in summary report that was, along with the list of strenghts, corrective measures and time schedule of their performance transmitted to the SÚJB. The results of PSR provided, among others, the basis for preparation of renewal of operational licences of the units of Dukovany NPP and Temelín NPP after completion of the previous ten years of operation.

Overview of completed / prepared PSR:

PSR of Dukovany NPP was executed after 20 years of operation in the years 2005 and 2006. PSR of Temelín NPP after 10 years of operation was executed in the years 2008 - 2010. A comprehensive evaluation under PSR identified appropriate opportunities to improve the safety, which were also confirmed by the results of Stress Tests. The major part is in the phase of implementation or preparation for implementation, and would be implemented even regardless of subsequent evaluation within the Stress Tests. The completed PSR envisages implementation of approved measures for Dukovany NPP by 2015, in some justified cases, by next PSR (2018), for Temelín NPP by 2018.

PSR of Dukovany NPP after 30 years of operation will be executed in the years 2013 to 2014.

The SÚJB evaluates the Final Reports of PSR of individual units, issues its opinions on PSR findings and on a list and completeness of corrective measures and periodically on termination of each individual year of operation, controls compliance with the time schedule and content of the corrective measures. It discusses with a licensee any changes in the time schedule for implementation of the corrective measures and approves the adopted technical and administrative measures.

Probabilistic safety assessment of Dukovany NPP

The first Probabilistic Safety Assessment study (PSA) level 1 of the Dukovany NPP was completed in 1993. The analysis for limited number of internal initiating events and reactor operation at the nominal power was developed.

Gradual development of the level 1 PSA model was performed; the study was extended to include other initiating events, such as internal fires, flooding, consequences of a high-energy pipeline break (HEPB), heavy load drops and external human induced events. Modifications implemented at the nuclear power plant, which included the design changes, equipment replacement and alterations in the operating procedures, have been gradually incorporated into the model. Furthermore, redeveloped analyses (thermal hydraulic, PTS, etc.) have been included and human factor impact has been modeled more detailed. Similarly, low-power modes and refueling outage have been included.

The first results of the level 2 PSA study establishing frequency of the radioactivity release into the environment during severe accidents were handed over to the state regulatory body in April 1998. Level 2 PSA has been processed for full power operation. In 2002, this analysis were updated throught new input data based on the actual results of the level 1 PSA model and has been thus incorporated into the Living PSA program. Last update of the level 2 PSA study was executed in 2006.

The Shutdown PSA (SPSA), i.e. the PSA for reactor low-power operation and for shutdown, was developed in 1999. The SPSA results showed that the total core damage contribution during outages is comparable to the contribution during operation at full power. Based on the Shutdown PSA results, new and more detailed emergency guidelines were developed. Some modifications in scheduled maintenance management were also performed.

Further to results of the level 1 and level 2 Living PSA study for the Dukovany NPP the effort concentrated on a reduction of impact of the most significant accident sequences. Further changes in the design were made, some equipment was replaced and new emergency procedures were developed. All the planned modifications of the power plant units relating to nuclear safety were evaluated, based on the results of the level 1 Living PSA study, and prioritized in terms of reduction of risk. The results of the level 1 Living PSA study have also been used to support the development of new procedures dealing with emergency and abnormal conditions (level 1 Living PSA) and procedure dealing with beyond design basis accidents (level 2 Living PSA). New symptom-based procedures have been then incorporated into the PSA model (in 1998 for nominal unit power and in 2002 for shutdown conditions).

With respect to some differences between the individual units of Dukovany NPP, the PSA model for Unit 1 was modified for other NPP units in order to show their actual state; therefore, the PSA models for Units 1, 2, 3 and 4 are currently available.

At Dukovany NPP, replacement of Instrumentation and Control of safety systems (RTS, ESFAS) was gradually executed and this fact was also shown in PSA model. Presently, the replacement of Instrumentation and Control Systems of safety systems is completed at all units and integrated into PSA models.

The so-called Living PSA study for the Dukovany NPP is a permanent program and, as the previous text shows, the work covers the following two main areas:

- updating of the study, i.e. modeling of the implemented modifications, updating of specific reliability data for the units and incorporation of more accurate analyses into the model, etc.,

- extending of the study scope.

In 2011, some external initiating events caused by natural effects such as earthquakce and adverse weather conditions, specifically extreme abrasive storms, extreme air temperature (high, low) were premodeled in the PSA study.

The PSA study is also utilized in some other applications (in addition to those mentioned above) such as adjustment of testing intervals for safety-important equipment, IAEA Safety Issues probabilistic assessment, adequacy assessment of existing Limits and Conditions (AOT), assessment of selected operational events, risk-informed in-service inspections (RI-ISI) are on the level of pilot project.

The PSA study for Dukovany NPP is developed in compliance with international standards (IAEA publication, ASME-2 standard, NUREG publication).

The level 1 PSA study for full power unit operation was the subject of the IAEA IPERS mission in 1998. Furthermore, an independent assessment of the PSA study (including study for shutdown conditions and level 2 PSA study) initiated by the SÚJB was carried out by Austrian company ENCONET Consulting in 2005.

The PSA study has been currently incorporated into the Living PSA program and consists of level 1 PSA and related level 2 PSA. Its conclusions are included in the Living PSA Summary Report for the respective year. The Summary Report presents detailed results for Unit 1 provided that different values for other units are always available, if required.

From 2008 and every thereafter, the SÚJB check was executed concerning the project "Living PSA" of Dukovany NPP, verification of continuous evaluation of operational safety of the units of Dukovany NPP and evaluation of risk profile during outages by means of risk monitoring "Safety Monitor of Dukovany NPP" and safety culture evaluation in the field of PSA analyses.

In subsequent years, the PSA study was extended to the full range of internal events and external events caused by human activities, of which only "plane crash" event has a certain contribution to risk, were incorporated therein.

The level 1 PSA study establishes the resulting Core Damage Frequency (CDF) for all unit operation modes for Dukovany NPP as well as total Fuel Damage Frequency (FDF) representing the risk level of unit operation with fuel in core as well as in the Spent Fuel Pool. Current results of the level 2 Living PSA study expressed by means of six classes of activity leakage from containment are also available; we extract LERF thereof. The following tables show comparison of the main results of the level 1 and 2 PSA study for individual units of Dukovany NPP (towards the end of 2012). The results include internal events and external events caused by human activities.

Overview of CDF, FDF and LERF for individual units of Dukovany NPP

	CDF [year^{-1}]	**FDF [year^{-1}]**	**LERF [year^{-1}]**
Unit 1	**2.72×10^{-5}**	**3.14×10^{-5}**	**2.56×10^{-6}**
Unit 2	**2.57×10^{-5}**	**2.99×10^{-5}**	**2.41×10^{-6}**
Unit 3	**2.42×10^{-5}**	**2.82×10^{-5}**	**1.97×10^{-6}**
Unit 4	**2.41×10^{-5}**	**2.82×10^{-5}**	**1.97×10^{-6}**

Overview of CDF, FDF and LERF of Unit 1 for power and shutdown operational modes

Unit 1	CDF [year^{-1}]	FDF [year^{-1}]	LERF [year^{-1}]
2 - 100 % N_{nom}	**1.17 x 10^{-5}**	**1.44 x 10^{-5}**	**2.56 x 10^{-6}**
N < 2 % N_{nom}	**1.55 x 10^{-5}**	**1.70 x 10^{-5}**	–
Total:	**2.72 x 10^{-5}**	**3.14 x 10^{-5}**	**2.56 x 10^{-6}**

Probabilistic safety assessment of the Temelín NPP

The first probabilistic assessment of the Temelín NPP Unit 1 and Unit 2 were developed in 1993 – 1996.

The goal of the PSA project of the Temelín NPP was on severe accident risks, to understand the most probable accident sequences that may occur at the plant, including their importance, to acquire quantitative understanding of the total Core Damage Frequency and frequency of release of radioactive substances and to establish the main contributors to such releases. The PSA project of the Temelín NPP included evaluation of level 1 PSA both at power operation, low-power operation and during outages, and the evaluation of risk, fires, flooding, seismic events and other external events. The project also included evaluation of the level 2 PSA. As to events, only the potential risks of sabotage and war were not assessed.

Since the beginning, PSA analyses have been drawn up as "Living", including close involvement and development of the individual analyses by the NPP personnel to maintain result models in an actual status for risk-informed applications everyday use either by the PSA specialists or by the NPP operating personnel. One of the above-mentioned applications was also the possibility of risk monitoring of operation of both units at Temelín sites. Upon these grounds, the work scope was extended in 1996-1999 and the PSA basic models (for the all operational states and levels 1 and 2) were converted to develop a localized version of the Safety Monitor 2.0 or 3.0 and 3.5 software from the Scientech Company. The main purpose of this software and its related probabilistic models is to analyze the impact of both actual and planned configurations of the NPP, including maintenance activities and equipment tests for immediate operational risk level in all operating modes without the necessity to have any knowledge from the PSA field. Validity of the licence for this software was subsequently then purchased for the Dukovany NPP.

In 2003, updating of the PSA analyses of the Temelín NPP was completed, based on current state of the power plant during its commissioning. The analyses updated in 2001-2003 represent knowledge on the plant's response to emergency, current design and operational condition after the implementation of many safety improvements. This enables us to assess the impact of safety related measures at the Temelín NPP, using the Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) and thus acquire a more realistic estimate of the current safety level in the commissioning and further operational stages.

The main results of the updated PSA models of Temelín NPP for analyzed list of internal and external initiating events and the Temelín NPP status at the beginning of 2013 represent Core Damage Frequency estimation of the Temelín NPP Unit 1 and Unit 2:

- CDF = 1.39.10^{-5}/year for operation at power
- CDF = 9.28.10^{-6}/year (outage) for all operating conditions of the outage
- CDF = 7.42.10^{-6}/year for internal fires
- CDF = 1.35.10^{-6}/year for internal flooding

- CDF = below $1.00.10^{-8}$ for seismic events
- CDF = below $1.00.10^{-7}$ for other external events
- Total CDF = $3.2.10^{-5}$/year for all operating modes and initiating events
- Total LERF = $4.04.10^{-6}$/year (without application of the SAMGs)

At the same time, a new conversion and migration of updated PSA models to the Safety Monitor software environment version 4.1 from the Safety Monitor software version 3.5 was performed. The software operation, including models, is currently tested in the Temelín NPP network environment and is used especially for optimization of maintenance activities both during operation and mainly during evaluation of each of the outages (time schedule of outage before its start, its potential modifications in the course of outages and subsequent compliance evaluation of predicted and actual risk profile), as well as for assessment of the overall risk profile of operation of all units of Temelín NPP and Dukovany NPP, and for support of applications for the evaluation of allowed outage time (AOT) .

Real annual cumulative value of CDF, as a result of Temelín NPP operational configuration risk monitoring, amounts to 1.10×10^{-5} for Unit 1 and 1.074×10^{-5} for Unit 2 of Temelín NPP for 2012 as compared with average value of calculated CDF from 2012 (1.39×10^{-5}).

The PSA is gradually utilized in a number of other applications (in addition to those mentioned above) such as:

- Risk assessment of intended modification of equipment,
- IAEA Safety Issues probabilistic assessment,
- Adequacy assessment of existing Limits and Conditions and proposal of changes in Limits and Conditions (AOT),
- Evaluation of selected risk-severe operational events,
- Assistance in development of EOPs, SAMGs and measures of power plant improvement in respect of severe accidents,
- Risk assessment of time schedules of shutdowns and subsequent evaluation of actual versus planned course and observance of specified risk criteria of the shutdowns,
- Risk assessment of divergences within BCO.

The PSA study for Temelín NPP is developed in compliance with international standards (IAEA publication, ASME-2 standard, NUREG publication).

The PSA study for Temelín NPP was the subject of the IAEA IPERS mission in 1995 (level 1 PSA, internal initiation events) and in 1996 (fires, flooding, external events including seismic events and level 2 PSA). Another IPSART mission took place in 2003 after update of this study. Similarly, an independent assessment of the PSA study initiated by the SÚJB was carried out by Austrian company ENCONET Consulting in 2005.

The SÚJB check has been annually executed since 2009 concerning the project “Living PSA“ of Temelín NPP, verification of continuous evaluation of operational safety of the units of Temelín NPP by means of risk monitoring “Safety Monitor of Temelín NPP” and safety culture evaluation in the field of PSA analyses.

9.1.3 Preventive maintenance, in-service and technical inspections of main components, evaluation of ageing

The Dukovany and Temelín nuclear power plants have implemented the following three basic programs with the goal to monitor and to maintain the level of nuclear and technical safety:

- preventive maintenance program,
- in-service inspections program,
- program of monitoring ageing of the main components.

Preventive maintenance program

Maintenance is carried out in agreement with the established maintenance program for individual equipment, which includes the preventive maintenance program. The methods and scope of maintenance depend on the specified level of safety and reliability of the equipment.

The **preventive maintenance** is further divided into preventive maintenance with predetermined cycles or preventive maintenance depending on technical condition.

The **preventive maintenance with predetermined cycles** is focused on long-term compliance with the safety, technical and economic requirements imposed on technological equipment. Its proposal and update is based on manufacturers' recommendations, own experience as well as on the international good practice. It is related to the In-service Inspection Program and the In-service Test Program.

The **preventive maintenance depending on technical condition** uses the appropriate diagnostic methods to ascertain the technical condition or its prediction on the basis of the monitoring of degradation mechanisms. A preventive maintenance intervention is planned based on the evaluation of the technical condition (or its prediction).

The preventive maintenance of nuclear power plants is contracted to qualified companies. All activities are carried out in accordance with the established procedures and under supervision.

In-service inspections program

In-service inspections are carried out in accordance with the in-service inspection plan prepared by a licensee and approved by the SÚJB. Components important for nuclear and technical safety are included into the inspection program; selection of these components is given by design. The inspection program is based on the design and is part of the accompanying technical documentation and quality assurance programs for each individual component. The results of in-service inspections are regularly evaluated and based on this evaluation, taking into account operational experience, legislative requirements and experience from other operated nuclear power plants, the in-service inspection program is optimized.

The requirements for inspection activities specified in this program are taken into account in the preventive maintenance program.

The following methods are used for the inspection purposes: visual inspection, fluorescent penetrant inspection, magnetic powder, eddy currents, ultrasound transmission, ultrasonic thickness measurement, dimension measurement, tightness and pressure tests, diagnostic measurements. The range and number of these methods depend on the particular component's importance. In accordance with the ENIQ (European Network for Inspection Qualification) methodology NDT methods are qualified on the safety-important components.

Inspections in difficult to access places or in places with higher radiation exposure are carried out by automated (manipulators and robots) methods. These are usually carried out by maintenance suppliers, mostly manufacturers of the monitored equipment or specialized companies with the required qualification.

An accredited Inspection Body of “B” type was established within the Technical Safety department to strengthen the independence and quality of supervision.

Components Life Management Program

On the basis of the defined Plant Life Management Program, the life is controlled at both NPPs for critical equipment, for which it is necessary to ensure a controlled ageing and for which maintenance of a safety condition is conditioned by equipment integrity and any equipment failure is unacceptable in terms of safety and long-term operation.

In respect to the primary circuit equipment residual service life of the reactor pressure vessel, steam generators, main circulation pumps, pressurizers, main circulation pipeline, primary circuit isolation valves, containments and fuel storage pools and refueling cavities is controlled. Input data into the life management program are the measured process parameters (especially temperature, pressure and dose load), as well as information obtained from non-destructive tests, chemical data to identify corrosion environment of components, as well as material and physical properties.

Life management on the secondary circuit focuses on the piping systems, where the erosive corrosion is the most significant degradation mechanism (i.e. flow accelerated corrosion).

The Ageing Management Program has been applied at Dukovany NPP as well as at Temelín NPP since the beginning of their operation. In view of the fact that Dukovany NPP has already exceeded half of its life originally set by the design and further that ČEZ, a. s. declared a strategic objective for its NPPs to stretch out the life span by 10 years as a minimum, the work was commenced in order to implement a Long Term Operation program in accordance with global best practice. Therefore, ČEZ, a. s. took part in the IAEA off-budget program called the Safety Aspects of Long Term Operation and participates in the on-going program International Generic Ageing Lessons Learned (IGALL).

Degradation mechanisms are identified in the life management process a mathematical description of the material damage process is created and subsequently the monitoring program for the evaluation of material damage trends and thus for the determination of the residual life is established.

In the Dukovany NPP, diagnostic software DIALIFE has been created for the machine technologies, performing the calculation of the equipments residual life using verified calculation programs based on information from the technological information systems of the production units, diagnostics, chemistry, special measurements, SCORPIO system, non-destructive testing results, and material properties database. In this way life monitoring of the following equipment is performed:

- Reactor pressure vessel
- Steam generator
- Pressurizer
- Main isolation valve
- Main circulation pump
- Min (coolant) circulation pipeline
- Coolant continuous cleaning system piping
- Pressurizer connecting piping
- Low pressure safety injection system piping

- High pressure pressure core spray system piping

For the monitoring in DIALIFE, the pipes of safety class 1 and 2, including the compensation pipe, are prepared.

Big attention is paid to the radiation embrittlement of the reactor pressure vessel. The program "Standard Surveillance Program" applied in Dukovany NPP removes, among others, the inaccuracies of the descending reduction and interpretation of data about neutron fluence, and enables to monitor the lifetime during the whole reactor pressure vessel life in accordance with the legislation and international standards.

Erosion/corrosion of piping systems made of carbon steel is monitored in the Dukovany NPP by the CHECKWORKS program on following systems:

- feed water to steam generator
- live steam
- residual heat removal
- feeding tank emptying into condenser
- condensate to feeding tank
- pipes 6, 7 and 8 of the turboset extraction
- heating steam condensate from the high-pressure re-heater
- condensate pumps discharge pipe to low-pressure re-heaters 1, 2, 3, 4, 5

Similarly, in Temelín NPP, diagnostic software DIALIFE has been used for the machine technologies, performing the calculation of the equipments residual lifetime using verified calculation programs based on information from the technological information systems of the units, diagnostics, chemistry, special measurements, non-destructive testing results, and material properties database. The Langer, Mason-Cofin and Woehler design life curves may be used in the program. In this way life monitoring for the low cycle fatigue of the following equipment is performed:

- Reactor
- Steam generator
- Pressurizer
- Main circulation pipeline
- Bubbler tank
- (Emergency) cooling exchanger
- Main circulation pump
- Pressurizer piping
- SG feedwater system
- Steam line from SG
- Emergency feedwater system to SG
- SG blowdown system
- Emergency core cooling system
- Pressurizer discharge line
- Coolant purification system

The monitoring applies to approximately 2000 points (reactor 1160, pipeline 638, MCP 104).

The DIALIFE includes also mathematical description of the material damage process caused by stress corrosion.

Big attention is paid to the radiation embrittlement of the reactor pressure vessel. Full-valued surveillance program is implemented for the reactor pressure vessel materials, including cladding, in accordance with the legislation and international standards.The reactor internals were verified using the accelerated in-pile experiments.

In addition, the online system MAFES is installed within the primary circuit diagnostic system to monitor and evaluate the temperature and pressure cycles. The evaluation is performed in 9 sections in the vicinity of potentially critical areas of weld deposits on the primary pipeline.

Erosion/corrosion of piping systems made of carbon steel is monitored in Temelín NPP by the CHECKWORKS program on following systems:

- feed water to steam generator
- blowdown piping
- live steam in intermediate turbine hall
- pipes of the turboset extraction
- regeneration condensate pipe

At Dukovany and Temelín NPPs, the Program of controlled ageing of safety cables has been introduced concerning the cables that are a part of safety systems or the systems related to safety. The cables are evaluated with regard to radiation, thermal, mechanical, compression and chemical load to which these cables are exposed during normal operation, possibly the maximum design accident and during its elimination. The system of evaluation of surveillance samples located in the deposits in identified areas of power plant executes by means of SW applications life calculation and evaluation.

9.1.4 Regulatory practice

SÚJB authority is given by the Atomic Act.

Nuclear and technical safety is evaluated and inspected through:

- the inspection activities aimed at observation of the Atomic Act and its implementing regulations,
- the so-called "licensing" procedures (to issue licences for particular practices),
- the approvals of documentation as defined by the Atomic Act.

The verification of a nuclear and technical safety status by the SÚJB is based particularly on its inspection activities. Section 39 of the Atomic Act establishes authority for the SÚJB inspectors to carry out inspection activities. Section 40 establishes authority of the inspectors to require that remedial measures are adopted within established deadlines, impose corrective measures, inspections, tests and reviews, including the right to propose fines. Moreover, in agreement with Section 40, the SÚJB is authorized, in the event of hazard arising from delay or occurrence of undesirable situation with impact on nuclear safety, to issue a provisional measure imposing the obligation to reduce the power output or even to suspend operation of the nuclear installation. For details – see chapter 3.1.2.

Essentially, there are different forms of inspection activities performed by the SÚJB:

- routine inspections and planned specialized inspections,
- inspections responding to a particular situation (the so-called "ad-hoc" inspections).

The routine inspections are planned to cover all regular important activities performed by the licensee, especially in respect to compliance with the Limits and Conditions for safe operation. This plan is developed based on the plans for operation, requirements of Limits and Conditions and requirements in the operating procedures; the inspections are performed on daily, weekly and quarterly basis. Results of the routine inspections are usually evaluated once a month. The evaluation activity is documented in monthly reports and discussed with the licensee.

In case of the planned specialized inspections a regular semi-annual plan is developed based on:

- evaluated results of the inspections performed during a previous period,
- plan of the nuclear installation operation,
- evaluation and conclusions of routine inspections,
- conclusions of the SÚJB assessment effort,
- independent analyses, findings from safety analyses.

The inspections are usually carried out by a team of inspectors, made up of resident inspectors and inspectors from the Central Office. The so-called "ad-hoc" inspections are performed to examine events and failures with impact on nuclear safety, as well as to clarify serious findings from the routine or planned inspections.

The SÚJB assesses the level of nuclear safety also in the course of the so-called "licensing" procedure to issue licences for activities identified in the Atomic Act and implementing decrees and guidelines, and with regard to international practice. Moreover, the SÚJB assesses the level of nuclear safety assurance within the following activities:

- assessment of the periodically submitted Final Safety Analysis Report (requirements for its submittal are specified in the respective SÚJB resolution),
- evaluation of the in-service inspections program,
- evaluation of the program for the enhancement of nuclear installations safety,
- evaluation of feedback from the operational experience and implementation of the latest scientific knowledge and technology.

In agreement with the Atomic Act, all results obtained by the SÚJB in the area of nuclear safety verification and assessment are regularly submitted to the government on annual basis. The results are also made available to the general public.

9.2 Statement on the implementation of the obligations concerning Article 14 of the Convention

In agreement with the requirements of Article 14 of the Convention, the Czech licensee performs comprehensive and systematic safety evaluation before a nuclear installation construction, commissioning and throughout its whole service life. The evaluation is documented and regularly updated at prescribed intervals to reflect operational experience and significant new scientific and technological information relating to nuclear safety and, in compliance with the Atomic Act, assessed by the responsible regulatory body. The requirements of Article 14 of the Convention are thus fulfilled.

10. Radiation Protection – Article 15 of the Convention

Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

10.1 Description of the current situation

10.1.1 Summary of legislation relating to radiation protection

Radiation protection in Czech nuclear installations is regulated by the Atomic Act and its implementing SÚJB Decree No. 307/2002 Coll., on radiation protection as amended.

The legislation in the radiation protection area is consistently based on internationally recognized radiation protection principles which observe recommendations of renowned international non-governmental expert organizations and especially recommendations issued by the International Commission on Radiological Protection (ICRP) No. 60 of 1990, as well as on related international fundamental standards for radiation protection approved by intergovernmental organizations, including the International Atomic Energy Agency.

Presently, revision of legislation in the field of radiation protection in the Czech Republic is being executed based on a new document The Recommendations of the International Commission on Radiological Protection, ICRP 103, 2007 and on prepared documents from "EC Council Directive Basic safety standards for protection against the dangers arising from exposure to ionising radiation" and "Radiation Protection and Safety of Radiation Sources International Basic Safety Standards, IAEA.

The Atomic Act establishes the obligation to obtain a licence from the SÚJB for practices listed in Section 9 (siting, construction, individual stages of commissioning, etc.). For more details see chapter 3.1.2. The same applies for the release of radionuclides into the environment and for radioactive waste management. A number of additional obligations for the licensee are established in Sections 17 – 19 of the Atomic Act. In respect to the radiation protection at nuclear installations the obligations include in particular:

- to assure radiation protection in the scope required by the particular licences and to assure systematic supervisions of compliance with radiation protection requirements,
- to comply with the conditions specified in the licence issued by the SÚJB, to proceed in accordance with approved documentation and to promptly investigate any violation of such conditions or procedures, and to adopt corrective measures to prevent the situation occurring again, including the obligation to promptly report all cases where any exposure limit has been exceeded to the State Office for Nuclear Safety,
- to comply with the technical and organizational conditions for the safe operation of nuclear installations as laid down in the implementing decrees,
- to participate in the functioning of the National Radiation Monitoring Network to the extent established in a government order,

- to promptly report to the State Office for Nuclear Safety any change or event affecting nuclear safety, as well as any change in circumstances decisive for issuance of the licence,
- to provide the general public with information on nuclear safety and radiation protection assurance,
- to monitor, measure, evaluate, verify and record all values, parameters and facts important from the radiation protection point of view, in the scope established in the implementing regulations, including radiation monitoring of individuals, the workplace and its vicinity, to keep and file records on the mentioned facts and to submit the recorded information to the State Office for Nuclear Safety in a manner specified in an implementing regulation,
- to minimize the produced quantity of radioactive wastes and spent nuclear fuel to the necessary level,
- to prepare and hand over to SÚRAO data on short-term and long-term production of radioactive waste, spent nuclear fuel, and other information necessary to determine the amount and method of payments to the nuclear account,
- to keep records about radioactive wastes by type of waste, in such a manner that all characteristics affecting its safe management are apparent,
- to provide for regular medical checkups of personnel who handle ionizing radiation sources,
- to provide a system of training, verification of competence and special professional competence of the personnel in accordance with the importance of the work they perform.

The Atomic Act also establishes the rights and obligations with respect to radioactive waste management. Depending on a level of contamination the Atomic Act basically distinguishes between three categories of radioactive wastes.

- wastes which satisfy the generic clearance levels stipulated by the SÚJB Decree No. 307/2002 Coll. (Section 57), and which may be discharged into the environment without the permit issued by the SÚJB,
- wastes exceeding these clearance levels, and which may be discharged into the environment following a relevant administrative procedure, based on a permit issued by the SÚJB, and in a manner and under conditions specified therein,
- wastes highly contaminated with radionuclides, requiring a long-term isolation from the environment and disposal in a radioactive waste repository. The disposal of radioactive wastes is entrusted by law to SÚRAO.

The basic decree for the implementation of the Atomic Act in the radiation protection area is the SÚJB Decree No. 307/2002 Coll., on the radiation protection. The decree specifies details of the manner and extent of the assurance of the protection of individuals and environment against adverse effects of ionizing radiation during radiation practices as well as during the preparation for and actual performance of actions to reduce the existing exposure; the regulation is thereby used for the implementation of the majority of authorizations established in the Atomic Act in respect to the radiation protection.

Among other things, the SÚJB Decree No. 307/2002 Coll. quantifies, which materials and objects are considered radionuclide sources, i.e. which things and objects are subject to regulation and, on the other hand, which may be excluded from the regulation. The decree establishes the criteria for ionizing radiation sources classification into 5 categories: as insignificant, minor, simple, significant and very significant sources (from Section 4 to Section 10), the criteria for categorization of workplaces, where the radiation activities are performed, into workplaces of categories I. to IV. (from Section 11 to Section 15), and the criteria for categorization of exposed workers into categories A and B (Section 16). The decree also defines the procedures and criteria related to the radiation protection optimization (Section 17) and decree introduces values of dose limits (form Section 18 to Section 23) too.

The SÚJB Decree No. 307/2002 Coll. also governs the details of methods and the scope of radiation protection provision in the course of radiation practices and in the course of actions to reduce exposure from radiation accidents, and it particularly:

- establishes the scope and manner of handling the ionizing sources requiring licence, and the requirements for radiation protection provision for the individual types they are handling,
- governs the details of radioactive waste management and the release of radionuclides into the environment,
- establishes technical and organizational conditions of safe operation of ionizing radiation sources and workplaces using such sources, including details about the controlled area definition and the categorization of workplaces with sources of ionizing radiation,
- defines values, parameters and facts necessary from the radiation protection point of view, establishes the scope of their monitoring, measuring, evaluation, verification, recording, registration and method of data transmission to the State Office for Nuclear Safety,
- establishes the guideline levels and details on rules for the adoption of measures to prevent or reduce exposure during a radiation accident.

10.1.2 Implementation of radiation protection requirements

Dose limits

New regulations issued in 2002 made the dose limit values to conform to the Council Directive 96/29/Euratom.

The most frequently used whole body dose limits are now expressed as internationally recommended values, which express the effect of exposure on the whole human organism (the effective dose). The values represent a sum of effective doses from the external exposure and relevant committed effective doses from internal exposure in a specified period. New regulations, unlike the previous ones, establish neither limits for periods shorter than one calendar year nor limits related to periods longer than five consecutive calendar years.

The limits for individual members of a population, i.e. persons usually exposed involuntarily and unconsciously, are lower than the limits for persons who are aware of the possible risks and are exposed voluntarily and intentionally, either while executing their professional duties or while being trained for such a profession.

The effective dose limits for occupational exposure of the personnel of categories A and B, i.e. the persons exposed to radiation in connection with the performance of radiation practices, are 100 mSv for the period of five consecutive calendar years, providing that in one calendar year the value shall not exceed 50 mSv. The operators of nuclear facilities assign for the work in their controlled areas only the staff of category A. This shall be accompanied by the introduction of routine regular monitoring of their individual doses and recording of these individual doses for the period of at least 50 years. In exceptional cases, other persons can also work in controlled area, however only on condition that their radiation exposure does not exceed general limits. In order to monitor the personnel in categories A and B, SÚJB Decree No. 307/2002 Coll. also establishes derived limits that are easier to monitor and expressed in immediately measurable units.

The effective dose limit for the individuals between 16 and 18 years of age, who are exposed to radiation consciously and voluntarily in the course of special training for their future profession, and who have been in a demonstrable way instructed about their potential occupational exposure and about the related risks, is 6 mSv in a single calendar year.

The general effective doses limits, i.e. limits related to all other individuals from the population, are 1 mSv for one calendar year or, under conditions laid down in the permit to operate the workplaces of category III. or IV., exceptionally the value of 5 mSv for the period of five consecutive calendar years.

The general limits are related to the average calculated exposure of the most exposed population group, for all expected exposure ways from ionizing radiation sources and all radiation practices, which are to be considered. Unless there is a direct basis for calculation available, it is necessary to use conventional estimates of variations of the factors affecting propagation of radionuclides or radiation exposure to the values of effective doses of individuals in critical group. For an easier check of observance of the population exposure limits in the surroundings of a certain facility, the SÚJB is entitled to determine optimization limit of the value of doses (the so-called dose constraints) related only to radiation exposure from this facility and used as the upper limit (the so-called upper bound) for optimization of radiation protection in relation to the population in the surroundings.

Conditions for discharges of radioactive substances

The discharging of liquid and gaseous radioactive substances from nuclear installations into the environment is, in accordance with the Atomic Act (Section 9) subject to the permit issued by the SÚJB, and more details, including the criteria necessary for the corresponding permit, are established in Section 56 of the SÚJB Decree No. 307/2002 Coll. In addition, the latter establishes the dose constraint for a total discharge of radioactive substances from a workplace where radiation activities are performed shall be an average effective dose of 250 microsievert (μSv) per calendar year for the appropriate critical group of the public, from which 200 μSv shall be for discharges into the atmosphere and 50 μSv for discharges into watercourses from nuclear installations. Each discharge shall be justified and optimized.

Justification is not required if the values of determined authorized limits do not exceed the value of annual effective dose of any individual from the population in the amount of 50 μSv deemed reasonably achievable level of radiation protection.

A permit to discharge radionuclides into the environment is issued by the SÚJB. However, for discharges into the watercourse a broader authorization is issued by the relevant water management authority, and on which the SÚJB issues binding opinion with respect to problems related to the radioactivity of waters.

The authorized limits for effluents expressed in effective doses and committed effective doses of the individual from the reference group of the population (also called “critical group”) in the vicinity of NPP are established for Dukovany and Temelín NPPs.

All real discharges are monitored by an extensive monitoring system operated both by the nuclear installation operators and by the independent measurements carried out directly by the SÚJB or through the State Institute for Radiation Protection. The measurement results provide reliable evidence that the permitted authorized limits are not exceeded.

Optimization in radiation protection

The technical and organizational requirements, limits and procedures used for the justification of a reasonably achievable level of radiation protection are established in Section 17 of the SÚJB Decree No. 307/2002 Coll. The requirements are assessed within the licensing process and in the course of regular inspections. For nuclear installations this means that:

- the corresponding protective measures as well as collective doses and doses in the relevant critical groups have to be assessed and compared before the commencement of each activity resulting in exposure,
- regular (annual) analysis of doses received during the activity resulting in exposure must be carried out, while considering additional measures available to assure the radiation protection and comparison with similar operated and socially acceptable activities.

The reasonably achievable level of radiation protection can be demonstrated by a procedure, which compares the costs of alternative measures for the enhancement of radiation protection (e.g. introduction of additional barriers) with the financial benefits expected from the correspondingly reduced exposure. The reasonably achievable level of radiation protection shall be considered proven and no additional measures are required if the costs are higher than the benefits. The SÚJB Decree No. 307/2002 Coll. establishes the amounts of monetary equivalents for the reduction of collective effective doses of exposed personnel or population, scale based on the expected average effective dose and exposure limits. The decree also takes into account the possible need for the adjustment of the financial amounts.

A reasonably achievable level of radiation protection shall be also considered to sufficiently proved if an annual effective dose of the exposed workers arising from a certain radiation activity does not exceed 1 mSv for each exposed worker even for predictable deviations from normal operation, and an annual effective dose to the public does not exceed 50 µSv for each individual, and a collective effective dose at a category IV workplace does not exceed 1 Sv. In such cases, it is not necessary to optimize radiation protection.

A dose constraint for a nuclear installation operation shall be a collective effective dose of 4 Sv per year for each gigawatt being installed in the nuclear installation related to the exposure of all exposed workers who undergo personal monitoring in compliance with the monitoring program.

Radiation monitoring in the vicinity of nuclear installations

An operator of a nuclear installation is legally responsible for the radiation monitoring in the installation vicinity. The monitoring shall be carried out in accordance with the monitoring program approved by the SÚJB. The monitoring program establishes the scope, frequency as well as the methods of measurement and evaluation of results and the corresponding reference levels. The monitoring at nuclear installations is currently performed, as a rule, directly by specialized departments of the operator. The SÚJB inspects the fulfillment of the monitoring program and also performs its own independent measurements.

The dose rates in the vicinity of Dukovany NPP and Temelín NPP are continuously monitored by a teledosimetric system operated by the nuclear power plant. There is at least one point of the national independent early warning network close to each plant (see later).

Monitoring of the equivalent dose rates due to external exposure in the vicinity of the nuclear power plants is performed by local networks of thermoluminiscent detectors operated by the radiation monitoring laboratory of the respective plant. Independently of these networks, The SÚJB Regional Centres perform their own measurements using the thermoluminiscent detectors. Until now, none of these networks has recorded any violation of the investigation levels caused by the operation of the nuclear power plant.

Regular sampling and measurements of radionuclides activity in components of the environment in the vicinity of Dukovany NPP is carried out by the radiation monitoring laboratory and the SÚJB Regional Center in Brno. In the vicinity of Temelín NPP the measurements are performed by the radiation monitoring laboratory and the SÚJB Regional Center in České Budějovice.

Since the nuclear installations are part of the National Radiation Monitoring Network, the regulatory bodies receive regular overviews of the measurement results. Moreover, the operator of the nuclear power plants on its own initiative publishes various information materials for the public. This area is governed by the Government Order No. 11/1999 Coll., on the emergency planning zone (see chapter 2.1.2).

A number of other measurements are performed in the nuclear power plants vicinity with the objective to detect and assess any release of radioactive substances and to provide credible background information necessary to make decisions on the measures to protect the population. The measurements are performed within the National Radiation Monitoring Network coordinated by the SÚJB. Results of the monitoring are submitted to the Committee for Civil Defense and Emergency Planning and to the public in annual reports on the radiation situation on the Czech Republic’s territory, through the relevant Regional Authorities, sanitary stations and libraries.

The function and organization of the Radiation Monitoring Network are governed by the SÚJB Decree No. 319/2002 Coll. as amended by the SÚJB Decree No. 27/2006 Coll. The Radiation Monitoring Network operates in two modes: the "regular" mode focuses on monitoring of the current radiation situation and on early detection of a radiation accident, while the so-called "emergency" mode focuses on the assessment of consequences of such an accident. The regular mode is carried out continuously by the so called "permanent elements" of the Radiation Monitoring Network. The emergency mode uses also its "emergency elements". The monitoring in normal conditions is carried out by several subsystems using either some selected or all permanent elements of the Radiation Monitoring Network. The subsystems can be divided into the following groups:

- early warning network, composed of 71 continually working measuring points with the automatic data transmission of the measured values to the central database,
- territorial TLD network of 206 measuring points equipped with thermoluminiscent dosimeters, of which 21 measuring points in local networks in the vicinity of Dukovany NPP and Temelín NPP,
- local TLD site with 71 measuring points equipped with thermoluminiscent detectors in the vicinity of Dukovany NPP and Temelín NPP,
- territorial network for air contamination measurements which includes 11 air-contamination measuring points, equipped with large-scale sampling equipment for aerosols and fallouts,

- network of 9 laboratories performing the gamma-spectroscopic and radiochemical analyses of the radionuclides content in the environment samples (aerosols, fallouts, food, drinking water, feedstuff, etc.),
- mobile groups and aircraft group equipped with the instrumentation measuring the dose rates in the atmosphere (volume activity) and on the ground (deposition of radionuclides).

Participation in the international exercises has confirmed that the Czech Radiation Monitoring Network is comparable with the European standards in respect to its equipment and density of measuring points.

10.1.3 Supervisory activities

The Atomic Act entrusted the execution of the state supervision of the radiation protection in the Czech Republic to the SÚJB (see chapter 3.1.2).

The inspection activities in radiation protection are performed by the SÚJB radiation protection inspectors. At present, there are in total 60 inspectors, located at the Central Office in Prague and at eight Regional Centers all over the country. The inspectors are required to prove their professional competence in the field, to have a university degree in the respective field and at least three years of professional experience. The inspectors are appointed by the SÚJB Chairperson. For more details see chapter 3.

The inspections are carried out by the inspectors of the SÚJB Regional Centers within the territory of the relevant region, or by the Specialized Inspection Groups focused on specific types of ionizing radiation sources and their workplaces, where it is required to achieve a higher level of the unification of radiation protection practices all over the state (e.g. nuclear medicine workplaces, workplaces with open radionuclide sources of category II and higher, nuclear energy, radio-therapeutic workplaces, etc.). This inspection system is complemented by inspections carried out ad hoc for special inspections, especially at the workplaces of categories III and IV.

The inspections are carried out in accordance with standards governed by the SÚJB internal documentation, which includes the establishment of principles for the preparation of inspections, their performance, evaluation and recording of results to the central database.

The inspections carried out in the field of nuclear power are evaluated in the feedback system on a monthly basis with a view to achieving high standard of inspection efficiency. As for the indicators for radiation protection at nuclear installations within the countries associated within the OECD, the Czech Republic reaches the first place in the category of light-water and heavy-water reactors (see annual reports of OECD, NEA, ISOE), which shows evidence of efficiency of this method of inspection activity assurance.

10.2 Statement on the implementation of the obligations concerning Article 15 of the Convention

The requirements of Article 15 of the Convention are fulfilled in the Czech Republic, both in respect to legislation and implementation.

11. Emergency preparedness - Article 16 of the Convention

(i) Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.

For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.

(ii) Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with the appropriate information for emergency planning and response.

(iii) Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.

11.1 Description of the current situation

11.1.1 Summary of national legislation for on-site and off-site emergency preparedness

The national legislation is in compliance with the IAEA documents such as TECDOC 718, Drawing Up a National Plan of Measures for the Case of Radiation Accidents; TECDOC 953, Method for Creating an Emergency Response Preparedness During Nuclear or Radiation Accidents; TECDOC 955, Basic Evaluation Procedures for Adoption of Protective Measures In the Course of the Reactor Accident.

The legislative framework for the emergency preparedness of nuclear installations and their vicinities is in particular given by the Atomic Act, its implementing decrees and related government orders (see Chapter 2.1.2).

The provision of Section 2 of the Atomic Act defines the basic terms – emergency preparedness, radiation incident, radiation accident, radiological emergency, emergency exposure, emergency planning zone and emergency plan.

In accordance with Section 3 of the Atomic Act, within its competence, the SÚJB:

- approves on-site emergency plans and their modifications after discussion on the relations to off-site emergency plans; the approval of on-site emergency plan is one of the conditions for obtaining a licence for the commissioning of the installation and its operation,
- establishes an emergency planning zone, based on the licensee request,
- controls the activity of the National Radiation Monitoring Network and performs the activities of its head office,

- ensures the activities of the Emergency Response Center and international information exchange on the radiation situation,
- ensures, by means of the National Radiation Monitoring Network and based on assessment of the radiation situation, the background information necessary to take decisions aimed at reducing or averting exposure in the case of a radiation accident,
- is obliged to provide the public with adequate information concerning the results of its activities, unless they are subject to state, professional or business secret, and to publish once a year a report on its activities and to submit the report to the Government of the Czech Republic and to the public.

Among other things, Section 4 of the Atomic Act establishes the principles for performance of radiation activities and limiting emergency exposure. The principles for averting or reducing exposure due to radiation accidents and exposure of people who participate in the mitigating interventions are elaborated in the implementing SÚJB Decree No. 307/2002 Coll., on radiation protection.

Within the general obligations, the provision of Section 17 of the Atomic Act establishes the obligation of a licensee to ensure emergency preparedness, including its verification, in the scope appropriate for the particular licenses, and to report to the SÚJB any change important from the emergency preparedness point of view, including changes in any facts relevant for license issuing.

The provision of Section 18 of the Atomic Act establishes, besides other obligations, the obligation of a licensee to:

- monitor, measure, evaluate, verify and record values, parameters and facts important for emergency preparedness, to the extent laid down by implementing regulations,
- keep and archive records of ionizing radiation sources, facilities, materials, activities, quantities, parameters and other facts important from the emergency preparedness point of view, and to submit the recorded data to the SÚJB in the manner laid down in an implementing regulation,
- ensure systematic supervision of observance of emergency preparedness, including its verification.

The provision of Section 19 of the Atomic Act establishes as one of the obligations of the license in the event of radiation incident, to the extent and in the manner determined by the on-site emergency plan approved by the SÚJB, to:

- notify immediately the relevant Regional Authorities, the SÚJB and other relevant bodies specified in the on-site emergency plan, of the occurrence or suspected occurrence of a radiation accident,
- ensure immediately warning the public within the emergency planning zone in case of a radiation accident,
- ensure immediately that the consequences of the radiation incident are dealt with in the premises, where his activities are performed and to take measures to protect employees and other persons from the effects of ionizing radiation,
- ensure the monitoring of exposures of employees and other persons, and prevent any release of radionuclides and ionizing radiation into the environment,
- inform relevant bodies, in particular on monitoring results, on factual and expected development of the situation, on measures taken to protect employees and the public,

and on measures taken to deal with the radiation incident and also on the factual and expected exposure of people,

- control and regulate exposure of employees and other persons participating in the radiation incident mitigation within the premises where the licensee performs his activities,
- cooperate in dealing with the consequences of the radiation incident which occurred on his premises,
- participate, in case of radiation accident, in the activities of the National Radiation Monitoring Network.

In addition, the same Article also establishes the obligation of the licensee to submit to the appropriate Regional Authority and to the relevant Municipal Offices with extended competences background documents to prepare the off-site emergency plan and to co-operate with the authority in order to ensure emergency preparedness within the emergency planning zone.

The Article also establishes that a government order will lay down a financial share of the licensee in covering activities of the National Radiation Monitoring Network in providing the public within the emergency planning zone of relevant installations or workplaces with antidotes, in running a press and information campaign aimed at ensuring that the public is prepared for radiation accidents, in providing a system for the notification of the relevant bodies to the extent and in the manner established in the on-site emergency plan, in providing a warning system to inform the public living in the vicinity of the nuclear installation, as well as the obligation of the licensee to participate in the removal of the consequences of the radiation accident within the emergency planning zone.

Based on the provision of Section 46 some ministries are obliged to participate in providing for the emergency preparedness, i.e. this Article establishes that: for requirements of the Radiation Monitoring Network on the Czech Republic's territory:

a) the Ministry of Finance ensures operation of specified parts of measuring points at border crossings and participates in operation of car borne monitoring groups,
b) the Ministry of Defence participates in operation of Early Warning Network, monitoring points at roadblocks and border crossings, operation of car borne monitoring groups and aircraft monitoring groups and ensures means of aerial survey,
c) the Ministry of Interior participates in operation of car borne monitoring groups,
d) the Ministry of Agriculture participates in operation of water contamination monitoring points and foodstuffs contamination measuring points,
e) the Ministry of Environment ensures meteorological service and participates in operation of the Early Warning Network, air contamination measuring points and water contamination measuring points,
f) the Ministry of Interior provides notification and warning system in assurance of emergency preparedness and in its verification.

The Ministry of Health creates a system of special medical care provided by selected clinics to persons irradiated during radiation incidents.

Details and requirements for emergency preparedness in the case of extraordinary events (radiation incidents and accidents) are established in the implementing regulations related to the Atomic Act:

- ***SÚJB Decree No. 318/2002 Coll.,*** on details in emergency preparedness of nuclear installations and workplaces with ionizing radiation sources, and on requirements on the content of on-site emergency plans and emergency rules, as amended by the SÚJB Decree No. 2/2004 Coll.,
- ***SÚJB Decree No. 307/2002 Coll.,*** on radiation protection, as amended,
- ***SÚJB Decree No. 319/2002 Coll***., on function and organization of the National Radiation Monitoring Network, as amended by the SÚJB Decree No. 27/2006 Coll.,

The **SÚJB Decree No. 318/2002 Coll**., establishes details of assuring emergency preparedness of nuclear installations, such as:

- identification of extraordinary event occurrence,
- assessment of the extraordinary events significance and their classification in three basic degrees,
- announcing an extraordinary event,
- activation of intervening persons,
- management and implementation of the intervention,
- requirements for the intervention procedures and instructions,
- requirements for the radiation situation monitoring program,
- methods to limit exposure of the employees and other persons,
- medical provision principles,
- ensuring documenting of the activities during an extraordinary event,
- submitting information on the occurrence and development of an extraordinary event to the SÚJB,
- requirements for training of employees and other persons,
- requirements for the emergency preparedness verification, including emergency exercises and tests of function of technical means, systems and devices necessary for management and implementation of the interventions,
- requirements for the contents of an on-site emergency plan,
- requirements for other documentation related to emergency preparedness.

The **SÚJB Decree No. 307/2002 Coll**., in the provision of Section 92, stipulates general regulations for the preparation and performance of the interventions, and in the provision Section 98 through Section 100 and in the Annex No. 8 establishes details in the manner and scope of radiation protection assurance during interventions to reduce exposure due to radiation incidents. Furthermore, the Decree establishes guidance levels for the early and recovery countermeasures.

Government Order No. 11/1999 Coll., defines for the licensee the following requirements:

- for the elaboration of a proposal for establishing an emergency planning zone for the nuclear facilities or workplaces with a significant source of ionizing radiation (in accordance with Section 17 of the Atomic Act the licensee shall submit this proposal to the SÚJB for the determination of the emergency planning zone size),
- for ensuring the activity of National Radiation Monitoring Network in the emergency planning zone,
- for the provision of the population in the emergency planning zone with antidotes,
- for ensuring the press and information campaign for the population in the emergency planning zone for the cases of radiation accidents,

- for the notification system of relevant bodies about occurrence or suspected occurrence of a radiation accident,
- for ensuring the warning system of population in the emergency planning zone.

Further requirements are laid down by the Act No. 239/2000 Coll., on the integrated rescue system and on amendments to some acts, as amended and by the Act No. 240/2000 Coll., on crisis management and on amendments to some acts, as amended.

Act No. 239/2000 Coll., on Integrated Rescue System and on amendment to some acts, as amended, establishes:

- Defines the Integrated Rescue System, establishes the units of the Integrated Rescue System and their authorities, authorities and powers of state bodies and municipal bodies, rights and duties of legal and natural entities during the preparation for extraordinary events and during rescue and remedial work and during the population protection before and during the declaration of a danger, emergency, threat to the country and war.
- In the provisions of Section 2, defines an extraordinary event, which is not identical (is broader) with the term “radiological emergency”.
- In the provisions of Section 18, defines communication between the units of the Integrated Rescue System.

Act No. 240/2000 Coll., the Crisis Act, and on amendment to some acts, as amended,

- Stipulates the powers and competencies of government bodies and authorities of regional self-government units as well as the rights and duties of legal entities and natural persons in preparation for crisis situations not related to assurance of protection of the Czech Republic against external attack and in their solution and during the protection of critical infrastructure and responsibility for the breach of such obligations..
- Incorporates the relevant regulations of the European Union and regulates the determination and protection of the European critical infrastructure.

Implementing legal regulations were added to the above-mentioned acts, which are, among others, related to emergency preparedness assurance and crisis management in the field of utilization of nuclear energy and ionizing radiation. The relevant details are amended by:

- ***Ministry of Interior Decree No. 328/2001 Coll.***, on some details in ensuring of the integrated rescue system, as amended by the Decree No. 429/2003 Coll.,
- ***Ministry of Interior Decree No. 380/2002 Coll***., for the preparation and performance of tasks for population protection,
- ***Government Order No. 462/2000 Coll.,*** for the implementation of Section 27 paragraph 8 and Section 28 paragraph 5 of the Act No. 240/2000 Coll., as amended,
- ***Government Order No. 432/2010 Coll.,*** on criteria for determining the elements of critical infrastructure.

Ministry of Interior Decree No. 328/2001 Coll., establishes details for ensuring integrated rescue system operation, including principles for coordination and collaboration of its units during common intervention. The Decree further establishes requirements for the contents of documentation of the integrated rescue system, way of elaboration of documentation and details on alarm degrees of the alarm plan. The Decree also establishes principles and way of elaboration, approval and use of regional emergency plan and off-site emergency plan, as well as the principles of crisis communication and connection within the integrated rescue system.

Off-site emergency plan, which is emergency plan prepared for the emergency planning zone, is classified into:

- information section,
- operations section,
- planes of specific activities.

Information section includes:

a) general description of the nuclear installation or workplace of the category IV,
b) characteristics of the territory, in particular data on demography, geography, climatic conditions and description of infrastructure on the territory,
c) list of municipalities, including the overview on the number of population, and list of legal and other responsible person included in the off-site emergency plan,
d) analyses results of possible radiation accidents, and possible radiological effects on the population, animals and environment,
e) classification system of radiation accidents in accordance with the on-site emergency plan,
f) requirements for the population and environment protection in relation to intervention levels during the radiation accident,
g) description of the emergency preparedness organizational structure in the emergency planning zone, including a listing of competencies of its components for the performance of necessary activities, and
h) description of a notification and warning system, which includes the relations to licensee and information transfer within the emergency preparedness organization in the emergency planning zone.

Operations section includes:

a) tasks of administration offices, municipalities and components having relation to countermeasures included in the off-site emergency plan,
b) way of radiation accident resolution coordination,
c) criteria for the declaration of corresponding crisis situations, in case the off-site emergency plan does not suffice for the radiation accident resolution,
d) way of securing information flows during the radiation accident consequences remedial management and
e) principles for activities during the spreading or the possibility of spreading of radiation accident consequences outside the emergency planning zone and cooperation between administration offices and municipalities having relations to countermeasures included in the off-site emergency plan.

Plans of specific activities establish procedures for the implementation of the individual measures for the following areas:

a) notification,
b) warning of population,
c) rescue and remedial work,
d) sheltering of the population,
e) iodine prophylaxis,

f) evacuation of persons,
g) individual protection of persons,
h) decontamination,
i) monitoring,
j) regulation of persons movement and transport,
k) traumatological plan,
l) emergency plan for veterinary measures,
m) regulation of food, feedstuff and water distribution and consumption,
n) measures in case of death of persons in the contaminated area,
o) public order and safety ensuring,
p) communication with the public and mass information media.

The **Ministry of Interior Decree No. 380/2002 Coll**., establishes, among others, details in the manner of informing legal and natural persons on the nature of the possible threat, upcoming measures and the way of their implementation, details of technical, operational and organizational plans ensuring an unified warning and notification system as well as a way of providing emergency information.

The **Government Order No. 462/2000 Coll.,** as amended, establishes in particular details of identification, recording, handling and filing of documents and other materials containing special facts, and procedure for designation of persons to contact with special facts, identification, record mode determination, handling and filing of documents and other materials containing special facts; procedure for designation of persons to contact with special facts; structure and activity and composition of the Regional Security Council , and content of activity and composition of the Municipal Security Council specified municipals , and the Regional Crisis Staff and specified municipality with extended competences, and content of activity and composition of the Regional Crisis Staff and specified municipality with extended competences; details and method of preparing of the crisis plan, details and method of preparing the crisis preparedness plan, and details and method of preparing the crisis preparedness plan of a critical infrastructure entity.

11.1.2 Implementation of emergency preparedness measures, including role of the State Supervision Body and other departments

Emergency response organization

In accordance with the SÚJB Decree No. 318/2002 Coll. the operator of the nuclear power plant (licensee) is obliged, in order to assure emergency preparedness, to create corresponding organizational and personal conditions so that in case of extraordinary events occurring the personnel of the nuclear power plant are ready to respond immediately to the situation and to commence preplanned activities aimed at eliminating the negative effects and consequences.

The Emergency Response Organization has been established both at the Dukovany locality and at the Temelín locality, which consists, during the early stage of extraordinary event development when it is required to provide for the activities related to the initial assessment of significance, notification of the extraordinary event, mobilization of intervening persons as well as operational management and implementation of intervention, of the continuous shift operation personnel only.

The issue of the Emergency Response Organization was also addressed in detail in The Czech

Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

Shift engineer

In case of extraordinary event occurrence the shift engineer is responsible for the management of the extraordinary event until the shift engineer relegates the responsibility to the mobilized Commander of Emergency response board. The Shift engineer activities during the extraordinary event occurrence adhere to the intervention instruction, which includes all responsibilities and competences, which of the most important are: assessment of extraordinary event significance - classification, provision of a notification and warning of the NPP personnel and warning within the emergency planning zone, notification of nuclear power plant top management and relevant bodies and organizations on extraordinary event occurrence, decision on the Standby emergency response organizations activation, decision on protective countermeasures for NPP personnel.

Operational MCR personnel

The MCR personnel having the basic workplace at the relevant MCR assure the control of each unit in case of an extraordinary event occurrence. In case the MCR is uninhabitable, respectively loss of the possibility of control of unit technology, the MCR personnel perform their activities from the ECR. Safety engineer responsible for extraordinary event management at the unit affected by an extraordinary event is transferred to support the personnel of this unit of the Dukovany NPP.

Other shift personnel

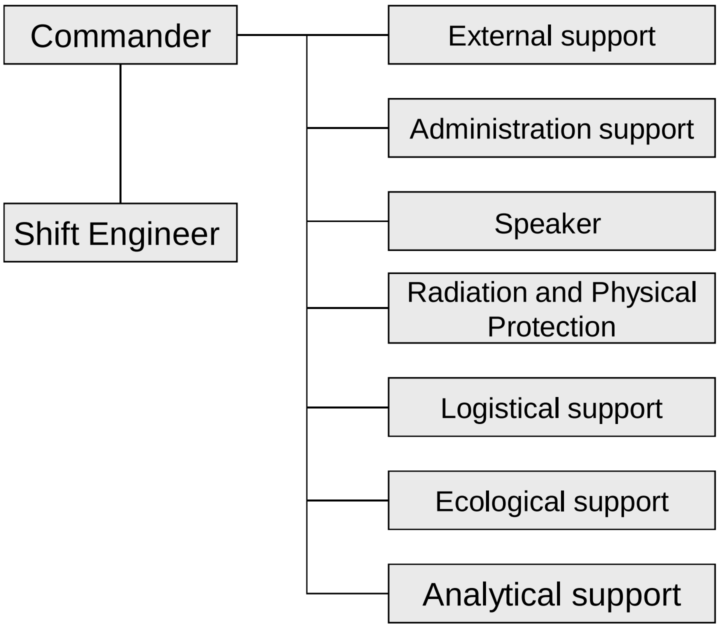
Other continuous shift operation personnel in case of an extraordinary event, depending on the significance degree, either proceeds with the activities in accordance with the instructions of the operational MCRs personnel to the extent of descriptions of its job positions, or gathers, in case of the declaration of protective countermeasures, in the operational support centre, from where, based on the instructions of the shift engineer or the Emergency response board, the required interventions in technology are carried out or the operative support is created to the unit of the NPP Fire Rescue Service during clearing and rescue works.

Emergency Response board

The Emergency Response Board is the main managing workplace of the NPP emergency response organization. The Emergency Response Board secures, after its activation, the management of activities of all employees and other persons participating in intervention work when eliminating development and solving consequences of an extraordinary event at NPP. The Emergency Response Board ensures the communication with the off-site emergency preparedness units.

The Emergency Response Board is established for the reason of prompt availability for action during management of the emergency response organization in case of the occurrence, duration and removal of extraordinary event consequences. Main tasks of the Emeergency Response Board, as a managing body, are to manage all activities in the NPP, to transfer information to superior and supervision bodies, to inform the public and to declare the protective countermeasures for NPP employees and other persons present on the NPP premises at the time of the extraordinary event occurrence. The Emeergency Response Boardcontrols the activities of the operationally established intervention groups during the liquidation of extraordinary event effects and consequences. The Emeergency Response Board secures the deliveries of necessary material, special means, and alternating the personnel as well as its maintenance and supplies.

Fig. No. 11-1
Emergency Response Board structure

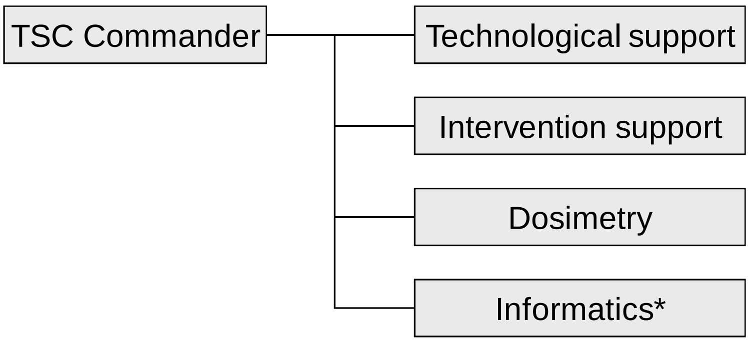


Technical Support Centre (TSC)

The Technical Support Centre personnel are made up of experts of technical departments (safety, dosimetry, operation, and informatics). The Technical Support Centre is staffed so as to be able to provide qualified technical support to the personnel of the main control room of the affected unit during extraordinary events management.

The TPC personnel also ensures immediate evaluation of nuclear power plant safety condition in consideration of nuclear safety and radiation protection; has control over the activity of operative intervention groups during management of extraordinary event consequences; and prepares basic documents and recommendations for decision-making and control activities of the Emergency Staff.

Fig. No. 11-2
Technical Support Centre (TSC) structure



*at Dukovany NPP, the Informatics function is ensured by TIS Operation Technician function

In the emergency preparedness system the emergency support centres represent specially prepared and equipped workplaces designed to secure the support of activities of personnel involved in the emergency response organization. Employees involved in the emergency response organization are obliged to participate in special theoretical and practical preparation aimed at acquiring activities determined by the on-site emergency plans and relevant intervention instructions.

Classification degrees of extraordinary event

To assess significance of extraordinary events, which may occur during the performance of radiation activities on a nuclear installation, these events are classified in three basic degrees (SÚJB Decree No. 318/2002 Coll., Section 5):

- extraordinary event of the first degree is an event which results or may result in an inadmissible exposure of employees and other persons or inadmissible release of radioactive substances into the premises of a nuclear installation or workplace. A first degree event may be a radiation incident, it has a limited and local character and may be sufficiently addressed with human and material resources available to the operating personnel or shift personnel, and no release of radioactive substances into the environment occurs during transport,
- extraordinary event of the second degree is an event, which results or may result in inadmissible serious exposure of the employees and other persons or in inadmissible release of radioactive substances into the environment, which do not require introduction of urgent countermeasures to protect population and the environment. A second degree event may be a radiation incident requiring mobilization of licensee's intervening persons and which may be sufficiently addressed with human and material resources available to the licensee or human and material resources contracted by the licensees,
- extraordinary event of the third degree is an event, which results or may result in an inadmissible serious release of radioactive substances into the environment, requiring introduction of urgent countermeasures to protect population and the environment, as specified in the off-site emergency plan and regional emergency plan. A third degree event is a radiation accident and in addition to mobilization of licensee's intervening persons and intervening persons under the off-site or regional emergency plans, involvement of other relevant bodies is required to address it.

National emergency preparedness and response systems

In accordance with the legal regulations, in particular in the area of crisis management, a structure of the emergency preparedness system was established in the Czech Republic for the case of crisis situations of different types. Fig. 11-3 shows the basic diagram of the structure of the emergency preparedness system for the case of a radiation accident.

In case of a radiation accident occurrence in the Czech Republic or abroad with a possible impact on the Czech Republic territory, the occurring crisis situation is being solved within the crisis (emergency) response system, the basic diagram of which is given in the Fig. 11-4.

Fig. No. 11-3
Basic diagram of the Czech Republic emergency preparedness structure for the case of an extraordinary event occurrence

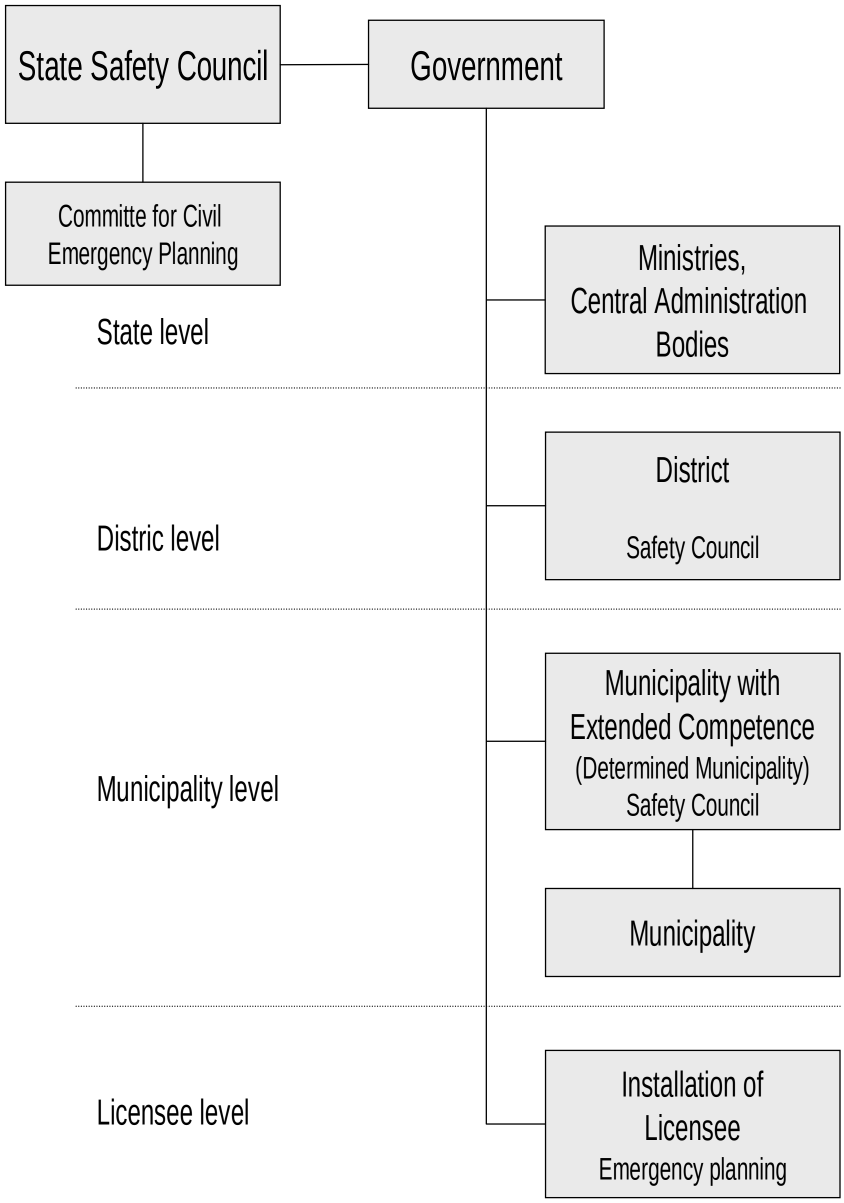
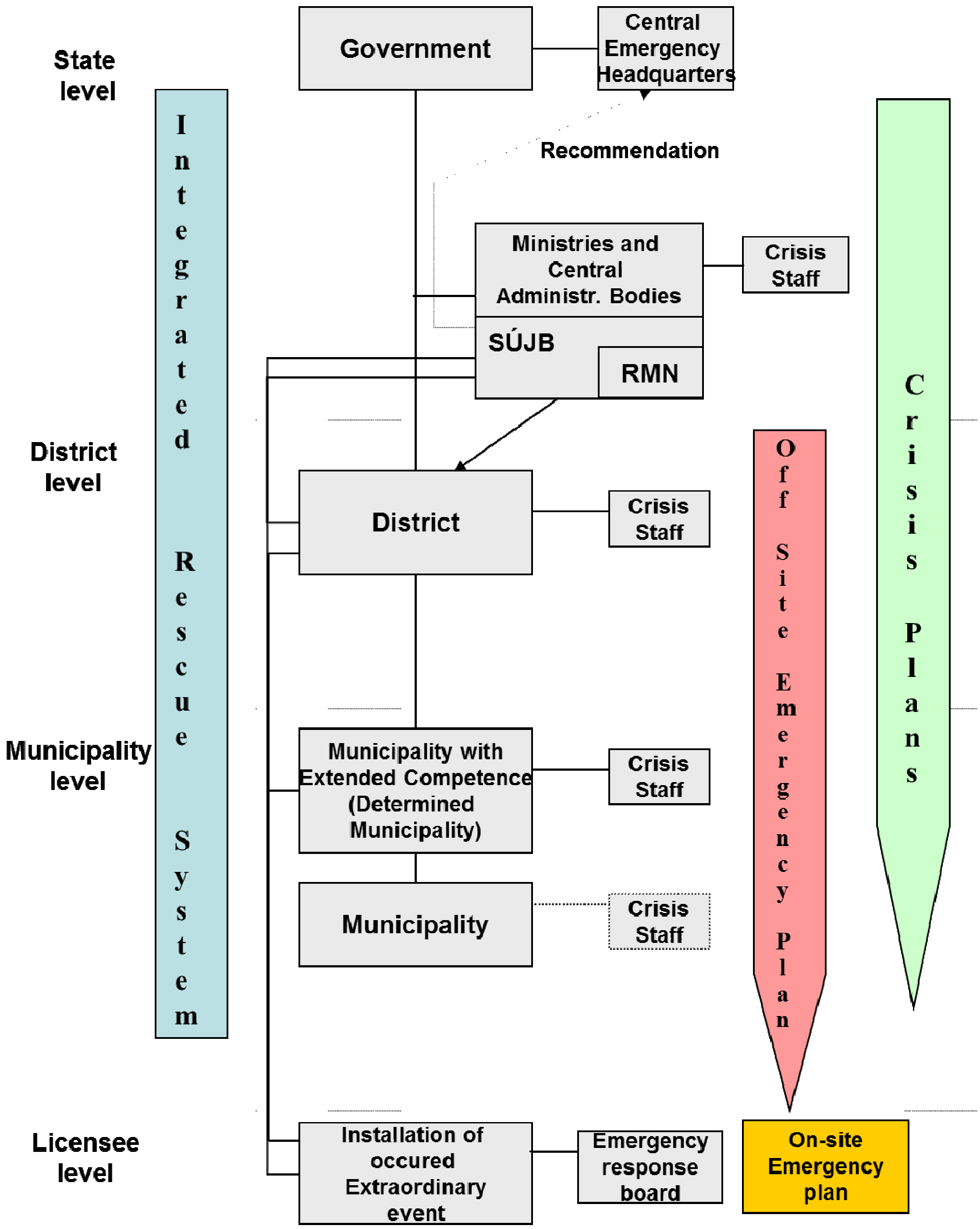


Fig. No. 11-4
Basic diagram of the Czech Republic emergency response structure during a radiation accident occurrence



The Czech Republic government is the highest body, responsible for the crisis situations preparedness and in case of their occurrence for their solution in the territory of the Czech Republic. As a standing working body of the government to coordinate the safety-related problems of the Czech Republic and prepare draft measures to assure it, the constitutional Act No. 110/1998 Coll., on the Czech Republic security, established the National Safety Council. In linkage to this Act, the government specified the activities and structure of the National Security Council by Czech Government Decree No. 391, of June 10, 1998 on the National Security Council and on planning of measures to secure the safety of the Czech Republic specified the activities of the National Security Council , as amended, and specified its main tasks in the area of emergency preparedness and emergency situation management. The activity of the National Security Council follows the statute approved by the government and the rules of procedure.

The government by the above mentioned Decree No. 391 of June 10 1998, as amended, has established a Committee for Civil Emergency Planning as a standing National Security Council working body for the coordination and planning of measures to secure the protection of national security, population and economics, critical infrastructure, to assure preventive measures to prevent use of nuclear, biological and chemical weapons including elimination of consequences of their use and to coordinate requirements on the requirements for civil resources necessary for security of the Czech Republic.

Issues in the area of planning and preparedness for the case of radiation accident occurrence come within the competence of the Civil Emergency Planning Committee (CEPC) and the areas of radiation accident solution within the competence of the Central Crisis Staff, which acts as a governmental body for the resolution of crisis situations.

The main tasks in the area of the CEPC competence are specified by the CEPC Statute and especially focused on the following:

- co-ordination of planning of the measures for assurance of protection of the population and economy, critical infrastructure including assurance of the measures in case of radiation accident,
- preventive measures against the use of mass destruction weapons including a solution to elimination of consequences of their use and harmonization of the requirements for civil sources necessary for assurance of safety of the Czech Republic
- assessment and discussion of the intentions of preparatory, planning and conceptual measures and activities,
- assurance of operative inter-branch co-ordination of preparatory, planning and conceptual measures and activities,
- evaluation of implementation of preparatory, planning and conceptual measures and activities as well as the proposals for implementation of necessary preventive measures,
- assessment, discussion and co-ordination of activities of the representatives of the Czech Republic in the bodies of European Union, North Atlantic Treaty Organization (NATO) and other international entities,
- discussion of the Plan of formation of civil sources for assurance of safety of the Czech Republic,
- coordination of safety research implementation of the Czech Republic.

The Minister of Interior is the Chairperson of the Committee for Civil Emergency Committee; the Deputy Minister of Interior is the Executive Deputy Chairperson and the deputy ministers of 12 departments, the SÚJB Chairperson, the Vice-Governor of the Czech National Bank, the Chairperson of the Administration of the State Material Reserves, the Director of the National Security Authority and the Director of the National Security Council, the Chairperson of the Council of Czech Telecommunication Office, the Police President, Chief Executive Officer of Fire and Rescue Service of the Czech Republic.

To ensure that the occurred crisis situations including the radiation accidents on a national level are addressed a working body of the National Security Council, the Central Crisis Staff is established. Depending on the nature of emergency situation, the chairman of the Central Crisis Staff is either the Minister of Interior or the Minister of Defence. The members of the Central Crisis Satff are deputy ministers and top managers of other central bodies of state administration including the SÚJB Chairperson. .

The Central Crisis Staff is also activated both in case of radiation accidents of a nuclear installation outside the Czech Republic territory with the possibility of impact on the Czech Republic, and during radiation accidents occurring during the transport of nuclear materials and radioactive substances.

On-site and off-site emergency plans of nuclear installations

On-site emergency plans of nuclear installations (licensees) are prepared in compliance with requirements for emergency preparedness assurance, and in the extent established by the SÚJB Decree No. 318/2002 Coll., as amended by the SÚJB Decree No. 2/2004 Coll. The plans establish the following:

- organizational structure of the licensee and principles for management and implementation of interventions in the case of an extraordinary event occurrence. In this connection, the plans define the duties of persons and on-site organizational departments and units in case of an extraordinary event declaration, classified in accordance with their significance to the individual degrees of the classification system (refer to classification of extraordinary events),
- methods of notification of persons and units of the licensee, and other external units and bodies which have to be called in to perform an intervention within the nuclear installation (licensee) premises,
- methods of notification of the SÚJB and state administration bodies (Regional Authorities and municipalities with extended competences, to the territory of which the emergency planning zone extends) on the occurrence of an extraordinary event of 1st and 2nd degree, and in the case of an extraordinary event of 3rd degree - radiation accident - the methods of their notification and ensuring of warning of the public within the emergency planning zone,
- requirements for the radiation situation monitoring in case of extraordinary event occurrence both for the nuclear installation (licensee) premises and for its vicinity. The plans establish methods of notification and warning of the personnel and persons present in the nuclear installation (licensee) for the particular degrees of extraordinary events, and necessary measures are specified there for the protection of their health and lives, and for the limitation and reduction of their irradiation. These plans define principles and procedures of gathering, sheltering, evacuation, providing emergency medical firstaid to all employees and persons affected, including medical provision and specialized medical care,

- procedures during the termination of the extraordinary events,
- procedures for management and implementation of interventions for designated persons and departments of a nuclear installation (licensee), including security of the protection of employees and persons established by the on-site emergency plan, as well as procedures for the notification of bodies and organizations affected by the on-site emergency plan, are processed in form of intervention instructions. The latter ones specify activities after the declaration of the corresponding degree of an extraordinary event including the necessary technical, instrumental, and material assurance.

Off-site emergency plans for the nuclear installations are elaborated by the respective Fire Rescue Services of regions in accordance with the requirements specified in Act No. 239/2000 Coll., as amended, and by the Ministry of Interior Decree No. 328/2001 Coll., as amended by Decree No. 429/2003 Coll., for the specified emergency planning zone. The off-site emergency plan is developed on the basis of documents handed over by the licensee and on the basis of partial documents prepared by respective regional authorities, units and municipalities.

Developed off-site emergency plans are discussed with the licensee and with the respective central administration bodies, i.e. with the SÚJB and the Ministry of Interior – General Directorate of Fire Rescue Service of the Czech Republic.

The off-site emergency plans set down targets and methods of ensuring the individual types of protective countermeasures:

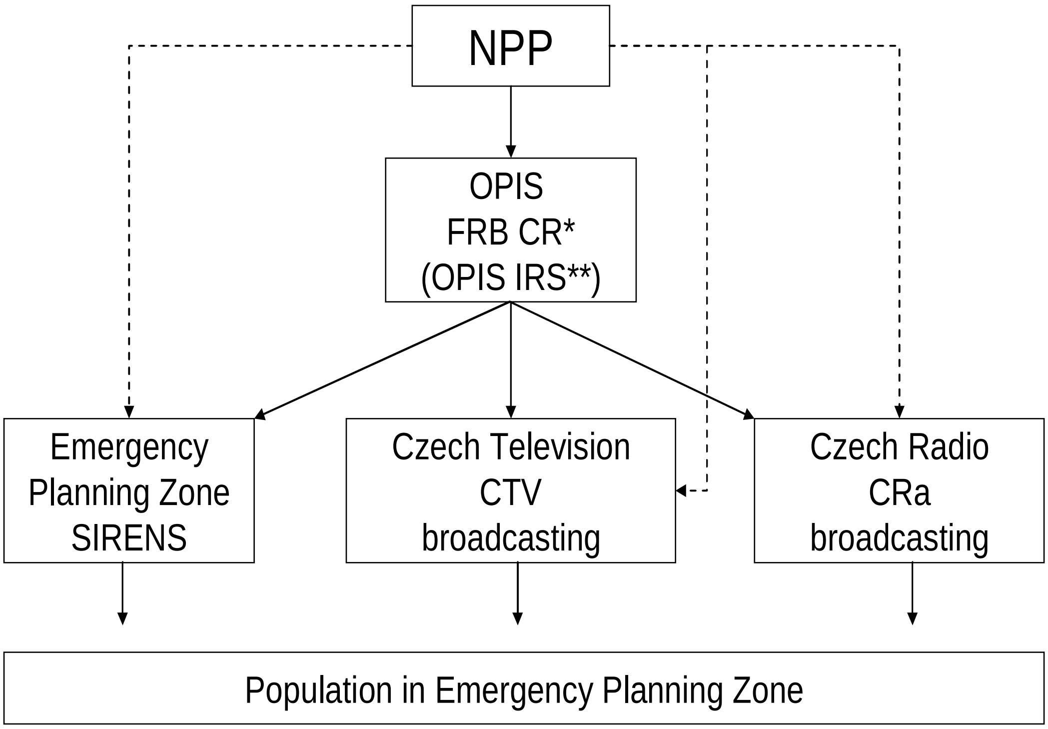
- notification of bodies and organizations,
- warning of the population,
- sheltering of the population,
- iodine prophylaxis,
- evacuation of people, including dosimetric checks and decontamination at the exits from the endangered territory,
- regulation of persons movements within the endangered territory,
- medical care.

Warning of the public within the emergency planning zone

In case of occurrence of extraordinary event of the 3rd degree, for both power plants, the principal measure for protection of the population, after notification transmitted to the relevant Regional Authorities and municipalities with extended competences, is warning of the public within the emergency planning zone. Warning of the public is assured within the emergency planning zone, formed by a territory 20 km around Dukovany NPP and 13 km around Temelín NPP. The public is warned by a signal of sirens with following radio and TV broadcasting (transmissions) of the prepared initial information on the radiation accident occurrence, and on the countermeasures to be taken (sheltering, iodine prophylaxis - taking antidotes) and recommendation on the preparation for evacuation of people within 5 km internal zone around Temelín NPP and within 10 km internal zone around Dukovany NPP. Schematic representation of the public warning system within the emergency planning zone is shown in Fig. No. 11-3.

Iodine prophylaxis (antidotes) is distributed in advance to the population within the emergency planning zone (households, schools, hospitals, and workplaces), when the Regional Authorities have approximately 10 % reserve of KI (potassium iodide) doses, and these preparations are on sale in pharmacies. The antidotes held by the public are regularly exchanged by the licensee before their expiration date. Simultaneously the "Public Protection Manual" is distributed to the public within the emergency planning zone, which includes the basic information on activities of the public in case of radiation accident.

Fig. No. 11-3
Schematic representation of the public warning system within the emergency planning zone



In accordance with Section 3 of the Atomic Act, the SÚJB provides, based on the evaluation of the radiation situation in the case of radiation incidents and accidents, background documents for the decision-making about measures leading to the mitigation or elimination of irradiation in case of a radiation accident. These background documents are elaborated by the SÚJB Crisis Staff based on information submitted from the affected nuclear installation and from data provided by the National Radiation Monitoring Network; the SÚJB Crisis Staff carries out its activities in the premises of the SÚJB Emergency Response Center. In the sense of the Crisis Act, the SÚJB Emergency Response Center is thus a crisis management workplace.

In case of an extraordinary event occurrence when using the background documents for the support of the decision making process, concerning the protective countermeasures using hardware, methodical and software tools located in the Emergency Response Center, the Crisis Staff, among others:

- evaluates the technology status development in relation to measures implemented by the nuclear installation operators,
- evaluates the radiation situation in the nuclear installation,
- elaborates, in collaboration with the Czech Hydrometeorological Institute, the prognoses of radioactive substances dispersion from the location of radiation accident occurrence, and information about a possible threat in the nuclear installation vicinity based on the meteorological situation and its presumed development,
- specifies the "source term" of the radioactive substances release and the extent of the affected territory.

The SÚJB Crisis Staff submits the elaborated background documents, depending on the size of the affected territory, to the Central Crisis Staff and to the Regional Crisis Staff.

The SÚJB Crisis Staff in cooperation with the Operations and Information Centre of the Ministry of Interior – General Directorate of Fire Rescue Service of the Czech Republic (OPIS MV-GŘ HZS ČR) ensures:

- notification of the IAEA within the meaning of the "Convention on Early Notification of a Nuclear Accident" and the "Convention on Assistance in the Case of a Nuclear and Radiation Accident" and contact points of the countries based on the closed international bilateral agreements, when continuous operation of the contact point for information transmission is ensured by the Operations and Information Center of the Ministry of Interior – General Directorate of Fire Rescue Service of the Czech Republic (OPIS MV-GŘ HZS ČR),
- notification of the EU within the meaning of the Council Decision No. 87/600/Euratom,
- providing the public with information.

Measures for providing the public with information, including emergency preparedness in nuclear installation vicinity

Within information provided to the public within the emergency planning zones of both nuclear power plants, the licensee prepared and the SÚJB assessed the “Manual for protection of the public in case of radiation accident of Dukovany NPP with calendar“ and the “Manual for protection of the public in case of radiation accident of Temelín NPP with calendar“ that are distributed to the households and public amenities in the emergency planning zone.

The manuals include the information how the public is to proceed after executed warning in the emergency planning zone in case of necessary hiding, application of iodine prophylaxis and in declaration of preparation for evacuation.

The public receives information also at the "Information Centres of the Nuclear Power Plants", and the NPPs and the SÚJB take on request of the relevant Regional Authorities part in the information campaigns organized by the Regional Authorities.

11.1.3 Training and exercise

Nuclear power plants have developed plans for the theoretical and practical training of their employees and other persons and units related to the occurrence of an extraordinary event of different degrees. For the persons and components determined by on-site emergency plan for management and execution of interventions, theoretical and practical preparations are organized that are focused on their activities in declaration of respective degree of extraordinary event according to the procedures of intervention determined by on-site emergency plan and their elaborated instructions for intervention. Emergency preparedness within the emergency planning zone according to off-site emergency plan is also checked at least once in 3 years by means of exercises with involvement of the components defined by off-site emergency plan in case of the occurrence of extraordinary event of the 3rd degree and the authorities of crisis management of the relevant central administrative bodies.

Emergency preparedness in the emergency planning zone in accordance with the off-site emergency plan is also being verified, once in three years at a minimum, with help of exercises, in which units defined by the off-site emergency plan for the case of an extraordinary event of the 3rd degree participate.

Exercises of the off-site emergency plan for the specified emergency planning zone are organized similarly in three activity phases:

Preparatory: a scenario is elaborated for the scheduled exercise, establishing:

- goal, scope and duration of the exercise
- determination of the model radiation accident, its development and process,
- specification of the emergency response procedures,
- specification of intervening units and hardware engagement for the emergency response,
- determination of persons, who will evaluate the exercise and exercise observers,

Implementation: the proper process of the exercise according to the prepared scenario in presence of all bodies, organizations and individual persons, responsible for the management and implementation of interventions, including the activities of the persons performing the evaluation or the exercise observers and crisis management bodies of the relevant central administrative bodies,

Evaluation: elaborated in form of final protocol; protocols are filed as proof of the scheduled emergency exercise evaluation for long-term storage; for each calendar year all performed partial emergency exercises are evaluated in summary; the deficiencies, discovered during the exercise, are applied at:

- changes, modifications or detailing of the off-site emergency plan,
- amendments and modifications of emergency response intervention procedures,
- preparation of bodies, organizations and persons managing or implementing interventions during emergency response,
- amendments of hardware, equipment and material,
- amendments or modifications of organizational assurance of the emergency response.

Coordination emergency exercises of ČEZ, a. s.

The coordination of emergency exercises together with the Integrated Rescue System units and other bodies defined in the off-site emergency plans which are described in The Czech Republic National Report – 2010 continued with the exercise “ZÓNA 2010” at the Temelín NPP site from 22 September to 23 September 2010. This exercise took place based on the approved Emergency Exercise Plan submitted to the SÚJB. The purpose of this exercise was to verify the activities of personnel and emergency response organization of Temelín NPP. Further the exercise verified the collaboration of the power plant with the units of the Integrated Rescue System of the Czech Republic according to the principles defined in the on-site and off-site emergency plan. The system of work organization of the units of the crisis management was also verified during the exercise. The exercise fulfilled its goal and verified the preparedness of each individual unit for solving extraordinary events.

In 2013, co-ordination emergency exercise ZONE 2013 at Dukovany NPP took place.

11.2 Statement on the implementation of the obligations concerning Article 16 of the Convention

The Czech Republic has adopted and implemented all measures ensuring that nuclear installations have regularly verified on-site and off-site emergency plans, and which cover activities to be performed in the case of an accident. The plans are prepared and verified before the nuclear installation begins its operation above the minimum level of power established by the Regulatory Body. At the same time, such measures are taken which ensure that the public of the Czech Republic as well as the competent bodies of states in the vicinity of nuclear installation, which may be feasibly affected by a radiation incident occurring in the nuclear installation on the territory of the Czech Republic, received the corresponding information for the preparation of emergency plans and mitigating interventions.

12. Siting - Article 17 of the Convention

Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:

(i) for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;

(ii) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;

(iii) for re-evaluating as necessary all relevant factors referred to in subparagraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;

(iv) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.

12.1 Description of the current situation

12.1.1 Description of the licensing process, including a summary of national legislation

The description of the licensing process in general - for siting, designing, construction, operation and decommissioning of a nuclear installation is included in chapter 2.1.2 of the present National Report. The legislative framework applicable for issuing the site approval from the aspect of nuclear safety and radiation protection is represented by the Atomic Act and its implementing regulations:

- ***SÚJB Decree No. 144/1997 Coll.***, on physical protection of nuclear materials and nuclear installations and nuclear facilities and their classification, as amended,
- ***SÚJB Decree No. 215/1997 Coll.***, on criteria for siting of nuclear installations and very significant ionizing radiation sources,
- ***Government Order No. 11/1999 Coll.***, on emergency planning zone,
- ***SÚJB Decree No. 195/1999 Coll.,*** on basic design criteria for nuclear installations with respect to nuclear safety, radiation protection and emergency preparedness,
- ***SÚJB Decree No. 307/2002 Coll.***, on radiation protection, as amended,
- ***SÚJB Decree No. 309/2005 Coll***., on assurance of technical safety of selected equipment,
- ***SÚJB Decree No. 132/2008 Coll.***, on Quality Assurance System in carrying out activities connected with utilization of nuclear energy and radiation protection and on quality assurance of selected eguipment in regard to their assigment to classes of nuclear safety.

As further mentioned in chapter 3.1.2, siting of a nuclear installation is one of the activities, to which the SÚJB has to issue an approval in accordance with the provision of Section 9 of the Atomic Act, from the nuclear safety and radiation protection point of view. For issuing the approval under Section 13 of the Atomic Act, the following preconditions apply:

- an environmental impact assessment according to the Act No. 100/2001 Coll., on environmental impact assessment,
- an approval of the quality assurance program for the activity being authorized.

Application for the nuclear installation siting must be, in accordance with the Appendix A of the Atomic Act, documented by the following documentation:

I. Initial Safety Analysis Report, the content of which shall include:

- description and evidence of suitability of the selected site from the aspect of siting criteria for nuclear installations and very significant ionizing radiation sources as established in an implementing regulation,
- description and preliminary assessment of the design concept from the viewpoint of requirements laid down in an implementing regulation for nuclear safety, radiation protection and emergency preparedness,
- preliminary assessment of the nuclear installation operation impact on the personnel, the public and the environment,
- proposal of concept for safe decommissioning,
- assessment of quality assurance in the process of the selection of site, the method of quality assurance for preparatory stage of the construction and the quality assurance principles for linking stages.

II. Analysis of needs and possibilities to provide physical protection

The SÚJB Decree No. 215/1997 Coll. establishes criteria for the assessment of the particular site suitability from the aspect of nuclear safety and radiation protection. At the same time, protection of other interests, resulting from the valid legislation, remains preserved. This Decree defines the exclusion and conditioning criteria.

Exclusion criteria are those limiting characteristics, which unequivocally exclude utilization of a particular region for siting nuclear installations. These criteria include radiological impacts of the planned installation on its vicinity under normal operating conditions and radiation emergency, as well as effects of the site on nuclear safety and radiation protection of the same installation.

Conditioning criteria are such characteristics, which make an area or land suitable for siting nuclear installations under the condition that it is feasible or technically possible to offset the unfavorable regional conditions, both natural and the ones caused by human activities.

In the implementing SÚJB Decree No. 195/1999 Coll., on basic design criteria for nuclear installations with respect to nuclear safety radiation protection and emergency preparedness, and particularly in the SÚJB Decree No. 215/1997 Coll., on criteria for siting of nuclear installations and very significant ionizing radiation sources, IAEA recommendations and guidelines for nuclear installations siting are taken into account.

The above mentioned implementing regulations of the Atomic Act, in accordance with the IAEA recommendations, require that assessments within the siting process should consider the historically most significant phenomena registered in the particular locality and its vicinity, as well as a combination of natural phenomena, phenomena resulting from human activity and accident conditions due to these phenomena. Within the siting and design, nuclear installations must be evaluated as to their resistance against the following natural phenomena and phenomena initiated by human activity:

- earthquakes,
- climatic effects (wind, snow, rainfall, outdoor temperatures, etc.),
- floods and fires,
- air crash, and flying and falling objects
- explosions of industrial, military and transport means, including explosions in nuclear installations buildings,
- release of dangerous and explosive fluids and gases.

Based on probabilistic assessment some of these events may be excluded when the probability of their occurrence is very low. It is in the SÚJB competence to establish such limiting values for each of those cases.

12.1.2 Measures for fulfillment of the siting criteria for nuclear installation

12.1.2.1 Dukovany NPP

Geographic position of the site

The Dukovany NPP is located in the south-eastern part of the region of Třebíč, to the southwest from the Brno city on the right bank of the Jihlava river. The location of the site within the Czech Republic is shown in the map in the Fig. 1-1 (chapter 1). The power plant is located 45 – 50 km from the state border with Austria, with the shortest air distance to the border being 35 km. The northern part of the region is a broken stretch of land with Jihlava river valley, in the southern part it changes into a plain. The region altitude varies from 369 up to 711 m above sea level. There are five smallish towns in the nuclear power plant vicinity – Třebíč, Náměšť nad Oslavou, Moravské Budějovice, Moravský Krumlov, and Jaroměřice nad Rokytnou. Brno city, with approximately 500,000 inhabitants, including suburban concentrations, is situated 35 km northeast of the plant. Approximately 101,110 people live within 20 km. Population density in other parts of the territory is very low, with only small settlements.

The site has been selected in a way to minimize possible interactions of the nuclear installation with the adjacent territory. Thus, in the immediate vicinity there are no large industrial facilities or frequented transport routes. Density of industrial facilities near Dukovany NPP is significantly lower than in other parts of the Czech Republic territory. The immediate vicinity of the nuclear power plant has an unequivocally agricultural character, and there are only a few small industrial works.

Protection against earthquake

Seismic assessment has been performed for the area determined by a circle with a radius of 200 km having its center in the nuclear power plant.

Geological surveys and knowledge of the bedrock under the cooling towers foundations are assessed as adequate. Surveys of the area under the reactor buildings I and II and the adjacent buildings were even assessed as adequate for one hundred percent. Constructions classified in the 1st category of seismic resistance (such as the reactor buildings) of the nuclear power plant are founded on a high quality underlying rock with the underground water below the level of foundations. The very high surface spring constant of the elastic bearing 200 MPa/m in the vertical direction and 140 MPa/m in the horizontal direction corresponds to a high quality bedrock, on which the reactor building is founded. Geological maps, geological profiles and the borehole characteristics are attached to the reports used for the preparation of the Final Safety Analysis Report for the Dukovany NPP.

At the Dukovany site, the greatest possible effects of an earthquake may be expected, according to historical data, from the Alps seismic focuses. It results from analyses considering both the greatest possible magnitude of shocks and the most adverse attenuation of intensities from distances in the direction of seismic focus – that the Dukovany site has entirely theoretically a maximum of macro-seismic intensity, which may be expected of 6° MSK. Calculation of the seismic risk has resulted in the limiting value of macro-seismic intensity of 5.8° MSK, which should not be exceeded even within a 10,000 year period.

The region of interest, Dukovany NPP, is continuously monitored by the local seismic station Kozének and its records are continuously seismically evaluated by the Energoprůzkum Praha s. r. o. and local seismic station KRUC, records of which are evaluated on a continuous basis by the Masaryk University in Brno – Institute of Physics of the Earth.

Analyses performed at the same time confirmed the non-existence of any local tectonic activity. Actually no observed effects of any earthquakes were reported for Dukovany village. Closest local activities originated in Jindřichův Hradec area, where epicentral intensities did not exceed 5° MSK-64, and the macro-seismic fields of which did not reach the Dukovany region.

Based on the above details using the most conservative approach, the following seismic characteristics may be obtained:

- design basis earthquake is equal to the maximum historically observed earthquake in the area, i.e. 6^o MSK-64,
- safe shutdown earthquake is equal to the maximum estimate of the maximum possible expected earthquake, i.e. 6^o MSK-64 + 0.5^o MSK-64 (error in the determination of intensity).

It results unambiguously from the above-mentioned assessment that due to the seismically entirely calm area and stability of the bedrock, the Dukovany NPP cannot be endangered by a seismic event. Despite that, as a contribution to safety, maximum conservative approach has been used, and in compliance with the IAEA recommendations and considering the results presented above, level SL-1 equals to 6° MSK-64 and level SL-2 equals to 7° MSK-64, it means 0.1 g acceleration (which is in the conditions of Central Europe a very highly conservative estimate of the safe shutdown due to earthquake) were specified for the Dukovany site.

Based on the unscheduled inspections in terms of seismic resistance, which were carried out in the area of seismicity after the accident at Fukushima Dai-i-chi NPP, no serious non-compliance between the current state and the design requirements was identified.

The issues “Seismic risk assessment” and “NPP protection against earthquake” were also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

Protection against floods and adverse climatic phenomena

The largest river in the vicinity is the Jihlava river, at the north of the nuclear power plant, from which service water is taken and into which the waste water is discharged. The power plant site is located approximately 100 m above the maximum levels. On the Jihlava river, near the nuclear power plant a system of waterworks Dalešice – Mohelno, forming a pumped-storage hydro-electric power plant, was built. Jihlava river flow at the in-flow to waterworks Dalešice varies around the average annual value of 6 m^3s^{-1}.

An analysis of floods and prediction scenarios of floods show that the locality of the Dukovany NPP, in consequence of its position on a high plain lying on a higher level than the crests of dams of waterworks Dalešice – Mohelno, never was, and is not endangered even now, by floods.

Specific knowledge of the meteorological situation in the vicinity of the nuclear power plant is necessary to determine the influence of cooling towers and to assess the radioactivity spread; therefore special attention was paid to accumulate such knowledge. The nuclear power plant vicinity is located within the Atlantic-continental area of temperate climatic zone of the Northern Hemisphere. Here, in the course of a year, air masses of oceanic and continental origin alternate, which is connected with frequent passages of atmospheric fronts. Specific meteorological measurements and observations at the site have been carried out continuously by the meteorological observatory of the Czech Meteorological Institute at Dukovany since June 1982. For its regular synoptic and climatological measurements the observatory uses standard meteorological instruments.

Adverse meteorological conditions for the locality in question, such as windstorms, precipitation and extreme temperatures have been taken into account in the design.

The issues “Risk assessment in terms of floods”, “Assessment of NPP protection against floods”, “Extreme climatic condition risk assessment” and “Assessment of NPP protection against extreme climatic conditions” were also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

Protection against effects caused by aircraft crash

The airspace above the nuclear power plant has been proclaimed prohibited for all flights in the document "Flight Information Manual" which is binding on all users of the Czech Republic airspace.

The nuclear power plant is located in a close vicinity of military airfield Náměšť (approximately 10 km). The space above the nuclear power plant with a radius of 2 km and height of 1500 meters is a prohibited space for airplanes.

Probabilistic as well as deterministic analyses of the possibility and consequences of an aircraft crash of various categories were carried out. The analyses have shown that the power plant is sufficiently protected against the effects caused by the impact of so-called “design aircraft”, model-equivalent to a civil or military aircraft.. Assessment of the protection against the effects caused by an aircraft crash was performed in accordance with the IAEA instructions. The results of the calculations have shown that the aircraft crash will not cause inadmissible destruction of the primary system because its civil structures, important for nuclear safety, are sufficiently resistant against possible impacts of such a crash. The analyses have also shown that the spatially isolated backed-up core cooling systems, together with civil protective structures, ensure that even an aircraft crash will not affect the function of the reactor emergency shutdown and cooling.

The issue “Protection against effects caused by aircraft crash” was also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

Protection against explosion pressure waves

Near Dukovany NPP, at a distance of about 500 meters, there is a second-class road (No. 15) – Brno, Ivančice, Dukovany, Jaroměřice nad Rokytnou, Moravské Budějovice. Other roads in the vicinity are less frequented. The analyses have shown that even in the case of a very improbable explosion of a transport vehicle carrying a dangerous freight, plant safety will not be affected in any way.

The plant has a single-line railway from the eastern direction of Moravský Krumlov and Brno. The probability of a train accident of trains carrying dangerous freight, both in present and in long-term prospect is practically zero.

In the plant vicinity, there are no external sources of potential danger. The analyses have shown that a potential explosion of hydrogen during its transport and storage, which represents the predominant source of possible explosions within Dukovany NPP premises, will not endanger equipment important for safety so that the safety function of the equipment will not fully fail. Higher attention is paid to the handling of hydrogen storage bins located outside the reactor units in order to minimize the possibilities of hydrogen escape.

The issue “Protection against explosion pressure waves” was also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

Protection against influence of third parties

The nuclear power plant design takes into account also the protection against the influence of third parties. Safety systems are redundant and spatially distant, the same is valid for their power supply. This engineered safety is supplemented with technical, organizational and regime system of measures, which shall prevent the inadmissible influence of third parties.

The issue “Protection against influence of third parties” was also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

12.1.2.2 Temelín NPP

Geographic position of the site

The Temelín site was selected at the turn of the seventies/eighties as a result of the evaluation of the parameters of the territory established by the ČSKAE Decree No. 4/1978 Coll., valid at that time. Location of the site in the Czech Republic is shown in the map in the Fig. 1-1 (chapter 1). The power plant is at a distance of 45 – 50 km from the state borders with Austria and the Federal Republic of Germany. The nearest permanently inhabited locality is the village Temelín with 876 inhabitants- at a distance of 2 km in northwest direction. The distance from Týn nad Vltavou with approximately 8,150 inhabitants is 6 km, and from the Vodňany town with 6,976 inhabitants is 14 km. The České Budějovice city is at a distance of 25 km and its population is approximately 100,000. Approximately 303,000 persons live within a radius of 30 km around the nuclear power plant, according to general census of the population in 2011. Population density in other parts of the territory is very low. Only small settlements prevail here.

Again, the site has been selected in a way as to minimize possible interactions of the nuclear installation with the adjacent territory. Thus, in the immediate vicinity there are neither large industrial facilities, with exception of the pipeline of the transit gas line, nor frequented transport routes. The density of industrial facilities in South Bohemia is significantly lower than in other parts of the Czech Republic territory. The immediate vicinity of the nuclear power plant has an unequivocally agricultural character, and there are only a few small industrial works. No industrial development in 10 km area in the perspective up to 2020 is planned.

Protection against earthquake

Despite the fact that the Czech Republic territory belongs among the geologically well surveyed territories, another detailed assessment of the geological underlying rock up to the distance of 30 km from the nuclear power plant had been performed in relation with the nuclear power plant siting. The original geological surveys performed during the eighties have been supplemented by 1991 – 1994 surveys in accordance with the IAEA recommendations.

The geological bedrock of the locality is represented by South-Bohemian branch of the Molanubikum and the South-Bohemian basins. Both units belong to the Bohemian massif, which was created by the end of Paleozoic Era in the final phase of Varisk rock forming cycle. The most frequent rocks here are gneiss, granites and quartz. The plant site has a rock substratum; the main buildings of the power plant are positioned on a homogeneous block with a size exceeding 500 x 500 m. Geomechanically, the plant underlying rock has a sufficient foundation bearing capacity for buildings and equipment of the nuclear power plant.

Seismic assessment has been performed for the whole area under interest, delimited by a circle of a 300 km radius having its center in the power plant. The biggest part of this area lies within the Bohemian massif territory, in the south and southeast it reaches the Alps-Carpathian region. The Moldanubikum under the NPP is the oldest and strongest part of the Bohemian massif. The seismic risk value is determined by Alps earthquakes. Results of the seismologic analyses show that there are no known cases of local tectonic shocks.

The earthquake catalogue was supplemented in accordance with the IAEA recommendation 50-SG-S1 rev. 1. The catalogue was revised and completed in accordance with the IAEA Safety Standard SSG-9. It is one of the important reference documents of the Final (Pre-operational) Safety Analysis Report, and starts with the year 1550.

The Temelín NPP zone of interest is continuously monitored by local seismological network with five stations, records of which are evaluated on a continuous basis by the Masaryk University in Brno – Institute of Physics of the Earth.

It results from the assessments based on the greatest possible shocks in the focus areas located in the concerned area and most adverse attenuation of intensities with the seismic focus far distant – the NPP´s limiting value of macro-seismic intensity which should not be exceeded with 0.95 probability even within 10,000 years period is 6.5^{o} MSK-64, which corresponds to 0.108 g in the conditions of Central Europe. The design acceleration was 0.1 g, which is fully conforming to the IAEA recommendations issued in 1991. These values have been used both in the design and construction of the buildings and equipment necessary to ensure a safe shutdown of the reactor, removal of residual heat and prevention of radioactive substance releases (classified in the category 1 of seismic resistance). The IAEA expert mission took place in 2003 (see Chapter 1.1.3.1).

The issues “Seismic risk assessment” and “NPP protection against earthquakce” were also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

Protection against external floods and adverse climatic phenomena

Operation of the power plant is primarily dependent on the Vltava river, from which service water is taken and into which the waste water is discharged. Vltava river represents a main axis of the Czech river system, and a number of water reservoirs which had been built on it years ago, forming the so called Vltava river cascade, it serves to protect against flooding and some of them help to generate hydroelectric power. A significant benefit provided by the cascade reservoirs is the equalization of the minimum flows. For the needs of Temelín NPP, two water reservoirs were added to this cascade: Hněvkovice from which process water is taken, and Kořensko, which is used to mix the discharged waste water with Vltava water.

Analysis of floods and prediction scenarios of floods show that the locality of Temelín NPP has never been flooded, and is not endangered by floods. The main plant buildings, housing equipment important for nuclear safety, are built at the altitude of 510 m above sea level. It results from the assessment of historic extreme flows that the power plant area is approximately 150 m above the maximum levels. The site has been also assessed from the aspect of possible destruction of water reservoirs on the upper course of the Vltava river.

Specific knowledge of the meteorological situation in the vicinity of the nuclear power plant is necessary to determine the influence of the cooling towers and to assess the radioactivity spread; therefore special attention was paid to accumulate such knowledge. The vicinity of the nuclear power plant is located within the Atlantic-continental area of temperate climatic zone of the Northern Hemisphere. Here, in the course of a year, air masses of oceanic and continental origin alternate, which is connected with the frequent passages of atmospheric fronts (average of 125 fronts a year). Prevailing are such meteorological situations when fronts come from the west, in a lesser degree – from the north. The specific meteorological measurements at the site have started at the time when the meteorological observatory was being built. The observatory is located at a distance of 3 km from the nuclear power plant in the northwest direction. The measurements were started in April 1988, and are carried out continuously since January 1989.

Adverse meteorological conditions for the locality in question, such as windstorms, precipitation and extreme temperatures have been taken into account in the design.

The issues “Risk assessment in terms of floods”, “Assessment of NPP protection against floods”, “Extreme climatic condition risk assessment” and “Assessment of NPP protection against extreme climatic conditions” were also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

Protection against effects caused by aircraft crash

The airspace above the nuclear power plant with a radius of 2 km and height 1500 m has been proclaimed prohibited for all flights by the "Flight Information Manual". The nearest flight corridor is situated 18 km from the power plant. Thus, air traffic has no effect on the nuclear power plant. The military airfield at Bechyně, located 25 km from the plant, was liquidated.

Calculations have shown that the power plant is protected against the effects caused by a military and civil aircraft crash. Assessment of the protection against the effects caused by an aircraft crash was performed in accordance with the IAEA instructions. The results of the calculations have shown that an aircraft crash would not cause inadmissible destruction of the primary system because its civil constructions, important for nuclear safety, are sufficiently resistant against the possible impacts of such a crash. The analyses have also shown that the spatially isolated back-up core cooling systems, together with civil construction, ensure that even an aircraft crash would not affect the function of the reactor emergency shutdown and cooling.

The issue "Protection against effects caused by aircraft crash" was also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

Protection against explosion pressure waves

In the vicinity of the nuclear power plant three branches of the transit gas line of 1400, 1000 and 800 mm diameter are situated. Their minimum distance from the plant reactor buildings is about 900 m. Transit gas line transports natural gas. Analyses have shown that even the maximum postulated accident on the gas line (simultaneous break of all three branches) would not impair the functions of the buildings and technological equipment. A series of measures was adopted to reduce the probability of a pipe accident occurrence and for the mitigation of possible consequences. The principal ones are the additional implementation of spherical valves, shortening of isolable gas pipe sections, and also a system for natural gas leakage monitoring. Calculations and analyses performed by professional organizations and research institutes were assessed positively by the SÚJB.

At the southeast boundary of the site is a frequented secondary road No. 105 České Budějovice – Týn nad Vltavou. Other roads in the plants close vicinity are less frequented. At a distance of more than 10 km, there are two sections of international roads used also for transportation of hazardous freights (ARD). However, the analyses have shown that even in case of a very improbable explosion of a transport vehicle carrying dangerous freight, the plant safety will be not affected.

The nearest railway situated about 1.4 km from the power plant is the local railway line Číčenice – Týn nad Vltavou with passenger and goods trains. Passenger trains are very infrequent. On this line, the probability of an accident of trains carrying dangerous goods both at present and in long-term prospect is practically zero.

The issue "Protection against explosion pressure waves" was also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

Protection against influence of third parties

The nuclear power plant design takes also into account protection against the influence of third parties. Safety systems are redundant and spatially distant, the same is valid for their power supply. This engineered safety is supplemented with technical, organizational and regime system of measures preventing the inadmissible influence of third parties.

The issue "Protection against influence of third parties" was also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

12.1.3 Activities leading to the preliminary assessment of nuclear energy installations siting

The SÚJB Decree No. 215/1997 Coll., requires that the impacts of the external events mentioned above should be re-evaluated, either after a certain time of operation or within the framework of the regular revisions of the safety documentation, applying most advanced scientific and technical tools and taking into account any changes which have occurred in the locality.

This impact re-evaluation has been performed over a ten-year period representing the period for which the licence for a nuclear power plant operation is issued in the Czech Republic. Issues related to siting criteria are also the subject of periodic safety evaluation performed in accordance with the IAEA document No. NS-G-2.10 Periodic Safety Review of NPP.

12.1.4 Assessment of environmental impact of a nuclear power plant

Environmental effect of Dukovany and Temelín NPPs was minimized and it is kept supervised, monitored and controlled which is proved by the introduction of EMS (Environmental management system) that was certified at Dukovany NPP in 2001 and at Temelín NPP in 2004. The certification was executed by company Det Norske Veritas, the certificate was issued based on Dutch accreditation RvA recognized all over the world. The recertifications executed up to now (the latest in 2010) found conformance with standard EN ISO 14 001 and thus they confirmed a justified holding of the certificate.

At Temelín NPP the environment components are monitored in compliance with the requirements of the legislation and, besides, according to a special extended Program of Environmental Impact Monitoring and Assessment already for many years. This allowed obtaining basic information prior to putting the power plant into permanent operation, which will be used for reference levels. For details, refer to Chapter 10 "Radiation protection".

The above-mentioned "Program of Environmental Impact Monitoring and Assessment", which has been performed since 2000, covers all environmental areas, i.e. atmosphere and climate, surface waters, soil, geo-factors and underground waters, agro systems, ionizing radiation and the public. The program was elaborated by the company Investprojekt Brno and the individual areas were elaborated by the representatives of Universities and research Institutes. The employees of the Academy of Sciences of the Czech Republic represented opponents of the proposal for the "Program". The program was approved in 1999 and the Temelín NPP assures its fulfillment starting from the subsequent year. The environmental status before the Unit 1 commissioning, i.e. by 2000, was evaluated, the data statistically processed and it forms the "zero", in other words pre-operational, environmental status. Data measured after the putting of Unit 1 and Unit 2 into operation are and will be related to this status.

The results of the monitoring and assessment are summarized each year in an annual report, elaborated by the individual solving parties of the "Program", and issued annually in a summary report. Its sponsor is the Water Research Institute.

During construction, in accordance with the newly adopted legislation, the Environmental Impact Assessment (EIA) was performed for all substantial design changes. The Ministry of the Environment issued a positive opinion to this assessment.

In addition, in the frame of the Melk protocol closed in December 2000 between the prime ministers of the Czech Republic and Austria with the presence of the EU commissioner for the enlargement. Another assessment of the nuclear plant impact on the environment was performed in the time period January – June 2001. This assessment was performed in accordance with the applicable EU regulations dealing with the assessment of the impact of projects on the environment.

Possible impact was monitored in the following areas:

- climate and atmosphere,
- hydrology,
- geology and seismicity,
- impact on the populations health,
- influence on the nature and landscape,
- wastes (including the radioactive ones) and possibilities of emergencies.

The Commission appointed by the government of the Czech Republic and having performed the assessment concluded that "the environmental impact of the Temelín NPP is small, insignificant and acceptable". In the conclusion, the Commission recommended 21 measures aimed in particular at intensifying the monitoring of all influences during the future plant operation. The measures are continuously fulfilled and regularly assessed.

Both EIA processes were accompanied by a proper public hearing, where all questions and comments raised by the public of the Czech Republic, Austria and Germany were answered.

12.1.5 Information on the preparation of new nuclear installation unit at Temelín site

ČEZ, a. s. is preparing the construction of new nuclear installation unit at Temelín power plant site. The intention is to build a new nuclear installation including associated civil structures and technological equipment. In terms of the original concept of Temelín NPP, this involves the completion of power plant with two units of modern type (Generation III+ reactors) including addition of power outlet lines to the switchyard in Kočín. Units with power capacity up to 1,700 MWe with the Generation III+ PWR reactor will be used. The total net installed power can reach up to 3,400 MWe.

The envisaged impacts of this project on the public health and on the environment (in all of its components), while taking into account the contributing effect of operation of the existing power plant and the existing background, were assessed within the interstate environmental impact assessment (EIA) process, which took place between 2008 and 2013. The EIA process was completed by issuing a favourable EIA decision by the Ministry of the Environment. The favourable EIA decision is conditioned by 90 conditions and states that the envisaged impacts do not exceed the relevant legal limits or (if no limit is determined) acceptable limit.

In November 2012, ČEZ, a. s. submitted to the SÚJB the application for siting of two new units at Temelín site and started the licensing procedure pursuant to the Atomic Act. The application includes the Initial Safety Analysis Report, which is a licensing document describing and evaluating, in particular, characteristics of the site. In addition, it describes and evaluates the design concept, quality issues, preliminary impact assessment of operation on the public and the environment, the future decommissioning method and analyses the needs of physical protection of the power plant.

The selection procedure for supplier of new units for Temelín site is also currently in progress; according to the expected time schedule, the contract with the selected supplier should be signed by the end of 2013.

12.1.6 International agreements with neighboring countries

The bilateral cooperation is concluded:

- With Slovakia (Agreement between the Government of the Czech Republic and the Government of the Slovak Republic on Cooperation in the Field of State Supervision of Nuclear Safety of Nuclear Installations and State Supervision of Nuclear Material). The cooperation is mainly carried out in the form of consultations over specific problems at the level of inspectors and workers of different management levels; joint inspections at selected installations are also organized on a regular basis and annual meetings are held.
- With Poland (Agreement between the Czech Republic and the Government of the Republic of Poland on Early Notification of a Nuclear Accident and on Exchange of Information on Peaceful Uses of Nuclear Energy, Nuclear Safety and Radiation Protection), where a two-year cycle of periodic meetings between the representative of both Parties is in progress.
- With the United States of America (Agreement between the Government of the Czech and Slovak Federal Republic and the Government of the United States of America on Cooperation in Peaceful Uses of Nuclear Energy), which takes place at formal and informal levels.
- With the Federal Republic of Germany (Agreement between the Government of the Czechoslovak Socialist Republic and the Government of the Federal Republic of Germany to Settle Issues of Common Interest in Connection with Nuclear Safety and Radiation Protection).
- With Austria (Agreement between the Government of the Czech Republic and the Government of the Republic of Austria to Settle Issues of Common Interest in Connection with Nuclear Safety and Radiation Protection).

In accordance with bilateral intergovernmental agreements concluded with the Federal Republic of Germany and with Austria, the Czech Republic submits to the state bodies of these countries information on its nuclear installations in border regions. Information is transferred regularly, at periodic bilateral meetings (annual meetings), and irregularly, within the agreed meetings, or in writing .

12.2 Statement on the implementation of the obligations concerning Article 17 of the Convention

Legislation of the Czech Republic establishes the relevant procedures for assessment of all factors important for safety of a nuclear installation in relation to its siting and for assessment of its probable environmental impact. At the same time, it introduces the regular re-evaluation regime for all important parameters – within the periodic assessment of nuclear safety assurance, while applying the up-to-date technical tools and knowledge and taking into account any changes, which occurred in the locality. It also follows that requirements of the legislation were implemented into the practice. The requirements of Article 17 of the Convention are fulfilled in the Czech Republic.

13. Design and construction - Article 18 of the Convention

Each Contracting Party shall take appropriate steps to ensure that:

(i) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defense in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;

(ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;

(iii) the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

13.1 Description of the current situation

13.1.1 Description of the licensing process including a summary of the national legislation

A general description of the licensing process for siting, design and construction, operation and decommissioning of a nuclear installation is the content of the chapter 2.1.2 and 3.1.2.

The legislative framework governing the issue of a construction permit which covers the nuclear safety and radiation protection aspects is established by the Atomic Act and its implementing regulations, in particular:

- ***SÚJB Decree No. 144/1997 Coll.***, on physical protection of nuclear materials and nuclear installations and nuclear facilities and their classification, as amended by the SÚJB Decree No. 500/2005 Coll.
- ***SÚJB Decree No. 215/1997 Coll.***, on criteria for siting nuclear facilities and very significant ionising radiation sources,
- ***SÚJB Decree No. 195/1999 Coll.***, on basic design criteria for nuclear installations with respect to nuclear safety radiation protection and emergency preparedness,
- ***SÚJB Decree No. 307/2002 Coll.***, on radiation protection, as amended,
- ***SÚJB Decree No. 318/2002 Coll.***, on details of emergency preparedness of nuclear facilities and workplaces with ionising radiation sources and on requirements on the content of on-site emergency plan and emergency rule, as amended by the SÚJB Decree No. 2/2004 Coll.,
- ***SÚJB Decree No. 309/2005 Coll.,*** on assurance of technical safety of selected equipment,
- ***SÚJB Decree No. 132/2008 Coll.***, on Quality Assurance System in carrying out activities connected with utilization of nuclear energy and radiation protection and on Quality assurance of selected equipment in regard their assignment to classes of nuclear safety.

As further mentioned in chapter 3.1.2, construction of a nuclear installation is one of the activities to which the SÚJB has to issue an approval in accordance with the provision of Section 9 of the Atomic Act, from the nuclear safety and radiation protection point of view.

For issuing the nuclear installation construction permit under Section 13 paragraph 5 of the Atomic Act, the following preconditions apply:

- approval of a quality assurance program for the approved activities,
- approval of a quality assurance program for the design.

Application for an approval for a nuclear installation construction must be in accordance with the Appendix B of the Atomic Act documented by the following documentation:

I. Final (Pre-operational) Safety Analysis Report, the content of which shall include:

- evidence that the proposed solution, given by the design, meets all requirements for nuclear safety, laid down in implementing regulations,
- safety analyses,
- data on the presumed lifetime of the nuclear installation,
- concept of a safe termination of operation and decommissioning of the approved nuclear installation, including nuclear waste disposal,
- concept of spent nuclear fuel management,
- assessment of quality assurance during preparation for construction, method of quality assurance for the carrying out of construction work and principles of quality assurance for linked phases,
- list of classified equipment.

II. Physical protection assurance proposal.

After positive assessment of the above documentation the SÚJB will issue the construction permit, whilst the list of classified equipment and physical protection assurance proposal are subject to a separate approval by the SÚJB.

13.1.2 Dukovany NPP

Basic nuclear safety principles included to the nuclear power plant design, including the application of the defense-in-depth strategy

Technological description of the Dukovany NPP units is given in the Annex 1.

The safety criteria and principles on which the original design was based were included into the Russian Contract design – "Technical Substantiation of Safety". The design criteria are here narrowed down to one basic nuclear safety criterion:

"NPP design must provide for the protection of operators and the public from outer and inner irradiation and surrounding environment from contamination by radioactive substances within approved standards. This should be assured both during long-term stationary operation and anticipated accident conditions."

Other criteria were established only implicitly as references to technical standards of the former USSR. The document "Technical Substantiation of Safety" (1974) served as a basis and already before putting of Dukovany NPP into operation a series of Czech and Russian normative regulations, which were taken into account when elaborating the original technical design into the particular design of Dukovany NPP, was issued.

When comparing the provisions of the above binding regulations during the series of analyses performed for units with the VVER-440/213 reactors at the beginning of the nineties with the current requirements for design documentation, it is possible to state that the Czechoslovak legislation of the eighties (and in principle also the regulations of the former USSR, which were subjected to similar development) was on a very good level. Generally, the requirements conformed to the contemporary understanding of nuclear safety, and principles and criteria included in the legislation, to a considerable extent, coincide with the current ones.

The technical design defined the so-called "design basis accident" – double ended rupture on the cold leg of the primary circuit (nominal diameter 500 mm) in the inseparable part of the reactor inlet.

The design considers technical and organizational measures to assure nuclear safety in the event of a single failure of the normal operating equipment simultaneously with an undetected long-term failure of other normal operating equipment. Simultaneously with the normal operating equipment failure, the failure of one independent safety division is investigated. The safety analyses included in the Safety Analysis Reports are performed for the defined and verified set of initiating events.

The Dukovany NPP design respects the defense-in-depth concept defined in the IAEA document INSAG-10. It is based on several protection levels, which include the consecutive physical barriers, preventing radioactive release into the environment:

- Level 1: Conservative design, design quality and safety culture,
- Level 2: Control of deviations from the normal operation and detection of failures,
- Level 3: Safety systems and protection systems,
- Level 4: On-site emergency management and radioactive leakage detection system,
- Level 5: Off-site emergency planning.

Periodic Safety Review, Final Safety Analysis Report and its periodic revisions, and successful implementation of the corrective measures program are considered as one of the main evidences that the design and the construction of the nuclear installation provide several reliable protection levels (defense-in-depth) against radioactive material release aimed at preventing accidents and mitigating their possible radiological consequences.

The issue “Defence in depth” was also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

Human factor and man - machine interface related design features

The operation of Dukovany NPP units has unequivocally proved that the design of this nuclear installation ensures its reliable, stable and easily controlled operation. Over the years, the plant underwent a number of modifications made with the objective to minimize the possibility of a human factor error and to improve the man-machine interface, especially in the process control system. Additional modifications are scheduled within the Modernization Program of Dukovany NPP (refer to the Annex 5). These modifications were implemented, or are focused both on the main control rooms and on the simplification of regular performance tests of individual equipment. Some of the modifications increase the share of automatic control and thus contribute to the reduction of the number of necessary operator interventions and consequently to the reduction of the number of potential human errors.

For a reliable and safe operation with emphasis on human factor and man-machine interface, both the design and the technical tools of the main control rooms are very significant. The main control room concept in the VVER-440/213 units, in its Dukovany NPP specific modification and renovated within the I&C system renovation project, provides:

- very good overview of the equipment condition, fast and easy orientation of the main control room personnel during normal operation as well as during transients. The original situation has been improved further by changes in the instruments ergonomic design implemented as a result of the operators initiative,
- easy and fast equipment control from the main control room,
- appropriate design of the failure and emergency warning systems which contributes to timely and correct identification of failures. Innovations were implemented with emphasis on improvement of the man-machine interface,
- appropriate combination of analogy (classic) type signaling and control of the main control room with digital elements – computer based equipment, which is implemented to the main control room. More extensive computerization in the main control room improves the personnel's work efficiency and has a favorable effect on the man-machine interface and thus limits possible errors due to "human factor". This concerns in particular a series of supporting computer programs performing auxiliary calculations enabling to utilize the documentation in digitized form, etc.

13.1.3 Temelín NPP

Basic principles of nuclear safety included in the nuclear power plant design, including application of the defense-in-depth strategy

Technological description of Temelín NPP units is given in the Annex 1 to the National Report.

At the present time the design is completed and modified so that both units have been on a level fully comparable with up-to-date nuclear power plants as to the level of nuclear safety assurance and other properties.

The basic design of Temelín NPP units 1 and 2 was elaborated by the Czech design organization Energoprojekt (EGP) Praha. Already before 1989, the inland experts have analyzed and modified the original design. Further technical improvements have resulted from the IAEA expert opinions, the SÚJB recommendations, proposals from the future operator and from many Czech experts and from the results of the External Audit performed by the company NUS Halliburton. Their implementation brought the technical level of units 1 and 2 of Temelín NPP into compliance with western nuclear power plant standards according to requirements of the end of the nineties.

Design changes were then verified and are further verified by new analyses performed with advanced computer codes, both in depth and structure conform to the requirements of international standards. Significant changes of the design are described in the chapter 1.1.3.2.

To reach and to maintain the required level of nuclear safety, Temelín NPP is designed to be compliant with generally applicable national and international regulations for nuclear safety assurance, and fulfils following basic safety functions:

- capability to shutdown safely the reactor and to maintain it in conditions of safe shutdown under all operating modes and events anticipated in the design,

- capability to remove residual heat from the reactor core under all operating modes and events anticipated in the design,
- capability to minimize any possible leakage of radioactive matter in a way not to exceed the stated limits in all operating modes and events anticipated in and after the design.

Observance of these general principles of safety is achieved by adhering consistently to the defense-in-depth principles and other principles as described in the IAEA Safety Standards and in the INSAG 10 document. Personnel and the vicinity of the nuclear power plant are protected against consequences of any severe accidents by physical barriers comprised of:

- nuclear fuel matrix (practically all fission products are retained within the matrix of the uranium dioxide pellets),
- fuel rods cladding (fuel cladding is made to remain hermetic over the whole time of utilization and thus preventing the fission products release),
- primary circuit (reactor pressure vessel and the primary circuit represent a barrier resistant to pressure load, heat and radiation exposure),
- containment – pre-stressed concrete dome (external 1.2 m thick containment covers the reactor and all important primary circuit equipment, and thus prevents radioactivity releases into the environment in the event of an accident related with the integrity damage of the preceding barriers).

The Periodic Safety Review, Final (Preoperational) Safety Analysis Report and its periodic revisions and the implementation of the program of PSR corrective measures are considered as one of the main evidences that the design of a nuclear installation provides for several reliable levels and methods of protection against the release of radioactive materials (defence in depth), with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur.

The issue "Defence in depth" was also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

13.2 Statement on the implementation of the obligations concerning Article 18 of the Convention

The legislation valid in the Czech Republic and its implementation in practice is compliant with the requirements of Article 18 of the Convention. The operated Dukovany NPP and Temelín NPP are designed with respect to the defense-in-depth concept against radioactive substance release with the goal to prevent occurrence of accidents and to mitigate their radiation consequences. Applied technologies are either well proven or verified by the tests combined with computational analyses.

14. Operation - Article 19 of the Convention

Each Contracting Party shall take appropriate steps to ensure that:

(i) the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning program demonstrating that the installation, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;

(iii) operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;

(iv) procedures are established for responding to anticipated operational occurrences and to accidents;

(v) necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;

(vi) incidents significant to safety are reported in a timely manner by the holder of relevant licence to the regulatory body;

(vii) programs to collect and analyze operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;

(viii) the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned both in activity and in volume, and in necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.

14.1. Description of the current situation

14.1.1 Description of licensing process, including summary of national legislation

The description of the licensing process, in general for siting, designing and construction, operation and decommissioning of nuclear installation is given in the chapter 2.1.2.

The legislative framework for approval of the operation of a nuclear installation from the nuclear safety and radiation protection point of view is established by the Atomic Act and its implementing decrees, in particular:

- ***SÚJB Decree No. 144/1997 Coll.***, on physical protection of nuclear materials and nuclear installations and nuclear facilities and their classification, as amended by the SÚJB Decree No. 500/2005 Coll.,

- ***SÚJB Decree No. 106/1998 Coll.***, on nuclear safety and radiation protection assurance during commissioning and operation of nuclear facilities,
- ***SÚJB Decree No. 307/2002 Coll.***, on radiation protection, as amended,
- ***SÚJB Decree No. 318/2002 Coll.***, on details of emergency preparedness of nuclear facilities and workplaces with ionizing radiation sources and on requirements on the content of on-site emergency plan and emergency rule, as amended by the SÚJB Decree No. 2/2004 Coll.,
- ***SÚJB Decree No. 185/2003 Coll.,*** on decommissioning of nuclear installations and workplaces of categories III and IV,
- ***SÚJB Decree No. 309/2005 Coll.,*** on assurance of technical safety of selected equipment,
- ***SÚJB Decree No. 132/2008 Coll.***, on Quality Assurance System in carrying out activities connected with utilization of nuclear energy and radiation protection and on Quality assurance of selected equipment in regard their assignment to classes of nuclear safety.

As it was said in chapter 3.1.2, commissioning and operation of a nuclear installation are activities for which the SÚJB authorization is required under the provision of Section 9 of the Atomic Act as to nuclear safety and radiation protection. According to Section 13 of the Atomic Act approval of a quality assurance program for the practice being licensed is a prerequisite for the issue of a licence for commissioning and operation of a nuclear installation.

Commissioning

An application for the issue of authorization for the individual stages of nuclear installation commissioning must be, in accordance with the Appendix C of the Atomic Act, accompanied with the following documentation:

a) For stages prior to loading nuclear fuel into a reactor:

- Time schedule for work in a given stage;
- Program for the stage in question;
- Evidence that installation and personnel are prepared for the stage in question;
- Evaluation of results of the preceding stage;
- Method by which physical protection is to be provided.

b) For the first loading of nuclear fuel into a reactor:

I. Final (Pre-operational) Safety Report, which shall include:

- Description of changes of the original design assessed in the Preliminary Safety Report and evidence that there has been no decrease in the level of nuclear safety of the nuclear installation;
- Supplementary and more precise evidence of nuclear safety and radiation protection provisions;
- Limits and conditions for safe operation of the nuclear installation;
- Neutron-physics characteristics of the nuclear reactor;
- Method of radioactive waste management;
- Quality assessment of classified equipment.

II. Further documentation, which shall include:

- Evidence that all prior decisions and conditions of the SÚJB were fulfilled;
- Time schedule for nuclear fuel loading;
- Program for nuclear fuel loading;
- Evidence that installation and personnel are prepared for nuclear fuel loading;
- Evaluation of the results of previous stages;
- On-site emergency plan;
- Changes in the provision of physical protection;
- Program of in-service inspections;
- Proposed decommissioning method;
- Cost estimate for decommissioning.

c) For stages following the first nuclear fuel loading into the reactor:

- Time schedule for work in this stage;
- Program of this stage;
- Evidence that installation and personnel are prepared for the stage in question;
- Evaluation of results of the previous stage.

After a positive evaluation of the above-mentioned documentation, the SÚJB issues the approvals for the individual phases of the reactor commissioning, whilst the program of the phases, proposed physical protection method, changes in physical protection assurance, proposed decommissioning method, on-site emergency plan, program of in-service inspections, as well as the Limits and Conditions for safe operation of a nuclear installation, are subject to a separate approval by the SÚJB.

Operation

Application for issuing the authorization for the nuclear installation operation must be, in accordance with Appendix D to the Atomic Act, accompanied with the following documentation:

- supplements to the Final (Pre-operational) Safety Analysis Report and further supplements to documentation required for the issue of a licence for the first nuclear fuel loading into the reactor, relating to changes carried out after the first nuclear fuel loading;
- evaluation of results of previous commissioning stages,
- evidence of implementation of previous decisions and conditions of the SÚJB,
- evidence that installation and personnel are prepared for operation;
- operation time schedule,
- up-dated limits and conditions for safe operation.

After positive evaluation of the above-mentioned documentation, the SÚJB issues the authorization for nuclear installation, whilst changes in the documentation, approved in previous stages, are subject to a separate approval by the SÚJB.

Although the authorization for operation under the Act is not time-limited, the SÚJB issues during the operation, in accordance with the Section 9 paragraph 1 letter e), authorization for restarting a nuclear reactor to criticality after a nuclear fuel reload, based on review of the documentation submitted in accordance with Appendix E to the Atomic Act, i.e.:

- neutron-physics characteristics of the reactor,

- evidence that installation and personnel are prepared for restart of the nuclear reactor to criticality, including preliminary evaluation of in-service inspections,
- time schedule for subsequent operation.

14.1.2 Limits and Conditions for safe operation

Establishment of the Limits and Conditions for safe operation is required by the existing legislation – the Atomic Act and a set of its implementing decrees, as one of the basic documents for issuing authorization of the first nuclear fuel loading into the reactor and for subsequent operation of the nuclear installation.

The requirements of the Limits and Conditions for safe operation have been formulated as early as in 1982, following an initiative of the regulatory body. The concept was based on the US NRC reference guide [14-1] for nuclear power plants with pressurized water reactors.

The Limits and Conditions for safe operation form a set of uniquely defined conditions, for which it has been proved that the operation of nuclear installation is safe. Classification of the Limits and Conditions for safe operation is established in SÚJB Decree No. 106/1998 Coll., and includes the following data categories:

- Safety limits,
- Protection systems setting,
- Limiting condition for the operation (requirements for operation ability and acceptable values of parameters),
- Requirements for checks,
- Organizational measures,
- Reasons for the Limits and Conditions.

Limits and Conditions establishes the values of physical and technological parameters affecting directly the condition of physical barriers, which prevent the leakage of radioactive substances, the setting of protection systems and the requirements for operation ability of equipment important from nuclear safety point of view.

In case any deviation from the Limits and Conditions occurs during the operation, responsible persons shall take immediate measures to restore the compliance as soon as possible. If the compliance cannot be restored and possible consequences of the deviation are significant for nuclear safety, the reactor must be put into state, in which the respective requirements of the Limits and Conditions do not apply. The operator is obliged to inform the SÚJB on all deviations from the requirements of the Limits and Conditions, subsequently an analysis of the Limits and Conditions violation is performed and measures preventing repetition of such event are proposed.

Limits and Conditions of the Dukovany NPP

The first version of the Limits and Conditions for the Dukovany NPP units was elaborated in accordance with the US NRC reference guide [14-1]. Since that time, the Limits and Conditions have been continuously developed and details modified. The Limits and Conditions were revised following an issue of the amended Atomic Act. These Limits and Conditions were put into force in 2001. The NUREG 1431 document was taken into account during the revision.

The document is kept updated depending on executed modifications and in compliance with the latest results of research and development and with the application of experience in operating of particular NPP units.

The requirements of the Limits and Conditions are based on the prerequisites and results of safety analyses, documenting the power plant safety at abnormal and emergency conditions (deterministic approach) and, when the limited technological system operation ability recovery time is fixed, they take the PSA results into account (probabilistic approach). The Limits and Conditions also reflect the calculation and experimental analyses and data, and are based on operational experience not only from the Dukovany units with the VVER 440/213 reactors, but also from similar units in other countries (Slovakia, Hungary and Russian Federation).

Contents and internal segmentation of the Limits and Conditions are compliant with the requirements of the Atomic Act and the SÚJB Decree No. 106/1998 Coll. Justification of the Limits and Conditions are an integral part thereof. The Limits and Conditions are directly approved by the SÚJB and are also part of the Final (Pre-operational) Safety Analysis Report.

Limits and conditions of Temelín NPP

Limits and conditions of the Temelín NPP were elaborated in accordance with the NUREG 1431 document and their requirements are based on the prerequisites of safety analyses, documenting the plant safety at abnormal and emergency conditions and consider conclusion of PSA. Contents and internal segmentation of Temelín NPP Limits and Conditions are compliant with the requirements of the Atomic Act and the SÚJB Decree No. 106/1998 Coll. Limits and Conditions of Temelín NPP are part of the Final (Pre-operational) Safety Analysis Report. The Limits and Conditions were approved by the SÚJB as an independent document within the licensing procedure for the authorization of the first fuel loading into the reactor core. Limits and Conditions documentation, which is used by the plant personnel, is composed of two parts:

1) Limits and Conditions for safe operation
2) Substantiation of the Limits and Conditions for safe operation

Each system in Temelín NPP is classified either as "important" or "unimportant" for the nuclear safety. Systems important for the safety are such systems, the availability for operation of which participates in the fulfillment of any of the safety functions. Systems important for the safety are divided in two subcategories, both of which are covered by the Limits and Conditions:

1) safety systems
2) safety related systems

Both these subgroups are covered with requirements of Limits and Conditions. Safety systems may further be classified as protection (actuating) systems, actuators (which are being actuated in case a certain predetermined value is exceeded) and supporting systems. Similarly it is possible to perform this division also for safety related systems. Here the actuators are controlled by control systems of safety related systems rather than by protection systems (limitation system, reactor control system etc.).

From the first fuel loading into the reactors of both units the approved Limits and Conditions were during the commissioning and during the trial operation, and now also in operation, several times modified with the changes approved separately. The necessity of performing these changes resulted from the performed approved equipment modifications and from the operational experience.

The revision of the whole document is executed periodically including justification of the Limits and Conditions.

14.1.3 Operation, maintenance, inspections and tests of nuclear installation

Operation

Units of both power plants are operated in accordance with internal decrees and the Limits and Conditions for safe operation. These documents are continuously and systematically updated and upgraded. The compliance with the documents is continuously monitored through the implemented control system and the so called "feed-back" system (see chapter 14.1.7).

The system catches all necessary and usable events. The plant personnel are familiar with the system and the system is used for the correction of discrepancies and defects. A great number of workers from all plant departments are involved in the process of identifying the causes of the problems and proposing effective corrective measures. The number of safety relevant events has decreased already for several consecutive years.

In Dukovany NPP as well as in Temelín NPP a system of WANO safety indicators evaluation is implemented, continuously providing information about the standards in the monitored areas in other NPPs in the world. Gathered information is used to recognize own level of Dukovany NPP and Temelín NPP in the individual indicators of the safety and operational status. The SÚJB uses the set of safety indicators to assess the nuclear safety level. The results of the safety indicators for 2004 – 2009 and for Dukovany NPP as well as Temelín NPP are shown in Annex 6.

Control documents defining the activities in the external and internal feedback process and the activities associated with the exchange of operational experience and technical information between the nuclear power plants of ČEZ, a. s. and the operators of other nuclear power plants via the WANO network were prepared by the licensee.

Basic system standards establishing principles for safe and reliable operation control are the Operation Control and Procedures and the Production Equipment Operation and Monitoring.

The Operations Control Rules are formulated in accordance with the ČEZ, a. s. strategy so that their observance shall ensure safe, reliable and economic and environmentally friendly operation of the nuclear installation, in compliance with:

- conditions of the SÚJB authorization,
- provisions of the binding legal decrees of the Czech Republic (acts and their implementing decrees),
- operating procedures.

Operation of Dukovany NPP as well as of Temelín NPP is managed by the Operations Control Department. The division of responsibilities for the individual activities is defined in the corresponding quality assurance programs.

Special emphasis is put on preparedness and qualification of operating personnel, especially so-called "selected personnel", i.e. personnel who have an immediate effect on nuclear safety (see chapter 6). Also other operating personnel undergo selection, training and hands-on training for the relevant function.

Shift operation in Dukovany NPP as well as in Temelín NPP is ensured by six, or seven (for selected professions), equally competent shifts providing for the operation as well as for periodic training and proper rest of the personnel.

Within all unit modes both NPPs use the PSA risk monitor application for monitoring the unit operation risk. Data about unavailability of equipment is analyzed for the reasons of tests, maintenance, and failures in all units. The analyses result in measures leading to the minimization of the operational risk.

When planning the equipment tests and maintenance, the outputs of the risk monitor are used to eliminate combinations of equipment unavailability, which are allowed by Limits and Conditions, but could increase the operational risk in the NPPs.

Organization and activities during annual outages

The basic or key indocators of outage preparation and performance are:

1. Nuclear safety
2. Radiation protection
3. Occupational safety
4. Scope of outage
5. Compliance with outage preparedness
6. Quality of human performance in outage.

The Outage Management Headquarters, made up of power plant managers and managers of main suppliers, is the top management body for outage at Temelín NPP.

Preparation and progress of the outage in Dukovany NPP or Temelín NPP is controlled by a group of personnel nominated by the Coordination Department manager in the following composition (this can differ at each individual site as well as for specific outages):

- outage manager,
- primary circuit working group head,
- secondary circuit working group head,
- electro working group head,
- instrumentation and control working group head.
- Head of the nuclear fuel working group.

An Outage Team may be also appointed by the Power Plant Manager for the preparation and course of the outage. The representatives of the main departments of the power plant and suppliers are appointed to the Outage Team. Shift maintenance dispatcher, who controls and checks the work in accordance with the approved specification for afternoon and night shifts and for holidays, cooperates closely with this group of outage management. Each working group meets on a regular basis on working days for consultation meetings, where its members inform on the current state of the monitored activities, and where tasks directed to the fulfillment of the plan of works are assigned.

After the consultation meetings, consultation meeting of the outage control group is held, at which, additionally to the heads of the working groups, the reactor unit manager, shift maintenance dispatcher and the operation and nuclear safety representativeare present. During this meeting tasks for the next 24 (or for 72) hours are assigned. Orders for the shift personnel are also consulted here, which are concentrated into an official document, named Daily Operational Schedule, which is being issued daily.

Fulfillment of the assigned tasks is then checked and evaluated during the consultation meeting of the shift maintenance dispatcher in the presence of the outage manager, the heads of the working groups, coordination and representatives of the administration of property, which is held the following day at the beginning of the morning shift.

During the occurrence of non-standard states, which could jeopardize the scheduled progress of the outage, the outage manager calls together the Control Staff, which adopts, after having evaluated the event, measures for the correction of the state.

Preparation of the outage begins at least six months prior to the scheduled date of its beginning, in accordance with the yearly outages scheduled. The yearly schedule is linked to the long-term plan of plant outages, where also the presumed duration of the outage is given based on the standard whilst taking into account long-term extensive activities.

- Basic framework of the main activities is determined based on regular periodic checks of the main components of the unit.
- Important scheduled reconstruction and modifications are included.
- Preparation of complex activities, such as special inspections, plant modifications, may be in progress even several years prior the corresponding outage.
- Six months or according to the approved milestones prior to the corresponding outage, fulfillment check of the conclusions and measures from the preceding outage is performed.
- Six months or according to the approved milestones prior to the outage, regular Coordination Consultation meetings are started.
- Requirements for execution are further detailed, simultaneously preparation of activities from the viewpoint of material assurance, documentation, selection of the contractor, approval by the regulatory body, etc. is in progress.
- Two months prior to the outage the Coordination Department issues the official schedule of the outage. The schedule includes decisive activities, which will be performed during the outage. The schedule includes revisions of the main components of the unit, important modifications of the equipment, order of the revisions of the individual electrical systems, availability of the safety systems and also includes logic links of the individual activities. The schedule includes already the sequence of important unit tests during the unit start-up. In the schedule the so-called critical path of the outage activities is marked. The outage schedule is assessed, from the viewpoint of reactor core damage risk, using the probabilistic calculation and it is optimized for the decrease of risk to be as low as achievable.
- Two months prior to the outage, preparation of the work orders for scheduled outage activities is finished and work starts on grouping these orders into the securing ones and the safety related ones.
- One month prior the outage, a list of modifications and technical solutions, which will be carried out during the outage, is submitted to the SÚJB.
- One week prior the outage a document is issued (operative program), describing in detail activities, which will be carried out in the frame of the unit outage. The document includes also the time schedule. A similar document is elaborated also for activities during the unit start-up after the outage.One week prior to the outage of Temelín NPP, a meeting is held to confirm the correctness and feasibility of a detailed time schedule for unit outage.

- Approximately two days prior the reactor start-up an expert commission meets (Technical Committee) to judge, based on a report on the performed operational checks, whether the reactor and the pertinent equipment is ready for the restart.
- Subsequently an application for the authorization of the reactor restart is sent to the SÚJB.
- Within one month after putting the reactor into operation a report on the performed repairs on the classified equipment is submitted to the SÚJB.
- Within two months after the outage, a summary report on the outage including recommendations and measures for later outages is elaborated.

The outage structure is governed by the following philosophy:

- Safety is the first priority.
- One critical path is clearly defined.
- During the outage systems and components will be put out of operation and locked once only.
- The outage takes into account the Shutdown PSA recommendations (probability of core damage frequency during outage and at low power levels),
- Systems and components with completed maintenance are tested in accordance with the approved procedure. These tests are performed by the Operations Control Department prior to placeing them into normal operation.
- Progress of works being in the critical path and in its vicinity is monitored in detail.
- Information on the overall progress of the outage belongs to the information frame being daily submitted to the outage coordination group.

Maintenance

The mission of the maintenance in Dukovany NPP as well as in Temelín NPP is to provide and controls all activities on plant equipment so that they are:

- in accordance with the plant design,
- in accordance with the Czech Republic legislation,
- in accordance with international recommendations,
- in accordance with the internal control documents,

and the following is assured:

- nuclear, radiation and conventional safety,
- required reliability,
- design lifetime,
- Limits and Conditions for safe operation.

and this is done with respect to optimal and effective spending of financial resources.

The main goal of maintenance is to ensure the required availability of the nuclear power plant technological equipment, timely removal of defects, their documenting and performance of monitoring.

The equipment maintenance is carried out in accordance with the elaborated maintenance program for individual equipment including also the preventive maintenance program. The maintenance method and scope depend on the required safety and reliability of the equipment.

The maintenance on equipment of all units in both NPPs is planned materially and financially for a long-term period (5 years), and daily (daily maintenance plan). The maintenance is ensured on a supply basis. For the purposes of efficient supply system setting, the equipment of Temelín NPP is divided into so-called logical complexes, which can be further divided into technological complexes and groups of equipment. The boundaries of logical complexes are defined in order to ensure the required function.

A long-term “strategic” partnership with key suppliers is established through framework agreements. Under the framework agreements, the relevant Contracts for Work with specific terms and conditions and specification for the logical complex are concluded.

Inspections and tests

In addition to the introduced Inspection and Test Program (see 9.1.3), regular tests of the equipment are performed by the operating personnel of Dukovany NPP and Temelín NPP during the operation of units and during regular refueling outages. Extent of the tests and their periodicity is given by the Limits and Conditions for safe operation and the Operating Procedures. Based on the requirements given by these documents annual time schedules of the tests are elaborated. For each test methods procedures are prepared, upon which the operating personnel act during the test. According to the test character, these tests are carried out either by qualified plant personnel or by qualified personnel of a supplier in cooperation with the corresponding experts from the plant. Each performed test is documented by a protocol or record.

Possibly identified deficiencies are eliminated, depending on their character and significance, in accordance with a system, described in the internal decrees of the plant. Those are formulated so that the requirements of the Limits and Conditions for safe operation and/or Operating Procedures are always fulfilled. Observance of the deadlines, actual performance and evaluation of the tests is controlled by independent control workers and by responsible managers.

Independent monitoring and evaluation of tests and inspections

Fulfillment and observance of requirements prescribed in the document Limits and Conditions are one of the highest priorities when assuring safe operation and is also the precondition for the fulfillment of safety analyses prerequisites. Limits and Conditions define the conditions for the operation of the unit, under which safety of the operation is proven. In the Temelín NPP systems are established for performance of checks in accordance with the Limits and Conditions, as well as for independent monitoring and evaluation of the correctness, effectiveness, and completeness of other documents and activities, susceptible to influence the fulfillment of the Limits and Conditions.

The requirement for performance of internal independent checks of the Limits and Conditions observance is included in the Limits and Conditions document. Execution of the inspections on the facility beyond the framework of the requirements for the inspections arising out of the Limits and Conditions is described in operating instructions; possibly it is executed based on the requirement and in compliance with quality assurance program according to prepared and approved operative program. These inspections are executed by the guarantor for individual systems and all responsible plant departments are familiarised with their results by the protocol.

14.1.4 Intervention procedures for the anticipated operational events and accidents

Procedures for activities carried out by the shift personnel and the unit main control room personnel are established in the Operating Procedures. All NPP operating documentation underwent an extensive reworking. Operating Procedures are divided into two parts: operating parts - used by operators in the process control, and descriptive part - used principally for the training purposes which, besides a detailed description of the equipment, contain description of the operating states, design values and other necessary data. All new documents are formally unified for both NPPs. Databases of signals, protections and blocks, valves, drives, etc. are being loaded in accordance with the documents revision. A new system of the databases provides for a better updating of the documents and is an important initial step for the preparation of the nuclear power plant´s extensive modernization.

For cases of abnormal status occurrence the relevant procedures (AOP) are elaborated in both NPPs.

For the support of the MCR operational personnel during the control of situations under emergency conditions, symptom-based Emergency Operating Procedures (EOPs) were prepared. Either the reactor scram or start of the safety systems is an initiation event for the start of the activities in accordance with the Emergency Operating Procedures.

These symptom-based Emergency Operating Procedures were evaluated in accordance with the methodology and in cooperation with the Westinghouse Company.

The package of the strategies includes a wide range of events within the emergency conditions – ranging from design basis accidents to possible combinations of events, including multiple breaks and equipment failures. Emergency Procedures include in accordance with the PSA Level 1 study, all relevant scenarios, which might lead, with a certain probability, to the core damage. The MCR operative personnel interventions are always in accordance with the requirements for the minimization of consequences of a possible radioactivity release into the environment.

The Symptomatic-oriented Emergency Operating Procedures deal with emergency conditions of the NPP according to their symptoms, i.e. independently on events. Monitoring of the critical safety functions is an integral part of the procedures. All emergency states are always resolved untill the so-called safe condition, when a nuclear unit is fully under the operator's control, and is mostly cooled down to the primary circuit temperature less than 100°C in accordance with the Operating Procedure.

The employees with a long-term professional practice in operation of the units were involved in preparation of symptomatically oriented emergency procedures. Individual stages of the new operational Procedure development were subject to verification both by Westinghouse personnel and by the personnel of the main control rooms of particular units. A study of the human factor response in the application of the Procedure has been prepared. The emergency procedures were validated at a simulator. The use of the procedures for abnormal and emergency conditions is regularly trained at a full-scale simulator.

The Emergency Operating Procedures (EOPs) are currently updated on regular basis using changes in design, comments arising during simulator training and especially comments arising from the long-term Westinghouse contract (the so-called "Maintenance program"). Annual meetings of the Procedure authors and Westinghouse employees are held to discuss significant comments and proposals from the NPP side and, at the same time, the Westinghouse Company discusses with the NPP personnel approved changes in generic instructions. Approved changes are after validation included into the Emergency Procedures. Extensive causative documentation, the so-called "Basis", forms an integral part of the Emergency Procedures.

The Emergency Procedures are also accompanied with a list of the reference analyses, which served as an input for the development of the Procedure and a list of analyses, which were used for the procedures validation, including their changes.

The procedure for fault condition solutions (Shutdown EOPs) was created for non-power reactor modes. The PSA results for non-power conditions (Shutdown PSA) were used as background material for the creation of this Procedure. The Procedure amends the EOPs so that all operating modes, including outage and refueling are covered.

In cooperation with the Westinghouse Company guidelines were created for the NPPs for the resolution of severe accidents (Severe Accident Management Guidelines - SAMGs). The guidelines are linked to EOPs. The guidelines are created both for the support of main control room personnel activities and (in particular) for the support during decision-making process of the Technical Support Center and the Emergency Response Board. Use of SAMGs, contained strategies and phenomena in severe accidents are the subject of the training of expert personnel of the main control room, the Technical Support Centre and the Emergency Response Board, and are practiced during emergency exercises.

All above given procedures (AOPs, EOPs, Shutdown EOPs and SAMGs) are created in the framework of one philosophy. The procedures are described in the same form and provide for defense-in-depth in the second through fourth level in accordance with the INSAG 10 document issued by the IAEA.

The issue “Severe accident management and recovery of safety functions of units at site” was also addressed in detail in The Czech Republic Extraordinary National Report [11-1], which was intended for the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

14.1.5 Engineering and technical support

The organization structure of Central Engineering Department of ČEZ, a. s. includes NPP Engineering, Project Preparation and Implementation (PARP) and Technical Support (the field of Long Term Operation) departments that execute and co-ordinate the activities of engineering and technical support. These central departments have a common competence for both Czech nuclear power plants. The responsibilities and rights of the department are clearly determined in control documents of ČEZ, a. s.

The main tasks of this department in the field of design administration are as follows:

- Equipment configuration change management with the application of the principles of Configuration Managementu (CM),
- Analyses and preparation of technical solution of the specified technical problems
- Creation and update of the Design Basis documents, List of specific equipments and specific equipments specially designed ,
- control of the Design Basis collection and update process and its utilization in the performance of equipment configuration changes (Design Basis),
- update of selected Licence Basis documents,
- equipment qualification process control,
- preparation of long-term operation of the Dukovany NPP and Temelín NPP beyond the design lifetime (PLEX/LTO),
- assurance of technical part as to nuclear-power installation decommissioning,

- utilization of national as well as international technical supporting programs.

Main objectives of this section in the field of equipment configuration changes control are as follows:

1. In the phase of pre-designing stage:
   - Acceptance and assessment of requirements (Technical Initiations) of the equipment administration departments, operational departments and other departments of both NPPs for the equipment configuration changes.
   - The preparation of conceptual design assignment for respective required and relevant changes in the equipment configuration (Business plan, Project plan), preparation of logical complexes development plan in regard to OJ development strategy
   - Complex assessment of technical, operational and safety aspects of prepared change in the equipment configuration, including fulfillment of legislative requirements to the state authorities.
2. In the phase of design preparation and implementation:
   - Check of design documentation of the equipment configuration changes from the viewpoint of observance of a conceptual technical assignment, which placed this change into the designing stage.
   - Technical support during implementation (installation) of the equipment configuration changes and during verification and testing of modified design functions affected by these changes.
   - Final Evaluation Report.

The execution of technical and engineering support of both NPPs and related changes in facility configuration is managed by advisory boards of Managing Directors of Dukovany and Temelín NPPs – Technical Committee of NPPs.

Preparing and Realization of Projects Department, which ensures technical and commercial preparation of the designs as well as implementation of the equipment or system modifications, so that the equipment administration departments, or the operational departments are entrusted with the charge of modified and tested equipment through the "turnkey" system, including delivery of required documentation. The Engineering of NPP and Preparing and Realization of Projects cooperate even in evaluating technical and economic benefit of each modification of the equipment and system.

Technical and engineering support is provided by highly educated personnel, qualified for specific tasks they perform themselves, or which are performed under their supervision. Close working relationships exist between the departments Engineering of NPP and Preparing and Realization of Projects and the operational departments of both NPPs, which are again formally defined in ČEZ, a. s. control documents. When performing the technical and engineering support ČEZ, a. s. closely cooperates with the general designer of both Czech nuclear power plants, ÚJV Řež a s. - EGP Praha Division, as well as with the Russian design organizations, which are authors of the original type designs of the VVER nuclear units. Further cooperation is continuously in progress with qualified research and scientific organizations and universities, as well as with suppliers and designers of implementing designs of individual systems of nuclear units of both plants.

The renovation and upgrading of safety, control and information systems at Dukovany NPP is assured within organization structure of Preparing and Realization of Projects Department by the project team Renovation of Instrumentation and Control Systems at Dukovany NPP that controls this extensive project. The team assures and controls all technical and investment activities related to this project. In the field of an increase in power – the utilization of project reserves of NPP units – the implementation is assured by project team the Utilization of project reserves of EDU NPP and ETE NPP.

In technical area, both teams closely co-operate with department Engineering of NPP.

14.1.6 Operational events experience exploiting in ČEZ, a. s. NPPs

The ČEZ, a. s. nuclear power plants apply the system permitting to benefit from their own operating experience – Dukovany NPP since the beginning of its commercial operation in 1985, and Temelín NPP in the course of its constructions and commissioning. At the same time also experience from international nuclear power plants, obtained from the IRS (Incident Reporting System) and WANO networks and from operators in Slovakia and experience from other site power plant, is used in the NPP. The whole process, which includes examination of the operational event causes, remedial measures and feedback of experience from these events, is ensured by specific departments in the relevant NPP and is described in relevant control documentation in individual NPPs.

The process covers methods for gathering information on operational events, their registration, investigation procedure, and analysis of their causes, establishment and adoption of remedial measures for these events, monitoring of their implementation and evaluation of operational events feedback effectiveness and trends. The process also includes obligation and procedure for the transfer of own experience to other NPP operators and for the dissemination of foreign and own operational experience within the plant.

In the given documentation, criteria are also given for recording the events; for safety related events the documentation also provides criteria in accordance with which selected events are reported to the SÚJB or other relevant bodies or organizations (ČEZ, a. s. Headquarters, Hygiene Service, Fire Service, etc.).

The events are evaluated according to the INES international scale for evaluation of event significance in the nuclear installations. A head of the Feedback section is responsible for the event-related investigation. This section coordinates the whole process of events investigation in the power plant, but also other further plant specialists from special departments are involved in the process.

Part of the above activities is supporting personnel honesty and effort to consistently investigate all events, which may jeopardize safe and reliable operation. The principle is that open communication setting and the admission of own mistakes is an acceptable impetus to improvement of the safety culture, whilst the priority is not to find the guilty parties, but to improve the condition.

For regular evaluation of effectiveness of experience from own operational events, the main criterion is the event non-recurrence for the same causes. Repeated events or problems are regularly evaluated in the ČEZ, a. s. NPPs in annual reports on the operational events and possible further measures are proposed. For tracking problematic areas – trends, precursors – the coding of event causes is used. This is elaborated as a part of annual report "Feedback from internal events".

Three types of events are distinguished in the monitoring system (process):

1) Events important from the nuclear safety viewpoint. These events must be discussed by the Failure Commission of the relevant NPP and the causes together with the adopted

corrective measures are regularly checked out by the SÚJB.

2) Minor (less significant) events (INES classification always less than 0, they are classified out of scale). These events are investigated within the work order of the corresponding departments; these events are not discussed by the Failure Commission; corrective measures are checked by the feedback of working group and chcecked and approved by the Failure Commission.

3) Events without consequences ("near misses"). These events are treated in the same way as the events in the preceding paragraph. Their possible influence on any process in the plant is being evaluated. Trending according to common causes is carried out and negative precursors are evaluated. Regular evaluation is submitted to the power plant management.

The Events Investigation Commission (Failure Commission), which is established as the advisory team of the executive director of NPP for identification of causes, corrective measures and conclusions for the events investigation in individual power plants, confirms at its regular meetings the completeness of the investigations of safety related event causes and adopts corrective measures for the elimination of their causes for the purpose of prevention of their repeating.

Significant events that can be used by other operators are, after recommendation from the Failure Commission, transferred into the WANO network.

The most severe events at power plants of ČEZ, a. s. (nuclear, thermal and water power plants) are discussed at Failure Commission of Production Division and experience in these events is transmitted back to all power plants. This makes all important data and experience available to other NPP personnel to be used for the improvement of the plant operation reliability. The power plant personnel is informed on selected events both from internal and from external feedback.

Both commissions are an element of the safety self-assessment of persons responsible for safety, and their activity and results are subject to independent supervision and evaluation by special departments that are not responsible for operating results.In accordance with the law, the SÚJB supervises this process, and in some cases of important events, inspects the progress of examination and assessment of sufficiency of remedial measures taken in the course of event management.

External events

NPPs of ČEZ, a. s. are actively involved both in Incident Reporting System working under IAEA and in system WANO - the international organization of nuclear power plant operators. This allows active and effective mutual cooperation with other NPP operators in operational experience exchange. Analysis and utilization of operational experience and technical information from other operated nuclear power plants conduce to improvement of the NPP operation safety and reliability. When sharing own operational experience ČEZ, a. s. NPPs conduce to effective application of this process within the international context.

The above given system of taking profit from the events in other nuclear installations on worldwide basis (WANO) is incorporated into the event investigation process. The main objective of the system is to transfer and to utilize any operating experience and technical information acquired by nuclear power plant operators in the ČEZ, a. s. NPPs practice. The system is described in a special instruction and comprises five basic programs:

- operational events reports,
- direct information exchange between the operators,
- operational indicators WANO, PRIS,
- good practice,
- partner inspections.

The selected information from WANO sources, mainly the SOER report (Significant Operating Experience Report), as well as INPO, IAEA, OECD - NEA sources is included into agenda of the Safety Committees and Failure Commissions at both sites. All obtained information is archived in form of a database, and used by the technical department experts as technical support in solving problems .

14.1.7 Notification of events important for nuclear safety

One of the basic legal obligations of the nuclear installation operator is to immediately notify safety related events to the Regulatory Body. Transferred reports cover the solution of events and non-nominal states, in relation to nuclear safety, radiation and physical protection, emergency preparedness and nuclear materials management, as well as all other activities and changes affecting nuclear safety and radiation protection.

The extent and method for transfer of information on selected events in respect of nuclear power plants operational safety are established by the document Principles of Communication between ČEZ, a. s. and SÚJB about events subject to legislative requirements. The reporting procedures are described in the plant internal documents. The Regulatory Body is regularly informed on the operational state of all reactor units through a daily report, which is always mutually consulted and amended by verbal commentary on other current information from the morning operative session of the shift engineer. The inspectors are acquainted with other scheduled activities for the nearest period through a valid daily operation plan.

For the operative communication (provable immediate transfer of information) both NPPs established a special log of operative contact between the operator and SUJB resident inspectors.

14.1.8 Optimization of nuclear installation operational radioactive waste production

Basic objective

Radioactive wastes from normal operation of both NPPs are stored, after the appropriate treatment, within the Dukovany Radioactive Waste Storage Facility. With respect to ecological and economic conditions of the NPPs, radioactive waste storage in this storage facility represents an optimal option fulfilling the basic objective – its isolation from the environment, until its radioactivity is significantly reduced as a result of decay. Storage in the storage facility is conditioned by processing the radioactive wastes into a form suitable for storage.

Activated materials (e.g. parts of detectors of in-core measurements), which due to a high content of limited radionuclides (^{63}Ni) do not meet the acceptability requirements for depositing in Radioactive Waste Storage Facility, are stored in NPP.

Liquid radioactive wastes are temporarily stored as radioactive concentrate after sedimentation and concentrating. Subsequently, they are processed in a bitumen product. Operation of the bitumenation line is organized so that the permitted volume of stored concentrates is not exceeded, and at the same time there is sufficient free volume for sewerage waters from the units operation. In

Temelín NPP this means processing of the whole volume of sewerage waters in several campaigns in the course of the year. In the Dukovany NPP the capacity of the technological equipment allows processing of concentrates with the volume higher than the volumes of new sewerage waters, and thus the quantity of stored concentrates permanently decreases.

Solid Radioactive Waste is systematically sorted and measured. A part of the waste with the content of radionuclides below release level is discharged to the environment in a controlled manner in compliance with the legal regulations. The remaining waste is processed, treated, characterized and subsequently deposited to Radioactive Waste Storage Facility. The decontamination, crushing and subsequent compression are used for final treatment of compressible waste. Solid radioactive waste i also treated with the use of high-pressure compression and incineration technologies in technological equipment of external suppliers outside the territory of the Czech Republic.

Radioactive sediments and deteriorated sorbents are stored in the storage tanks. A significant change took place in the field of deteriorated sorbent management. In 2011, deteriorated sorbent treatment into an aluminosilicate matrix SIAL started and 190 ton of waste was treated by the end of 2012, and the amount of stored sorbents decreased by more than 60%. The verification of technologies for treatment of these kinds of waste is currently in progress .

Minimization principle

The basic requirement during radioactive waste management is the minimization of their amount. This process includes avoidance of the waste occurrence, modification of technological equipment, operating procedure modifications and optimization of processes during the waste treatment and processing. Minimization is understood as a complex process with direct impacts both in environmental and economic indicators of the NPP operator.

At NPP, the following measures are continuously implemented aimed at reducing the radioactive waste generation:

- development and implementation of low-waste decontamination technologies,
- separation of non-active sediments from the exchanger cleaning,
- separation, activity measurement and subsequent introduction of deteriorated sorbents into the environment,
- restriction of objects brought into the controlled area and unrelated to working activity,
- limiting entries of persons into the controlled area,
- optimization of protective plastic sheets usage,
- replacement of service water with condensate or demineralized water in points, where leakage occur (reduction of salts amount in radioactive concentrates).

14.2 Statement on the implementation of the obligations concerning Article 19 of the Convention

The above text proves that the legislative requirements imposed on the commissioning of a nuclear installation, its operation and performance of the proper activities conform, in the Czech Republic, to the requirements of Article 19 of the Convention.

15. SUMMARY

In 2011, the so-called “Stress Tests” were carried out at both nuclear power plants – Temelín NPP and Dukovany NPP – targeted review of safety margins of NPPs in connection with the events that occurred at the Fukushima NPP, i.e. extreme natural events seriously endangering safety functions and leading to severe accidents. For more information see Chapter 1 of the National Report, which describes the commitments under Article 6 of the Convention.

Within the Stress Tests, ČEZ, a. s. assessed the level of resistance (robustness) and sufficiency of safety margins of Dukovany NPP and Temelín NPP during: extreme natural conditions, loss of safety functions (power supply, heat removal into ultimate heat sink) and development of event into the area of severe accident.

A detailed deterministic evaluation of the level of defence in depth and the ability to fulfil the basic safety functions during the selected initiating events, including their beyond design basis effects (intensity or failure combination), regardless of extremely low probability of their occurrence, was carried out. The evaluation was carried out for all operating modes and states of units, including simultaneous impact on all units at the specific site.

The range of evaluation within the Stress Tests significantly exceeded the framework of licensing requirements laid down in the applicable legislation. The results of evaluation confirmed the fact that NPP designs as well as Accident Management and emergency preparedness systems of both NPPs are very robust and provide for significant margins to prevent severe accidents from occurring.

Results of the Stress Tests confirmed the existence of safety and time margins and high resistance of of both nuclear power plants against external extreme influences. In particular, the appropriateness of before adopted decisions to implement measures resulting in improved resistance of the original designs was confirmed in relation to seismic risk. No issue was identified at any power plant which would require an immediate action. Both power plants are capable to manage safely even highly improbable, extreme emergency situations, without a risk for the surrounding areas .

In spite of the above mentioned statement, the Stress Tests identified organizational and technical measures for further improvement of resistance of both power plants against extreme external influences. Such potential measures will be the subject of further analyses in terms of efficiency. Any measures of technical nature affecting the modifications of existing power plant designs will be subjected to feasibility studies including proposals for specific design changes, which should be approved by the SÚJB before their implementation.

The national action plan for improving nuclear safety of nuclear installations in the Czech Republic was completed on 31 December 2012. The action plan was prepared following the conclusions of the Stress Tests, as published along with the Joint Declaration of the European Nuclear Safety Regulators Group (ENSREG) and the European Commission on 26 April 2012**.**

The action plan contains a set of all main conclusions and recommendations included in the National Report of Stress Tests for the Czech Republic, reports of ENSREG examinations, including the Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear Safety.

The action plan of the Czech Republic is enclosed to this National Report in Annex 9 and is divided into four parts:

- Part I deals with the problems related to external risks (earthquakes, floods, extreme climatic conditions), loss of ultimate heat sink and full power failure or their combination.

- Part II deals with the national infrastructure, emergency preparedness and response to extraordinary events and the international cooperation.

- Part III relates to cross-section issues.

- Part IV includes a list of measures aimed at implementing all recommendations contained in Parts I-III. This is a summary of corrective actions identified during periodic safety assessment of Dukovany NPP and Temelín NPP after twenty or ten years of operation, safety-related findings during IAEA reviews/missions, findings ascertained during the implementation of Dukovany NPP long-term operation (LTO) project and, last but not least, conclusions of Stress Tests performed in the light of accident occurred at the Fukushima Daiichi NPP in Japan.

A N N E X E S

to the National Report of the Czech Republic under the Convention on Nuclear Safety

ANNEX 1 Description of the Dukovany and Temelín NPPs, and schedule of the performed safety improvements

1. Dukovany NPP

1.1 Main components

1 Reactor
2 Pipelines of primary circuit
3 Main isolation valve
4 Main coolant pump
5 Steam generator
6 Pressurizer
7 Spent fuel pool
8 Refueling cavity
9 Emergency core cooling system
10 Refuelling machine
11 Bubbler tower
12 HVAC system
13 Ventilation stack
14 Reactor building crane
15 Turbine high pressure stage
16 Turbine low pressure stage
17 Generator
18 Condenser
19 Separator-reheater
20 Regenerative heaters
21 Feedwater tank with feedwater deaerator
22 Steam piping into turbine
23 Cooling circulation circuit piping
24 Insulated cables for generator power outlet
25 High-voltage transformer of power output 400 kV
26 House consumption transformer 6 kV
27 Manipulation crane

1.2 NPP technical parameters

Number of reactor units **4**

Reactor type: Pressurized water reactor VVER 440/213

Output parameters of one unit

Nominal thermal output	1444 MWt
Generator output	501 MWe
Net electrical output	470 MWe
Auxiliary consumption	30.5 MWe

Reactor technical parameters

Reactor height	23.67 m
Pressure vessel inner diameter	3.542 m
Cylindrical part wall thickness	140 mm
Thickness of pressure vessel cladding	9 mm
Empty pressure vessel weight	215.15 t
Reactor weight	395 t

Reactor core

Number of fuel assemblies	312
Number of fuel rods per assembly	126
Number of control assemblies	37
Core height	2.5 m
Core diameter	2.88 m
Fuel enrichment	3.82*/4.25**/4.38**% U 235
Core loading (UO_2)	42 t
Fuel cycle	five years

* with profiled enrichment

** with profiled enrichment and burnable absorber

Reactor cooling system

Number of cooling loops	6
Inner diameter of main cooling piping	500 mm
Volume of coolant in primary circuit	209 m^3
Primary circuit working pressure	12.261 MPa
Inlet coolant temperature	approx. 267 °C
Outlet coolant temperature	approx. 297 °C
Reactor coolant flow	42 000 m^3 per hour

Steam generator

Number per unit	6
Steam production per SG	477 t. p h.
Steam output pressure	4.751 MPa
Steam output temperature	260.7 °C
Steam generator weight	approx. 165 t
Steam generator body diameter	3.21 m
Steam generator body length	11.80 m

Main coolant pump

Number per unit	6
Nominal power consumption	1.6 MW
Operational capacity	approx. 7000 m^3 per hour
Rotor speed	1460 r.p.m.
Pump weight	approx.48 t

Turbine

Number of high pressure sections	1
Number of low pressure sections	2
Nominal rotor speed	3000 r.p.m.
Inlet steam temperature	254.9°C
Inlet steam pressure	4.318 MPa

Generator

Rated power	255 MW
Output voltage	15.75 kV
Nominal frequency	50 Hz
Cooling media	hydrogen - water

Condenser

Number per turbine	1
Number of pipes per condenser	31 716
Water flow	35 000 m^3 per hour
Pipe material	titanium

Cooling towers

Number per unit	2
Height	125 m
Diameter in top of the tower	59.49 m
Foot diameter	87.94 m
Wall thickness	0.6-0.15 m
Water flow (one tower)	approx. 10.55 m^3 per second
Volume of evaporated steam from one tower	max. 0.15 m^3 per second

1.3 Modernization changes already implemented in Dukovany NPP

A) Changes implemented within the "Back-fitting of Dukovany NPP"

1. A7 Main coolant pump control algorithms modification
2. A8 Steam generator level measurement reliability improvement
3. A12 Hydrogen recombination system within hermetic zone installation
4. A21 High-pressure compressors replacement
5. A23 Addition of redundant back-up to the category one power supplies No. 4
6. A30 Teledosimetric system installation
7. A32 Grab tank on Skryje stream installation
8. B1 Cooling system installation for the machine halls roof steel structure
9. B5 Stationary fire extinguishing equipment installation for central oil system
10. B7 Unit electrical fire detection system upgrade
11. B10 Stationary halon fire extinguishing system installation for unit electrical equipment

B) Changes implemented within the "Modernization of Dukovany NPP"

1. ZL 1702 Installation of electrical fire detection system at water pump station "Jihlava"
2. ZL 2180 Modernization of system for public warning during accidents
3. ZL 2374 Construction of interim spent fuel storage facility
4. ZL 3103 0.4 kV switchgears upgrade
5. ZL 3582 Hydroaccumulators isolation valves control
6. ZL 3664 32/16/16 MVA back-up house consumption transformer installation
7. ZL 3701 Pressure measurement in the SG box
8. ZL 3704 Reconstruction of the protection actuated by "MSH break" signal
9. ZL 3818 EDU surroundings teledosimetric system - RA control data transfer
10. ZL 3863 Fire-proof spraying of critical and important cable rooms
11. ZL 4290 Pressurizer safety valve's keys modification
12. P588 Innovation of boronmeters
13. P590 AKOBOJE (nuclear power plant automatic security guard complex) optimization
14. P591 Replacement of Freon in cold supply plant
15. P598 Chemical water treatment station modernization
16. P601 Conversion of documentation to the digital form
17. P602 MCR full scope simulator
18. P606 Roof flats construction for the EDU employees
19. S150 Condenser reconstruction
20. S357 Post-emergency hydrogen recombination
21. S439 Replacement feeding water line for the I&C sensors flushing system
22. S568 Spray system's sumps protection
23. S675 Replacement of water and oil coolers in the diesel generator I station
24. S765 Condensate treatment system modernization
25. S776 Diesel generators electrical system reconstruction
26. S907 Extension of stable sprinkling device functions
27. S952 Construction of intermediate floor in the panel intermediated relay's rooms and common control rooms
28. T130 Construction of new telephone switchboard

29. T215 The Jihlava Pumping Station I&C reconstruction
30. T248 Pressurizer safety valve (relief valve) node reconstruction
31. T263 Auxiliary feedwater pump replacement
32. T317 Replacement of water and oil coolers for diesel generator II station
33. T370 Replacement of storage pool pumps by a sealess type
34. T516 Fitting of diodes in I&C switchboards
35. T547 Batteries replacement in First category power supplies system No. 4
36. T556 Control room diesel generator annunciation upgrade
37. T703 Ultimate emergency feedwater pump to SG section collector displacement
38. T764 Secondary circuit continuous measurement system installation
39. T785 Intermediate building +14,7 pipeline whip restraints
40. T802 Section switchboards service inlets of selected consumers reconstruction
41. T982 Fire protection barriers
42. T983 Fire protection barriers
43. T984 Fire protection barriers
44. T996 Access path to cooling towers
45. U064 Coating of the main production unit II, primary part of 3rd and 4th reactor unit
46. U097 Chemical water treatment continuous measurement
47. U116 Bringing out of „Danger of SG overpressurising“ signal
48. U247 Coating of cable rooms in transversal and intermediate building and turbine hall – reactor unit No.1
49. U444 Outside transformer basements
50. U496 Exhausting of storage pool
51. U560 Reconstruction of drinking and fire water in Dukovany NPP, stage II
52. U584 Emergency lightning of chemical neutralization building
53. U685 Revitalization of AKOBOJE (nuclear power plant automatic security guard complex) and arrangement of Back-up control centre
54. U697 Emergency venting of primary circuit
55. U725 Covering of rail access corridor of main production units I, II
56. U726 Replacement of pressure measurement recording devices
57. U754 Protection of DIAMO K input signals
58. U775 Elimination of the scram protection signal – the pressure in the main steam collector
59. U777 Assuring of the NPP Dukovany tertiary regulation
60. U780 Assuring of the NPP Dukovany secondary regulation - main production units I and II
61. U876 Upgrade of the SCORPIO-VVER system
62. U917 Modification of the DukNet computer network
63. U919 Modification of the turbogenerator drip tank
64. U950 Modification of internal connecting pipelines of auxiliary service buildings for primary systems
65. U969 Checking of bitumenation in the low-level waste treatment
66. V015 Reconstruction of the air conditioning P – 460, 461, P – 470 in the operational building II
67. P059 Reconstruction of de-mineralized water pipelines including fittings
68. V061 Modification of SW extractor data from central information system of radiation control for emergency coordination centre of Regulatory body
69. V062 Modernization of Monitoring system electric – binary part
70. V063 Modernization of Monitoring system electric – analog part

71. V064 Modernization of Monitoring system electric – central unit
72. V066 Superstructure of diagnostic systems for free parts monitoring
73. V077 Modification of information system LOIS
74. V078 Upgrade of the Genie Inspector software
75. V082 Modification of the DARS system
76. V103 Separation of turbine-generator intermediate circuits
77. ST152343 Heating steam inlet regulation for condenser-deaerator
78. ST153272 Elimination of electronic fire alarms false signals
79. ST153589 Feeding water and steam balance disturbance signaling
80. ST153919 Construction of the waste management center near by the auxiliary boiler plant
81. ST154113 Auxiliary power supply for the 9CN201 switchboard
82. ST154119 Effluent measurement in the VK1 ventilation stack
83. ST154173 Signaling of flooding of underground areas in turbine hall
84. ST154782 Completion of eyes' rinsing devices in auxiliary service buildings for primary systems
85. ST154897 Installation nets for windows in the turbine hall
86. ST155021 Cooling of panel intermediated relay-2 and panel intermediated relay-3 in 3rd reactor unit
87. ST155038 Assuring of the internal contamination measurement during loss of DukNet-Genie2000
88. ST155039 Exchange of comparative protection of the V483-6 line
89. ST155042 Virtual power plant
90. ST155054 Enlargement of the alpha server 3 RAM and HDD capacity
91. ST155055 Assuring of substitutional effluent measurement in Laboratory of radiation control of environment
92. ST155070 Modification of the ARS software (physical protection system)
93. ST155075 Upgrade of SCORPIO – VVER II
94. ST155099 Air elimination from the cold supply plant condenser
95. ST155100 Separation of turbine-generator intermediate circuits
96. ST155102 Information system security increasing in NPP Dukovany
97. ST155124 Replacement of the I&C equipment in the intermediate building +14.7 m - reactor unit 2
98. ST155189 Exchange of PC/reactor operator, PC/turbine operator, PC/SERVIS BLAN
99. ST155197 Installation and operation of "Photovoltaic power station" in NPP Dukovany
100. ST155198 Modification of Data terminal equipment and Secondary regulation promoter NPP Dukovany for tertiary regulation in remote control
101. ST155379 Application of DART in NPP Dukovany
102. ST15U875 Turbine hall equipment - pH increasing
103. ST155567 Installation of tilted rail
104. ST154561 Strengthening of high energy pipelines
105. ST153786 Motors drives of valves on +14,7 m level of intermediate building
106. ST155213 Upgrade of N16 measurement
107. ST155108 Contamination measurement of subjects on Dukovany NPP area borders
108. ST155184 Seismic strengthening of TS10,50W01,02
109. ST155300 Seismic strengthening of dieselgenerator station (DGS) 2 (units 3,4)
110. ST154482 Dieselgenerator (7-12) reconstruction
111. ST154440 Measurement of H_2 concentration in systems TS10, TS50
112. ST154635 Rupture protection of HNK (main feedwater header) and HVK (main

discharge header) -mechanical part

113. ST155158 Seismic strengthening of DGS
114. ST155171 Installation of identification card scanner in the entry to shelters
115. ST154481 Dieselgenerator (1-6) reconstruction
116. ST155367 Equipment qualification - seismic analyses, type tests
117. ST155444 DG over-revolution protection algorithm modification
118. ST155036 Installation of internal emergency siren at education and training centre
119. ST154226 Replacement of fire-protection doors
120. ST154685 Revitalization of AKOBOJE (nuclear power plant automatic security guard complex) and arrangement of Back-up control centre – creation of dislocation conditions
121. ST154554 Detection system of leakage amount from primary circuit
122. ST153102 Reconstruction of secondary distributors
123. ST154587 Completing of primary pipe whip restraints
124. ST155012 Change of automatics on arm. TQ22,42,62S02 opening
125. ST155173 Relieving the shortage of HV electric equipment qualification
126. ST155185 Seismic resilience and adaptation of min. ultimate emergency feedwater pump to SG control
127. ST155202 TC10,50S01 power supply from class I power supply
128. ST155215 Change of ESW pipeline dimension for TL10 coolers
129. ST155308 Exchange of DME series sensors (measuring of Level, Temperature and Pressure) in RA, TH, TJ, TQ, XL, YA, YC, YP systems
130. ST155481 Exchanging of pipeline of ESW for cooldown condenser
131. ST155483 Flanged connection to SG blowdown line.
132. ST155504 Replacement of electro-driven valve Klimact for hand valves
133. ST155512 Change of opening automatics on TQ22, 42, 62S02 valves.
134. 5314 Seismic hardening of the I&C equipment
135. 5235 Ensuring of qualification requirements for the cable trays on Unit 3
136. 5748 Hot water heating of gas tank detention of restraint systems
137. 5756 Replacing the electric drives 7.229.1-3 for seismically resistant
138. 5177 Removal of seismic lacks from EQ at electronic devices
139. 5844 Replacing of the CYAY and CYKY type safety cables (including LTOKA26), safety issue category III
140. 5234 Hardening (seismic) of the buildings 1A, 2A, 3A, 4A 2.3
141. 5322 Provision of seismically resistant spread area of ESW in the cooling tower
142. 5535 Prevention of complete loss of coolant during LOCA
143. 5728 Implementation of a new signalling from the mean level in the pressurizer at the main control room
144. 5797 Reconnecting of DC oil pumps of TG (run-down oil pump - DC and emergency shaft seal pump - DC) from UPS 1 and 2 to UPS 4
145. 4026 Replacement of electronic fire alarms Tesla and sensors in pipe and cable ducts
146. 6690 Using of innovative modules of Scorpio
147. 6511 Reconstruction of high-volume sampling of aerosols in the ventilation stack 2
148. 6540 Changing of settings of RLS
149. 6286 Increasing of the number of impellers of pumps 4TK20,60D02
150. 5612 Ionization chambers - neutron noise measurement
151. 5666 Reconstruction of continuous analyzers of primary circuit
152. 5711 Integration of HW and SW failure of the control signals of DG to remote

		signalling
153.	5762	Modification of cooling junction of sealing oil of generators
154.	5766	Adaptation of roof trusses of turbine building of main production units I,II
155.	5817	Adaptation of circuit of monitoring of the control voltage of Automatic Reserve Substitution
156.	5876	Upgrade of RTARC program at the Dukovany NPP
157.	6535	Replacing of safety cables in HELB conditions
158.	6554	Replacing of safety cables in LOCA conditions at the unit 2
159.	6604	Replacing of safety cables in LOCA conditions at the unit 1
160.	6605	Replacing of safety cables in LOCA conditions at the unit 4
161.	6633	Cable structure at the longitudinal building +14.7 meters and replacement of cables in the primary circuit – unit 4
162.	6672	Replacing of unqualified cables during refuelling outage of unit 3 in 2011
163.	6675	Replacing of unqualified cables during refuelling outage of unit 2 in 2011

2. Temelín NPP

2.1 Main components

1. Reactor
2. Pipelines of primary circuit
3. Main coolant pump
4. Pressurizer
5. Steam generator
6. Polar crane
7. Spent fuel pool
8. Refuelling machine
9. Hydroaccumulators
10. Containment
11. Ventilation stack
12. Emergency core cooling system
13. Diesel generator station
14. Turbine hall
15. Feedwater tank
16. Main steam piping
17. High pressure turbine stage
18. Low pressure turbine stage
19. Generator
20. Exciter
21. Separator
22. Condenser
23. Heat exchanger
24. Coolant inlet and outlet
25. Pumping station
26. Cooling water pump
27. Cooling tower
28. Generator power outlet
29. Transformer
30. Power output
31. Distillate reservoirs

2.2 NPP technical parameters

Number of units	2
Reactor type	PWR VVER 1000

Unit parameters

Nominal thermal output	3000 MWt
Generator output	981 MWe
Net electrical output	963 MWe
Auxiliary consumption	50 MWe

Reactor technical parameters

Reactor height	10.9 m
Pressure vessel inner diameter	4.5 m
Cylindrical part wall thickness	193 mm
Thickness of pressure vessel cladding	7 – 18 mm
Reactor weight without coolant	approx. 800 t
Pressure vessel weight	322 t

Reactor core

Number of fuel assemblies	163
Number of fuel rods per assembly	312
Number of rod cluster control assemblies	61
Height of active core	3.6 m
Core height	3.1 m
Fuel enrichment	max. 5 % U 235
Core loading (UO_2)	92 t
Fuel cycle	four years

Reactor cooling system

Number of cooling loops	4
Inner diameter of main cooling piping	850 mm
Volume of coolant in primary circuit	337 m^3
Primary circuit working pressure	15.7 MPa
Inlet coolant temperature	approx. 290 °C
Outlet coolant temperature	approx. 320 °C
Coolant flow	84 800 m^3 per hour

Steam generator

Number per unit	4
Steam quantity produced in 1 SG	1470 t/h
Outlet steam pressure	6.3 MPa
Outlet steam temperature	278.5 °C
Steam generator weight	approx. 416 t
Steam generator body diameter	4.2 m
Steam generator body length	14.5 m

Main coolant pump

Number per unit	4
Nominal power consumption	5.1 – 6.8 MW
Operational capacity	approx. 21 200 m^3 p. hour
Rotor speed	1000 r.p.m.
Pump weight	approx. 156 t

Containment system

Height of cylindrical part	38 m
Inner diameter of cylindrical part	45 m
Wall thickness	1.2 m
Thickness of stainless steel liner	8 mm

Turbine

Number of high pressure stage	1
Number of low pressure stage	3
Rotor speed	3000 r.p.m.
High pressure stage weight	206 t
Low pressure stage weight	480 t

Generator

Rated apparent power	1111 MVA
Power factor	0,8
Output voltage	24 kV
Nominal frequency	50 Hz
Cooling media	hydrogen – water
Weight	564 t

Condenser

Number per turbine	3
Number of pipes per condenser	approx. 32 000
Pipe length	12 m
Pipe material	titanium

Cooling tower

Number per unit	2
Height	154.8 m
Diameter in top of the tower	82.6 m
Foot diameter	130.7 m
Wall thickness	0.9 – 0.18 m
Number of askew columns	112
Water flow (one tower)	approx. 17.2 m^3/s
Volume of evaporated steam from one tower	max. 0.4 m^3/s

2.3 Modernization changes already implemented in Temelín NPP

1. I&C Systems replacement
2. Nuclear fuel, control clusters (lifetime)
3. Radiation monitoring system (RMS)
4. Primary circuit diagnostic system (TMDS)
5. Sipping - identification and quantification of the fuel assembly damage
6. Bitumination system
7. Refuelling machine I&C system replacement
8. Installation of compact grid in the spent fuel pool
9. Full scope simulator
10. Technical support center
11. Inverters, rectifiers (AEG)
12. Penetrations (Škoda + ISTC Company)
13. Replacement of J2UX circuit breakers
14. Unit transformer penetration (Passoni Villa bushings)
15. Addition of back-up power supply for main production unit No. 2
16. Addition of a common back-up diesel generator station (DGS)
17. Increase of accumulator batteries capacity
18. Implementation of "reserve electrical protections" and provision for full selectivity in 6 kV radial electrical networks
19. Pressurizer electrical heaters continuous control
20. Installation of hydrogen recombination system
21. Post-accident hydrogen monitoring system
22. Replacement of selected valves
23. Reconstruction of stabile fire extinguishing system for outdoor power transformers
24. Introduction of secondary load follow regulation
25. Construction of plant terminal (TELETE)
26. Modification of the essential service water and non-essential service water systems
27. Replacement of pumps
28. Modification of containment sump system
29. Containment venting (single failure)
30. Titanium condenser pipes installation
31. RCCA drives replacement
32. Introduction of new chemistry control
33. New safety analysis
34. ATWS analysis
35. PSA level 1 and 2 development project
36. Severe accidents analysis
37. SW independent verification & validation project (IV&V)
38. Leak Before Break
39. EOPs development project
40. SAMG development project
41. Fire safety, cables, electronic fire detection system
42. Seismic analysis
43. Completion of documentation
44. ISE project
45. Modification of SG inner parts

46. Addition of new SG water level measurement
47. I&C system for polar crane replacement
48. Filtration system for emergency control room
49. Modification of main control room venting system
50. Installation of GERB absorbers
51. Addition of drench fire extinguishing system for main coolant pumps
52. Addition of radioactive waste treatment system for liquid wastes liquidation after accidents
53. Addition of system for collection of boric water and system for separation
54. Replacement of asbestos sealing
55. Installation of new heat-exchangers of active engineered safety systems
56. Addition of relief valve to pressurizer system
57. Replacement of steam generator steam pipes quick-acting valves
58. Modernization of main coolant pumps
59. Organized depository of high activity wastes
60. Replacement of Freon in cooling systems
61. Nuclear safety improvement (high energy piping separation)
62. Unit fire safety improvement
63. Nuclear safety improvement - improvement of steam generator safety relief valves functionality
64. Nuclear safety improvement - improvement of steam dump to atmosphere functionality
65. Essential and non-essential cooling water lines redesign
66. Steam generator steam flow measurement method improvement
67. 1000 MW turbine high pressure control valves redesign
68. Condensate pumps improvement
69. Diesel generator electrical protection system modernization
70. Main divisional category II 6 kV switchboard (and selected non-unit 6 kV switchboard) emergency arc protection replacement
71. Electrical inverter (UPS for all the safety system motory loads) replacement.
72. Radiation safety information system
73. Turbine trip logic improvement
74. 10220 Modernization of NPP Temelín seismic network including supplement of seismic station
75. 10242 Algorithm for overwriting fixed pressure value in main steam header if Reactor scram or Limitation System take effect and SG level is below 185 cm
76. 10809 Function of subcooling and fixed T hot – elimination of inconsistency between RCLS and PRPS
77. 10846 Reconstruction of facility for liquidation of MNT and TK sensors
78. 10131 Exchange of valve motors in feedwater system to SG TX
79. 10299 Design and documentation for exchange of existing nickel sealing of filter covers 1 (2) TC 10, 20, 30, 40 NO 1 by ridge-shape sealing
80. 10072 Replacement of existing Russian electromotor 4A315S6A5U3 cooled by water by motor with air cooling
81. 10776 Spent fuel pool Cooling within nominal unit mode after Fast acting valves on TG lines lockup.
82. 10798 Modification of introduction of impulse lines of pipelines, venting, and drainage lines from main technological line systems 1(2) TQ, 1(2) TC, 1(2) TK, 1 TG, 2 YD
83. 10832 Exchange of pressuriser electroheaters sealing

84. 6739 Exchange of flash protection
85. 6784 DGS protection modification
86. 7118 Exchange nickel and asbestos-graphitic packing of manhole pressurizer for ridge-shape sealing.
87. 7119 Exchange of existing nickel packing of primary collectors, secondary lids and side opening
88. 10193 Supplement of nitrogen to thermosifons of Sulzer SO 800/04 pumps
89. 7064 Noise decrease in room No AE 340/3
90. A025 To replace manual valves of UE system with motor operated remote control valves for hydrogen refilling.
91. A070 LS signal “Cutting off the steam supply on bypass valve to condenser”
92. A234 Modifications on essential service water
93. A276 Replacement of sampling member for steam flow measuring from SG.
94. A385 Modification of input HW for temperature measuring of primary circuit loops
95. A643 Penalization from AFD in PRPS
96. A764 MCP shell blinding with pressure blind flange
97. A789 Replacement of the TSFO (physical protection technical system) control system and its optimisation
98. A799 Installation of LKP-M/3 into trial operation
99. A902 Reduce of discrepancy probability in the control rod area - unit 1
100. A923 Reduce of discrepancy probability in the control rod area – unit 2
101. A954 Modification of RCS sampling system and post accident sampling system (PASS a PAGSS)
102. A960 Elimination of steam line 2Tx80 vibrations in A820
103. A994 Back-up entrance
104. B106 Modification of pressurizer safety valve supply line and flange sealing method
105. B133 Completion of radiation monitoring measuring instrument for containment exit
106. B363 Modification of emergency protection function from the high temperature in the hot leg
107. B053 Implementation of new signals FAS (according to corrective measures 17/203/04, 18/187/05, and other initiatives)
108. B116 The replenishment of controlled entries to the containment and surrounds of main production unit I and II
109. B124 Adaptation of junction point of technological venting of steam generator primary collector
110. B340 Modernization of DHG (Data Highway Gateway) for PRPS
111. B362 Adaptation of the function generator of requested pressure in the primary circuit
112. B380 Emergency power supply of ZIRU at the emergency control room of main production unit 1 and 2
113. B391 Adaptation of damping plate - tightness when filling / drainage of SFP
114. B427 Blocking of action of limiting system (A) during shutdown of running TG
115. B459 Replacement of mechanical seal of pumps 2TQ12(22;32)D01
116. B541 The replenishment of bypass of check flap valves at the outlet of ESW at pumping station of ESW
117. B553 Replacement of check flap valve 1(2)VF10(20;30)S16;S17
118. B738 Adaptation of PAMS in the status tree CSF "Containment"
119. B757 Replacement of toroidal compensator of reactor shaft
120. C078 Replacing of engine of auxiliary feedwater pumps
121. C119 Implementation of activities of UIS integration and modifications of displays for outages of unit 1and unit 2 in 2010

122. C158 Adaptation of the pump discharge line 1TQ33D01 to reduce vibration
123. C210 Removal of vibration of pump discharge line 2TQ32D01
124. C225 1TZ40S03, S06 - insufficient space above the valve for removing of air receiver and the whole valve
125. C262 The replenishment of bypass of ESW for TG exchanger
126. C294 1(2)VF40(50,60)F001- change of disposition of sampling point (corrective measure 02/99/09)
127. C305 Prevention of uncontrolled lapse of cluster at AC supply of cabinets Panels of power control of clusters outside the tolerance band
128. C316 1(2)VF- replacement of diameter and material for IP measurement of ESW system
129. C349 Service power supply of the Radiation Monitoring Network - signalling of outlets power supply
130. C380 Reassessment of the requirement for operability of TQ40S05
131. C593 Changing of the alarm values of vacuum in the containment (TQ10,20,30P016 and TQ10P916)
132. C615 Implementation of activities of UIS integration and modifications of displays for outages of unit 1and unit 2 in 2011
133. C707 Design and supply of a new membrane of bubbler tank
134. C867 Implementation of activities of UIS integration and modifications of displays for outages of unit 1and unit 2 in 2012
135. D340 The change of the category of emergency power supply for two valves TL22/42

ANNEX 2 IAEA safety recommendations fulfillment status

Safety issues solution status for the NPPs with VVER-440/213 at the Dukovany NPP

Ident.	Name of the safety findings	Cat.	State
G	***GENERAL***		
G 01	Classification of components	II	4
G 02	Qualification of equipment	III	3
G 03	Reliability analysis of safety class 1 and 2 systems	II	4
RC	***CORE***		
RC 01	Prevention of uncontrolled boron dilution	II	4
CI	***COMPONENT INTEGRITY***		
CI 01	RPV integrity	II	4
CI 02	Non-destructive testing	III	4
CI 03	Primary pipe whip restraints	II	4
CI 04	Steam generator collector integrity	II	4
CI 05	SG tubes integrity	II	4
CI 06	SG feedwater distribution pipe	I	4
S	***SYSTEMS***		
S 01	Primary circuit cold overpressure protection	II	4
S 02	Mitigation of a steam generator primary collector break	II	4
S 03	Reactor coolant pump seal cooling system	II	4
S 04	Pressurizer safety and relief valves qualification for water flow	II	4
S 05	ECCS sump screen blocking	III	4
S 06	ECCS suction line integrity	II	4
S 07	ECCS heat exchanger integrity	II	4
S 08	Power operated valves on the ECCS injection lines	I	4
S 09	Steam generator safety and relief valves qualification for water flow	II	4
S 10	Steam generator safety and relief valves performance at low pressure	II	3
S 11	Steam generator level control valves	I	4

Ident.	Name of the safety findings	Cat.	State
S 12	Emergency feedwater make-up procedures	I	4
S 13	Feedwater supply vulnerability	III	4
S 14	Main control room ventilation system	II	3
S 15	Hydrogen removal system	II	4
S 16	Primary circuit venting under accident conditions	II	4
S 17	Essential service water system	II	4
I&C	***I&C***		
I&C 01	I&C reliability	II	3
I&C 02	Safety system actuation design	I	4
I&C 03	Review of reactor scram initiating signals	II	4
I&C 04	Human engineering of control rooms	II	4
I&C 05	Physical and functional separation between the main and emergency control rooms	II	4
I&C 06	Condition monitoring for the mechanical equipment	I	4
I&C 07	Primary circuit diagnostic systems	II	4
I&C 08	Reactor vessel head leak monitoring system	II	4
I&C 09	Accident monitoring instrumentation	II	4
I&C 10	Technical support center	II	4
I&C 11	Water chemistry control and monitoring equipment (primary and secondary)	I	4
EL	***ELECTRIC POWER SUPPLY***		
EL 01	Start-up logic for the emergency diesels	I	4
EL 02	Diesel generators reliability	I	4
EL 03	Protection signals for emergency diesel generators	I	4
EL 04	On-site power supply for incident and accident management	II	4
EL 05	Emergency battery discharge time	II	4
C	***CONTAINMENT***		
C 01	Bubbler condenser strength behaviour at max. pressure difference possible under LOCA	III	4
C 02	Bubbler condenser thermodynamic behaviour	II	4
C 03	Containment leak rates	II	4
C 04	Maximum pressure differences on walls between compartments of hermetic boxes	II	4

Ident.	Name of the safety findings	Cat.	State
C 05	Peak pressure in containment and activation of sub-atmospheric pressure after blowdown	I	4
IH	***INTERNAL HAZARDS***		
IH 01	Systematic fire hazards analysis	II	4
IH 02	Fire prevention	III	4
IH 03	Fire detection and extinguishing	II	4
IH 04	Mitigation of fire effects	II	3
IH 05	Systematic flooding analysis	I	4
IH 06	Turbine missiles	I	4
IH 07	Internal hazards due to high energy pipe breaks	III	3
IH 08	Heavy load drop	I	4
EH	***EXTERNAL HAZARDS***		
EH 01	Seismic design	III	3
EH 02	Analyses of plant specific natural external conditions	I	4
EH 03	Man induced external events	II	4
AA	***ACCIDENT ANALYSIS***		
AA 01	Scope and methodology of accident analysis	II	4
AA 02	QA of plant data used in accident analysis	I	4
AA 03	Computer code and plant model validation	II	4
AA 04	Availability of accident analysis result for supporting plant operation	I	4
AA 05	Main steamline break accident analysis	I	4
AA 06	Overcooling transients related to pressurized thermal shock	II	4
AA 07	Steam generator collector rupture analysis	II	4
AA 08	Accidents under low power and shutdown (LPS) conditions	II	4
AA 09	Severe accidents	I	4
AA 10	Probabilistic safety assessment (PSA)	I	4
AA 11	Boron dilution accidents	I	4
AA 12	Spent fuel cask drop accidents	I	4
AA 13	ATWS	I	4
AA 14	Total loss of electrical power	I	4
AA 15	Total loss of heat sink	I	4

Safety issues solution status for the NPPs with VVER-1000 at the Temelín NPP

Ident.	Name of the safety findings	Cat.	State
G	***GENERAL***		
G 01	Classification of components	II	4
G 02	Qualification of equipment	III	4
G 03	Reliability analysis of safety class 1 and 2 systems	II	4
RC	***CORE***		
RC 01	Prevention of inadvertent boron dilution	II	4
RC 02	Control rod insertion reliability/Fuel assembly deformation	III	4
RC 03	Subcriticality monitoring during reactor shutdown conditions	II	4
CI	***COMPONENT INTEGRITY***		
CI 01	RPV embrittlement and its monitoring	III	4
CI 02	Non-destructive testing	III	4
CI 03	Primary pipe whip restraints	II	4
CI 04	Steam generator collector integrity	III	4
CI 05	Steam generator tube integrity	II	4
CI 06	Steam and feedwater piping integrity	III	4
S	***SYSTEMS***		
S 01	Primary circuit cold overpressure protection	II	4
S 02	Mitigation of a steam generator primary collector break	II	4
S 03	Reactor coolant pump seal cooling system	II	4
S 04	Pressurizer safety and relief valves qualification for water flow	II	4
S 05	ECCS sump screen blocking	III	4
S 06	ECCS water storage tank and suction line integrity	II	4
S 07	ECCS heat exchanger integrity	II	4
S 08	Power operated valves on the ECCS injection lines	I	4
S 09	Steam generator safety and relief valves qualification for water flow	III	4
S 10	Steam generator safety valves performance at low pressure	II	4
S 11	Steam generator level control valves	I	4
S 12	Emergency feedwater make-up procedures	I	4
S 13	Cold emergency feedwater supply to SG	I	4

S 14	Ventilation system of control rooms	II	4
S 15	Hydrogen removal system	II	4

IDENT.	NAME OF THE SAFETY FINDINGS	CAT.	STATE
I&C	***INSTRUMENTATION AND CONTROL***		
I&C 01	I&C reliability	II	4
I&C 02	Safety system actuation design	I	4
I&C 03	Automatic reactor protection for power distribution and DNB	I	4
I&C 04	Human engineering of control rooms	II	4
I&C 05	Control and monitoring of power distributions in load follow mode	II	4
I&C 06	Condition monitoring for the mechanical equipment	I	4
I&C 07	Primary circuit diagnostic systems	II	4
I&C 08	Reactor vessel head leak monitoring system	III	4
I&C 09	Accident monitoring instrumentation	II	4
I&C 10	Technical support center	II	4
I&C 11	Water chemistry control and monitoring equipment (primary and secondary)	I	4
EL	***ELECTRICAL POWER***		
El 01	Off-site power supply via startup transformers	I	4
El 02	Diesel generators reliability	I	4
El 03	Protection signals for emergency diesel generators	I	4
El 04	On-site power supply for incident and accident management	II	4
El 05	Emergency battery discharge time	III	4
El 06	Ground faults in DC circuits	I	4
CONT	***CONTAINMENT***		
Cont 01	Containment by-pass	II	4
IH	***INTERNAL HAZARDS***		
IH 01	Systematic fire hazards analysis	II	4
IH 02	Fire prevention	III	4
IH 03	Fire detection and extinguishing	II	4
IH 04	Mitigation of fire effects	II	4
IH 05	Systematic flooding analysis	I	4
IH 06	Protection against flood for emergency electric power distribution boards	II	4
IH 07	Protection against the dynamic effects of main steam and feedwater line breaks	II	4
IH 08	Polar crane interlocking	II	4
EH	***EXTERNAL HAZARDS***		
EH 01	Seismic design	II	4

EH 02	Analyses of plant specific natural external conditions	I	4
EH 03	Man induced external events	II	4
AA	***ACCIDENT ANALYSIS***		
AA 01	Scope and methodology of accident analysis	II	4
AA 02	QA of plant data used in accident analysis	I	4
AA 03	Computer code and plant model validation	I	4
AA 04	Availability of accident analysis result for supporting plant operation	I	4
AA 05	Main steam line break accident analysis	I	4
AA 06	Overcooling transients related to pressurized thermal shock	II	4
AA 07	Steam generator collector rupture analysis	II	4
AA 08	Accidents under low power and shutdown (LPS) conditions	II	4
AA 09	Severe accidents	I	4
AA 10	Probabilistic safety assessment (PSA)	I	4
AA 11	Boron dilution accidents	I	4
AA 12	Spent fuel cask drop accidents	I	4
AA 13	Anticipated transients without scram (ATWS)	II	4
AA 14	Total loss of electrical power	II	4
AA 15	Total loss of heat sink	II	4

Ranking of issues:

I Issues reflect a departure from recognized international practices. It may be appropriate to address them as a part of actions to resolve higher priority issues.

II Issues are of safety concern. Defence in depth is degraded. Action is required to resolve the issue.

III Issues are of high safety concern. Defence in depth is insufficient. Immediate corrective action is necessary. Interim measures might also be necessary.

IV Issues are of the highest safety concern. Defence in depth is unacceptable. Immediate action is required to overcome the issue. Compensation measures have to be established until the safety problems are resolved.

State:

1 – not yet decided
2 – project preparation
3 – project implementation
4 – solved

ANNEX 3 IAEA and WANO Missions

The annex provides detailed descriptions of international missions for the last three years. The complete list is in Chapter 1

1. OSART mission 2011 (Dukovany NPP)

In June 2011 there was a third OSART mission in Dukovany NPP, i.e. inspection of operation and development of Dukovany NPP.

The mission takes place every 10 years on IAEA recommendation and at the invitation of the Government of the Czech Republic (1st OSART mission – September 1989, 2nd OSART mission – November 2001, 3rd OSART mission – June 2011). The mission is used to compare the practice in Dukovany NPP with the international standards and recommendations of the IAEA in 9 expert areas and also follows the common approach to the Safety culture by all stakeholders.

The plant was prepared for inspection in the expected range according to available IAEA documentation, knowledge (OSMIR database with the results of previous missions, final reports of OSART and WANO Peer Review missions in Dukovany and Temelin NPP) and according to the experiences gained from others plants. The 3rd OSART mission was concluded with a statement that Dukovany NPP is very well operated nuclear facility.

In the Final report 3 changes were recommended and 11 opportunities for further improving of existing procedures were suggested. The OSART mission defined 10 good practices in Dukovany NPP that will be recommended on international website to other international operators of NPP. Because of this, the OSART mission 2011 was very successful in international comparison. The result will be used for further improving of operation of Dukovany NPP.

2. SALTO Follow-up mission 2011 (Dukovany NPP)

SALTO Follow-up IAEA mission took place in November 2011, the team consisted of one member of the IAEA staff and two external experts. The participating expert from Sweden was a member of the original team SALTO and one expert from Belgium was involved in earlier OSART mission. Follow-up visit took place in accordance with the results of the mission SALTO and the IAEA TC programme.

The general conclusion of the mission was that the policy documents for LTO and PLIM were approved at the corporate level and were used in further work in this area. Plant has created a draft of internal document based on the recommendations of the mission and on the basis of the strategy LTO in 2009. However, the problem in this area is not yet fully resolved, because it was decided about a strategy for the LTO, which has to be partly based on implementation of the methodology EPRI AP-913. This is change of the original terms of the PLIM-LTO activities, in the meaning as major activities were discussed by LTO missions in 2008.

The summary of the conclusion of the mission:

There was not formulated any new recommendation or suggestion. There were closed and confirmed 21 corrective measures (12 belonged to suggestions and 8 belonged to recommendations and 1 solved in other way) of total 37 corrective measures (for 11 suggestions and 12 recommendations). There are still open 16 corrective measures (4 to the suggestions and 12 to the recommendations).

One recommendation in status 4 was not closed (A2-1 to qualification), two established corrective measures to recommendation A2-3, which were not accepted with the status, the mission recommended to reassess. The issue concerns the approach to the evaluation of life time of electrolytic condenser.

The biggest discussion was about the implementation of methodology EPRI AP 193. It was noted that it is a change of the original Strategy of LTO. The implementation of this methodology for increasing the reliability should be accompanied by world practice diversion from SALTO approach to inventory of device (AMR - Ageing Management Review).

3. WANO Peer Review mission 2011 (Temelin NPP)

The most important tool to achieve the objective of the mission WANO is a program peer review. In Temelin NPP the mission took place in November 2011. There were 17 colleagues from the branch who represented three WANO regional centres (Moscow, Paris and Atlanta) and 7 countries: Bulgaria, Canada, Finland, Italy, Russia, Slovakia and Ukraine in the team.

The result is that the Moscow centre - WANO-MC - recognizes that many activities and practices in Temelin NPP are done correctly.

At the same time peer review team identified 17 areas in which improvements can be achieved in the ongoing efforts to ensure the safe operation of the plant. These options are based on the best observed experience in the field, not on the minimum acceptable standards or conditions.

4. WANO Peer Review mission 2012 (Dukovany NPP)

The third WANO Peer Review mission, i.e. review the safe operation of Dukovany NPP, was held in September 2012.

WANO organization after the events in Fukushima adopted several measures to improve the quality of their activities, one of which is shortening the period between these missions to four years. The previous WANO Peer Review mission took place in 1997 and 2007 at Dukovany NPP.

The plant was prepared for review in the range expected according to documentation submitted under WANO, knowledge (final reports of OSART and WANO Peer Review missions in Dukovany and Temelin NPP) and according to experiences gained from other plants. The WANO Peer Review mission was concluded with a statement that Dukovany NPP is very well operated nuclear facility.

In the final report 19 areas for improvement of existing processes at Dukovany NPP were recommended. WPR EDU mission defined 4 good practices and 5 strengths that will be recommended to the other operators of nuclear power plants. In the final summary the team leader of experts highlighted three areas (staff behaviour including contractors, feedback not only from events and emergency preparedness). Corrective measures have been taken to improve these areas, much attention is focused on the establishing the method of observation and coaching of which positive impact will be reflected in more areas.

5. OSART mission 2012 (Temelin NPP)

At the request of the Government of the Czech Republic IAEA team consisting of international experts visited Temelin NPP in November 2012 in order to assess its operational safety (OSART). The objective of the mission was inspection and assessment of the operational practices in the areas Organization and management, Operation, Maintenance, Technical Support, Operational Experience, Radiation Protection, Chemistry and Severe Accident Management. Furthermore, the experts and their counterparts at the plant exchanged technical experience and knowledge about options to make further efforts to achieving the common goal of excellence in operational safety.

This Temelin OSART mission was 172nd mission of the program initiated in 1982. The team was composed of experts from Brazil, Hungary, Slovakia, Sweden, South Africa, Ukraine, and Great Britain and the IAEA staff and observers from Slovakia too. Common experience with nuclear energy of the team members were approximately 304 years in total.

Five recommendations and six suggestions for improvement and six good practices were formulated in the final report.

ANNEX 4

Production division
ČEZ, a. s.
Dukovany NPP

Equipment Renovation Program
Dukovany NPP
MORAVA

Procedural Report

Production Division, ČEZ, a. s.
December 2011

Background

The drafting of the ***"Back-fitting of Dukovany Nuclear Power Plant"*** program, the main goal of which was to increase the level of nuclear safety, was already started during the commissioning of the individual units in the Dukovany NPP. The initial design of the Backfitting was created in 1990 and in 1991 preparation and implementation of the individual activities was started. In the present time all major measures from this program are already implemented. A series of further activities, the aim of which was equipment renovation, was implemented also outside the "Back-fitting" program.

Since the beginning of the nineties the verification in-depth commenced to check the safety level of nuclear power plants constructed based on Russian design, and the efforts to put them out of operation increased in intensity. Regarding these trends, it became obvious that it would be necessary to perform a complex evaluation of the real situation in the Dukovany NPP. A series of analyses and supporting programs was carried out in the frame of international activities and within the Czech Republic. Assessment of the Dukovany NPP was performed both by own experts from the Dukovany NPP and by independent (mainly foreign) experts. For instance experts from the International Atomic Energy Agency (IAEA), experts from nuclear power plants in operation from different countries, experts from the regulatory bodies (Czech and foreign), experts from the manufacturers of nuclear power plants equipment, etc. were involved in the assessment.

Concept of the **Equipment Renovation Program,** which was later named **MORAVA** (**MO**dernization - **R**econstruction - **A**nalyses - **VA**lidation), was based on an extensive technical assessment of the Dukovany NPP (technical audit), the goal of which was to evaluate the actual situation of the Dukovany NPP and to propose a list of necessary modifications, which would form a basis for the equipment reconstruction in the next period of time.

The Dukovany NPP audit was split in two parts:

A) **Internal audit**, carried out by teams of about 100 Dukovany NPP employees with the support of external organizations (ÚJV ŘEŽ, 3E Praha and others), evaluated the equipment from five viewpoints:

1. Equipment reliability and its impact on nuclear safety
2. Failure rate of the equipment and its impact on the NPP availability (impact on the production outages)
3. Equipment requirements for maintenance
4. Residual lifetime of the equipment and spare parts status
5. Further impacts, not included in the above (radiation protection, fire protection etc.)

B) **External audit –** within the PHARE project, the ENAC consortium has performed an independent assessment of the technical security of the Dukovany NPP from the viewpoint of international standards and nuclear safety principles.

This step has represented the first verification of the proposed scope of modifications in the Dukovany NPP. **IAEA mission** aimed at assessing approach of the Dukovany NPP to the solution of the so-called Safety issues (described by IAEA for VVER 440/213 within the offbudget program (publication IAEA-EBP-WWER-03). To assess the level of operation many international missions were organized since 1989 (see below).Several international activities were utilized for preparation of a new activity - **Dukovany NPP LTO** (Long Term Operation) **Assurance Program**. Seven in-progress measures from MORAVA program have been included into this program since 2009.

Main milestones and program starting points

The main milestones for the determination and specification of Equipment Renovation Program and its control, performed both by own efforts or using international support are listed below: Since 2010, remaining measures from MORAVA Program and their management have been included into a new activity - Dukovany NPP LTO Assurance Project which is the first project of implementation of Dukovany NPP LTO Assurance Program.

1990 – Drafting of the "Initial design of the so-called Back-fitting", i.e. modernization based on the resolution of the government of the ČSSR No. 309 (November 20, 1986) with the main goal to increase nuclear safety;

1991 – Creation of an Engineering Services Center in ČEZ-Dukovany NPP;

1991 – Commencement of activities included in the Back-fitting program;

1991 – Assessment of the conclusions in the so-called "Green Paper" (safety evaluation of the NORD NPP in the former GDR – Dukovany NPP team);

1992 – Common activities of the VVER 440/V213 units operators (list of safety improvements, Dukovany NPP representatives, members of the VVER 440/213 club);

1994-95 Internal technical audit (Dukovany NPP working teams, support from ÚJV Řež);

1995 – External technical safety audit (ENAC consortium – PHARE program);

1995 – Safety Report, updated after 10 years of operation (Škoda Praha);

1995 – Probabilistic Safety Assessment (Dukovany NPP team and ÚJV Řež, further living PSA);

1996 – Finalization of the Back-fitting program (most of the activities were carried out, the remaining ones were included into the Equipment renovation program);

1996 – Triangular agreement on cooperation and technical information exchange among Dukovany NPP, Bohunice NPP, and Mochovce NPP (exchange of information about modernization measures);

1996-99 Composition and validation of the Emergency Operating Procedures (EOPs – created by the Westinghouse Company) – analyses conclusions resulted in recommendation for modifications;

1997 – Evaluation of the conclusions of technical evaluations and missions;

1998 – Drafting of the Equipment Renovation Program documentation (Dukovany NPP team and ÚJV Řež, EGP Praha);

1999-2000 – Implementation of the Preliminary Feasibility Study (Dukovany NPP team and EGP Praha);

2001 – Organizational change in ČEZ-Dukovany NPP in the area of modifications control (creation of the technical engineering center and transfer of the investments preparation and implementation to the Maintenance and Repairs Departmen)t;

2004 – Establishment of the Nuclear Power Plants Division (common organizational structure for Dukovany NPP as well as for Temelín NPP).

2004 - Decision to create LTO Assurance program for the assurance of operation blond 2015 (decision to relocate remaining measures from MORAVA Program to LTO Assurance Program)

2004 - Establishment of first working groups for the LTO Assurance Program preparation and start of LTO Assurance Program documentation preparation with help of IAEA SALTO project (main goal – to assure operation of Dukovany NPP till 2025 with possibility of extension till 2045)

2006 – Finalisation of IAEA SALTO Project (final report)

2007 - Preparation of the technical-economic study of feasibility of Dukovany NPP LTO

2008 – Finalization of the LTO Assurance Program (The rest of modernization measures from the Equipment Renovation Program MORAVA was relocated to LTO Program, except of I&C Refurbishment and Power Up-rate Projects which were realized simultaneously

2009 – CEZ Board of Directors approved the Strategy of Dukovany NPP LTO, documentation of LTO Assurance Program and commencement of the first LTO Project

2009 – Preparation and implementation of measures from Dukovany NPP LTO Project started

SÚJB requirements from the Decision for units 1 to 4 and other supporting evaluations were further inputs to the Equipment Renovation Program.

Since 1990, supporting PHARE (EU) programs are also used.

To verify the Dukovany NPP approach, independent evaluations have been used (the main ones being):

1989 - OSART (IAEA) mission

1991 - RE-OSART (IAEA) mission

1993 - ASSET (IAEA) mission

1995 – IAEA mission focused on the Safety issues area

1996 – ASSET (IAEA) mission

1996 – "Insurance" (March & McLeuman, Gradmann & Holler)

1997 – "Insurance" (Czech Nuclear Pool)

1997 – Peer Review (WANO, INPO)

1998 – IPERS (IAEA - PSA-1)

1999 – WPR, Follow-up (WANO), Verification of fulfillment of the WPR conclusion from 1997

2000 – "Insurance" (Czech Nuclear Pool), Continuous inspection on insurance risks

2001 – ISO 14000 (Det Norske Veritas), Certification audit of Dukovany NPP environmental impact

2001 – OSART (IAEA) mission, Operational safety verification

2002 – ISO 14001 (Det Norske Veritas) Re-certification audit of Dukovany NPP environmental impact

2004-6 – IAEA SALTO Project (participation of Dukovany NPP experts)

2007 – 2nd international WANO Peer Review Mission

2008 - International IAEA SALTO Peer Review Mission

2009 – Follow-up International WANO Peer Review
2011 - International SALTO Follow-up mission

Morava programme was verified as well through exchange of information within WANO in the following year.

Course of program

The Equipment Renovation Program, called MORAVA, linked up to the modernization activities designed and implemented in the frame of the Back-fitting Program.

The Equipment Renovation Program documentation was approved during the ČEZ-Dukovany NPP technical council meeting in March 1998. The program was later named MORAVA.

Significance and purpose of the work on the Equipment renovation program have two main aspects – safety and economical (in summary – to reach the safety level accepted in the EU, to extend the licence till 2025 while conserving the competitiveness).

Many safety relevant activities were already carried out. Majority of the proposed measures based on IAEA safety findings, which were assessed also in the frame of the EU (Atomic Questions Group), are already resolved. All this induced a significant decrease of the probability of core meltdown. A concerted effort of the Czech Republic, Slovak Republic and Hungary helped to resolve common recommendation of the AQG for the Vacuum bubbler condenser.

In the present time the main effort is directed to conslusion of the solution of the Category III safety findings (the highest priority given for VVER440/213) and the intermediate Category II.

Renovation of the Instrumentation and Control (I&C) system is one of the most significant activities within the MORAVA program. The renovation of the I&C system in the Dukovany NPP is performed from Unit to Unit till 2010.

Dukovany NPP Equipment renovation program control

Dukovany NPP Equipment renovation is composed of a set of partial projects or modules. The part A – Propositions, specifying, among other things, the Dukovany NPP approach in the area of the Equipment renovation program preparation and implementation, was also part of the Equipment renovation program documentation (dated March 1998). Stepwise implementation of the individual Equipment renovation program parts or modules using standard procedure in accordance with the Dukovany NPP legislation in a way not to influence the refueling outages duration and not to modify the basic safety philosophy of the project was one of the basic principles. The selected way of project implementation has proven to be the most suitable also regarding the optimal use of financial resources of ČEZ, a. s. without the necessity to plan great yearly peaks.

The whole set of activities was assessed as to feasibility, including the complex economic analysis. The evaluation results confirm the correctness of the selected approach.

Since 2009, the rest of modernization measures from the Equipment Renovation Program MORAVA have been relocated to LTO program.

Preparation of Dukovany NPP LTO program

Realization of the Equipment Renovation Program MORAVA created preconditions for successful LTO period. Based on equipment status evaluation, Dukovany NPP started consideration of possibility of LTO for 50 or 60 years of operation.

In 2004, Configuration Management Changes Committee of Nuclear Division evaluated and approved conception of Dukovany LTO. IAEA SALTO Project, realized from 2003 to 2006, summarized current practice in the area of LTO preparation and defined preconditions and resources for LTO, including requirements on LTO programs.

In cooperation with the SÚJB, Dukovany NPP experts participated in the working groups of IAEA SALTO Project. Dukovany LTO Assurance Program was step by step created till the end of 2008 based on IAEA guides and the best world practices which were obtained from SALTO Project.

CEZ Board of Directors has approved the Strategy of Dukovany NPP LTO on its meeting on January 19, 2009. Together with the Strategy was approved a project “Licence Assurance and Preparedness of Dukovany NPP for Operation in the Period of 2015 till 2025”. Project became the 8th key initiative of the “Effectiveness Program” and is managed as “Dukovany NPP LTO Assurance Project”.

The technical-economic study of feasibility of Dukovany NPP LTO has verified technical feasibility and also demonstrated economical profitability.

Prior to LTO Assurance Project official approvement, the long and demanding preparation of Dukovany NPP LTO Assurance Program started since 2004. This program has considered all known safety aspects of LTO and covered a set of measures which are necessary for fulfillment of all requirements of national legislation and the SÚJB for readiness for LTO after 2015.

Safety part of Dukovany NPP LTO Assurance Program was reviewed in April 2008 by international SALTO Peer Review Mission. Conclusions of this Mission have confirmed correctness of Dukovany NPP approach to preparation of LTO. Next IAEA SALTO Mission is planned for 2014 for final confirmation of Dukovany LTO preparedness.

Dukovany LTO Assurance Project is the first part of realization of Dukovany NPP LTO Assurance Program for the period 2009 – 2015. Project will create preconditions for future operation of NPP. All the particular measures have been planned with emphases to assure maximum safety according to requirements of the SÚJB and following the best world practices. Project includes partial project – Dukovany NPP Personal Renewal which will help NPP to assure qualified personnel for future with a horizon till 2045, to prepare its personnel for new units and to keep the required level of knowledge and experience of the personnel.

CONCLUSION

The Dukovany NPP represents reliable, and highly safe and environmentally friendly source of electric power in the Czech Republic. It is a Czech nuclear power plant as its design was completed in the Czech Republic, and it was constructed and manufactured there based on design background from the former Soviet Union. The parameters of the Dukovany NPP are fully comparable with the nuclear power plants operated in the Western countries (including the European Union countries) and will be further improved during the further plant development. It is also fully comparable with nuclear power plants operated in the countries in Western Europe as to safety; and is fully competitive as to economic effectiveness.

The conclusions of the WENRA evaluation report "Nuclear safety in the EC candidate countries" (10/2000) states: "It is expected that upon the complete implementation of the modernization program, the Dukovany NPP will reach the safety level fully comparable with the nuclear power plants of the same operational age operated in Western Europe".

The last evaluation of the European Union conducted at the beginning of 2001 by the AQG (Atomic Questions Group) and the WPNS (Working Party on Nuclear Safety) shows that the major safety deviations, which they had indicated, are correctly identified and solved in MOP Annex 4 to the National Report of the Czech Republic 7/8 Ref. No. 7972/2010 under the Convention on Nuclear Safety with the highest priority (see Annex 1). The conclusions of the OSART mission carried out at the end of 2001 confirmed high safety level.

The Equipment renovation program MORAVA as well as its modernization part was thus determined to be in accordance with the European safety practice, and the preparation and implementation is advancing in a correct, controlled direction.

Safety improvement and equipment modernization which have been realized in the frame of Equipment Renovation Program (MORAVA) makes possible to consider operation of Dukovany NPP till the year 2045.

Program Morava was completed in 2011 and until unresolved projects have been included in the Dukovany LTO Assurance Project.

ANNEX 5 List of Legislative Regulations Dealing with Nuclear Energy and Ionizing Radiation and Related Documents

ATOMIC ACT AND RELATED IMPLEMENTING DECREES

Act No. 18/1997 Coll., on peaceful utilisation of nuclear energy and ionising radiation **(the Atomic Act)** and on Amendments and Alterations to Some Acts as amended by Act No. 83/1998 Coll., Act No. 71/2000 Coll., Act No. 132/2000 Coll., Act No. 13/2002 Coll., Act No. 310/2002 Coll., Act No. 320/2002 Coll., Act. No. 279/2003 Coll., Act No. 186/2004 Coll., Act. No. 1/2005 Coll., Act No. 253/2005 Coll., Act No. 413/2005 Coll., Act No. 186/2006 Coll., Act. No. 342/2006 Coll., Act. No. 296/2007 Coll., Act. No. 124/2008 Coll., Act. No. 189/2008 Coll., Act. No. 247/2008 Coll., Act. No. 158/2009 Coll., Act. No. 223/2009 Coll. , Act. No. 227/2009 Coll., Act. No. 249/2011 Coll., Act. No. 250/2011 Coll, Act No. 375/2011 Coll. and Act. No. 350/2012 Coll.

- ***SÚJB Decree No. 144/1997 Coll.***, on physical protection of nuclear materials and nuclear facilities and their classification, as amended by the SÚJB Decree No. 500/2005 Coll.,
- ***SÚJB Decree No. 146/1997 Coll***., specifying activities directly affecting nuclear safety and activities especially important from radiation protection viewpoint, requirements on qualification and personnel training, on methods to be used for verification of special professional competency and for issue authorisations to selected personnel, and the form of documentation to be approved for the licensing of expert training of selected personnel, as amended by the SÚJB Decree No. 315/2002 Coll.,
- ***SÚJB Decree No. 215/1997 Coll***., on criteria for siting of nuclear installations and very significant ionizing radiation sources,
- ***SÚJB Decree No. 106/1998 Coll***., on nuclear safety and radiation protection assurance during commissioning and operation of nuclear facilities,
- ***Government Order No. 11/1999 Coll***., on emergency planning zone,
- ***SÚJB Decree No.195/1999 Coll.,*** on basic design criteria for nuclear installations with respect to nuclear safety radiation protection and emergency preparedness,
- ***SÚJB Decree No. 307/2002 Coll***., on radiation protection, as amended,
- ***SÚJB Decree No. 317/2002 Coll***., on type-approval of packagings for shipment, storage and disposal of nuclear materials and radioactive substances, on type-approval of ionizing radiation sources and shipment of nuclear material and specified radioactive substances (on type-approval and shipment),
- ***SÚJB Decree No. 318/2002 Coll***., on details of emergency preparedness of nuclear facilities and workplaces with ionizing radiation sources and on requirements on the content of on-site emergency plan and emergency rule, as amended by the Decree of the SÚJB No. 2/2004 Coll.,

- ***SÚJB Decree No. 319/2002 Coll***., on function and organization of the National Radiation Monitoring Network, as amended by the Decree of the SÚJB No. 27/2006 Coll.,

- ***SÚJB Decree No. 360/2002 Coll,*** establishing a method to create a financial reserve for decommissioning of nuclear installations or workplaces in categories III or IV,

- ***Government Order No. 416/2002 Coll,*** on the amount and terms of payments to the nuclear account by radioactive waste producers and the annual subsidy to the communities and the rules for its payment,

- ***SÚJB Decree No. 419/2002 Coll,*** on personal radiation passes,

- ***SÚJB Decree No. 185/2003 Coll.,*** on decommissioning of nuclear installation or workplaces of category III or IV**,**

- ***SÚJB Decree No. 193/2005 Coll.,*** sets the list of theoretical and practical areas forming the education and preparation content required in the Czech Republic for the performance of regulated activities belonging to the competence of SÚJB,

- ***SÚJB Decree No. 309/2005 Coll.,*** on assurance of technical safety of selected equipment,

- ***SÚJB Decree No. 461/2005 Coll***, on the procedure for providing subsidies intended for the introduction of measures leading to a reduction of indoor exposure to natural radionuclides and a reduction of natural radionuclide concentration in drinking water appointed for public supply,

- ***SÚJB Decree No. 462/2005 Coll***, on distribution and collection of detectors intended for identification of buildings with an icreased level of exposure to natural radionuclides and on conditions for acquirement of state budget subsidy,

- ***SÚJB Decree No. 132/2008 Coll.,*** on Quality Assurance System in carrying out activities connected with utilization of nuclear energy and radiation protection and on Quality assurance of selected equipment in regard their assignment to classes of nuclear safety,

- ***Government Order No. 73/2009 Coll,*** on information exchange related to the international transport of radioactive waste and spent fuel,

- ***SÚJB Decree No. 165/2009 Coll.,*** establishing a list of selected items in the nuclear area,

- ***SÚJB Decree No. 166/2009 Coll.,*** establishing a list of selected items of dula use in the nuclear area,

- ***SÚJB Decree No. 213/2010 Coll.,*** on accounting for and control of nuclear material and on reporting of data required by EC regulations,

- ***Government Order No. 399/2011 Coll,*** on fees for professional activities of the State Office for Nuclear Safety.

MULTILATERAL INTERNATIONAL TREATIES AND TREATIES WITH IAEA

Part of the valid Czech legislation in the given area includes the following international treaties signed by the Czech Republic (or the former Czechoslovak Socialistic Republic and later the Czech and Slovak Federal Republic):

- The Convention on the Physical Protection of Nuclear Materials (in Vienna on October 26, 1979, communication of the MZV No. 27/2007 Coll.),
- The Convention on Early Notification of a Nuclear Accident (in Vienna on September 26, 1986, communication of the MZV No. 116/1996 Coll.),
- The Convention on Assistance in the Case of a Nuclear or Radiation Accident (in Vienna on September 26, 1986, communication of the MZV No. 115/1998 Coll.),
- Nuclear Safety Convention (in Vienna on June 17, 1994, communication of the MZV No. 67/1998 Coll.),
- Vienna Convention on Civil Liability for Nuclear Damage (in Vienna on May 21, 1963, ratified, communication of the MZV No. 133/1994 Coll.),
- The Joint Protocol relating to the Application of the Vienna and Paris Conventions on Liability for Nuclear Damage (in Vienna in 1988, ratified, communication of the MZV No. 133/1994 Coll.),
- The Protocol on Amendment to the Vienna Convention on Civil Liability for Nuclear Damage (in Vienna on September 12, 1997, signed by the Czech Republic on June 18, 1998, however has not been ratified as yet). By virtue of Act No. 158/2009 Coll., the Czech Republic adapted the amount of liability of the operators and state guarantees to this protocol,
- The Comprehensive Nuclear Test Ban Treaty (has not became valid as yet, the Czech Republic's Government Order No. 535/1996),
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radiological Waste Management (in Vienna on September 5, 1997, UV No. 593/1997, ratified on March 26, 1999),
- The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) (Decree by the MZV No. 61/1974 Coll., of March 29, 1974),
- The Convention on Supplementary Compensation for Nuclear Damage (in Vienna on September 12, 1997, the Government Order No. 97/1998, signed by the Czech Republic, however has not been ratified),
- The Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, February 25, 1991, ratified on February 26, 1991, Decree by the MZV No. 91/2001 Coll.),
- The Convention on Korean Energetics Development Organization (KEDO) – letter of the MZV on acceptance of the Agreement of March 9, 1995 and of the supplemental Protocol of 1997 by the Czech Republic dated January 27, 1999; the Czech Republic became a member on February 9, 1999,
- The Agreement between the Czech Republic and the International Atomic Energy Agency on Safeguards, based on the Treaty on Non-proliferation of Nuclear Weapons (in Vienna on September 18, 1996, through communication of the MZV No. 68/1998 Coll.),

- The Supplemental Protocol to the Agreement between the Czech Republic and the International Atomic Energy Agency on Safeguards, based on the Treaty on Non-proliferation of Nuclear Weapons (in Vienna on September 28, 1999, through communication of the MZV No. 74/2003 Coll.),
- Adapted supplemental Agreement on Technical Assistance provided by the International Atomic Energy Agency to Government of the Czech and Slovak Federal Republic (in Vienna on September 20, 1990, No. 509/1990 Coll.).

SELECTED ACTS CONCERNING THE SÚJB

- ***Act No. 281/2002 Coll***., on some measures with regard to prohibition of bacteriological (biological) and toxin weapon, as amended,
- ***Act No. 106/1999 Coll.,*** on free access to information, as amended,
- ***Act No. 123/1998 Coll.,*** on the right to information on environment, as amended,
- ***Act No. 594/2004 Coll***., implementing the regime of the European Communities to control the export of dual use goods and technologies, as amended,
- ***Act No. 19/1997 Coll***., on some measures related to prohibition of chemical weapons, as amended,
- ***Act No. 100/2001 Coll***., on assessment of impact on the environment,
- ***Act No. 111/1994 Coll.,*** on road traffic, as amended,
- ***Act No. 552/1991 Coll.,*** on state inspection, as amended,
- ***Act No. 183/2006 Coll.,*** on Spatial Planning and Building Rules (Building Act), as amended,
- ***Act No. 500/2004 Coll***., on administrative procedure (Rules of Administration), as amended by Act No. 413/2005 Coll.
- ***Government Order No. 341/2009 Coll.,*** about the amount of payment and transfer to the nuclear account by radioactive waste producers and about the annual subsidy to the communities and the rules for its takedown.

EMERGENCY LEGISLATION

- ***Constitutional Act No. 110/1998 Coll***., on security of the Czech Republic, as amended.
- ***Ministry of Interior Decree No. 328/2001 Coll***., on certain details of providing of integrated emergency system, as amended,
- ***Act No. 239/2000 Coll.,*** on integral rescue system and on the amendment of some laws, as amended,
- ***Act No. 240/2000 Coll.,*** on crisis management and on the amendment of some laws, as amended,
- ***Act. No. 59/2006 Coll***., on severe accident prevention, as amended,
- ***Act No. 412/2005 Coll.,*** on classified information protection and on security competence, as amended.

ANNEX 6 Evaluation of the Safety Performance Indicators Set

The Evaluation of the Safety Performance Indicators Set of the National Report of the Czech Republic 2013 can be found on SÚJB website http://www.sujb.cz/en/reports/the-czech-republic-national-report-under-the-convention-on-nuclear-safety-2013/

ANNEX 7 References

[1-1] Technical Notes of the Operational Safety Review Team to Czechoslovakia, Czech Power Works, NPP Dukovany; IAEA, 1989.

[1-2] Zpráva o plnění doporučení mise OSART v oblasti údržby; MAAE, 1991.

[1-3] Report of the OSART mission to the Dukovany NPP, IAEA-TCR-00918, 2003.

[1-4] ASSET Mission to the Dukovany NPP in Czech Republic; IAEA, 1993.

[1-5] ASSET Peer Review of the Dukovany NPP Self Assessment of Operational Events Reflecting Safety Performance; IAEA, 1996.

[1-6] Safety issues and their ranking for WWER- 440 Model 213 Nuclear Power Plants; IAEA, 1996.

[1-7] A Safety Improvement Review Mission to Dukovany NPP; IAEA, 1996.

[1-8] Site Safety Review Mission – Final Report; IAEA, 1990.

[1-9] Pre Operational Safety of Nuclear Installations, Czech Power Works, Temelín NPP – Report tothe Government of the Czech and Slovak Federal Republic; IAEA, 1990.

[1-10] Temelín Design Review Mission – Final report; IAEA, 1990.

[1-11] Technical Notes of the Pre-Operational Safety Review Team to Czechoslovakia, Czech Power Works, NPP Temelín; IAEA, 1992.

[1-12] QARAT Mission Report (IAEA-RU-3845 a IAEA-RU-3846); IAEA, 1994.

[1-13] Report of the Consultant Meeting Design Modifications of Temelín NPP; IAEA, 1994.

[1-14] Temelín Fire Safety Mission Final Report; IAEA, 1996.

[1-15] Safety Issues and their Ranking for WWER-1000 Model 320 Nuclear Power Plants; IAEA, 1996.

[1-16] Report of VVER Safety Issues Resolution at the Temelín NPP; IAEA, 1996.

[1-17] WANO Peer Review of Temelín Nuclear Power Plant, IAEA, 2004.

[1-18] WANO Follow-up Peer Review of Temelín Nuclear Power Plant, IAEA, 2006.

[1-19] Peer Review Service on Safe Long Term Operation (SALTO), “A Peer Review mission for Dukovany Nuclear Power Plant in Czech Republic”, IAEA-TCR-04190, 21 – 25 April 2008.

[1-20] WANO Peer Review of Dukovany Nuclear Power Plant, WANO, 06/2007.

[1-21] WANO Peer Review (Follow-up) of Dukovany Nuclear Power Plant, WANO MC, 01/2009.

[1-22] Dukovany Nuclear Power Plant Peer Review, WANO Moscow Centre, Final report, September 2012.

[1-23] Zátěžové testy JE – ČEZ, a.s., Ocenění bezpečnosti a bezpečnostních rezerv JE Dukovany, prosinec 2012.

[1-24] National Report on "Stress tests" NPP Dukovany and NPP Temelín, Czech Republic, Evaluation of Safety and Safety Margins in the light of the accident of the NPP Fukushima, Rev. 1, March 2012.

[1−25] Technical Notes of the OSART to Temelin NPP, Czech Republic, IAEA November 2012

[1-26] Temelin Nuclear Power Plant Peer Review, WANO Moscow Centre, Final report, December 2011.

[1-27] Zátěžové testy JE – ČEZ, a.s., Ocenění bezpečnosti a bezpečnostních rezerv JE Temelín, prosinec 2012.

[1-28] OSART Mission to the Dukovany NPP, Czech Republic, IAEA, June 2011.

[6-1] BN JB-1.3- Odborná přípravu a výcvik pracovníků k výkonu pracovních činností na jaderných zařízeních, SÚJB, 2010.

[14-1] Standard Technical Specifications – NUREG 0452; US-NRC, 1980.

[A3-1] IAEA-TCR-04190 report "Peer Review Mission for Dukovany NPP", 21 – 25 April 2008, Dukovany, Czech Republic.

ANNEX 8 Research Nuclear Installations

This Annex has been elaborated beyond the scope of obligations resulting from the Nuclear Safety Convention. The Annex contains description and safety of the research reactors in the Czech Republic.

Description

The nuclear program in the Czech Republic has been supported since the beginning of its development by the domestic experimental base. The main role in this base has been played by the ÚJV Řež, a.s., which was established in 1955. A Significant part of the experimental base has been research reactors.

Pursuant to Act on state-governed surveillance of nuclear safety (1984), the research reactors have been subject to similar regulatory regime as the nuclear power plants and other nuclear installations: approval process, submission of safety-related documentation – safety reports, Limits and Conditions, etc., subject of the inspections carried out by SÚJB, which also issues authorizations for main control room personnel. This regulatory regime was further strengthened by issuing the Atomic Act in 1997 and its amendment in 2002.

In 2004, the SÚJB issued the Safety Guide –requirements for research reactors for assurance of nuclear safety, radiation protection, physical protection and emergency preparedness, which superseded SÚJB Decree No. 9 of 1985. The IAEA recommendations issued in 2003 and operational experience from research reactors in the Czech Republic and worldwide were used in its preparation.

Operators of all nuclear research installations, in accordance with these documents, perform also internal self-assessment of safety of research reactors and other facilities and regularly inform SÚJB on operational results and abnormal events.

Overview of research reactors

LVR-15 Research Reactor in ÚJV Řež s.r.o.

Construction of the reactor, originally named VVR-S, was commenced in 1955 and the reactor was commissioned on September 24, 1957. Its thermal power was 2 MWt. The reactor served as a multi-purpose research reactor for the Czechoslovak nuclear program and the national economy. The reactor was employed to produce radioisotopes, to irradiate materials and for scientific research in the reactor physics area. Its output was increased to 4 MWt in 1964. Essential reconstruction took place in 1989, when all equipment including the reactor vessel was replaced. Transition to highly enriched fuel IRT-2M (80%) was performed and the output was increased to 8 MWt. In 1994 the maximum allowed output was increased to 10 MWt and the reactor utilisation was increased by transition to three-week campaign.
Construction of several experimental loops in the nineties significantly increased the experimental possibilities of the LVR-15 reactor. The loops simulate conditions in the PWR and BWR reactors and thus allow testing of construction materials under real conditions. In 1995 the reactor switched to fuel with lower enrichment (36 %).

At the present time, LVR-15 reactor is ranked in Europe among several active material testing reactors. Besides material research (reactor vessel materials irradiation, corrosion tests of primary circuit materials and core internals) and tests of primary circuit water regimes, the reactor is employed to perform neutron activation analysis, to produce and develop new radiopharmaceutical isotopes, to produce radiation-treated silicon for electrotechnical industry, for irradiation service and scientific research of material properties on horizontal channels. In the past years, utilization factor of reactor LVR-15 was around 50%.Since 2000 the reactor was ranked among several workplaces in the world dealing with the neutron capture therapy for brain tumours. This project was interrupted due to a lack of the funds.

In April 2003 the reactor operator received from SÚJB approval to continue operation until the end of 2014.

The IAEA INSARR mission on the LVR-15 reactor took place on December 1-5, 2003 and experts from five countries operating research reactors participated therein. The mission stated that "the IAEA recommendations for research reactors safety are observed during the reactor operation, and the reactor is operated in a safe and competent way". The mission further made a statement on active approach of the Institute and reactor management to nuclear safety and radiation protection. In conclusion, the mission submitted to the operator a set of recommendations to further improve safety of the LVR-15 reactor operation. Based on these recommendations the operator prepared a time schedule for their implementation.

The follow-up INSARR mission in December 2005 verified the fulfillment of proposed recommendations and concluded that the overwhelming majority of proposed recommendations were met showing high safety culture of reactor personnel and Institute management.

In 2006, the programme of ageing management of selected reactor components was initiated and focused on extending of operating time of the research reactor after 2014. In 2010, the management of the Institute has decided that these activities will be focused on 2028. This intention is supported by very good operational results of reactor LVR-15, the results of last five-year cycle of in-service inspection in 2007 and the results of the programme of ageing management.

The LVR-15 reactor has been incorporated in the report CSNI/NEA/OECD, 2007 – Support facilities for existing and advanced reactor (SFEAR) among significant experimental infrastructures for current and future NPPs.

Since 2005, the Czech Republic has joined to global initiative of the USA, Russia and IAEA GTRI (Global Thread Reduction Initiative) whose objective is to reduce the risk of abuse of nuclear and radioactive materials for terrorist attacks. This initiative includes two projects:

RRRFR – (Russian Research Reactors Fuel Return) for return of spent and fresh fuel of Russian origin back to Russia and RERTR (Reduction of Enrichment from Research and Test Reactors) for reduction of enriched fuel in research reactors below 20%.
The implementation of project RRRFR was successfully executed on 1st – 8th December 2007, when in total 568 spent fuel assemblies from LVR -15 research reactor were successfully transported to Russia (Majak facility). The transport, which was executed mostly on rails, used high-capacity transport casks VPVR/M manufactured in ŠKODA Plzeň. These casks were later used for transport of spent fuel from other countries – Hungary, Bulgaria, Poland, Ukraine; transport from Serbia and Belorusia is in preparation. Final transport of spent fuel from reactor LVR-15 took place in April 2013.

RERTR (Reduction of Enrichment of Research and Test Reactors below 20%) was commenced on 3rd August 2009 by transport of 12 fuel assemblies IRT – 4M (with enrichment 19.7%) to the Institute. In October 2009, the Institute submitted to SÚJB an application for reactor operation with the assemblies of this type. The goal will be testing of the assembly behaviour in power operation. The number of these assemblies in reactor core will gradually increase up to a full transition to a new fuel. On 12th February 2010, based on SÚJB approval, the reactor core was loaded with three new assemblies. This event shall be considered a significant milestone in reactor operation.

LR-0 Critical Assembly in ÚJV Řež a. s.

The LR-0 critical assembly was built by reconstructing the heavy-water TR-0 critical assembly with zero output in the ÚJV Řež, a.s. and most of its equipment was manufactured in the former Czechoslovakia. The reactor was served to perform research on reactor core of the NPP A-1 (HWGCR) in Jaslovské Bohunice. The reactor was put into operation on June 21, 1972 and was operated until 1979.

In connection with transition of the Czechoslovak nuclear program to VVER pressurized water reactors, the TR-0 was reconstructed to LR-0 experimental light water reactor with zero output. Physical start-up of the LR-0 reactor took place on December 19, 1982 and the reactor was put into permanent operation in 1983. Maximum allowed output of the reactor is 5 kWt and it is operated using shortened fuel assemblies of VVER-1000 and VVER-440 reactors.
The reactor is employed to perform research on core physics (it has variable pitch of a reactor lattice), storage racks and to simulate neutron fields in the power reactors. The reactor may be regulated using absorption rods, boric acid and by moderator level.

Within upgrading of reactor LR-0, it was decided to execute innovation of I&C system of LR-0, to digital one, and consistent separation of operating and safety systems. Based on SÚJB approval of 17th September 2007, the innovation was executed in the period 2007-2008. On 18th December 2009, SÚJB issued permit to operation for the period till 31st December 2019.

With the aim to assure financing of further operation research reactors in Nuclear Research Institute, since 1st January 2010 both reactors including operating personnel were transferred to daughter company Research Centre that fulfils the conditions for financing from governmental sources.

VR-1 Training Reactor at ČVUT - FJFI

The VR-1 training reactor was commissioned on December 3, 1990 at ČVUT-FJFI (Czech Technical University – The Faculty of Nuclear Science and Physical Engineering). The reactor used the IRT-M fuel and all its equipment was manufactured in the former Czechoslovakia. The reactor is served in the training process of university students, in the scientific activities and for needs to prepare specialists of the Czech nuclear power programme. The training reactor participates in international cooperation (TEMPUS, ENEN and NEPTUNO programs) and it has close contacts with similar training reactors in UK, Netherlands and Austria.

In October 2005, the 36% enriched fuel (HEU) of VR-1 reactor was exchanged for 19.7% enriched fuel (LEU). The VR-1 reactor became the first reactor with IRT type Russian fuel, for which such exchange was executed within the RERTR program.

The application for further operation of reactor VR-1 was submitted to SÚJB in 2007 and SÚJB approval till the end of 2017 was granted.

ŠR-0 Research Assembly in Plzeň

In 1971 the ŠR-0 light water research assembly with zero output was put into operation at

ŠKODA Plzeň. Original allowed output of the system of 100 Wt was increased in 1975 to 2 kWt. This reactor was decommissioned in 1992.

Conclusion

All nuclear research reactors operated in the Czech Republic are in compliance with IAEA recommendations – Safety requirements for research reactor and Code of conduct on safety of research reactors and with other Safety Standards for the research reactors.

ANNEX 9 NATIONAL ACTION PLAN on Strengthening Nuclear Safety of Nuclear Facilities in the Czech Republic

Post Fukushima

National Action Plan (NAcP)

on
Strengthening Nuclear Safety of Nuclear Facilities
in the Czech Republic

State Office for Nuclear Safety
July 2013

Content

1. Introduction

Post Fukushima National Action Plan (NAcP) on Strengthening Nuclear Safety of Nuclear Facilities in the Czech Republic follows the National Report on „Stress Tests“ of Dukovany NPP and Temelín NPP, Czech Republic [1], prepared under the initiative of the European Commission in response to the Fukushima nuclear power plant accident.

In accordance with the specifications elaborated by a group of European Nuclear Regulators ENSREG the national stress tests report analyzed in detail the safety aspects of Dukovany and Temelin NPPs in terms of extreme external conditions, particularly their robustness against beyond design basis earthquakes, floods and extreme weather conditions leading to loss of ultimate heat sink, complete loss of electrical power (black out) or a combination thereof. The aim of the stress tests was to assess the resistance of existing nuclear power plants to these extreme loads, to assess time reserves to cliff edge moments of irreversible damage of the reactor core and to propose measures to strengthen their overall robustness in similar extreme situations.

National stress tests report has resulted in the conclusion that the design basis, which was used in the design of both nuclear power plants is in accordance with the valid nuclear legislation of the Czech Republic and that they both have sufficient reserves to the analyzed very unlikely extreme events. Detailed analyses of the behaviour of nuclear power plants in these extreme conditions allowed to propose a number of specific technical and administrative measures to further enhance their robustness and delaying the onset of irreversible damage of the nuclear fuel and barriers preventing release of fission products into the plant and then into the environment.

National Report of the Czech Republic along with national reports of other countries were subject to a detailed assessment by an independent group of international experts, initially in topically oriented peer review organized by the European Commission and the ENSREG in February 2012 in Luxembourg. The results of this topical peer review were summarized in two forms: first in a summary report generalizing conclusions and recommendations based on all national reports [2], secondly, in national evaluation peer review reports, which were a basis for subsequent evaluation missions (so-called "country visits") associated with visit of a selected nuclear power plant. In the case of the Czech Republic it was the Dukovany NPP. Conclusions of this evaluation were summarized in the final "Peer Review Country Report” [3], containing in addition to the general summary evaluation a list of recommendations for further improvement of nuclear safety in the Czech Republic, both of general nature and specific for Dukovany and Temelín NPPs. This assessment by independent international experts confirmed the general conclusions of the National Report on the compliance of design bases of the Czech nuclear power plants with applicable national laws and international practices. Final review of stress tests of the Czech NPPs by ENSREG group ended with a visit to the Temelín NPP in September 2012, the conclusions of which were summarized in the report [4].

National stress tests report of the Czech nuclear power plants was in a condensed form [5] also presented to the Second Extraordinary Meeting of the Parties to the Convention on Nuclear Safety, which took place on 27 - 31 August 2012 at the International Atomic Energy Agency (IAEA). Conclusions of this meeting, summarized in a document [6] became, like the conclusions of the evaluation of stress tests carried out within the group ENSREG, a source of ideas for further increasing the level of nuclear safety of Contracting Parties to the Convention, including the Czech Republic.

Recommendations from the review processes within the ENSREG Group and the Extraordinary meeting of the Contracting Parties to the Convention on Nuclear Safety, along with opportunities to enhance robustness of Dukovany and Temelín NPPs identified in the National Stress Tests Report form a set of measures, which represent the basis of the present National Action Plan (NAcP) on Strengthening Nuclear Safety of Nuclear Facilities in the Czech Republic

National Action Plan on Strengthening Nuclear Safety of Nuclear Facilities in the Czech Republic contains a compilation of all the major conclusions and recommendations contained in the National Stress Tests Report on nuclear power plants of the Czech Republic [1], reports from the peer review process by the ENSREG group [2,3,4], including the Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the Convention on Nuclear safety [6]. The National Action Plan is structured, in accordance with the structure suggested by ENSREG [7], into four parts. Part I is devoted to the issues of external hazards (earthquakes, floods, extreme weather conditions), the loss of ultimate heat sink and complete loss of electrical power, eventually their combination. Part II deals with the national organization, the organization of emergency preparedness and emergency response, and international cooperation, as were evaluated at an extraordinary meeting of the Convention on Nuclear Safety. Part III is devoted to the crosscutting issues. The focus of the Action Plan - Part IV - contains the list of measures aimed in implementing all the recommendations contained in parts I - III. The set of these measures is the sum of corrective actions identified in the Periodic safety review of Dukovany NPP and Temelín NPP after 20, respectively 10 years of operation, safety findings by the IAEA missions, findings identified within the project LTO EDU and last but not least, the findings identified in the stress tests after the Fukushima nuclear power plant disaster.

Proposed measures relating to Dukovany NPP and Temelín NPP will be implemented by the licensee ČEZ, a. s. Measures of general nature, such as the amendment of the nuclear legislation, off-site emergency preparedness, international cooperation, etc. will be implemented by the state administration, especially SÚJB and other ministries.

National Action Plan on Strengthening Nuclear Safety of Nuclear Facilities in the Czech Republic is a living document which will be regularly reviewed and based on new knowledge continuously updated.
Revision 1 of the NAcP was prepared to reflect the results of the ENSREG NAcP workshop commenced in April 2013 in Brussels and the results of the SÚJB supervision since the NAcP issuance in December 2012.
The following main modifications have been made in the revision 1 of the NAcP:

- Links between recommendations and action have been improved.
- Several actions have been added as results of SÚJB oversight over NAcP implementation.
- Implementation status of actions has been updated where needed.

2. European level recommendations

No.	Recommendations	Activity Action No.
	Recommendations from ENSREG "Compilation of recommendations and suggestions"	
1	The peer review Board recommends that WENRA, involving the best available expertise from Europe, develop guidance on natural hazards assessments, including earthquake, flooding and extreme weather conditions, as well as corresponding guidance on the assessment of margins beyond the design basis and cliff-edge effects.	**12**
2	The peer review Board recommends that ENSREG underline the importance of periodic safety review. In particular, ENSREG should highlight the necessity to re-evaluate natural hazards and relevant plant provisions as often as appropriate but at least every 10 years. External hazards and their influence on the licensing basis should be reassessed periodically using state-of-the-art data and methods. PSR was identified as one good tool.	**None (PSR is in the current practice)**
3	Urgent implementation of the recognised measures to protect containment integrity is a finding of the peer review that national regulators should consider.	**49, 46 – 50**
4	Necessary implementation of measures allowing prevention of accidents and limitation of their consequences in case of extreme natural hazards is a finding of the peer review that national regulators should consider.	**Many (see other parts of the NAcP)**
5	Deterministic methods should form the basis for hazard assessment. Probabilistic methods, including probabilistic safety assessment (PSA), are useful to supplement the deterministic methods.	**None (use of PSA is in the current practice)**

PART I

3. Other topics

3.1 Topic I – Natural hazards

Earthquake

In the Czech Republic, there are no tectonic structures which could result in severe earthquakes. There is 95% probability that the Dukovany NPP site cannot be hit by an earthquake severer than 6° MSIS-64 (PGA hor = 0.06 g). The real SSC robustness is higher, so there is a safety margin for the remaining 5 % uncertainty.

Nevertheless, as early as 1995, a decision was made to perform seismic upgrading of the significant safety equipment and civil structures in the Dukovany NPP area to the value of the peak ground acceleration PGA = 0.1 g (the maximum design basis earthquake, MDE/DBE-2/SSE). This project is still underway. Currently, more than 90% (including all technology) of the significant safety equipment has qualification documentation which complies with requirements and proves seismic resistance, and, as for other equipment, (electro part and I&C systems) implementation of modifications is drawing to an end. Potential hypothetical consequences of an earthquake are limited to loss of seismically non-resistant SSC which might take part in fulfilment of supporting safety functions. It concerns, above all, possible insufficient mobile equipment capacity, people and loss of communication facilities. As a consequence of the damaged infrastructure in the surroundings of the nuclear power plant, it would be the loss of operability of the technical communication facilities between control centres and persons taking actions, including communication with external control centres and the state administration bodies, which would make actions complicated. The objective of the proposed measures is further strengthening of the in-depth defence level during an earthquake. (National report, page 78)

As clearly shown in the assessment, the site of the NPP Temelín was chosen exceptionally well from seismic point of view. The site can be characterized as highly stable in relation to external natural events, including seismicity. Moreover, the robustness of the VVER1000 project and diversity of the seismically resilient SSC ensure a sufficient resilience and safety margin in case of design and beyond design seismic events.
The potential adverse effects of earthquakes are, therefore, limited only to seismically nonresilient SSC, which may be contributing to the fulfilment of auxiliary safety functions. This is the case of, for example, a long-term power supply after losing the external power supply (3 days and more) using just emergency sources, which require external resupplying with diesel fuel for the DG.
Activities after a seismic event could also be complicated by a loss of the means of communication between the control centres and responding persons including the communication with external control centres and state administration due to damaged infrastructure around the NPP. The aim of the proposed measures is further strengthening of defence-in-depth protection in case of earthquakes. (National report, page 216)

Flooding

The basic design basis provisions to prevent occurrence of floods due to precipitation, in addition to the sitting of the power station, is the sufficiently dimensioned storm-water disposal system, the above-ground height of entrances, accesses and gates with respect to the surrounding ground space and weathering of the adjacent communications and other outdoor areas adjacent to buildings essential from the point of view of nuclear safety. All the civil structures located in the Dukovany NPP premises are safely protected by means of the altitude level of the premises.
(National report, page 83)

The site of the Temelín NPP has never been, and is not now, threatened by floods from watercourses. The main objects of the Temelín NPP containing systems relevant for nuclear safety are located 507.30 m above sea level. This is 135 m above the level of the Hněvkovice water reservoir on the Vltava River. A safety evaluation with respect to the potential breaking of dams on water reservoirs in the upper part of the Vltava River (Lipno I on the Vltava, Římov on the Malša) was carried out for the Temelín NPP. In case the Lipno I reservoir is damaged, water approximately equalling a 10,000-year flood will flow through the profile of Hněvkovice. In case of a 10,000-year flood, the level reached in the profile of Hněvkovice will lead to flooding of most of the pumping station supplying raw water for the Temelín NPP, which will disable the standard raw water supply for the Temelín NPP, and both units will have to be shutdown. However, the site contains a sufficient reserve of water to cool down the units to a cold state. During the biggest floods on the Vltava River in 2002, the profile of Hněvkovice recorded a level corresponding to the maximum level considered for this water reservoir. Water was passing through the dam in a standard way and no significant damage was found on the pumping station for the Temelín NPP or on the dam. Buildings relevant for safety cannot be flooded from the gravity sewer system even in case of extreme precipitation. The Temelín NPP is built as a cascade, with buildings relevant for nuclear safety located in the highest areas and the terrain sloping towards the edges of the location, which also allows for natural gravity drainage if the rain sewer fails. The building objects in the Temelín NPP are also designed to be flood-resilient in case of a maximum one-day rainfall that leads to a maximum water level of 47.2 mm (in case of 100-year rainfall) and 88.1 mm (in case of 10,000-year rainfall), in case the sewer system is completely disabled. The location also contains mobile equipment of the fire rescue unit, which is adapted for pumping water from local floods in excess of 10,000-year values. Because flooding from external watercourses is inherently ruled out and the building objects in the Temelín NPP are designed to be resilient against floods even in the case of extreme rainfall (watertight lids, height of entry and installation openings), there is at least 100% reserve before reaching levels at which water would flood the buildings. Thanks to the gravity drainage of water from the location, this level cannot be reached. (National report, page 222)

Extreme weather conditions

For NPP Dukovany in the case of extreme wind with the time of re-occurrence of 10,000 years, the safety function of residual heat removal might be endangered. The main cause is that ventilator towers have not been installed in the ESW system and the main cooling towers are not sufficiently resistant to extreme wind. It was also discovered that, in the case of extreme wind occurrence, some significant safety civil structures are not sufficiently resistant; however, detailed effects on the equipment concerned have not yet been analyzed. Possible

damage to the fuel deposited in the reactor or in SFSP after the loss of the reactor hall's roof integrity due to extreme wind is highly improbable.
The most significant impact of extreme snow load might be fall of the turbine hall's roof, which might result in a loss of the safety systems located in the turbine hall. The most significant problems might be caused by failure of the ESW system, which might lead to risk to the function of long-term residual heat removal. This holds true on condition that preventive removal of snow off the turbine hall's roof fails. Some partial differences in the actual resistance of selected buildings from the required values of resistance under extreme load are addressed in the project of supplementary seismic qualification of the significant safety equipment in civil structures, which is being completed. Currently, review analyses are underway to re-prove sufficient resistance to the effects of climatic extremes for all civil structures, systems and components which ensure performance of the basic safety functions.
The assessment of extreme climatic phenomena was reduced only to the scope of significant safety civil structures and the equipment located therein. Therefore, it is necessary to assume that, in particular, an event such as extreme wind or extreme snow might result in damage to civil structures providing for auxiliary services. Such events might also cause the location's isolation and its inaccessibility for a period of several days. On the design basis, the Fire Brigade building (LFRU) is not classified as a significant safety building, therefore, it has not been assessed from the point of view of extreme natural conditions effects (extreme wind, extreme snow, earthquake). Therefore, it is not known whether the LFRU building might be damaged as a consequence of natural conditions. At the present time, analyses regarding the resistance of the LFRU building are being performed. (National report, page 93)

The design and diversity of the SSC of NPP Temelin ensure sufficient resiliency and reserves in case of extreme weather events. The possible adverse effects of extreme natural events could lead to shutdown of units, however they cannot pose a threat to the safety functions. The auxiliary functions could be influenced as a result of extreme natural events, e.g. in case the media in the bridge pipes freeze. The aim of the proposed measures is to further strengthen the defence-in-depth protection in case of extreme natural events. (National report, page 226)

3.1 Topic I – Natural hazards

3.1.1 Hazard Frequency

No.	Recommendations	Activity Action No.
Hazard Frequency The use a return frequency of 10E-4 per annum (0.1g minimum peak ground acceleration for earthquakes) for plant reviews/back-fitting with respect to external hazards safety cases.		
3.1.1.1	Recommendations from National Stress test Report	
3.1.1.1.1	**NPP Dukovany:** To complete the project of Dukovany NPP seismic upgrading. (tab.10)	**1**
3.1.1.1.2	**NPP Dukovany:** Control and ensuring of non-seismic equipment anchoring (tab.10)	**1**
3.1.1.1.3	**NPP Dukovany:** To work out earthquake operating regulations (tab.10)	**7, 52**
3.1.1.1.4	**NPP Dukovany:** EDMG instructions for use of alternative means (tab.10)	**52, 53**
3.1.1.1.5	**NPP Dukovany:** To ensure working of emergency response units in case of unavailability of ECC (tab.10)	**59**
3.1.1.1.6	**NPP Dukovany:** Seismic resistance of LFRU building (tab.10) Note:Mobile firemen equipment as temporary solution.	**3, 84**
3.1.1.1.7	**NPP Dukovany:** Alternative means of communications after a seismic event (tab.10)	**57**
3.1.1.1.8	**NPP Dukovany:** Analysis regarding threat to shelters on a seismic event (tab.10)	**59, 60**

3.1.1.1.9	**NPP Dukovany:** Ensuring of sufficient amount of staff after a seismic event (tab.10)	**37, 40**
3.1.1.1.10	**NPP Dukovany:** Access to buildings, availability of machinery (tab.10)	**53**
3.1.1.1.11	**NPP Temelin:** Alternative refuelling diesel using tank trucks for long-term operation of the DG (tab.30)	**22**
3.1.1.1.12	**NPP Temelin:** EDMG manuals for using alternative means. (tab.30)	**53**
3.1.1.1.13	**NPP Temelin:** OER (organization of emergency response) ability outside the ECC (emergency control centre) (tab.30)	**59**
3.1.1.1.14	**NPP Temelin:** Resilience of the LFRU (local fire rescue unit) to seismicity (tab.30) Note:Mobile firemen equioment as temporary solution.	**2, 84**
3.1.1.1.15	**NPP Temelin:** Alternative means of communication after a seismic event (tab.30)	**57**
3.1.1.1.16	**NPP Temelin:** Analysis of the threat to the shelters in case of a seismic event (tab.30)	**59, 60**
3.1.1.1.17	**NPP Temelin:** Security of the staff after a seismic event (tab.30)	**60**
3.1.1.1.18	**NPP Temelin:** Access to buildings, accessibility for heavy machinery (tab.30)	**53**
3.1.1.2	Recommendations from ENSREG Country Peer Review	
3.1.1.2.1	**NPP Dukovany:** During the plant visit it was explained that SSCs of safety classified systems reach resistance values between 0,11g and 0,169g. The upper resistance limits for circulation cooling water is given as 0.112g, based on the capability of the cooling towers. It is recommended that SUJB should consider ensuring enhanced capability for this function. (page 7)	**33**

3.1.1.2.2	**NPP Dukovany:** The upgrade program for Dukovany NPP is scheduled to be completed in 2015. It is recommended that SUJB should continue to monitor the ongoing earthquake resistance qualifications and reinforcements for the Dukovany NPP to ensure that all the safety related SSCs of the plant are resistant for at least 0.1 g PGA. It is also recommended that the proposed reinforcement should continue to be monitored by the national regulator. (page 8).	**1, 72**
3.1.1.2.3	**NPP Dukovany:** It is recommended that SUJB should consider how to monitor resolution of: • actions to increase the plant's capabilities to cope with the indirect effects of an earthquake and other external events • low seismic margins for cooling towers serving as heat sink for the ESW • low seismic capability for fire brigade building. (page 8)	**1st – 4, 70** **2nd – 33** **3rd – 3**
3.1.1.3	Luxembourg general peer review report	
3.1.1.3.1	Driving all plant reviews/back-fitting with respect to external hazards safety cases to the 10-4 per annum/0.1g minimum peak ground acceleration. (§5.3.1)	**1**
3.1.1.4	ENSREG - Follow - up fact finding site visit NPP Temelin	
3.1.1.4.1	Seismically qualifying the fire brigade building (page 3.)	**2**

3.1.2 Secondary Effects of Earthquakes

Secondary Effects of Earthquakes The possible secondary effects of seismic events, such as flood or fire arising as a result of the event, in future assessments.		**Activity Action No.**
3.1.2.1	Recommendations from National Stress test Report	
3.1.2.1.1	**NPP Dukovany:** Seismic PSA (tab.10)	**4 , 70 (PSR)**
3.1.2.2	Recommendations from ENSERG Country Peer Review	
3.1.2.2.1	**NPP Dukovany:** It is recommended that SUJB should consider how to monitor resolution of: • actions to increase the plant's capabilities to cope with the indirect effects of an earthquake and other external events (page 8)	**4, 70**
3.1.2.3	Luxembourg general peer review report	

3.1.2.3.1	Clarifying requirements for the approach to the secondary effects of seismic events, such as flood or fire arising as a result of the event, in future assessments. (§5.3.5)	**4, 70**

3.1.3 Protected Volume Approach

Protected Volume Approach The use a protected volume approach to demonstrate flood protection for identified rooms or spaces.		**Activity Action No.**
3.1.3.1	Luxembourg general peer review report	
3.1.3.1.1	Clarifying requirements for the approach to the secondary effects of seismic events, such as flood or fire arising as a result of the event, in future assessments. (§5.3.5) Temelin and Dukovany sites are not endangered by natural or specific floods. However, all buildings are designed with the respect to withstand extreme rainwater.	**4, 70**
3.1.3.1.2	That the protected volume approach is an effective way of demonstrating flood protection for identified rooms or spaces. (§ 5.3.6) All buildings were inspected and additional measures against extreme rainwater in selected buildings have been implemented.	**9, 10, 11**

3.1.4 Early Warning Notifications

Early Warning Notifications The implementation of advanced warning systems for deteriorating weather, as well as the provision of appropriate procedures to be followed by operators when warnings are made.		**Activity Action No.**
3.1.4.1	Luxembourg general peer review report	
3.1.4.1.1	That some countries refer to weather alert systems. Advance warning of deteriorating weather is often available in sufficient time to provide the operators with useful advice and national regulators should ensure that appropriate communications and procedures are developed by all operators.(§ 5.3.11)	**5**

3.1.5 Seismic Monitoring

	Seismic Monitoring The installation of seismic monitoring systems with related procedures and training.	**Activity Action No.**
3.1.5.1	Recommendations from ENSREG Country Peer Review	
3.1.5.1.1	**NPP Dukovany:** During the PSR process a re-evaluation against 0,1g PGA for Dukovany NPP, in line with IAEA guidance has been introduced. During the country visit it was explained that work has been carried out to evaluate the seismic hazard using modern methods taking account of recent paleoseismological and geodetic data. This SHA is still to be validated and it is recommended that SUJB considers the implications during the PSR process. (page 8.)	**45**
3.1.5.2	Luxembourg general peer review report	
3.1.5.2.1	Installation of seismic monitoring systems and development of associated procedures and training for those NPPs that currently do not have such systems. (§5.3.10) Internal seismic monitoring system is implemented at Temelin NPP.	**6**

3.1.6 Qualified Walkdowns

	Qualified Walkdowns The development of standards to address qualified plant walkdowns with regard to earthquake, flooding and extreme weather – to provide a more systematic search for non-conformities and correct them (e.g. appropriate storage of equipment, particularly for temporary and mobile plant and tools used to mitigate beyond design basis (BDB) external events).	**Activity Action No.**
3.1.6.1	Luxembourg general peer review report	

3.1.6.1.1	How best to ensure that specific operational requirements of external events safety cases are adequately maintained. Regulators and operators should consider developing standards to address qualified plant walkdowns with regards to earthquake, flooding and extreme weather – to provide a more systematic search for non-conformities and correct them (e.g. appropriate storage of equipment, particularly for temporary and mobile plant and tools used to mitigate BDB external events). This plant-based activity would benefit from clear labelling of qualified equipment. (§ 5.3.7) Extraordinary inspections (during May, 2011) of plant resistance against internal and external floods were conducted. No significant discrepancy of current status with design requirements have been identified at Temelin NPP and only minor discrepancies of current status with design requirements have been identified at Dukovany NPP that were immediately corrected.	**7, 8, 52**

3.1.7 Flooding Margin Assessments

Flooding Margin Assessments The analysis of incrementally increased flood levels beyond the design basis and identification of potential improvements, as required by the initial ENSREG specification for the stress tests.		**Activity Action No.**
3.1.7.1	Recommendations from National Stress test Report	
3.1.7.1.1	**NPP Dukovany:** EDMG instructions for use of alternative means (tab.11)	**53**
3.1.7.1.2	**NPP Dukovany:** Analysis regarding threat to shelters in the case of floods (tab.11)	**9, 60**
3.1.7.1.3	**NPP Temelin:** Increasing the resilience of the DG in case of external flooding (tab.31)	**9**
3.1.7.1.4	**NPP Temelin:** Ability of the OER to function via the ECC (tab.31)	**59**
3.1.7.1.5	**NPP Temelin:** EDMG manuals for using alternative means (tab.31)	**53**
3.1.7.1.6	**NPP Temelin:** Analysis of the threat to the shelters in case of floods (tab.31)	**9, 60**
3.1.7.2	Recommendations from ENSREG Country Peer Review	

3.1.7.2.1	**NPP Temelin:** Increasing the protection of the diesel fuel pumps against the effects of flooding and also an alternative shelter is to be set up for the emergency response organization when the dedicated emergency response centre is damaged due to some external hazard. (page 10)	**9**
3.1.7.2.2	**NPP Temelin:** Convincing information is provided that the flooding from external water courses is "inherently ruled out" and the possible maximum flooding due to extreme rainfall is limited due to the morphological characteristics of the sites. At the same time there is a proposed measure for the Temelin site that the resilience of the emergency diesel generators should be increased, with a reference to the latest PSR. (page 10)	**9**
3.1.7.2.3	**For both NPPs:** The main requirement is that the SSCs necessary for safe shutdown of the plant need to remain operational after any possible flood situation. (page 9.)	**9, 10, 11**
3.1.7.2.4	**For both NPPs:** Some modifications to emergency procedures and analyses regarding the usability of the shelters under flooding conditions are foreseen. (page 10)	**9, 60**
3.1.7.3	Luxembourg general peer review report	
3.1.7.3.1	That in all countries that have not considered incrementally increased flood levels and associated potential improvements they should consider requiring the operators to do so. (§ 5.3.2)	**7, 8, 9, 10, 11**
3.1.7.4	ENSREG -Follow-up fact finding site visit NPP Temelin	
3.1.7.4.1	Increasing the protection of the diesel fuel tanks against the effects of flooding (with a reference to the latest PSR) (page 3.)	**9**
3.1.7.4.2	Increase resistance against rainfall of several buildings (DG´s building and emergency shelter) (page 3.)	**9**
3.1.7.4.3	Setting up an alternative shelter for the emergency response organization (e.g. when the dedicated emergency response centre is damaged due to some external hazard – like flooding) (page 3.)	**60**

3.1.8 External Hazard Margins

	External Hazard Margins In conjunction with recommendation 1 and 17, the formal assessment of margins for all external hazards including, seismic, flooding and severe weather, and identification of potential improvements. Licensing basis protection against external hazards (e.g. flood seals and seismic supports) should be verified to be effective. Margin assessments should be based on periodic re-evaluation of licensing basis for external events considering possible cliff-edge effects and grace periods.	**Activity Action No.**
3.1.8.1	Recommendations from National Stress test Report	
3.1.8.1.1	**NPP Dukovany:** To implement measures for diversion means of the ultimate heat sink (to CT). (tab.15)	**33**
3.1.8.1.2	**NPP Dukovany:** To work out operating regulations for extreme events (wind, temperature, snow) (tab.15)	**7**
3.1.8.1.3	**NPP Dukovany:** EDMG instructions for use of alternative means (tab.15)	**53**
3.1.8.1.4	**NPP Dukovany:** Ensuring of sufficient number of staff after extreme events (tab.15)	**40**
3.1.8.1.5	**NPP Dukovany:** Resistance of civil structures (LFRU, CPS, MPU etc.) to extreme conditions (tab.15)	**1, 3**
3.1.8.1.6	**NPP Dukovany:** To work out methods of evaluation of external effects, verification of analyses performed, possible technical measures (tab.15)	**12**
3.1.8.1.7	**NPP Temelin:** Alternative supply of diesel fuel from the tank for long-term operation of the DG. (tab.33)	**22**
3.1.8.1.8	**NPP Temelin:** Ensuring safety and operational staff in case of extreme events (tab.33)	**40**
3.1.8.1.9	**NPP Temelin:** Executing methodology for assessing external effects, verification of analyses carried out, possible technical measures (tab.33)	**12**
3.1.8.2	Recommendations from ENSREG Country Peer Review	

3.1.8.2.1	**NPP Dukovany:** There is a reference to the Dukovany PSR in relation to ensuring separation of safety systems from systems for normal operation used for ultimate heat sink because of the inadequate capability of the cooling towers in regard to extreme wind. Possibilities include using separate cooling towers or sprinkler pools for ESW heat sink. It is recommended that the SUJB considers how to ensure that this issue is effectively resolved and appropriate improvements incorporated. (page 11)	**33**
3.1.8.2.2	**For both NPPs:** In the stress test process it has been identified that the procedures for special handling of weather related threats need to be elaborated and some specific additions might be necessary to the emergency management procedures. The organizational arrangements to ensure the necessary staff in case of lasting extreme weather conditions have to be elaborated. The considerations for extreme low temperatures may be too simple, not taking into account the realistic related effects, e.g. station black-out. Some refined further analyses and verification of current analyses are judged to be necessary. The elaboration of diverse connection to the ultimate heat sink and the load analyses of specific civil structures are already in progress and it is recommended that the SUJB should ensure that the question of diverse ultimate heat sink is resolved effectively. (page 11)	**12, 33, 40**
3.1.8.3	Luxembourg general peer review report	
3.1.8.3.1	Strengthening the PSR process by encouraging a more consistent approach to the determination of margins for external events, including external event PSAs (including seismic) and regular reviews of the design and beyond design hazards. (§ 5.3.3)	**4, 69, 70**
3.1.8.3.2	That with regard to hazard definition, techniques and data are still developing. WENRA, involving the best available expertise from Europe, should develop guidance on natural hazards assessments, including earthquake, flooding and extreme weather conditions, as well as corresponding guidance on the assessment of margins beyond the design basis and cliff edge effects. (§5.3.4)	**12**
3.1.8.4	ENSREG -Follow-up fact finding site visit NPP Temelin	
3.1.8.4.1	Elaboration of procedures for special handling of weather related threats with some specific additions to the emergency management procedures. (e.g. organizational arrangements to ensure the necessary staff in case of lasting extreme weather conditions) (page 3.)	**7, 8, 12, 40, 52**
3.1.8.5	Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the CNS	
3.1.8.5.1	Re-evaluating the hazards posed by external events, such as earthquakes, flood and extreme weather conditions, for each nuclear power plant site through targeted reassessment of safety. (page 5.)	**45, 70**

3.2 Topic 2 - Loss of safety systems

Loss of AC/DC power

NPP Dukovany electrical systems fulfil the requirements of the machine-nuclear part and respect the properties of the electricity network outside NPP, particularly with respect to NPP Dukovany operational safety and the production of electricity. Ensuring safety in the case of a breakdown in the supply of electricity is ensured by the high level of mutual independence of both working and reserve house consumption resources and the redundancy of the secure power supply system (SSPS), which supply key safety systems and components and have their own emergency resources. The NPP Dukovany house consumption distribution network is supplied from diversified working, reserve and emergency electricity resources.
(National report, page 95.)

Despite the robust defense-in-depth exists against total loss of power supply, areas for improvement of resistance against SBO have been identified for cases of concurrent failure of all defense-in-depth levels of electric power supply. (National report, page 104, tab. 16.) These areas were primary source for actions in the NAcP.

Electrical systems in the Temelín NPP were designed to comply with the requirements of the mechanic-nuclear part and respect the properties of the off-site power grid, especially with respect to the safety of operation of the Temelín NPP and production of electricity.
The safety of the Temelín NPP in case of a loss of power was handled in the design by a high degree of diversification of the operating and reserve sources for house consumption, as well as by the redundancy and diversification of the secure power supply systems (SPSS), which contain own emergency sources and supply not only safety systems, but also safety related and other important systems and components of both units. The power supply for house consumption is separate for each unit in order to prevent the spreading of electrical disturbances. (National report, page 228.)

Despite the robust defense-in-depth exists against total loss of power supply, areas for improvement of resistance against SBO have been identified for cases of concurrent failure of all defense-in-depth levels of electric power supply. (National report, page 246, tab. 34). These areas were primary source for actions in the NAcP.

Loss of UHS

The ultimate heat sink of heat released from the fuel of NPP Dukovany units is represented by the surrounding atmosphere. Unused heat during the production mode of the unit or residual heat after reactor shutdown is transferred into the ultimate heat sink in several ways:

a) Through the secondary circuit by means of the system for condensing and the circulating cooling water – in normal and abnormal operation in the production mode, in starting and disconnection of TG and in the emergency mode after disconnection of the reactor if working or reserve supply sources are ensured. This method does not ensure the transfer of the reactor into a cold status.

b) Using the system for cooling and delivery of heat into essential technical water (ESW) – at normal and abnormal operation and under emergency conditions, it is possible to transfer the reactor into a cold status (about 50 °C in RC and in SFSP).

c) By direct release of steam into the atmosphere from SG while filling SG with supply water – under abnormal or emergency operation; it is not possible to transfer the reactor into a cold status (cooling-down max. to 110 °C).

d) The alternative method of additional cooling in the case of not enabling the natural circulation of the coolant in loops, by the feed&bleed method on the primary circuit (PSV + ECCS) with the heat removal into essential technical water – this strategy is used in all cases of the loss of the heat removal through the secondary circuit. The heat from RC is transferred directly into containment from which, through the ECCS system (pumps TH,TQ and cooler TQ) is removed by the ESW system into the atmosphere. In terms of the function and the loss of the ultimate sink, this method is at the same level as the heat removal by the ESW system in the cooling-down process (similar to b). (National report, page 105).

Despite the robust defense-in-depth system exists against loss of heat removal to the ultimate heat sink, areas for improvement of resistance against loss of UHS have been identified for cases of concurrent failure of all defense-in-depth levels of UHS. (National report, page 110, tab. 17). These areas were primary source for actions in the NAcP.

The ultimate heat sink for both units of the Temelín NPP is also ensured by the atmosphere. Unused heat from operation at power of the units or residual heat from the core after shutdown, can be removed to the ultimate heat sink in several ways:

a) Transfer of heat via the TG condensation system into the circulation cooling water and via cooling towers into the atmosphere – under normal and abnormal power operation, start-up as well as shutdown of the TG and under emergency conditions after the reactor was shut down, provided that working or reserve sources of power supply are available.

b) Transfer of residual heat from the core and components of safety systems using the essential service water system into the cooling basins with spraying system and from there into the atmosphere – under normal and abnormal operation and in emergencies, with the possibility of bringing the reactor into a cold state.

If operating means of heat transfer into the ultimate heat sink are unavailable, it is possible to employ alternative methods of heat transfer:

a) Direct transfer of heat by releasing steam from the SG into the atmosphere while adding supply water – in abnormal or emergency operation; this variant allows long-term removal of heat from the core, but does not allow cooling-down the reactor to a cold state (cooling-down to approximately 110 ^{o}C).

b) Alternative "feed and bleed" method (controlled discharge of coolant from the I.C into the containment, transfer of heat via ECCS exchangers into the ESW and supply of cooled coolant using ECCS pumps into the I.C – only in emergency conditions when it is impossible to use a secondary transfer of heat. (National report, page 238).

Desipte the robust defense-in-depth system exists against loss of heat removal to the ultimate heat sink, areas for improvement of resistance against loss of UHS have been identified for cases of concurrent failure of all defense-in-depth levels of UHS. (National report, page 246, tab. 34). These areas were primary source for actions in the NAcP.

Loss of UHS combined with SBO

The functions of power supply from emergency sources and heat transfer to the ultimate heat sink are closely related and loss of one of the functions may affect the other function and vice versa. Although multiple failures of defense-in-depth levels would have to occur before the loss of both functions, considering severity of consequences of such conditions additional measures have been proposed in order to improve even so robust design with regard to heat transfer to atmosphere as the ultimate heat sink. The measures to enhance the robustness of the units in case of SBO combined with the loss of UHS are the same as the measures identified in case of SBO and in case of the loss of UHS.

The goal of the proposed short-term measures is to eliminate identified risks by strengthening defense-in-depth protection levels in case of initiation events beyond the framework of the current design (earthquake, floods, extreme conditions, results of human interference, etc.) that could result in a loss of the ability to perform the safety functions during an SBO in combination with a loss of UHS. (National report, page 114, tab. 18 (Temelín NPP), respectively page 246, tab. 34 (Dukovany NPP)).

3.2 Topic 2 - Loss of safety systems

3.2.1 Alternate Cooling and Heat Sink

	Alternate Cooling and Heat Sink The provision of alternative means of cooling including alternate heat sinks.	**Activity Action No.**
3.2.1.1	Recommendations from National Stress test Report	
3.2.1.1.1	**NPP Dukovany:** Ensuring additional source for adding water into SG. (tab.17)	**13**
3.2.1.1.2	**NPP Dukovany:** Analysis of possibility of alternative adding of water into the reactor by pump and new pipeline (tab.17)	**15**
3.2.1.1.3	**NPP Dukovany:** Implementation of measures for diversified means of the ultimate heat sink (to CT) (tab.17)	**33**
3.2.1.1.4	**NPP Dukovany:** Preparation of the procedure for the loss of UHS and ESW systems on all 4 units (tab.17)	**33**
3.2.1.1.5	**NPP Dukovany:** Completion of the existing regulations with the procedure for filling SG of all four units by fire extinguishing technology (tab.17)	**13, 53, 55**
3.2.1.1.6	**NPP Dukovany:** The existing regulations prefer the way of filling the open reactor and SFSP with self-gravitation from XL trays (tab.17)	**15**
3.2.1.1.7	**NPP Dukovany:** The collection of cooling from SFSP by adding coolant and accumulation in TH tanks (tab.17)	**15**
3.2.1.1.8	**NPP Dukovany:** EDMG manuals for the use of alternative means (tab.17)	**53**
3.2.1.1.9	**NPP Dukovany:** Ensuring additional supply source for systems SPS I. category and selected consumer appliances SPS II. category. (tab.18)	**18**
3.2.1.1.10	**NPP Dukovany:** Production of the procedure for restoration of SBO supply for all units (tab.18)	**18, (41)**

3.2.1.1.11	**NPP Temelin:** Alternative water supply for SG/SFSP/I.C (in case of I.C leakage). (tab.34)	**16**
3.2.1.1.12	**NPP Temelin:** Analysis of heat transfer from the I&C after losing the ESW (tab.34)	**26**
3.2.1.1.13	**NPP Temelin:** Procedure for restoring the power supply after an SBO in all units (tab.34)	**18, (41)**
3.2.1.1.14	**NPP Temelin:** EDMG manuals for using alternative means (tab.34)	**53**
3.2.1.2	Recommendations from ENSREG Country Peer Review	
3.2.1.2.1	**NPP Dukovany** There is a reference to the Dukovany PSR in relation to ensuring separation of safety systems from systems for normal operation used for ultimate heat sink because of the inadequate capability of the cooling towers in regard to extreme wind. Possibilities include using separate cooling towers or sprinkler pools for ESW heat sink. It is recommended that the SUJB considers how to ensure that this issue is effectively resolved and appropriate improvements incorporated. (page 11.)	**33**
3.2.1.2.2	**NPP Dukovany:** In Dukovany NPP there are 4 wet cooling towers for twin units, which serve as heat sink for service water and also for essential service water (TVD) systems. Cooling towers are not qualified as safety components. This issue was recognized during the last periodic safety review in 2009, and is being addressed by the project "Separation of safety systems from operational systems" (No. 5983). As it was discussed during the country visit, this safety improvement project is currently in design phase; the hardware modification is scheduled from 2015 to 2017. It is recommended, that the regulator considers how to ensure this is resolved effectively. (page 15.)	**33**
3.2.1.2.3	**NPP Dukovany:** • Specific possible safety improvements for Dukovany NPP related to the loss of UHS: Implement diverse (to the cooling tower) UHS means • Develop a procedure for the loss of UHS and ESW systems in all 4 units • Develop a procedure for the refilling of steam generators using fire fighting equipment • Filling an open reactor and spent fuel pool (SFP) by gravity drainage from bubbler trays • Removal of heat from the coolant in the SFP by means of coolant replenishment and its accumulation in emergency cooling water tanks (TH-system) • Extensive damage mitigation guidelines for the use of alternative means (page 17.)	**33** **53** **13** **15** **15** **53**

3.2.1.2.4	**NPP Dukovany:** In general there is redundancy and diversity in the electric and cooling capabilities to ensure safety functions, however additional alternate heat sink has not be implemented in Dukovany NPP. Besides that there are plans to increase system robustness to cope with SBO and LUHS. SUJB should follow the diversification of ultimate heat sink in Dukovany and the application of means and procedures to improve battery discharge time and makeup of steam generators. (page 17.)	**33, 20, 13, 17**
3.2.1.2.5	**NPP Temelin:** In Temelin NPP enough fire trucks are present, however no water connection points are available on relevant systems of the units. Safety improvement measure was decided by the licensee to resolve this issue. It was clarified during the country visit that the first phase of system modification will be realized in 2012, and the full implementation is planned in 2013. SUJB should consider to follow up the implementation (page 16)	**14**
3.2.1.2.6	**NPP Temelin:** • Specific possible safety improvements for Temelín NPP related to the loss of UHS: • Install new hook up points for fire trucks • Develop a procedure for the loss of UHS and ESW systems in both units • Extensive damage mitigation guidelines for the use of alternative means • Alternative replenishment of water to steam generator/SFP/primary circuit (with unsealed primary circuit) • Analysis of heat removal from I&C systems following a loss of ESW (page 17.)	**14** **53** **53** **14, 16** **26**
3.2.1.2.7	**For both NPPs:** In the stress test process it has been identified that the procedures for special handling of weather related threats need to be elaborated and some specific additions might be necessary to the emergency management procedures. The organizational arrangements to ensure the necessary staff in case of lasting extreme weather conditions have to be elaborated. The considerations for extreme low temperatures may be too simple, not taking into account the realistic related effects, e.g. station black-out. Some refined further analyses and verification of current analyses are judged to be necessary. The elaboration of diverse connection to the ultimate heat sink and the load analyses of specific civil structures are already in progress and it is recommended that the SUJB should ensure that the question of diverse ultimate heat sink is resolved effectively. (page 11.)	**7** **8** **52**

3.2.1.2.8	**For both NPPs:** It is recommended, that the SUJB consider how to monitor the licensee in respect: • to ensure that the new safety related equipment has beyond design basis capability for hazards. • to increase the plant robustness by implementation of alternative means for AC power supply for core cooling and heat removal • to improve the battery depletion time and implement battery recharging • to provide additional fire truck (Dukovany NPP) • to install hook up points for steam generator water make-up at Temelin NPP (page 17.)	**13 – 27** **18, 19** **18, 19** **78** **14**
3.2.1.3	Luxembourg general peer review report	
3.2.1.3.1	Using alternative means of cooling including alternate heat sinks. SG gravity feeding, or using other sources of water, supply from stored condenser cooling water, alternate tanks or wells on the site, or water sources in the vicinity (reservoir, lakes, etc) is an additional way of enabling core cooling and prevention of fuel degradation. Some plants identified possible actions, including additional analysis that might be needed. (§ 6.3.2)	**73** **15, 16** **38, 39** **40, 41** **42, 43**
3.2.1.4	ENSREG -Follow-up fact finding site visit NPP Temelin	
3.2.1.4.1	Installing new hook up points for fire trucks (page 3.)	**14**

3.2.2 AC Power Supplies

AC Power Supplies The enhancement of the on-site and off-site power supplies.		**Activity Action No.**
3.2.2.1	Recommendations from National Stress test Report	
3.2.2.1.1	**NPP Dukovany:** Ensuring additional supply source for systems SPS I. category and selected consumer appliances SPS II. category. (tab.16)	**18**
3.2.2.1.2	**NPP Dukovany:** Elaboration of a procedure for restoration of SBO supply for all units (tab.16)	**18, 53**
3.2.2.1.3	**NPP Dukovany:** Elaboration of a procedure for filling of SG of all four units by fire extinguishing technology (tab.16)	**13**
3.2.2.1.4	**NPP Dukovany:** Ensuring alternative source of electricity for shelters and telephone exchanges (tab.16)	**18, 34**

3.2.2.1.5	**NPP Dukovany:** Ensuring alternative source of electricity for the TSPP supply (tab.16)	**18**
3.2.2.1.6	**NPP Dukovany:** Ensuring sufficient personnel during long-term SBO (tab.16)	**40**
3.2.2.1.7	**NPP Dukovany:** Ensuring the functioning of emergency response organization in the case of non-accessibility of ECC (tab.16)	**59, 60**
3.2.2.1.8	**NPP Temelin:** Securing a sufficient number of staff in case of a long-term SBO (tab.34)	**41**
3.2.2.1.9	**NPP Temelin:** Analyses of the possibility of shift staff in case of an SBO in both units (tab 34.)	**41**
3.2.2.1.10	**NPP Temelin:** Alternative sources and means of communication after a seismic event (tab. 34)	**35, 57, 59**
3.2.2.1.11	**NPP Temelin:** Elaboration of a procedure for the operation of units in case of a long-term power supply from emergency sources (tab.34)	**53**
3.2.2.2	Recommendations from ENSREG Country Peer Review	
3.2.2.2.1	**For both NPPs:** It is recommended, that the SUJB consider how to monitor the licensee in respect: • to increase the plant robustness by implementation of alternative means for AC power supply for core cooling and heat removal to improve the battery depletion time and implement battery recharging. (page 17.)	**18, 19, 20, 21**
3.2.2.3	Luxembourg general peer review report	
3.2.2.3.1	Backup (SBO) DG installation (page 29.)	**18, 19**
3.2.2.3.2	Analysis of off-site power supply robustness, subsequent enhancements (if found feasible) (page 29)	**74**

3.2.3 DC Power Supplies

	DC Power Supplies The enhancement of the DC power supply.	**Activity Action No.**
3.2.3.1	Recommendations from National Stress test Report	

3.2.3.1.1	**NPP Dukovany:** Analysis of the discharging time of accumulator batteries in case of controlled releasing of the load, revision of OIs , changing the connection and operation of emergency lighting (including replacement of light bulbs by energy saving lamps) (tab.16)	**20, 75**
3.2.3.1.2	**NPP Temelin:** Alternative source for recharging accumulator batteries and supplying selected appliances (tab.34)	**21**
3.2.3.1.3	**NPP Temelin:** Using the safety DG of the other unit in case of an SBO (tab.34)	**79**
3.2.3.1.4	**NPP Temelin:** Analysis of the discharging period of the accumulator batteries in case of a controlled reduction of the load, details on procedures (including replacement of light bulbs by energy saving lamps) (tab.34)	**21, 75**
3.2.3.2	Recommendations from ENSREG Country Peer Review	
3.2.3.2.1	**NPP Dukovany:** The capacity of the accumulator battery sets of Dukovany secured power supply SPSS 1, 2 and 3 is 1500 Ah. According to the design, the discharge time of accumulator batteries with the maximum conservative load is at least 2 hours. Procedures have been developed to reduce the less important loads and saving of DC capacity. The real depletion time may be much longer than two hours (6 to 8 hours). Based on the fact that battery depletion is an important cliff edge effect, further improvements are under consideration. It is recommended, that the regulator considers how to ensure this is resolved effectively. (page 15.)	**18, 20**
3.2.3.2.2	**NPP Temelin:** Temelin NPP is equipped with 3x1600 Ah batteries for power supply of safety systems and 2x2400 Ah batteries for safety related consumers. The discharge time for these batteries is also at least 2 hours. Currently, recharging of the accumulator batteries during SBO is not provided. If the power supply can't be restored within 2 hours, the operating personnel will lose the information on plant parameters and hence this is the first cliff-edge effect in case of SBO. For that purpose an improvement measure is proposed for ensuring an alternative source for battery recharging. (page 15.)	**19, 21**
3.2.3.2.3	**For both NPPs:** It is recommended, that the SUJB consider how to monitor the licensee in respect: • to increase the plant robustness by implementation of alternative means for AC power supply for core cooling and heat removal to improve the battery depletion time and implement battery recharging. (page 17.)	**19** **21**
3.2.3.3	ENSREG -Follow-up fact finding site visit NPP Temelin	

3.2.3.3.1	Improving the battery depletion time and implement battery recharging by SBO DG (page 4.)	**19, 21**

3.2.4 Operational and Preparatory Actions

Operational and Preparatory Actions Implementation of operational or preparatory actions with respect to the availability of operational consumables.		**Activity Action No.**
3.2.4.1	Recommendations from National Stress test Report	
3.2.4.1.1	**NPP Temelin:** Alternative supply of diesel fuel from a tank truck for long-term operation of the DG (tab.34)	**22**
3.2.4.2	Luxembourg general peer review report	
3.2.4.2.1	Operational or preparatory actions such as ensuring the supply of fuel and lubrication oil, battery load-shedding to extend battery life are examples of measures that are small (in many cases procedural) but that could make a considerable difference in response to initiators. All in all, most of the plants have already considered these measures and might be adding to them in the future. (§6.3.3)	**22**
3.2.4.3	ENSREG -Follow-up fact finding site visit NPP Temelin	
3.2.4.3.1	Developing procedures for complex accidents (e.g. loss of UHS and ESW systems, procedure for the alternative replenishment of water to steam generator/SFP/primary circuit (with unsealed primary circuit, use of mobile DGs during SBO's, long term DG operation.) (page 3.)	**53**

3.2.5 Instrumentation and Monitoring

Instrumentation and Monitoring The enhancement of instrumentation and monitoring.		**Activity Action No.**
3.2.5.1	Luxembourg general peer review report	
3.2.5.1.1	Safety improvements could be achieved and robustness strengthened by installing additional power sources and / or additional instrumentation that is based on simple physical principles (e. g. passive temperature, pressure readers).	**19, 21, 23, 24, 27**

3.2.6 Shutdown Improvements

	Shutdown Improvements The enhancement of safety in shutdown states and mid-loop operation.	**Activity Action No.**
3.2.6.1	Recommendations from National Stress test Report	
3.2.6.1.1	**NPP Dukovany:** Prepare “shutdown SAMG” for shutdown / Severe accident in SFSP (tab.22)	**56**
3.2.6.1.2	**NPP Temelin:** Procedure for the isolation of the containment when in shutdown (tab.34)	**56**
3.2.6.1.3	**NPP Temelin:** Elaborate “SAMG shutdown” (fuel degradation with open reactor/in SFSP) (tab.36)	**56**
3.2.6.2	Recommendations from ENSREG Country Peer Review	
3.2.6.2.1	**For both NPPs:** Development of SAMGs for shutdown modes including open reactor and SFP accidents; (page 25.)	**56**
3.2.6.3	Luxembourg general peer review report	
3.2.6.3.1	Robustness could be increased through a systematic analysis of the shutdown state/mid-loop operation, in order to reduce or inhibit this operating mode and/or increase safety by adding dedicated hardware or procedures/drills (page 30).	**28**

3.2.7 Reactor Coolant Pump Seals

	Reactor Coolant Pump Seals The use of temperature-resistant (leak-proof) primary pump seals. Study of RCP pump seal leakage following long term AC power failure.	**Activity Action No.**
3.2.7.1	Luxembourg general peer review report	
3.2.7.1.1	Considering the use of temperature-resistant (leak-proof) primary pump seals in some of the designs (page 30.) Sealing of the RCPs is assured by high pressure water dependent on AC/DC power supplies. The existing studies of seals behaviour in case of loss of AC/DC confirmed long-term RCP seals tightness for VVER type RCPs.	**80**

3.2.8 Ventilation

Ventilation The enhancement of ventilation capacity during SBO to ensure equipment operability.		Activity Action No.
3.2.8.1	Recommendations from National Stress test Report	
3.2.8.1.1	**NPP Temelin:** Analysis of heat transfer from the I&C after losing the ESW (tab.34)	**25, 26, 29, 30**
3.2.8.2	Recommendations from ENSERG Country Peer Review	
3.2.8.2.1	**NPP Temelin:** Analysis of heat removal from I&C systems following a loss of ESW (page 17.)	**25, 26, 29, 30**
3.2.8.3	ENSREG -Follow-up fact finding site visit NPP Temelin	
3.2.8.3.1	Analysis of the heat removal from I&C systems following a loss of ESW (page 3.)	**25, 26, 29, 30**

3.2.9 Main and Emergency Control Rooms

Main and Emergency Control Rooms The enhancement of the main control room (MCR), the emergency control room (ECR) and emergency control centre (ECC) to ensure continued operability and adequate habitability conditions in the event of a station black-out (SBO) and in the event of the loss of DC (this also applies to Topic 3 recommendations). Habitability of control rooms/emergency centres under DEC conditions.		Activity Action No.
3.2.9.1	Recommendations from National Stress test Report	
3.2.9.1.1	**NPP Temelin:** Analysis of the radiation situation in the CR/ ECR in case of a severe accident (tab.36)	**58**
3.2.9.2	Recommendations from ENSREG Country Peer Review	
3.2.9.2.1	**For both NPPs:** The main control rooms (MCR) and the emergency control rooms (ECR) are equipped with emergency filtered ventilation systems and are shielded and protected sufficiently against radiation. The habitability of the MCR and ECR in case of containment failure during a severe accident has not been analysed. Finally, it is recognized that not all systems used under SAM are designed to withstand earthquakes. It is recommended that the seismic resistance of the systems used for severe accident management should be further analysed. (page 21.)	**31, 58**

	Additional power sources and ventilation systems will be implemented at Dukovany and Temelin NPPs to ensure continued operability and adequate habitability conditions in the event of a station black-out.	

3.2.10 Spent Fuel Pool

Spent Fuel Pool The improvement of the robustness of the spent fuel pool (SFP).		**Activity Action No.**
3.2.10.1	Recommendations from National Stress test Report	
3.2.10.1.1	**NPP Dukovany:** The existing procedures prefer the way of filling the open reactor and SFSP by self-gravitation from XL trays (tab.17)	**15**
3.2.10.1.2	**NPP Dukovany:** Heat removal from SFSP by adding coolant and its accumulation in TH tanks (tab.17)	**15**
3.2.10.1.3	**NPP Dukovany:** Prepare “shutdown SAMG” for shutdown / Severe accident in SFSP (tab.21)	**56**
3.2.10.1.4	**NPP Dukovany:** Completion of measurements of the Ra situation and the status of SFSP (tab.21)	**27**
3.2.10.1.5	**For both NPPs:** Alternative water supply for SG/SFSP/I.C (in case of I.C leakage) (tab.34)	**15**
3.2.10.1.6	**NPP Temelin:** Transfer of heat from the SFSP without an additional water supply (tab.34)	**81**
3.2.10.1.7	**NPP Temelin:** Elaborate “SAMG shutdown” (fuel degradation in open reactor/in SFSP) (tab.36)	**56**
3.2.10.2	Recommendations from ENSREG Country Peer Review	
3.2.10.2.1	**NPP Dukovany:** Filling an open reactor and spent fuel pool (SFP) by gravity drainage from bubbler condenser trays (page 17.)	**15**
3.2.10.2.2	**NPP Dukovany:** Removal of heat from the coolant in the SFP by means of coolant replenishment and its accumulation in emergency cooling water tanks (TH-system)	**15**

3.2.10.2.3	**NPP Dukovany:** Extensive damage mitigation guidelines for the use of alternative means	**53**
3.2.10.2.4	**NPP Dukovany:** Improvement of the crisis plans and SAM documentation (e.g., providing SAMG for shutdown states and spent fuel pool accidents) (page 23.)	**56**
3.2.10.2.5	**NPP Temelin:** Alternative replenishment of water to steam generator/SFP/primary circuit (with unsealed primary circuit) (page 17.)	**16**
3.2.10.2.6	**For both NPPs:** Accidents during shutdown states and occurring at the SFP are not addressed in the existing SAMGs, but will be available by 2014. It is recommended that SUJB considers how to monitor the implementation. (page 26.)	**56**
3.2.10.3	Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the CNS	
3.2.10.3.1	Installing additional equipment and instrumentation in spent fuel pools to ensure cooling can be maintained or restored in all circumstances, or performing additional technical evaluations to determine if additional equipment and instrumentation are needed. (page 6.)	**27, 32**

3.2.11 Separation and Independence

Separation and Independence The enhancement of the functional separation and independence of safety systems.		**Activity Action No.**
3.2.11.1	Recommendations from National Stress test Report	
3.2.11.1.1	**NPP Dukovany:** Implementation of measures for diversified means of the ultimate heat sink (to CT) (tab.17)	**33**
3.2.11.2	Recommendations from ENSREG Country Peer Review	

3.2.11.2.1	**NPP Dukovany:** In Dukovany NPP there are 4 wet cooling towers for twin units, which serve as heat sink for service water and also for essential service water (TVD) systems. Cooling towers are not qualified as safety components. This issue was recognized during the last periodic safety review in 2009, and is being addressed by the project "Separation of safety systems from operational systems" (No. 5983). As it was discussed during the country visit, this safety improvement project is currently in design phase; the hardware modification is scheduled from 2015 to 2017. It is recommended, that the regulator considers how to ensure this is resolved effectively. (page 15.)	**33**

3.2.12 Flow Path and Access Availability

Flow Path and Access Availability The verification of assured flow paths and access under SBO conditions. Ensure that the state in which isolation valves fail and remain, when motive and control power is lost, is carefully considered to maximise safety. Enhance and extend the availability of DC power and instrument air (e. g. by installing additional or larger accumulators on the valves). Ensure access to critical equipment in all circumstances, specifically when electrically operated turnstiles are interlocked.		**Activity Action No.**
3.2.12.1	Recommendations from National Stress test Report	
3.2.12.1.1	**NPP Dukovany:** Ensuring alternative source of electricity for shelters and telephone exchanges (tab.16)	**34**
3.2.12.1.2	**NPP Dukovany:** Ensuring sufficient personnel during long-term SBO (tab.16)	**37, 40**
3.2.12.1.3	**NPP Temelin:** Securing a sufficient number of staff in case of a long-term SBO (tab.34)	**36, 41**
3.2.12.2	ENSREG -Follow-up fact finding site visit NPP Temelin	
3.2.12.2.1	Valves power reconnection to batteries for containment isolation during SBO (page 4.)	**82**
3.2.12.3	Luxembourg general peer review report	
3.2.12.3.1	Robustness could be enhanced by systematically analysing the consequences and, as necessary, changing the logic to ensure safety is carefully considered and maximised (page 30).	**83**

3.2.13 Mobile Devices

Mobile Devices The provision of mobile pumps, power supplies and air compressors with prepared quick connections, procedures, and staff training with drills.		**Activity Action No.**
3.2.13.1	Recommendations from National Stress test Report	
3.2.13.1.1	**NPP Dukovany:** Ensuring additional supply source for systems SPS I. category and selected consumer appliances SPS II. category (tab.16)	**18, 38**
3.2.13.1.2	**NPP Dukovany:** Ensuring additional sources for water supply including corresponding procedures and guidelines and availability of trained and qualified personnel (tab.16)	**38**
3.2.13.1.3	**NPP Dukovany:** Ensuring alternative source of electricity for shelters and telephone exchanges (tab.16)	**34**
3.2.13.1.4	**NPP Dukovany:** Ensuring alternative source of electricity for the TSPP supply (tab.16)	**34**
3.2.13.1.5	**NPP Temelin:** Alternative supply of diesel fuel from a tank truck for long-term operation of the DG (tab.34)	**22**
3.2.13.1.6	**NPP Temelin:** Alternative water supply for SG/SFSP/I.C (in case of I.C leakage) including corresponding procedures and guidelines and availability of trained and qualified personnel (tab.34)	**16, 36, 41**
3.2.13.1.7	**NPP Temelin:** Alternative source for recharging accumulator batteries and supplying selected appliances (tab.34)	**21**
3.2.13.2	Recommendations from ENSREG Country Peer Review	
3.2.13.2.1	**For both NPPs:** In particular, the following measures have to be implemented: providing mobile (portable) equipment for ensuring feasibility of the SAM actions (page 25.)	**38, 39**
3.2.13.2.2	**For both NPPs:** • increase robustness of storage building structures for mobile devices including fire trucks, or relocation of equipment (page 25.)	**1, 2, 3**

3.2.13.3	Luxembourg general peer review report	
3.2.13.3.1	That the design for storage of mobile equipment to perform necessary safety functions should take account of external events at the design and beyond design levels, to ensure appropriate availability in the event of being required following a significant external event. Similar considerations apply for external hazards robustness of on-site centres for SAM. (§ 5.3.9)	**1, 2, 3**
3.2.13.3.2	Availability of a variety of mobile devices, with prepared quick connections, procedures on how to connect and use and staff training for deployment of such equipment. It is important that the equipment is to be stored in locations that are safe and secure even in the event of general devastation caused by events (significantly) beyond the design basis. Mobile sources of power would enable the use of existing equipment; mobile pumps would enable direct feeding of the primary or secondary side, even using alternative sources of water. Mobile battery chargers or mobile DC power sources will allow extended use of instrumentation and operation of controls. Fire-fighting equipment, including fire trucks, diesel pumps, generators, emergency lighting, etc., is normally readily available at the plants. Engineered and prepared connections as well as drills on the use of this equipment significantly add to the robustness for BDB events. (§6.3.1)	**13, 14, 38, 39, 42, 43**

3.2.14 Bunkered/Hardened Systems

Bunkered/Hardened Systems The provision for a bunkered or "hardened" system to provide an additional level of protection with trained staff and procedures designed to cope with a wide variety of extreme events including those beyond the design basis (this also applies to Topic 3 recommendations).		**Activity Action No.**
3.2.14.1	Recommendations from National Stress test Report	
3.2.14.1.1	**NPP Dukovany:** Alternative means of communications after a seismic event (tab.10)	**57**
3.2.14.1.2	**NPP Dukovany:** Analysis regarding threat to shelters in the case of floods (tab.11)	**9**
3.2.14.1.3	**NPP Temelin:** Analysis of the threat to the shelters in case of a seismic event (tab.30)	**45,**
3.2.14.1.4	**NPP Temelin:** Analysis of the threat to the shelters in case of floods (tab.31)	**9, 60**
3.2.14.2	Recommendations from ENSREG Country Peer Review	

3.2.14.2.1	**For both NPP:** Some modifications to emergency procedures and analyses regarding the usability of the shelters under flooding conditions are foreseen. (page 10)	**9, 60**
3.2.14.2.2	**NPP Temelin:** Increasing the protection of the diesel fuel pumps against the effects of flooding and also an alternative shelter is to be set up for the emergency response organization when the dedicated emergency response centre is damaged due to some external hazard. (page 10)	**9**
3.2.14.3	Luxembourg general peer review report	
3.2.14.3.1	That some countries have proposed to develop a “hardened core” of selected safety systems protected against extreme hazards. (§ 5.3.8)	**1, 2, 3, 8, 9, 15, 16, 17, 18, 19, 20, 21**
3.2.14.3.2	Within the stress tests evaluation the bunkered system proved its worth in ensuring an additional level of protection, able to cope with a variety of initiators, including those beyond the design basis. The concept is taken even further in the form of the "hardened core" where in addition to equipment, trained staff and procedures designed to cope with a wide variety of extreme events will be available. (§ 6.3.4)	**15, 16, 17, 18, 19**

3.2.15 Multiple Accidents

Multiple Accidents The enhancement of the capability for addressing accidents occurring simultaneously on all plants of the site and consideration of the site as a whole for a multi-units site in the safety assessment.		**Activity Action No.**
3.2.15.1	Recommendations from National Stress test Report	
3.2.15.1.1	**NPP Dukovany:** Ensuring of sufficient amount of staff after a seismic event (tab.10)	**40, 41**
3.2.15.1.2	**NPP Dukovany:** Ensuring sufficient personnel during long-term SBO (tab.16)	**40, 41**
3.2.15.1.3	**NPP Dukovany:** Preparation of the procedure for the loss of UHS and ESW systems on all 4 units (tab.17)	**53**

3.2.15.1.4	**NPP Dukovany:** Extending existing procedures with the procedure for filling SG of all four units by fire extinguishing technology (tab.17)	**13**
3.2.15.1.5	**NPP Dukovany:** Ensuring staffing of CR (tab.21)	**37**
3.2.15.1.6	**NPP Temelin:** Security of the staff after a seismic event (tab.30)	**52, 60**
3.2.15.1.7	**NPP Temelin:** Access to buildings, accessibility for heavy machinery (tab.30)	**53, 60**
3.2.15.1.8	**NPP Temelin:** Ensuring safety and operational staff in case of extreme events (tab.33)	**36, 37, 40, 41**
3.2.15.1.9	**NPP Temelin:** Procedure for restoring the power supply after an SBO in all units (tab.34)	**18, 19**
3.2.15.1.10	**NPP Temelin:** Analyses of the possibility of shift staff in case of an SBO in both units (tab.34)	**36, 37**
3.2.15.2	Recommendations from ENSREG Country Peer Review	
3.2.15.2.1	**NPP Dukovany:** Develop a procedure for the loss of UHS and ESW systems in all 4 units (page 17.)	**53**
3.2.15.2.2	**NPP Temelin:** As it has been already mentioned, nearly all severe accident management measures are dependent on AC power by relying on battery back-up power, local manual operations, diesel generators, pumps, etc. If the power supply in both Units is lost, the shift personnel could also be overloaded by activities related to restoring the power supply. This means that the capacity of the personnel on-site would not be sufficient to cope with the multi-Unit accidents. Further measures are foreseen. (page 23.)	**36, 37, 40, 41**
3.2.15.2.3	**NPP Temelin:** Develop a procedure for the loss of UHS and ESW systems in both units (page 17.)	**53**
3.2.15.2.4	**For both NPPs:** In particular, the following measures have to be implemented: further analyses of the impacts from the infrastructure damages, multiple Unit accidents etc on the SAM and emergency response provisions. (page 25)	**44, 51**
3.2.15.3	Luxembourg general peer review report	

3.2.15.3.1	The stress tests evaluation identified issues and consequently led to improvements in preparedness for the events that could affect multiple units. Previously, the multi-unit site protections were sometimes designed to cope with a serious challenge facing one of the units. During the stress tests, it was identified that robustness could be enhanced if additional equipment and trained staff were to be made available to deal with events affecting all the units on one site. While the process of improvement is not yet completed, it has been initiated on many sites. (§ 6.3.5)	**38, 39, 40, 41, 42, 43**

3.2.16 Equipment Inspection and Training Programs

Equipment Inspection and Training Programs The establishment of regular programs for inspections to ensure that a variety of additional equipment and mobile devices are properly installed and maintained, particularly for temporary and mobile equipment and tools used for mitigation of BDB external events. Development of relevant staff training programmes for deployment of such devices.		**Activity Action No.**
3.2.16.1	Recommendations from National Stress test Report	
3.2.16.1.1	**NPP Dukovany:** Introduction of TSC training in the area of severe accidents (tab.21)	**55**
3.2.16.1.2	**NPP Temelin:** Verification of the system functions in beyond design basis operating states (tab.36)	**51**
3.2.16.2	Recommendations from ENSREG Country Peer Review	
3.2.16.2.1	**NPP Dukovany:** In the area of abilities to manage severe accidents opportunities were identified to increase the safety. This concerns administrative solutions, personnel area as well as hardware. The key proposed measures include: • enhancement of the staff training in SAM field (page 23.)	**55, 56**
3.2.16.2.2	**NPP Temelin:** To manage severe accidents there are still opportunities to increase the safety. This concerns administrative solutions, personnel area as well as hardware. The key proposed measures by the regulatory authority include: • enhancement of the staff training in SAM field (page 23.)	**55**
3.2.16.2.3	**For both NPPs:** • Implement system for periodic verification of operability of new mobile equipment • Implement system for training of new mobile equipment usage	**42, 43**

3.2.17 Further Studies to Address Uncertainties

Further Studies to Address Uncertainties The performances of further studies in areas were there are uncertainties. Uncertainties may exist in the following areas: · The integrity of the SFP and its liner in the event of boiling or external impact. · The functionality of control equipment (feedwater control valves and SG relief valves, main steam safety valves, isolation condenser flow path, containment isolation valves as well as depressurisation valves) during the SBO to ensure that cooling using natural circulation would not be interrupted in a SBO. · The performance of additional studies to assess operation in the event of widespread damage, for example, the need different equipment (e.g. bulldozers) to clear the route to the most critical locations or equipment. This includes the logistics of the external support and related arrangements (storage of equipment, use of national defence resources, etc.).		**Activity Action No.**
3.2.17.1	Recommendations from National Stress test Report	
3.2.17.1.1	**NPP Dukovany:** Analyses: Seismic resistance of LFRU building (tab.10)	**2**
3.2.17.1.2	**NPP Dukovany:** Analyses: Seismic PSA (tab.10)	**4, 70**
3.2.17.1.3	**NPP Dukovany:** Analyses: Analysis regarding threat to shelters in the case of floods (tab.11)	**9, 50**
3.2.17.1.4	**NPP Dukovany:** Analyses: Resistance of civil structures (LFRU, CPS, MPU, etc.) to extreme conditions (tab.15)	**1, 2**
3.2.17.1.5	**NPP Dukovany:** Analyses: To work out methods of evaluation of external effects, verification of analyses performed, possible technical measures (tab.15)	**12**
3.2.17.1.6	**NPP Dukovany:** Analyses: Analysis of the discharging time of accumulator batteries for the unit for releasing the load, revize OIs , changing the connection and operation of emergency lighting (tab.16)	**75**
3.2.17.1.7	**NPP Dukovany:** Analyses: The collection of cooling from SFSP by adding coolant and accumulation in TH tanks (tab.17)	**15**
3.2.17.1.8	**NPP Temelin:** Analyses: Resilience of the LFRU (local fire rescue unit) to seismicity (tab.30)	**3**

3.2.17.1.9	**NPP Temelin:** Analyses: Access to buildings, accessibility for heavy machinery (tab.30)	**53, 60**
3.2.17.1.10	**NPP Temelin:** Analyses: Analysis of the threat to the shelters in case of floods (tab.31)	**9, 60**
3.2.17.1.11	**NPP Temelin:** Analyses: Elaborating methodology for assessing external effects, verification of analyses carried out, possible technical measures (tab.33)	**12, 44, 52**
3.2.17.1.12	**NPP Temelin:** Analyses: Analysis of heat removal from I&C after losing the ESW (tab.34)	**26**
3.2.17.1.13	**NPP Temelin:** Analyses: Analysis of the discharging period of the accumulator batteries in case of a controlled reduction of the load, revision of procedures (tab.34)	**75**
3.2.17.1.14	**NPP Temelin:** Analyses: Transfer of heat from the SFSP without an additional water supply (tab.34)	**81**
3.2.17.1.15	**NPP Temelin:** Analyses: Analyses of the possibility of shift staff in case of an SBO in both units (tab.34)	**36, 41**
3.2.17.1.16	**NPP Temelin:** Analyses: Localization of melt outside the RPV (tab.36)	**49**
3.2.17.1.17	**NPP Temelin:** Analyses: Analysis of the radiation situation in the CR/ ECR in case of a severe accident (tab.36)	**58**
3.2.17.1.18	**NPP Temelin:** Analyses: Analyse the possibility and various alternatives of modifications to complete the original containment design with the feasible venting option for the case of severe accidents (Type II). (page 299.)	**49**
3.2.17.2	Recommendations from ENSREG Country Peer Review	
3.2.17.2.1	**For both NPPs:** In particular, the following measures have to be implemented: Further analyses of the impacts from the infrastructure damages, multiple Unit accidents etc on the SAM and emergency response provisions. (page 25.)	**44, 51, 61**

3.3 Topic 3 - Severe accident management

Severe accident management

The objectives of managing (control) accidents in both NPPs are to ensure the 4th level of defence-in-depth protection (to limit consequences after the origination of an accident). This level is followed by the 5th level of defence-in-depth related to the emergency preparedness of the NPP as the (mitigate consequences of accidents with releases of Ra substances). Both NPPs have implemented a system for managing accidents for ensuring the 4th level of defence-in-depth protection and the system of emergency preparedness for ensuring the 5th level of defence-in-depth protection. The functioning of the mutually linked systems for managing accidents and accident preparedness is ensured by the comprehensive set of measures of personnel, administrative and technical character.

Hydrogen mitigation in containment

Containments of NPP Dukovany units are fitted with a system for liquidating post accident hydrogen which is solely designed for design basis accidents. For the LOCA accidents, where only a very low volume of hydrogen is produced, there are 17 hydrogen recombiners available in the containment. Enhancement of the robustness of the NPP Dukovany for severe accidents was decided after the Periodic Safety Review in 2006. In the final phase of the preparation, there is a project for the construction of the system for effective liquidation of hydrogen which will be able to manage hypothetically originated hydrogen in the case of the worst scenario (in terms of the production of hydrogen) of a severe accident. The current analyses and experience from other VVER confirmed that such a system consisting of powerful re-combiners (approx 30 pieces) completed with burners in the case of functioning spray system, can restrict the risk of the flame spreading and exclude the risk of the detonation. (National report, page 146)

The containments in the Temelín NPP are equipped with a post-accident hydrogen liquidation system, designed for design basis accidents. This system contains passive autocatalytic recombiners and it is able to dispose hydrogen released during accidents for a long period of time, thus keeping the concentration of hydrogen low enough to prevent its combustion – but only during design basis accidents. The existing hydrogen management system might not be sufficient for severe accidents. However, a project is currently being prepared that involves the installation of a hydrogen management system to liquidate hydrogen produced during severe accidents. (National report, page 275)

Containment overpressure

The purpose of the design function of the containment in NPP Dukovany is to prevent the release of Ra substances into the environment, or to restrict the radiation consequences of the accident in the surroundings. The containment represents the last barrier against release and is independent of the other barriers. The function of the containment is ensured by the construction and the structure which definitely resists design over-pressure of 150 kPa and with most probability, double over-pressure. The tightness of the containment is regularly inspected (within the PERIZ tightness test) and measures are taken to maintain or to increase the tightness. (National report, page 146)

The integrity of the containments within the Temelín NPP is ensured by the following systems:
- Containment isolation system – separating valves automatically closed when the pressure in the containment increases. Operability depends on power supply.
- System for pressure reduction in the containment – spray pumps and supply tanks with chemical reagents capturing post-accident iodine. The operability depends on the power supply.
- Post-accident hydrogen management system – passive auto-catalytic recombiners, designed for design basis accidents – does not require a power supply. (National report, page 276)

3.3 Topic 3 - Severe accident management

3.3.1 WENRA Reference Levels

No.	Recommendations	Activity Action No.
WENRA Reference Levels The incorporation of the WENRA reference levels related to severe accident management (SAM) into their national legal frameworks, and ensure their implementation in the installations as soon as possible.		
3.3.1.1	Luxembourg general peer review report	
3.3.1.1.1	In response to their previous commitments, regulators should incorporate the WENRA reference levels related to SAM into their national legal frameworks, and ensure then implementation as soon as possible. (§ 7.3.2)	**62**

3.3.2 SAM Hardware Provisions

No.	Recommendations	Activity Action No.
SAM Hardware Provisions Adequate hardware provisions that will survive external hazards (e.g. by means of qualification against extreme external hazards, storage in a safe location) and the severe accident environment (e.g. engineering substantiation and/or qualification against high pressures, temperatures, radiation levels, etc), in place, to perform the selected strategies.		
3.3.2.1	Recommendations from National Stress test Report	
3.3.2.1.1	**NPP Dukovany:** Increase of the capacity of the system for the liquidation of emergency hydrogen (tab.22)	**46**
3.3.2.1.2	**NPP Dukovany:** Cooling of the melt from the outside of RPV (tab.22)	**48**
3.3.2.1.3	**NPP Dukovany:** Oxygen regeneration in shelters (tab.21)	**60**
3.3.2.1.4	**NPP Temelin:** Alternative supply of water into the containment reservoir (tab.36)	**16**

3.3.2.1.5	**NPP Temelin:** System for the liquidation of hydrogen in the containment in case of a severe accident (tab.36)	**47**
3.3.2.2	Recommendations from ENSREG Country Peer Review	
3.3.2.2.1	**For both NPPs:** • Re-criticality The normal procedure is to feed borated water into the reactor coolant system. For some circumstances the SAMGs at both sites (Temelin and Dukovany) include the strategies allowing injection of non-borated water into the reactor as a last possibility to cool the fuel or debris at in-vessel phase of severe accident progression. As it has been clarified during the country visit the possibility of re-criticality has been considered by the NPPs and has been excluded based on certain qualitative considerations, although no dedicated detailed analyses have been performed. It is recommended that regulatory authority considers the need of requesting additional investigations of the potential for re-criticality for the correspondent SAM strategies. (page 21.)	**61**
3.3.2.2.2	**For both NPPs:** • Control rooms: The main control rooms (MCR) and the emergency control rooms (ECR) are equipped with emergency filtered ventilation systems and are shielded and protected sufficiently against radiation. The habitability of the MCR and ECR in case of containment failure during a severe accident has not been analysed. Finally, it is recognized that not all systems used under SAM are designed to withstand earthquakes. It is recommended that the seismic resistance of the systems used for severe accident management should be further analysed. (page 21.)	**58, 31, 51**

3.3.2.2.3	**For both NPPs:** In particular, the following measures have to be implemented: • alternative containment sump water make up (Temelin) • selection and implementation of appropriate solution for protecting containment from the overpressure loads; • providing mobile (portable) equipment for ensuring feasibility of the SAM actions; • ex-vessel cooling at Dukovany NPP • cooling of molten core is still an open issue for Temelin NPP • installation of additional recombiners sufficient for severe accident conditions at Temelin and Dukovany NPPs A filtered venting system to protect the containment against loss of integrity and to reduce significantly the releases of radioactivity to the environment should be analysed in order to determine any appropriate modifications for all units at Temelin NPP and for all units at Dukovany NPP. The current system is not designed for severe accident conditions. The filtered venting system would limit a long-term containment over pressurization resulting from accumulation of non-condensable gases and decay heat, generated inside the containment in case of a severe accident. Implementation of the measures identified during stress tests and recommended during peer review of the national report will ensure robustness of the SAM arrangements of the Dukovany and Temelin NPPs. (page 25.)	**15, 16, 46, 47, 48, 49, 50**
3.3.2.3	Luxembourg general peer review report	
3.3.2.3.1	Effective implementation of SAM requires that adequate hardware provisions are in place to perform the selected strategies. (§ 7.3.3)	**51**
3.3.2.3.2	The means for maintaining containment integrity should in particular include depressurization of the reactor coolant system, prevention of damaging hydrogen explosions, and means of addressing long-term containment over-pressurization, such as filtered venting. (§ 7.3.4)	**46 – 50**
3.3.2.4	ENSREG -Follow-up fact finding site visit NPP Temelin	
3.3.2.4.1	Selection of appropriate strategy to protect containment against overpressure (filtered venting system is one option) (page 4.)	**49**
3.3.2.4.2	Installation of additional sufficient hydrogen recombiners for severe accident conditions (page 4.)	**47**
3.3.2.4.3	Instrumentation for SA harsh conditions (Analysis and measures) (page 4.)	**51**
3.3.2.4.4	Corium in/ex vessel cooling (page 4.)	**48, 49, 50**
3.3.2.5	Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the CNS	

3.3.2.5.1	Upgrading safety systems or installing additional equipment and instrumentation to enhance the ability of each nuclear power plant to withstand an unexpected natural event without access to the electrical power grid for an extended period of time, including for an external event affecting multiple units. (page 6.)	**13 – 27, 76**

3.3.3 Review of SAM Provisions Following Severe External Events

	Review of SAM Provisions Following Severe External Events The systematic review of SAM provisions focusing on the availability and appropriate operation of plant equipment in the relevant circumstances, taking account of accident initiating events, in particular extreme external hazards and the potential harsh working environment.	**Activity Action No.**
3.3.3.1	Recommendations from National Stress test Report	
3.3.3.1.1	**Both NPPs:** Verification of the system functions in beyond design basis operating states (tab.36)	**51**
3.3.3.2	Luxembourg general peer review report	
3.3.3.2.1	PSR should continue to be maintained as a powerful regulatory instrument for the continuous enhancement of defence-in-depth in general, and the provisions of SAM in particular. The lessons learned from the Fukushima accident and from the stress tests should be reflected in the scope of future PSRs. (§ 7.3.1)	**72**
3.3.3.2.2	A systematic review of SAM provisions should be performed, focusing on the availability and appropriate operation of plant equipment in the relevant circumstances, taking account of accident initiating events, in particular extreme external hazards and the potential harsh working environment. (§ 7.3.5)	**51**
3.3.3.2.3	The assessment of SAM provisions should take account of the need to work with a severely damaged infrastructure (i.e. in which the usual means of communication and access, etc. are disabled) of plant level, corporate-level and national-level aspects and of long-duration accidents affecting multiple units at the same time (on individual and nearby sites as appropriate). (§ 7.3.6)	**36, 37, 43, 52, 53, 40, 41, 57, 59, 77**
3.3.3.3	ENSREG -Follow-up fact finding site visit NPP Temelin	
3.3.3.3.1	Further analyses of the impacts from the infrastructure damages, multiple Unit accidents etc on the SAM and emergency response provisions. (page 4.)	**36, 37, 52, 53, 40, 41, 57, 59, 77**

3.3.3.4	Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the CNS	
3.3.3.4.1	Performing or planning an evaluation of the guidance that is to be used by the operator to manage emergency situations resulting from severe accidents caused by extreme natural phenomena at nuclear power plants, including for low power and shutdown states. These documents include emergency operating procedures to prevent core damage, severe accident management guidelines to prevent containment failure, and extensive damage mitigation guidelines to address accidents that result in fires or explosions that affect a large portion of a nuclear power plant. (page 6.)	**53, 56**

3.3.4 Enhancement of Severe Accident Management Guidelines (SAMG)

Enhancement of Severe Accident Management Guidelines (SAMG) In conjunction with the recommendation 2.4, the enhancement of SAMGs taking into account additional scenarios, including, a significantly damaged infrastructure, including the disruption of plant level, corporate-level and national-level communication, long-duration accidents (several days) and accidents affecting multiple units and nearby industrial facilities at the same time.		**Activity Action No.**
3.3.4.1	Recommendations from National Stress test Report	
3.3.4.1.1	**NPP Dukovany:** Prepare "shutdown SAMG" for shutdown / Severe accident in SFSP (tab.21)	**56**
3.3.4.1.2	**NPP Temelin:** Execute "SAMG shutdown" (fuel degradation with open reactor/in SFSP) (tab.36)	**56**
3.3.4.2	Recommendations from ENSREG Country Peer Review	
3.3.4.2.1	**For both NPPs:** development of SAMGs for shutdown modes including open reactor and SFP accidents; (page 25.)	**56**
3.3.4.3	ENSREG -Follow-up fact finding site visit NPP Temelin	
3.3.4.3.1	Developing extensive damage mitigation guidelines (page 3.)	**53**
3.3.4.3.2	Development of SAMGs for shutdown modes including open reactor, SFP accidents and multi unit accidents (page 4.)	**56**
3.3.4.4	Analysis of human resources, communication, personnel training and guidance during severe long term accidents (esp. multi-unit) and validation of effectiveness through exercises	**36, 37, 40, 41, 43, 54, 55, 57**

3.3.5 SAMG Validation

SAMG Validation The validation of the enhanced SAMGs.		**Activity Action No.**
3.3.5.1	Luxembourg general peer review report	
3.3.5.1.1	The SAMGs should be comprehensively validated taking due account of the potential long duration of the accident, the degraded plant and the surrounding conditions. Pre-planned SAM actions should be designed to function effectively and robustly for suitably lengthy periods following the initiating event. In most cases, durations of at least several days should be assumed for planning and assessment purposes. (§ 7.3.7)	**54**
3.3.5.2	Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the CNS	
3.3.5.2.1	Developing probabilistic safety assessments to identify additional accident management measures or changes in radiation protection measures for workers on the site that might be needed to perform necessary activities in the event of a severe accident. (page 6.)	**69**

3.3.6 SAM Exercises

SAM Exercises Exercises aimed at checking the adequacy of SAM procedures and organisational measures, including extended aspects such as the need for corporate and nation level coordinated arrangements and long-duration events.		**Activity Action No.**
3.3.6.1	Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the CNS	
3.3.6.1.1	Reviewing and updating national, regional, provincial, municipal and local emergency plans and conducting exercises to encourage greater coordination among the different organizations. (page 6.)	**55, 66**

3.3.7 SAM Training

SAM Training Regular and realistic SAM training exercises aimed at training staff. Training exercises should include the use of equipment and the consideration of multi-unit accidents and long-duration events. The use of the existing NPP simulators is considered as being a useful tool but needs to be enhanced to cover all possible accident scenarios.		**Activity Action No.**
3.3.7.1	Recommendations from National Stress test Report	

3.3.7.1.1	**NPP Dukovany:** Introduction of TSC training in the area of severe accidents (tab.21)	**55**
3.3.7.1.2	**NPP Temelin:** Appointing qualified and well-trained staff to the ERO (tab.36)	**55**
3.3.7.2	Recommendations from ENSREG Country Peer Review	
3.3.7.2.1	**NPP Dukovany:** The key proposed measures include: enhancement of the staff training in SAM field (page 23.)	**55**
3.3.7.2.2	**NPP Temelin:** To manage severe accidents there are still opportunities to increase the safety. This concerns administrative solutions, personnel area as well as hardware. The key proposed measures by the regulatory authority include: • enhancement of the staff training in SAM field (page 23.)	**55**
3.3.7.3	Luxembourg general peer review report	
3.3.7.3.1	Training and exercises aimed at checking the adequacy of SAM procedures and organisational measures should include testing of extended aspects such as the need for corporate and national level coordinated arrangements and long-duration events (§ 7.3.8)	**55**

3.3.8 Extension of SAMGs to All Plant States

Extension of SAMGs to All Plant States The extension of existing SAMGs to all plant states (full and low-power, shutdown), including accidents initiated in SFPs.		**Activity Action No.**
3.3.8.1	Recommendations from National Stress test Report	
3.3.8.1.1	**NPP Dukovany:** Prepare "shutdown SAMG" for shutdown / Severe accident in SFSP (tab.21)	**56**
3.3.8.1.2	**NPP Dukovany:** EDMG manuals for the use of alternative means (tab.21)	**53**
3.3.8.1.3	**NPP Temelin:** Execute "SAMG shutdown" (fuel degradation with open reactor/in SFSP) (tab.36)	**56**
3.3.8.1.4	**NPP Temelin:** EDMG manuals for the use of alternative means (tab.36)	**53**

3.3.8.2	Recommendations from ENSREG Country Peer Review	
3.3.8.2.1	**NPP Dukovany:** In the area of abilities to manage severe accidents opportunities were identified to increase the safety. This concerns administrative solutions, personnel area as well as hardware. The key proposed measures include: • improvement of the crisis plans and SAM documentation (e.g., providing SAMG for shutdown states and spent fuel pool accidents) (page 23.)	**56, 66**
3.3.8.2.2	**NPP Temelin:** To manage severe accidents there are still opportunities to increase the safety. This concerns administrative solutions, personnel area as well as hardware. The key proposed measures by the regulatory authority include: • improvement of the crisis plans and SAM documentation (e.g., providing SAMG for shutdown states and spent fuel pool accidents) (page 23.)	**56, 66**
3.3.8.2.3	**For both NPPs:** As a result of the stress tests several measures to increase the safety level of the NPPs were identified and will be analysed and implemented in the future. Although the exact list of actions, priorities and schedule of implementation of these measures are still being finalized by the licensee and the regulatory authority, some of them have been clearly specified in the national report. In particular, the following measures have to be implemented: • development of SAMGs for shutdown modes including open reactor and SFP accidents (page 25.)	**56**
3.3.8.2.4	**For both NPPs:** Accidents during shutdown states and occurring at the SFP are not addressed in the existing SAMGs, but will be available by 2014. It is recommended that SUJB considers how to monitor the implementation. (page 26.)	**56**

3.3.9 Improved Communications

Improved Communications The improvement of communication systems, both internal and external, including transfer of severe accident related plant parameters and radiological data to all emergency and technical support centre and regulatory premises.		**Activity Action No.**
3.3.9.1	Recommendations from National Stress test Report	
3.3.9.1.1	**NPP Dukovany:** Alternative means of communications after a seismic event (tab.10)	**57**

3.3.9.1.2	**NPP Dukovany:** Ensuring alternative means for warning and notification of NPP Dukovany personnel and inhabitants in EPZ (tab.21)	**57**
3.3.9.1.3	**NPP Dukovany:** Ensuring alternative source of electricity for safe places and telephone exchanges (tab.16)	**34**
3.3.9.1.4	**NPP Temelin:** Alternative means of communication after a seismic event (tab.30)	**57**
3.3.9.1.5	**NPP Temelin:** Alternative sources and means of communication after a seismic event (tab.34)	**35**
3.3.9.2	Recommendations from ENSREG Country Peer Review	
3.3.9.2.1	**NPP Dukovany:** In the area of abilities to manage severe accidents opportunities were identified to increase the safety. This concerns administrative solutions, personnel area as well as hardware. The key proposed measures include: additional technical measures (ensuring access to facilities, alternative communication means, etc). (page 23.)	**57**
3.3.9.2.2	**NPP Temelin:** To manage severe accidents there are still opportunities to increase the safety. This concerns administrative solutions, personnel area as well as hardware. The key proposed measures by the regulatory authority include: • additional technical measures (ensuring access to facilities, alternative communication means, etc). (page 23.)	**57, 59, 60**
3.3.9.3	ENSREG -Follow-up fact finding site visit NPP Temelin	
3.3.9.3.1	Emergency response provisions such as providing long term communication, alternative means (cell phones, radios, limited wire telephone) etc. (page 3.)	**57**
3.3.9.4	Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the CNS	
3.3.9.4.1	Improving their radiation monitoring and communications capabilities and enhancing public communications, such as via dedicated public websites. (page 6.)	**63**

3.3.10 Presence of Hydrogen in Unexpected Places

Presence of Hydrogen in Unexpected Places The preparation for the potential for migration of hydrogen, with adequate countermeasures, into spaces beyond where it is produced in the primary containment, as well as hydrogen production in SFPs.		Activity Action No.
3.3.10.1	Recommendations from National Stress test Report	
3.3.10.1.1	**NPP Dukovany:** Increase of the capacity of the system for the liquidation of emergency hydrogen (tab.22)	**61**
3.3.10.1.2	**NPP Dukovany:** Prepare “shutdown SAMG” for shutdown / Severe accident in SFSP (tab.22)	**56**
3.3.10.1.3	**NPP Temelin:** System for the liquidation of hydrogen in the containment in case of a severe accident (tab.36)	**47, 61**
3.3.10.2	Recommendations from ENSREG Country Peer Review	
3.3.10.2.1	**For both NPPs:** installation of additional recombiners sufficient for severe accident conditions at Temelin and Dukovany NPPs (page 25.)	**46, 47**

3.3.11 Large Volumes of Contaminated Water

Large Volumes of Contaminated Water The conceptual preparations of solutions for post-accident contamination and the treatment of potentially large volumes of contaminated water.		Activity Action No.
3.3.11.1	Luxembourg general peer review report	
3.3.11.1.1	When developing SAM action plans, conceptual solutions for post-accident fixing of contamination and the treatment of potentially large volumes of contaminated water should be addressed. (§ 7.3.9)	**68**

3.3.12 Radiation Protection

Radiation Protection The provision for radiation protection of operators and all other staff involved in the SAM and emergency arrangements.		Activity Action No.
3.3.12.1	Recommendations from National Stress test Report	

3.3.12.1.1	**NPP Dukovany:** Completion of measurements of the Ra situation and the status of SFSP (tab.21)	**27, 32**
3.3.12.1.2	**NPP Temelin:** Analysis of the radiation situation in the CR/ ECR in case of a severe accident (tab.36)	**58**
3.3.12.1.3	**NPP Temelin:** Connecting isolation valves of the containment ventilation system to the accumulator batteries (tab.34)	**82**
3.3.12.2	Recommendations from ENSREG Country Peer Review	
3.3.12.2.1	**For both NPPs:** The main control rooms (MCR) and the emergency control rooms (ECR) are equipped with emergency filtered ventilation systems and are shielded and protected sufficiently against radiation. The habitability of the MCR and ECR in case of containment failure during a severe accident has not been analysed. Finally, it is recognized that not all systems used under SAM are designed to withstand earthquakes. It is recommended that the seismic resistance of the systems used for severe accident management should be further analysed (page 21.)	**58**
3.3.12.3	Luxembourg general peer review report	
3.3.12.3.1	Radiation protection of operators and all other staff involved in the SAM and emergency arrangements should be assessed and then ensured by adequate monitoring, guaranteed habitability of the facilities (hardened on-site emergency response facility with radiation protection) needed for accident control, and suitable availability of protective equipment and training. (§ 7.3.10)	**58, 59, 60**

3.3.13 On Site Emergency Centre

On Site Emergency Centre The provision of an on-site emergency centre protected against severe natural hazards and radioactive releases, allowing operators to stay onsite to manage a severe accident.		**Activity Action No.**
3.3.13.1	Recommendations from National Stress test Report	
3.3.13.1.1	**NPP Dukovany:** To ensure working of emergency response units in case of unavailability of ECC (tab.10)	**59**
3.3.13.1.2	**NPP Dukovany:** Ensuring the functioning of emergency response elements in the case of non-accessibility of ECC (tab.16)	**59**

3.3.13.1.3	**NPP Temelin:** OER (organization of emergency response) ability outside the ECC (emergency control centre) (tab.30)	**59**
3.3.13.1.4	**NPP Temelin:** Ability of the OER to function via the ECC (tab.31)	**59**
3.3.13.1.5	**NPP Temelin:** Ability of the ERO to function outside the ECC (tab.36)	**59**
3.3.13.2	Recommendations from ENSREG Country Peer Review	
3.3.13.2.1	**For both NPPs:** Control rooms: The main control rooms (MCR) and the emergency control rooms (ECR) are equipped with emergency filtered ventilation systems and are shielded and protected sufficiently against radiation. The habitability of the MCR and ECR in case of containment failure during a severe accident has not been analysed. Finally, it is recognized that not all systems used under SAM are designed to withstand earthquakes. It is recommended that the seismic resistance of the systems used for severe accident management should be further analysed. (page 21.)	**58**
3.3.13.3	Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the CNS	
3.3.13.3.1	Upgrading regional, off-site and on-site emergency response centres. (page 6.)	**59**

3.3.14 Support to Local Operators

Support to Local Operators Rescue teams and adequate equipment to be quickly brought on site in order to provide support to local operators in case of a severe situation.		**Activity Action No.**
3.3.14.1	Recommendations from National Stress test Report	
3.3.14.1.1	**NPP Dukovany:** Preparation of agreements with external elements (IRS, army) and nearby NPP. Organizational measures (tab.21)	**37**
3.3.14.1.2	**NPP Temelin:** Prepare agreements with external organisations (IRS, army) close to the NPP. Organizational measures (tab.36)	**36**
3.3.14.1.3	To consider the establishment of a common VVER operator centre for mutual aid in the case of severe accidents (Dukovany, Bohunice, Mochovce, Paks) (page 299.) Note:	**No action (see Note)**

	Establishment of VVER operators centre was not found feasible. Each operator is preparing necessary resources without cooperation with others.	
3.3.14.2	Recommendations from ENSREG Country Peer Review	
3.3.14.2.1	**NPP Dukovany:** In the area of abilities to manage severe accidents opportunities were identified to increase the safety. This concerns administrative solutions, personnel area as well as hardware. The key proposed measures include: completion of off-site places for their use as alternative location for SAM team (page 23.)	**59**

3.3.15 Level 2 Probabilistic Safety Assessments (PSAs)

Level 2 Probabilistic Safety Assessments (PSAs) A comprehensive Level 2 PSA as a tool for the identification of plant vulnerabilities, quantification of potential releases, determination of candidate high-level actions and their effects and prioritizing the order of proposed safety improvements. Although PSA is an essential tool for screening and prioritising improvements and for assessing the completeness of SAM implementation, low numerical risk estimates should not be used as the basis for excluding scenarios from consideration of SAM especially if the consequences are very high.		**Activity Action No.**
3.3.15.1	Recommendations from National Stress test Report	
3.3.15.1.1	**NPP Dukovany:** Seismic PSA (page 79.)	**70**
3.3.15.2	Luxembourg general peer review report	
3.3.15.2.1	Although PSA is an essential tool for screening and prioritising improvements and for assessing the completeness of SAM implementation, low numerical risk estimates should not be used as the basis for excluding scenarios from consideration of SAM especially if the consequences are very high. (§ 7.3.11)	**69, 70**

3.3.16 Severe Accident Studies

Severe Accident Studies The performance of further studies to improve SAMGs.		**Activity Action No.**
3.3.16.1	The availability of safety functions required for SAM under different circumstances.	**51, 61**

3.3.16.2	Accident timing, including core melt, reactor pressure vessel (RPV) failure, basement melt-through, SFP fuel uncover, etc.	**44, 61**
3.3.16.3	PSA analysis, including all plant states and external events for PSA levels 1 and 2.	**69, 70**
3.3.16.4	Radiological conditions on the site and associated provisions necessary to ensure MCR and ECR habitability as well as the feasibility of AM measures in severe accident conditions, multi-unit accidents, containment venting, etc.	**44, 58, 61**
3.3.16.5	Core cooling modes prior to RPV failure and of re-criticality issues for partly damaged cores, with un-borated water supply.	**44, 61**
3.3.16.6	Phenomena associated with cavity flooding and related steam explosion risks.	**44, 61**
3.3.16.7	Engineered solutions regarding molten corium cooling and prevention of basemat melt-through.	**49, 67**
3.3.16.8	Severe accident simulators appropriate for NPP staff training.	**55**
3.3.16.9	xCNS: Filtration efficiency; R&D related to: - In vessel corium retention - Hydrogen risk studies (e.g. large scale test…)	**48, 49, 67**

PART II

4. Issues from CNS EOM Group discussions

4.1 Topic 4 - National organisations

No.	Recommendations	Activity Action No.
4.1.1	Review and revision of nuclear Laws, Regulations and Guides. • Where the RB is constituted of more than one entity, it is important to ensure efficient coordination. • Emphasis on the need for comprehensive periodic reviews of safety, using state-of-the-art techniques. • To remind CP that national safety frameworks include the RB, TSO and Operating Organisations. - Wide participation in safety networks for operating organizations, RB and TSOs will strengthen them	62
4.1.2	Changes to functions and responsibilities of the RB. • Effective independence of the RB is essential, including the following aspects: - Transparency in communicating its regulatory decisions to the public. - Competent and sufficient human resources. - Adequate legal powers (e.g. suspend operation). - Financial resources	62
4.1.3	Importance of inviting IRRS missions, and to: • Effectively implement the findings • Make the findings and their means of resolution publicly available. • Invite follow -up missions.	71

4.1.4	Review and improvements to aspects of National EP&R • How to routinely exercise: - All involved organizations, up to ministerial level - Scenarios based on events at multi-unit sites • How to train intervention personal for potentially severe Accident conditions • Rapid intervention team to provide support to sites • Determination of the size of the EPZ is variable • Trans- border arrangements need to be further considered and exercised • The use of regional centres to provide support to sites • Education of the public and the media in aspects related to emergencies (e.g. radiation does and their effects)	66
4.1.5	Openness, transparency and communication improvements: • Communication with stakeholders is a continuous activity not just in an emergency • Active stakeholder engagement in the decision-making process builds public confidence • International bilateral cooperation can be beneficial (e.g. joint regulatory inspections) • The proper balance of understandable information provided to informed groups and the general public needs to be addressed • The transparency of the operators activities needs to be enhanced	63
4.1.6	Post- Fukushima safety reassessments and action plans: • All CP should perform a safety reassessment and the resolution of their findings should be progressed through a national action plan or other transparent means and should not be limited to NPPs in operation. • Established safety networks should be efficiently used by CP to disseminate and share relevant information.	72
4.1.7	Human and organizational factors (HOF): • There is a need to further develop human resource capacity and competence across all organizations in the field of nuclear safety • Governmental level commitment is needed to ensure along-term approach is developed for capacity building • Collaborative work is needed in the area of improving and assessing HOF, including safety culture. • The role of sub-contractors may be important; can they be hired quickly?	64

4.2 Topic 5 - Emergency Preparedness and Response

No.	Recommendations	Activity Action No.
4.2.1	Expansion of the set of scenarios on which the plan was based – NPP PLUS Infrastructure / NPP PLUS chemical plant	66
4.2.2	Increasing the scope of off-site exercise programs to reflect NPP plus external infrastructure simultaneous problems	66
4.2.3	Blending mobile resources into planning and drill programs	42, 43
4.2.4	Increasing emphasis on drilling with neighbouring countries	66
4.2.5	Exercising all interface points (national, regional, municipal,..)	66
4.2.6	Performing of longer term exercises to reflect the challenges of extreme events	66
4.2.7	Enhancing radiation monitoring and communication systems by additional diversification / redundancy	23, 24, 57
4.2.8	Development of a common source term estimation approach	See note at the end of the section 4.2
4.2.9	Provide access to a "big picture" (international picture) of radiological conditions	See note at the end of the section 4.2
4.2.10	Development of reference level for trans-border processing of goods and services such as container transport	See note at the end of the section 4.2
4.2.11	Re-examination of approach and associated limits to govern the "remediation" phase	See note at the end of the section 4.2

4.2.12	Develop criteria for the return to evacuated area and criteria for return to normal from emergency state	See note at the end of the section 4.2
4.2.13	Improvement of the approach to establish contamination monitoring protocols and locations during the recovery phase	See note at the end of the section 4.2
4.2.14	Hardening of support infrastructure (Emergency Response Centres, Sheltering facilities, essential support facilities (like Corporate Offices) with back-up power, environmental radiological filtering, etc.	34, 35
4.2.15	Analyzing medical and human aspects of response to support Emergency workers	See note at the end of the section 4.2
4.2.16	Implementation of processes to enable access to inter-country support including customs processes for access for diplomats and emergency response personal	See note at the end of the section 4.2
4.2.17	Systematic assessment of all aspects of organizations that contribute to emergency response using tools like job and task analysis	See note at the end of the section 4.2
4.2.18	Develop radiological reference levels for rescue and emergency response personnel in extreme events	See note at the end of the section 4.2
4.2.19	Develop reference levels for the application of immediate countermeasures such as sheltering, iodine distribution and evacuation	See note at the end of the section 4.2
	Note: Issues with no specific action are understood as topics where results of international cooperation (research, IAEA, WENRA, and other international organisations) shall be used in the Czech republic when will be available.	

4.3 Topic 6 - International Cooperation

No.	Recommendations	Activity Action No.
4.3.1	Strengthening the peer reviews process of CNS and of missions (IAEA, WANO and Industry) • Effectiveness of IAEA peer review processes should be reviewed in response to concerns raised by the public and Non Governmental Organizations. • The CNS national reports should include how peers review and mission findings have been addressed. • Processes and initiatives should be strengthened to ensure implementation of findings of the peer review and missions. • CNS review meetings should ensure robust peer reviews and reporting of peer review results and findings.	67
4.3.2	Strengthening the peer reviews process of CNS and of missions (IAEA, WANO and Industry) - continue • Plant design safety features and related modifications should be considered in WANO and OSART missions. • Better coordination of WANO and IAEA peer review activities should be established. • International experience gained from the review of Russian designs after Chernobyl could be considered as an example of good international practice.	67
4.3.3	Optimisation of the Global Safety Regime • Primary responsibility for safety remains with operators • The collective responsibility of the various institutions and organizations should be optimized • The growing number of international meetings, assessments, peer reviews and expanding mandates is placing high demands on existing human resources, which may become counter productive • Efforts should be continued to reduce duplication of initiatives and actions by various organizations such as IAEA, NEA, EU, WANO, etc. • The respective roles and objectives of the various organizations, institutions and missions should be recognized in the optimization process	67

4.3.4	Strengthening communication mechanisms through regional and bilateral cooperation • Initiatives relating to the Regional Crisis centre for operators of NPPs with VVER type reactors as being implemented by Moscow WANO Centre and also considered by some other vendor countries. • Bilateral agreements between vendor countries and new embarking countries, complemented by IAEA Standards and review processes, have been reported to be effective and should be encouraged. • Strong support of political leaders is important to establish the necessary nuclear safety infrastructure. • Countries with established nuclear programmes should assist with the establishment of nuclear and regulatory infrastructure. • Countries should cooperate with neighbouring and regional countries and exchange information on their civil nuclear power programmes.	67
4.3.5	Effectiveness of experience feedback mechanisms • Information exchange and feedback should be enhanced by using the established mechanisms (e.g. IRS, INES) and organisations (eg. WANO). • The sharing and utilisation of information is limited and not always necessarily well coordinated or disseminated. This has been identified as an area for improvement. • All nuclear power plants should share Operating Experience. • The current focus is on reporting events and not necessarily on learning from the events. Effectiveness of Operating Experience Feedback should be assessed and its implementation should be included in peer reviews.	67
4.3.6	Strengthening and expanded use of IAEA Safety Standards • The Safety Fundamentals remain appropriate as a sound basis for nuclear safety when properly implemented. • Implementation should strike the right balance between prevention and mitigation. • The IAEA Safety Standards should be taken into account in developing national nuclear safety regulations. • These Safety Standards have a role to play in seeking continuous improvements to safety at existing nuclear power plants.	62

Part III

5. Cross-cutting issues

No.	Recommendations	Activity Action No.
5.1 4.4.1	Public discussion of safety issues should be encouraged (Transparency)	63
5.2 4.4.2	An open and trustful relationship between regulators, operators and the public with keeping in mind their respective roles and functions is essential	65
5.3 4.4.3	Recognizing differences in national cultures, each CPs should define appropriate actions to ensure that the desired safety culture characteristics are achieved in the regulatory and operational organizations	64

PART IV

6. Implementation Activities - Actions

Action No.	Plant / Type	Topic	Action / Activity	Recommendation No.	Status	Completion
1	EDU/ PWR	natural hazards	Structures reinforcement against extreme climatic phenomena.	3.1.1.1.1, 3.1.1.1.2, 3.1.1.2.2, 3.1.1.2.3, 3.1.1.3.1, 3.1.8.1.5, 3.2.13.2.2, 3.2.13.3.1, 3.2.14.3.1, 3.2.17.1.4	in progress	2014
2	ETE/ PWR	natural hazards	Fire brigade building reinforcement Note: Mobile fire brigade equipment as temporary solution (Action 84).	3.1.1.1.14, 3.1.1.4.1, 3.2.13.2.2, 3.2.13.3.1, 3.2.14.3.1, 3.2.17.1.1, 3.2.17.1.4	in progress	2014
3	EDU/ PWR	natural hazards	Fire brigade building reinforcement Note: Mobile fire brigade equipment as temporary solution (Action 84).	3.1.1, 3.1.1.1.6, 3.1.1.2.3, 3.1.8.1.5, 3.2.13.2.2, 3.2.13.3.1, 3.2.14.3.1, 3.2.17.1.8	in progress	2015
4	EDU & ETE/ PWR	natural hazards	In the study PSA to evaluate the risk resulting from the induced floods or fires after the seismic event.	3.1.2, 3.1.3, 3.1.1.2.3 3.1.2.1.1, 3.1.2.2.1, 3.1.2.3.1, 3.1.3.1.1, 3.1.8.3.1, 3.2.17, 3.2.17.1.2	in progress	2014
5	EDU & ETE/ PWR	natural hazards	Ensuring the availability of regional weather forecasts and predictions for the shift engineer decision on the future operation and activities at the NPP.	3.1.3, 3.1.4.1.1	in progress	2013
6	EDU/ PWR	natural hazards	Implementation of internal seismic monitoring system.	3.1.5, 3.1.5.2.1	in progress	2014

7	EDU/ PWR	natural hazards	Completion of the procedures for managing extreme conditions in the site (wind, temperature, snow, earthquake).	3.1.6, 3.1.1.3, 3.1.6.1.1, 3.1.7.3.1, 3.1.8.1.2, 3.1.8.4.1, 3.2.1.2.7	finished	2013
8	ETE/ PWR	natural hazards	Completion of the procedures for managing extreme conditions in the site (wind, temperature, snow, earthquake).	3.1.6, 3.1.6.1.1, 3.1.7.3.1, 3.1.8.4.1, 3.2.1.2.7, 3.2.14.3.1	finished	2013
9	EDU & ETE/ PWR	natural hazards	Protection against flooding (Temelin Diesel generator station, Dukovany Emergency control centre).	3.1.7, 3.1.3.1.2, 3.1.7.1.2, 3.1.7.1.3, 3.1.7.1.6, 3.1.7.2.1, 3.1.7.2.2, 3.1.7.2.3, 3.1.7.2.4, 3.1.7.3.1, 3.1.7.4.1, 3.1.7.4.2, 3.2.14.1.2, 3.2.14.1.4, 3.2.14.2.1, 3.2.14.2.2, 3.2.14.3.1, 3.2.17.1.3	implemented	2012
10	EDU/ PWR	natural hazards	Hardening of entrances to the cable ducts against flooding – extreme rainfall.	3.1.7, 3.1.3.1.2, 3.1.7.2.3, 3.1.7.3.1	in progress	2013
11	EDU/ PWR	natural hazards	Hardening of entrances to the diesel generator station against flooding – extreme rainfall.	3.1.7, 3.1.3.1.2, 3.1.7.2.3, 3.1.7.1.3	in progress	2013
12	EDU & ETE/ PWR	natural hazards	Development of guidance on natural hazards assessments, including earthquake, flooding and extreme weather conditions, as well as corresponding guidance on the assessment of margins beyond the design basis and cliff-edge effects. Note: Worldwide action being performed under umbrella of WENRA and IAEA.	3.1.8, 3.1.8.1.6, 3.1.8.1.6, 3.1.8.1.9, 3.1.8.2.2, 3.1.8.3.2, 3.1.8.4.1, 3.2.17.1.5, 3.2.17.1.11	in progress	2015
13	EDU / PWR	design issues	Provision of back-up water supply into SG from external mobile equipment using external connection points.	3.2.1.1.1, 3.2.1.1.5, 3.2.1.2.3, 3.2.1.2.4, 3.2.1.2.8, 3.2.2.1.3, 3.2.13.3.2, 3.2.15.1.4, 3.3.2.5.1	implemented	2012
14	ETE / PWR	design issues	Provision of back-up water supply into SG from external mobile equipment using external connection points.	3.2.1.2.5, 3.2.1.2.6, 3.2.1.2.8, 3.2.1.4.1, 3.2.13.3.2, 3.3.2.5.1	in progress	2013
15	EDU / PWR	design issues	Provision of back-up coolant supply into depressurised reactor and storage pools with	3.2.1.1.2, 3.2.1.1.6, 3.2.1.1.7, 3.2.1.2.3, 3.2.1.3.1, 3.2.10.1.1,	in progress	2013-2014

			additional and sufficient sources of coolant.	3.2.10.1.2, 3.2.10.1.5, 3.2.10.2.1, 3.2.10.2.2, 3.2.14.3.1, 3.2.14.3.2, 3.2.17.1.7, 3.3.2.2.3, 3.3.2.5.1		
16	ETE / PWR	design issues	Provision of back-up coolant supply into depressurised reactor and storage pools with additional and sufficient sources of coolant.	3.2.1.1.11, 3.2.1.2.6, 3.2.1.3.1, 3.2.10.2.5, 3.2.13.1.6, 3.2.14.3.1, 3.2.14.3.2, 3.3.2.1.3, 3.3.2.5.1	in progress	2013-2014
17	EDU / PWR	design issues	Emergency cooling method – implementation of another emergency feedwater pump to SG.	3.2.1.2.4, 3.2.14.3.1, 3.2.14.3.2, 3.3.2.5.1	in progress	2013-2015
18	EDU / PWR	design issues	Implementation of additional stable source of power supply (SBO-DG) for subsequent increasing of resistant against „station blackout"scenario.	3.2.1.1.9, 3.2.1.1.10, 3.2.1.1.13, 3.2.1.2.8, 3.2.2.1.1, 3.2.2.1.2, 3.2.2.1.4, 3.2.2.1.5, 3.2.2.2.1, 3.2.2.3.1, 3.2.3.2.1, 3.2.13.1.1, 3.2.14.3.1, 3.2.14.3.2, 3.2.15.1.9, 3.3.2.5.1	in progress	2013-2014
19	ETE / PWR	design issues	Implementation of additional stable source of power supply (SBO-DG) for subsequent increasing of resistant against „station blackout" scenario.	3.2.1.2.8, 3.2.2.2.1, 3.2.2.3.1, 3.2.3.2.2, 3.2.3.3.1, 3.2.5.1.1, 3.2.14.3.1, 3.2.14.3.2, 3.2.15.1.9, 3.3.2.5.1	in progress	2013-2014
20	EDU / PWR	design issues	Implementation of alternative measures to ensure long term DC power supply in case of SBO, i. e., among the other measures, ensuring recharging of batteries in case SBO and implementation of measures to extend batteries discharging time.	3.2.1.2.4, 3.2.2.2.1, 3.2.3.1.1, 3.2.3.2.1, 3.2.14.3.1, 3.3.2.5.1	in progress	2012-2016
21	ETE / PWR	design issues	Implementation of alternative measures to ensure long term DC power supply in case of SBO, i. e., among the other measures, ensuring recharging of batteries in case SBO and implementation of measures to extend batteries discharging time.	3.2.2.2.1, 3.2.3.1.3, 3.2.3.1.4, 3.2.3.2.2, 3.2.3.3.1, 3.2.13.1.7, 3.2.14.3.1, 3.3.2.5.1	in progress	2013-2014
22	EDU&ETE / PWR	design issues	Provision of alternative fuel filling for long-term operation of DG including providing of fuel sources.	3.1.1.1.11, 3.1.8.1.7, 3.2.4.1.1, 3.2.4.2.1, 3.2.13.1.5, 3.3.2.5.1	in progress	2013

23	EDU / PWR	design issues, EP&R	Provision of alternative methods of monitoring of key parameters necessary for technological accidents management.	3.2.5.1.1, 3.3.2.5.1, 4.2.7	implemented	2012
24	ETE / PWR	design issues, EP&R	Provision of alternative methods of monitoring of key parameters necessary for technological accidents management.	3.2.5.1.1, 4.2.7, 3.3.2.5.1	in progress	2013
25	EDU / PWR	design issues	Provision of heat removal from the I&C systems for long-term monitoring of key parameters during SBO.	3.2.8.1.1, 3.2.8.2.1, 3.2.8.3.1, 3.3.2.5.1	in progress	2013-2015
26	ETE / PWR	design issues	Provision of heat removal from the I&C systems for long-term monitoring of key parameters during SBO.	3.2.1.1.12, 3.2.1.2.6, 3.2.8.1.1, 3.2.8.2.1, 3.2.8.3.1, 3.2.17.1.12, 3.3.2.5.1	in progress	2013-2015
27	EDU / PWR	design issues	Implementation of important measurements into post-accident monitoring system – the addition of RA situation measurement and SFP condition into PAMS.	3.2.5.1.1, 3.2.1.2.8, 3.2.10.1.4, 3.2.10.3.1, 3.3.2.5.1, 3.3.4.4, 3.3.12.1.1	in progress	2013-2015
28	ETE / PWR	design issues	Exclude the mid-loop modes of operation during shutdown unit state (organizational measure).	3.2.6.3.1	implemented	2012
29	EDU / PWR	design issues	Provision of heat removal from the key safety component during SBO.	3.2.8.1.1, 3.2.8.2.1, 3.2.8.3.1	in progress	2015
30	ETE / PWR	design issues	Provision of heat removal from the key safety component during SBO.	3.2.8.1.1, 3.2.8.2.1, 3.2.8.3.1	in progress	2015
31	EDU / PWR	design issues	Completion of the project of control rooms habitability.	3.2.9.2.1, 3.3.2.2.2	in progress	2015
32	EDU / PWR	design issues	Completion of SFP status parameters and the other important measurements into PAMS.	3.2.10.3.1, 3.3.12.1.1	in progress	2013-2015
33	EDU / PWR	design issues	Implementation of the ventilator towers for ensuring independent ultimate heat sink.	3.1.1.2.1, 3.1.1.2.3, 3.1.8.1.1, 3.1.8.2.1, 3.1.8.2.2, 3.2.1.1.3, 3.2.1.1.4, 3.2.1.2.1, 3.2.1.2.2, 3.2.1.2.3, 3.2.1.2.4, 3.2.11.1.1, 3.2.11.2.1	in progress	2014-2016

34	EDU / PWR	design issues, EP&R	Provision of back-up power supply of Security Technical Systems and shelters and power supply of telephone exchanges, communications, lighting, turnstiles.	3.2.2.1.4, 3.2.12.1.1, 3.2.13.1.3, 3.2.13.1.4, 3.3.9.1.3, 4.2.14	in progress	2013-2014
35	ETE / PWR	design issues, EP&R	Provision of back-up power supply of telephone exchanges, communications and radio network.	3.2.2.1.10, 3.3.9.1.5, 4.2.14	in progress	2013-2014
36	ETE / PWR	design issues	Ensuring long-term capacity of external technical and professional (off site) support for difficult technological extraordinary events	3.2.12.1.3, 3.2.13.1.6, 3.2.15.1.8, 3.2.15.1.10, 3.2.15.2.2, 3.2.17.1.15, 3.3.3.2.3, 3.3.3.3.1, 3.3.4.4, 3.3.14.1.2	in progress	2013
37	EDU / PWR	design issues	Ensuring long-term capacity of external technical and professional (off site) support for difficult technological extraordinary events	3.1.1.1.9, 3.2.12.1.2, 3.2.15.1.5, 3.2.15.1.8, 3.2.15.1.10 3.2.15.2.2, 3.3.3.2.3, 3.3.3.3.1, 3.3.4.4, 3.3.14.1.1	in progress	2013
38	EDU / PWR	design issues	Provision of alternative mobile devices for alternative fluids pump and provision of power supply	3.2.1.3.1, 3.2.13.1.1, 3.2.13.1.2, 3.2.13.2.1, 3.2.13.3.2, 3.2.15.3.1	in progress	2014
39	ETE / PWR	design issues	Provision of alternative mobile devices for alternative fluids pump and provision of power supply	3.2.1.3.1, 3.2.13.2.1, 3.2.13.3.2, 3.2.15.3.1	in progress	2014
40	EDU / PWR	design issues	Ensuring sufficient capacity and expertise of on-site personnel for multi-unit long term accidents and for the whole site affected	3.1.1.1.9 , 3.1.8.1.4, 3.1.8.1.8,, 3.1.8.2.2, 3.1.8.4.1, 3.2.1.3.1, 3.2.2.1.6, 3.2.12.1.2, 3.2.15.1.1, 3.2.15.1.2, 3.2.15.1.8, 3.2.15.2.2, 3.2.15.3.1, 3.3.3.2.3, 3.3.3.3.1, 3.3.4.4	in progress	2014

41	ETE / PWR	design issues	Ensuring sufficient capacity and expertise of on-site personnel for multi-unit long term accidents and for the whole site affected	3.2.1.1.10, 3.2.1.1.13. 3.2.1.3.1, 3.2.2.1.8, 3.2.2.1.9, 3.2.12.1.3, 3.2.13.1.6, 3.2.15.1.1, 3.2.15.1.2, 3.2.15.1.8, 3.2.15.2.2, 3.2.15.3.1, 3.2.17.1.15, 3.3.3.2.3, 3.3.3.3.1 3.3.4.4	in progress	2014
42	EDU&ETE / PWR	design issues, EP&R	Provision of periodic verification of the functionality of alternative mobile devices for mitigation of damage	3.2.16, 3.2.14, 4.2.3, 3.2.1.3.1, 3.2.13.3.2, 3.2.15.3.1, 3.2.16.2.3	in progress	2015
43	EDU&ETE / PWR	design issues, EP&R	Provision of periodic practicing of the using of alternative mobile devices for mitigation of damage	3.2.16, 3.2.14, 4.2.3, 3.2.1.3.1, 3.2.13.3.2, 3.2.15.3.1, 3.2.16.2.3, 3.3.2.3, 3.3.4.4	in progress	2015
44	EDU&ETE / PWR	SAM	Analyse states of severe accidents according to the current “state of art” to reduce uncertainty in the resistance of equipment and in the preparation of procedures for the activities management	3.2.17, 3.2.15.2.4, 3.2.17.1.11, 3.2.17.2.1 3.3.2.2.1, 3.3.16.2, 3.3.16.4, 3.3.16.5, 3.3.16.6	in progress	constantly
45	EDU&ETE / PWR	Natural hazards	Assessment of seismic hazard of sites	3.2.17, 3.1.5.1.1, 3.1.8.5.1, 3.2.14.1.3	finished	2012
46	EDU / PWR	SAM	Completion of projects of increase the capacity of the system for the hydrogen disposal during severe accidents	3.3.2, 3.3.10, 3.3.2.1.1 3.3.2.2.3, 3.3.2.3.2, 3.3.10.1.1, 3.3.10.2.1	in progress	2013-2015
47	ETE / PWR	SAM	Completion of projects of increase the capacity of the system for the hydrogen disposal during severe accidents	3.3.2, 3.3.10, 3.3.2.2.3 3.3.2.4.2, 3.3.2.3.2, 3.3.10.1.3, 3.3.10.2.1	in progress	2013-2015
48	EDU / PWR	SAM	Implementation of external RPV cooling – melted core detention inside RPV (Installation of means for flooding A004, modification of RPV heat shield)	3.3.2, 3.3.10, 3.3.2.1.2 3.3.2.2.3, 3.3.2.4.1, 3.3.2.4.4, 3.3.2.3.2, 3.3.16.9	in progress	2015
49	ETE / PWR	SAM	Completion of analysis and propose a strategy and schedule for implementation of measures for preservation of long-term containment	3.3.2, 3.3.10, 3.2.17.1.16, 3.2.17.1.18, 3.3.2.2.3, 3.3.2.4.1, 3.3.2.4.4, 3.3.2.3.2,	in progress	2014

			integrity (to stabilize melt and prevent overpressure)	3.3.16.7, 3.3.16.9		
50	ETE / PWR	SAM	Implementation of measures for maintaining long-term containment integrity according to selected severe accident management strategies	3.3.2, 3.3.10, 3.2.17.1.3, 3.3.2.2.3, 3.3.2.4.4, 3.3.2.3.2,	in progress	according to the schedule
51	ETE, EDU/ PWR	SAM	Verification of the correctness of assumptions about the functioning of the equipment during beyond design conditions and external risks, including possible measures to ensure functionality according to SAMG	3.3.3, 3.2.15.2.4, 3.2.16.1.2, 3.2.17.2.1, 3.3.2.3.1, 3.3.2.4.3, 3.3.3.1.1, 3.3.3.2.2, 3.3.3.2.3, 3.3.16.1	in progress	2014
52	EDU&ETE / PWR	SAM	Issuance of a new procedure for coping with extreme conditions at sites (wind, temperature, snow, earthquake)	3.3.4, 3.1.1.3, 3.1.1.1.4, 3.1.6.1.1, 3.1.8.4.1, 3.2.1.2.7, 3.3.3.2.3, 3.2.15.1.6, 3.2.17.1.11	finished	2013
53	EDU&ETE / PWR	SAM	Processing of guides for the use of alternative technical means (FLEX, EDMG, etc. …)	3.3.4, 3.1.1.1.4, 3.1.1.1.10, 3.1.1.1.12, 3.1.1.1.18, 3.1.7.1.1, 3.1.7.1.5, 3.1.8.1.3, 3.2.1.1.5, 3.2.1.1.8, 3.2.1.1.14, 3.2.1.2.3, 3.2.2.1.2, 3.2.2.1.10. 3.2.4.3.1, 3.2.10.2.3, 3.2.15.1.3, 3.2.15.1.7, 3.2.15.2.1, 3.2.15.2.3, 3.2.17.1.9, 3.3.3.2.3, 3.3.3.4.1, 3.3.4.3.1, 3.3.8.1.2, 3.3.8.1.4	in progress	2015
54	EDU&ETE / PWR	SAM	System setup of AM procedures and guidelines verification and validation	3.3.5, 3.3.4.4, 3.3.5.1.1	in progress	2014
55	EDU&ETE / PWR	SAM	System setup of training (drills), exercises and training for severe accident management according to SAMG, including the possible solutions of multi-unit severe accident	3.3.6, 3.3.7, 3.3.4.4, 3.2.1.1.5, 3.2.16.1.1, 3.2.16.2.1, 3.2.16.2.2, 3.3.6.1.1, 3.3.16.8	in progress	2014

56	EDU&ETE / PWR	SAM, design issues	Development and implementation of guidelines for severe accident management during shutdown conditions and in SFP (SSAMG)	3.3.8, 3.2.14, 3.2.6.1.1, 3.2.6.1.2, 3.2.6.1.3, 3.2.6.2.1, 3.2.10.1.3, 3.2.10.1.7, 3.2.10.2.4, 3.2.10.2.6, 3.2.16.2.1, 3.3.3.4.1, 3.3.4.1.1, 3.3.4.1.2, 3.3.4.2.1, 3.3.4.3.2, 3.3.8.1.1, 3.3.8.1.3, 3.3.8.2.1, 3.3.8.2.2, 3.3.8.2.3, 3.3.8.2.4, 3.3.10.1.2	in progress	2014
57	EDU&ETE / PWR	SAM, EP&R	Providing of alternative means for internal and external communication, notification and warning of staff and population during loss of existing infrastructure	3.3.9, 4.2.7, 3.1.1.1.7, 3.1.1.1.15, 3.2.2.1.10, 3.2.14.1.1, 3.3.9.1.1, 3.3.9.1.2, 3.3.9.1.4, 3.3.9.2.1, 3.3.9.2.2, 3.3.9.3.1	in progress	2013
58	EDU&ETE / PWR	SAM	Analysis of habitability MCR/ECR during severe accidents, including the impact on MCR/ECR unaffected unit	3.3.12, 3.2.9.1.1, 3.2.9.2.1, 3.2.9.2.1, 3.2.17.1.17, 3.3.2.2.2, 3.3.12.1.2, 3.3.12.3.1, 3.3.13.2.1, 3.3.16.4	in progress	2013
59	EDU&ETE / PWR	SAM	Providing of alternative means of abnormal occurrence management during loss of primary control centres (Emergency Control Centre, Physical Protection Control Centre, Fire Protection Control Centre)	3.3.13, 3.1.1.15, 3.1.1.1.8 , 3.1.1.1.13, 3.1.1.1.16, 3.1.7.1.4, 3.2.2.1.7, 3.2.2.1.10, 3.3.9.2.2, 3.3.12.3.1, 3.3.13.1.1, 3.3.13.1.2, 3.3.13.1.3, 3.3.13.1.4, 3.3.13.1.5, 3.3.13.3.1, 3.3.14.2.1	in progress	2014 - analysis
60	EDU&ETE / PWR	SAM	Providing of necessary technical means, protection of personnel and equipment and background during the period outside the implementation of interventions (24 hours / 7 days)	3.3.14, 3.3.4.4, 3.1.1.1.8, 3.1.1.1.16, 3.1.1.1.17, 3.1.7.1.2, 3.1.7.1.6, 3.1.7.2.4, 3.1.7.4.3, 3.2.2.1.7, 3.2.14.1.4, 3.2.14.2.1, 3.2.15.1.6, 3.2.15.1.7, 3.2.17.1.9, 3.2.17.1.10 3.3.2.1.3, 3.3.9.2.2	in progress	2013

61	EDU&ETE / PWR	SAM	Analysing of conditions and severe accident scenarios based on the current "state of art" and the results of experiments from research of materials behaviour during severe accident	3.3.16, 3.2.17.2.1, 3.3.2.2.1, 3.3.3.3.1, 3.3.10.1.1, 3.3.10.1.3, 3.3.16.1, 3.3.16.2, 3.3.16.4, 3.3.16.5, 3.3.16.6	in progress	constantly
62	national	national organisations	Reviewing of legislation in the field of nuclear energy to reflect WENRA Reports	4.1.1, 4.1.2, 3.3.1, 4.3.6	in progress	2015
63	national	national organisations cross-cutting issues	Providing of transparency and open communication with the public/stakeholders	4.1.5, 5.1, 3.3.9.4.1	in progress	constantly
64	national	national organisations cross-cutting issues	Consolidation of safety culture – regular assessment of safety culture by regulatory body	4.1.7, 5.3	in progress	constantly
65	national	cross-cutting issues	Setting up open and professional relationship with the regulatory bodies – the realization of regular summits of SUJB with the operator	5.2	in progress	constantly
66	national	national organisation, EP&R	Regular update of emergency plans	4.1.4, 4.2.1, 4.2.2, 4.2.4, 4.2.5, 4.2.6	in progress	constantly
67	national	International Cooperation	International cooperation – participation of experts of the Czech republic (regulatory body and operator) in international programs and activities of IAEA, OECD/NEA, WANO, EC-ENSREG, WENRA and bilateral cooperation	4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5	in progress	constantly
68	national	SAM	Analyses of potential accident scenarios resulting in large volumes of contaminated water including definition of remedial measures	3.3.11, 3.3.11.1.1	in progress	2015

69	national	SAM	Upgrade PSA LEVEL 2 for both NPPs for the identification of plant vulnerabilities, quantification of potential releases related to extreme external conditions	3.3.15, 3.1.8.3.1, 3.3.3.2.1, 3.3.5.2.1, 3.3.15.2.1, 3.3.16.3	in progress	2015
70	national	natural hazard	Seismic PSA including analysis of secondary effects with a proposals for remedial measures	3.1.3, 3.1.1.2.3, 3.1.2.1.1, 3.1.2.2.1, 3.1.2.3.1, 3.1.3.1.1, 3.1.8.3.1, 3.1.8.5.1, 3.2.17.1.2, 3.3.15.1.1, 3.3.15.2.1, 3.3.16.3	in progress	2015
71	national	national organisations	IRRS missions invited for November 2013	4.1.3	in progress	November 2013
72	national	national organisations	Post- Fukushima safety reassessments and action plans – stress tests and follow up action plan	3.1.1.2.2, 3.2.3.2.3, 4.1.6	in progress	constantly
73	ETE/PWR	design issues	Analysis for the SG gravity feeding use in EOPs is to be finished and subsequently EOPs are to be updated	3.2.1, 3.2.1.3.1	in progress	2014
74	EDU, ETE/PWR	design issues	Analysis of off-site power connections reinforcement and subsequent reinforcements, if needed	3.2.2.3.2	finished	analysis 2013, modifications (if needed) 2015
75	EDU, ETE/PWR	design issues	Performing batteries capacity real load test	3.2.3, 3.2.3.1.1, 3.2.3.1.4, 3.2.17.1.6, 3.2.17.1.13	procedures in preparation	2015
76	EDU, ETE/PWR	design issues	Alternative supply of selected valves from mobile power supply sources	3.2.12, 3.3.2.5.1	analyses in progress	2015
77	EDU, ETE/PWR	SAM	During the preparation of EDMG guidelines for the use of alternative technical means an update of SAMG will be performed including extensions of SAMGs by incorporating long-	3.3.4	in progress	2015

			term activities in accordance with the findings of EPRI - ETE, EDU			
78	EDU/ PWR	design issues	Procurement of additional fire truck to cope with multiunit accidents.	3.1.1.1.6, 3.1.1.1.14	in progress	2013
79	EDU, ETE/ PWR	design issues	Preparation and validation of procedures for the use of the safety DG of the other unit in case of an SBO.	3.2.3.1.3	in progress	2013
80	EDU, ETE/ PWR	design issues	Summarisation of existing documents that prove long term MCP seal tightness in SBO situation, additional analyses (if found necessary).	3.2.7.1.1	finished	2013
81	EDU, ETE/ PWR	design issues	Feasibility analysis of heat transfer from the SFSP without an additional water supply.	3.2.10.1.6, 3.2.17.1.14	in progress	2013
82	ETE/ PWR	design issues	Selected valves power supply reconnection to batteries for containment isolation during SBO.	3.2.12.2.1, 3.3.12.1.3	finished	2012
83	ETE, EDU/ PWR	design issues	Feasibility study based on existing analyses that prove flow paths and access availability.	3.2.12.3.1	in progress	2014
84	ETE, EDU/ PWR	natural hazards	Procurement of fire brigade truck equipped with necessary devices to cope with selected SA.	3.1.1.1.6, 3.1.1.1.14	in progress	2013

7. Conclusions

All measures contained in the Action Plan are to be completed by the end of 2015. Any problems that may affect implementation of the Action Plan will be considered case by case between the license holder and regulatory authority. If the measure included in the Action Plan is to perform study or analysis, new measures may be identified based on its results. Action plan will be updated accordingly based on results of these considerations. Based on any new information resulting from still on-going investigations of Fukushima accident new measures may be included in the Action Plan as well. Existing deadlines indicated in the Action Plan are mainly allowed by the fact that many of listed measures both Dukovany NPP and Temelin NPP are already in advanced stage of implementation since they were proposed before the Fukushima events on the basis of Periodic Safety Reports results. For example, in case of Dukovany NPP this applies particularly to the seismic hardening to value of 0.1 g acceleration, which was a result of periodic safety review (PSR) of this plant made in 2009.

The core of measures in the Action Plan were proposed by license holder ČEZ, a.s. and accepted by SÚJB (State Office for Nuclear Safety) as nuclear safety regulatory authority. Both Dukovany NPP and the Temelín NPP developed so called Safety Increasing Program (SIP) based on conclusions of the National Stress Tests Report, lessons learned from EU stress tests peer review exercise and previous periodic safety review findings. This initiative is in line with licensee prime responsibility for safety principle defined in the law. After regulatory review the licensee list was supplemented by measures/actions requested by SÚJB. This Action Plan represents complete set of measures (as of 31st December 2012) to strengthen safety of Czech nuclear power plants in response to the Fukushima nuclear power plant accident. Based on article 17 of the Atomic Act this final version of Action Plan will be transferred to the licensee ČEZ, a.s. via letter of SÚJB Chairperson together with description of procedure that will be applied for regulatory oversight of its implementation. In particular, Action Plan implementation will be monitored through scheduled inspections continuously. If needed, new measures will be included or modification of already existing measures will be done in accordance with principles mentioned in previous paragraph.

Both the Action plan, as well as the conclusions of the interim inspection will be made public on the SÚJB and ČEZ, a. s. websites.

References

[1]: National Report on "Stress Tests" of NPP Dukovany and NPP Temelín, Czech Republic, December 2011
[2]: ENSREG Peer Review Report, Luxembourg, April 2012 (identified as Luxembourg general peer review report in the text of the NAcP)
[3]: ENREG Country Peer Review, April 2012
[4]: ENSREG - Follow-up fact finding site visit NPP Temelín, September 2012
[5]: Extraordinary National Report under the Convention on Nuclear Safety, May 2012
[6]: Final Summary Report of the 2nd Extraordinary Meeting of the Contracting Parties to the CNS, August 2012
[7]: Compilation of recommendations and suggestions, ENSREG, July 2012