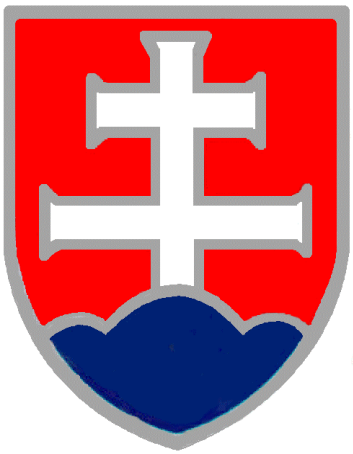
NATIONAL ACTION PLAN
of the
SLOVAK REPUBLIC



Update

Nuclear Regulatory Authority of the Slovak Republic

(UJD SR)

December 2017

Content

Abbreviations

AC	Alternating Current
CCS	Central Crisis Staff
DG	Diesel Generator
EBO	Bohunice Power Plant
EMO	Mochovce Nuclear Power Plant
EMO1&2	Mochovce Nuclear Power Plant Units 1&2
ENSREG	The European Nuclear Safety Regulators Group
ESFAS	Engineering Safety Features Actuation System
EOP	Emergency Operating Procedures
ERC	Emergency Response Centre
ERO	Emergency Response Organization
ESWS	Essential Service Water System
EU	European Union
HP	High-pressure
IAEA	International Atomic Energy Agency
IPSART	International Probabilistic Safety Assessment Review Team
IRRS	Integrated Regulatory Review Service
MCP	Main Circulation Pump
MDBE	Maximal Designe Basic Earthquake
MOD V-2	Programme on Modernization and Improvement of NPP Bohunice 3&4
NAcP	National Action Plan
NPP	Nuclear Power Plant
NSSS	Nuclear Steam Supply System
OCG	Operational Control Group
OSART	Operational Safety Review Team
PC	Primary Circuit

PRZ	Pressurizer
PSA	Probabilistic Safety Assessment
PSR	Periodic Safety Review
RLS	Reactor Limitation System
RPS	Reactor Protection System
RTS	Reactor Trip System
RPV	Reactor Pressure Vessel
SAM	Severe Accident Management
SAMG	Severe Accident Management Guidelines
SBO	Station Black-out
SG	Steam Generator
SCRMN	Slovak Centre of Radiation Monitoring Network
SEFWS	Super Emergency Feed Water System
SE, a. s.	SlovenskéElektrárne, Inc.
SFP	Spent Fuel Pool
SIRM	Safety Improvement of Mochovce NPP Project Review Mission - occlusions of IAEA mission performed at Mochovce in June 1994
SO	Secondary Circuit
TSSM	Technical Specifications for Safety Measures
UJD SR	Nuclear Regulatory Authority of the SR
UVZ SR	Public Health Authority of the SR
VARVYR	Warning and Notification
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators' Association

Preface

This report updates the information contained in the 2015 report including the progress in implementing each of the individual actions within the NAcP;

This report is available on the web page of ENSREG and on UJD SR web page (www.ujd.gov.sk).

I. Introduction

Following the accident at Fukushima Daiichi in 2011, the European Union (EU) countries that operate nuclear power plants each produced a national action plan (NAcP). These plans identified the actions necessary to enhance nuclear safety focusing on nuclear power plants (NPPs), and within the Terms of Reference of ENSREG.

The NAcP follows the Structure proposed in the ENSREG Action Plan. It contains comprehensive information on the actions planned/complete/under implementation after Fukushima as well as information on safety improvements and measures adopted before Fukushima.

The first NAcP workshop was held on 22 – 26 April 2013 and the second on 20 – 24 April 2015 to discuss and review the status of implementation of the NAcPs for the EU countries together with Switzerland and Ukraine. The workshop reports are available on the ENSREG website.

A considerable part of the measures listed are completed. The remaining once are in an advanced stage of implementation.

Slovakia is committed to continue in implementing the NAcP until all activities and measures had been completed. Members of ENSREG agreed to update their NAcPs by the end of 2017 and then regularly each two years.

General information

Regulatory Framework

The state regulatory authority performing the state supervision upon nuclear safety of nuclear installations is the Nuclear Regulatory Authority of the Slovak Republic (UJD SR). The state supervision over nuclear safety is performed in accordance with the Atomic Act (No. 541/2004 Coll.) and subsequent set of regulations, in particular Regulation No. 430/2011 (as amended) laying down details on requirements for nuclear safety. The whole set of legislative basis has been updated in 2011 - 2012, in line with the progress in the development of the IAEA Safety Standards and WENRA Reference Levels. Radiation protection is performed by the Public Health Authority (ÚVZ SR) in accordance with the Act No. 355/2007 Coll.

The most recent change in the legal framework is the Act No. 96/2017 Coll. by which the Act No. 541/2004 Coll. (Atomic Act) was amended. The amendment relates to:

- Transposition of the Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear
- Partial transposition of the Council Directive 2013/59/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation,

WENRA Reference Levels

One of the objectives of WENRA, as stated in its terms of reference, is to develop a harmonized approach to nuclear safety and radiation protection issues and their regulation in Europe. A significant contribution to this objective was the publication, in 2006, of a report on harmonisation of reactor safety in WENRA countries. This report addressed the nuclear power plants in operation and it included “Safety Reference Levels” (SRLs), which reflected expected practices to be implemented in the WENRA countries. The SRLs were updated in 2007, 2008 and 2014.

The SRLs have been established for greater harmonisation within WENRA countries raising the level of nuclear safety in Europe by their implementation in the national regulatory framework and in NPPs. The emphasis of the SRLs has been on nuclear safety, primarily focussing on safety of NPPs. The SRLs specifically exclude nuclear security and with a few exceptions, radiation safety.

Full harmonisation of safety regulations with WENRA SRL 2008 has been achieved /1/. As regards WENRA SRL 2014, there are 44 out of 101 newly added or modified (after Fukushima) SRLs implemented.

Nuclear Power Plants

Currently there are 4 WWER-440/V213 nuclear units in operation in Slovakia, 2 units in Jaslovské Bohunice and another 2 in Mochovce site. In Mochovce there are also two WWER- 440/V213 units with significantly upgraded design under construction. The owner and operator (the holder of the operating permit) of all operating and constructed nuclear units in Slovakia is a stock company Slovenské elektrárne, a. s. (SE, a. s.).

Basic data about all units covered by this report are in the table.

Plant	NPP Bohunice 3&4	EMO1&2 NPP	EMO3&4 NPP
Site	Bohunice	Mochovce	Mochovce
Reactor type	WWER-440/V213	WWER-440/V213	WWER-440/V213
Reactor thermal power, MWt	1471	1471	1375
Gross electric power, MWe	505	470	470
Plant status	In operation	In operation	Under construction
Date of first criticality	1984-85	1998-99	Under construction
Last Periodic Safety Review	2008	2011	-

Upgrading of the plants since the original design

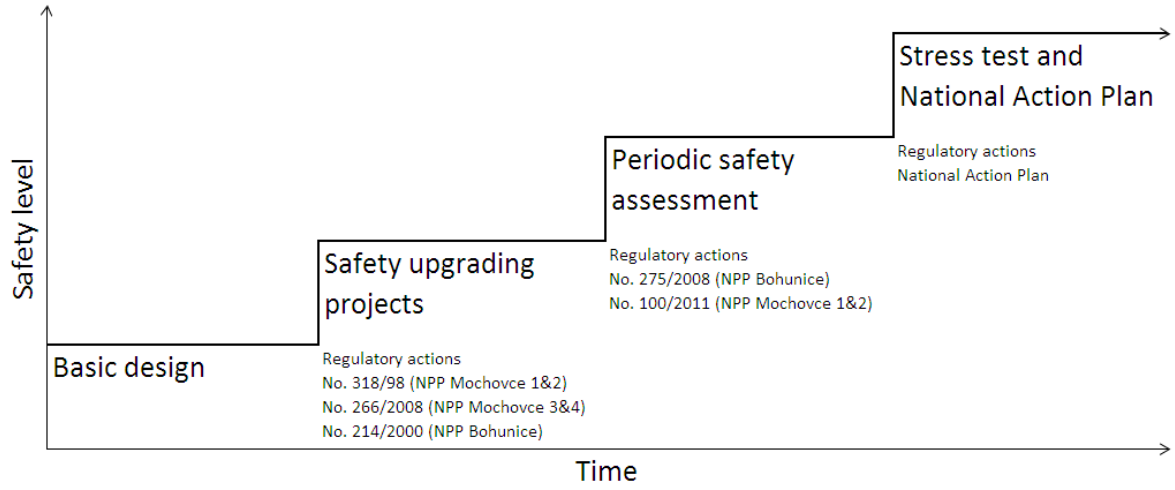
The NPPs have been significantly upgraded throughout their operation. In spite of the robustness of the original design, several modifications based on operational experience and by international and national safety assessments have already been carried out (see picture below). Improvement of the containment tightness/integrity of existing plants is one of the major achievements.

All nuclear power plants have their safety reports that are updated according to the regulator's requirements and reviewed by the regulator. In accordance with the current national legislation, the SAR update on nuclear installations in Slovakia is currently being implemented continuously. Existing Probabilistic Safety Assessment studies (PSA Level 1 and Level 2) confirm that the NPPs meet internationally recognized safety targets. The Probabilistic Safety Assessment studies (PSA Level 1 and Level 2) are regularly updated. The latest update for NPP EBO V2 was in 2015 and for NPP EMO in 2016. Based on the results from the EU stress tests, some specific parts of the safety documentation related to the assessment of rare extreme external hazards and the implementation of severe accident management measures were updated.

All operating units have been subject of a number of international missions performing independent review of their safety level. Since 1991 there were in total more than 20 IAEA missions (site review, design review, OSART, IPSART missions), 6 WANO missions, 2 RISKAUDIT missions and 1 WENRA mission.

Just after Fukushima and based on WANO recommendations during the period from April to October 2011, non-standard tests and checks of equipment important for coping with extreme conditions exceeding the basic design were successfully performed on the operating units. The tests included e.g. verification of the long-term run of diesel generators, the possibility for delivery of cooling water from the bubbler-condenser to the spent fuel pool, feed water supply to steam generators from a mobile source, supplying of water from cooling towers to essential service water system, connection of a back-up power supply from the hydro power plant, and others.

Illustration of safety improvements



II. Basic approach and monitoring

Several ENSREG recommendations adopted on the basis of the stress tests coincides with the on-going projects on:

1. Severe accidents management (SAM) such as
   - To analyse the necessity of filtered venting of the containment to support SAM
   - To analyse a response to severe accidents at multi units at the same site
2. NPP resistance against external risks with very low probability of occurrence (occurrence less than 1.10-4/year)
   - External floods (spreading of floods inside the power plant, drain system capacity etc.)
   - Seismic event

The measures, from which some have been already implemented, are divided into the following groups:

- Short-term – to be finished by 31/12/2013
- Medium-term – to be finished by 31/12/2015
- Additional measures, which resulted from analyses performed during the medium term, and implemented after 2015

Monitoring of the Action Plan implementation

Majority of tasks resulting from the NAcP are covered by UJD SR decisions issued in the past and in particular after completion of the periodic safety assessment of NPPs in the years 2008 (NPP Bohunice) and 2011 (NPP Mochovce). According to these decisions the operator was obliged to report to UJD SR on the progress and the results achieved annually.

Due to the specific nature of the stress tests and as a provision for accepting the measures proposed by the licensee, UJD SR performed inspections within its annual inspection plans the aim of which were to ascertain the factual implementation of measures. During inspection the inspectors are authorized inter alia, to:

a) Enter at any time and without limitation to premises of licensees and to the nuclear facilities,
b) Carry out control, participate in tests and perform tasks with the aim to establish compliance with the requirements resulting from the law,
c) Request submission of documentation, records or other documentation necessary for performance of inspection activity,
d) Upon notice to the statutory body of the licensee or his authorized employee to take samples of necessary amount of materials or media that are in use,
e) Use technical means for making photo-documentation, video-documentation and audio-documentation necessary for performance of inspections,
f) Require maintaining of equipment, workplaces, constructions and buildings or parts thereof in their original condition until the completion of the screening,

g) Order performance of measurements, controls, tests and other actions needed for performance of inspection,

The inspection results confirmed the operator´s compliance with the Action plan in terms of substance and deadlines as well. Some measures have been completed before deadline. However in the case of updated severe accident analyses (e.g. accident at multi units), and based on the outcomes of self-assessment /7/ and /8/ UJD SR requested the licensee to expedite the work in preparing a plan of implementation of measures. Some delays related to verification and validation of SAMGs were also identified by UJD SR. Details are reported in Chapter III. Inspection activities will continue for monitoring the progress in implementing the Action Plan during the coming years.

III. Status of implementation

RECOMMENDATIONS OF TOPIC 1 (NATURAL RISKS)

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
1.	ENSREG Compilation of recommendations 2.2	Periodic safety review	Re-assessment of natural risks as a part of periodic safety assessments Status: According to UJD SR Regulation No. 33/2012 Coll., Section 2 the licensee is obliged to conduct periodic assessment by the date up on which ten years have elapsed since the previous PSR. The objective of PSR (§9) is to assess the extent, up-to date and quality of deterministic safety evaluations, probability-related safety evaluations and analyses of the effect of internal and external hazards in terms of the current condition of the project and operation, structures, systems and components of nuclear equipment, the analytical methods used, calculation instruments and data, as well as in terms of the condition predicted by the date of the next periodic evaluation.	Completed	Completed	Under construction
2.	ENSREG Compilation of recommendations 2.3 EC Communication – specific to Slovakia 5.11 XCNS	Confinement integrity	To analyse a necessity of filtered venting of the containment and other potential technical measures for long-term heat removal from the containment and reduction of radiation load of the environment taking into account activities in this area at other operators of WWER-440/V213 NPP types and considering measures implemented within the SAM project.	Completed	Completed	Completed

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **Analyses completed.** **The best solution based on the outcomes is a SAM dedicated, independent long-term heat removal system.** **Concept of a full-fledged filtered containment venting system for severe accident (FVKTH) raises problems with permanent loss of coolant from the containment required for external cooling of reactor pressure vessel. FVKTH additionally sets high requirements for cooling of discharged steam-air mixture or for creating large inventory of coolant. Technical meetings are organized (information exchange) with other operators of VVER 440 on the subject matter.**			
3.	**ENSREG Compilation of recommendations 2.4**	**Prevention of accidents because of natural risks and limitation of their consequences**	**The National Action Plan covers all tasks in an integrated/comprehensive manner.** **Status:** **Short term (immediate) measures:** **Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed. (Immediate measures - flood protection bags were implemented in buildings where safety systems are located).**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			<u>Long-term measures:</u> **The procurement process and the implementation of measures in EBO and EMO is ongoing. Some of the measures are already implemented.** **Measures resulting from assessment of EMO1,2 civil structures are being incorporated into the ongoing seismic reinforcement documentation (project IPR 20400).** **Evaluation of the outcomes of the study on "Impact of extreme external temperatures in selected rooms of EBO, EMO NPPs after loss of cooling" has been completed without any need of additional measures.** **(See ID 4, 8, 12, 13, 14)**	**In progress**	**In progress**	
4.	**ENSREG Compilation of recommendations 3.1.1** **XCNS**	**<u>Hazard frequency related to weather</u>**	**To evaluate resistance of selected systems, structures and components (SSC) at extreme external events (floods caused by heavy rain, high and low external temperatures, direct wind and other relevant events for the given locality) on the basis of updated new studies on meteorological conditions for Jaslovské Bohunice and Mochovce localities, and to consider events with intensity corresponding to the probability of occurrence once per 10,000 years or less; to prepare a plan for implementation of additional measures or to implement them.**			**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **Short term (immediate) measures:** **Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed. (Immediate measures - flood protection bags were implemented in buildings where safety systems are located).** **New metrological studies for the site were developed for EBO /2/ and for EMO /3/.** **A time schedule of implementation of measures for 2014 - 2018 to enhance the resistance of selected EBO and EMO1,2 civil structures was prepared.** **Long-term measures:** **The procurement process and the implementation of measures in EBO and EMO is ongoing. Some of the measures are already implemented.** **Measures resulting from assessment of EMO1,2 civil structures are being incorporated into the ongoing seismic reinforcement documentation (project IPR 20400).** **Evaluation of the outcomes of the study on "Impact of extreme external temperatures in selected rooms of EBO, EMO NPPs after loss**	**Completed** **In progress**	**Completed** **In progress**	

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			of cooling" has been completed without any need of additional measures. **(See ID 3, 8, 12, 13, 14)**			
5.	**EC Communication Annex**	**Hazard frequency related to seismicity**	**To analyse seismic margins of selected systems, structures and components (SSC).To evaluate the resistance of selected SSC at a seismic event with intensity corresponding to the probability of occurrence less than once per 10,000 years.** **Status:** **Seismic margins of civil structures evaluated /4/.** *** Additional measures:** **Evaluation of seismic margins (GIP method) for additional seismically qualified equipment performed and being implemented (project IPR 20400).**	**Completed**	**In progress***	**Included in the design documentation**
6.	**EC Communication Annex** **EC Communication– specific to Slovakia 5.11**	**Seismicity – minimum peak ground acceleration 0,1 g**	**To immediately prepare priorities for determination of an order of actions implemented within the seismic reinforcement of EMO1&2 SSC on the basis of their contribution to safety; to include seismic reinforcement of EMO common structures to actions with the highest priority. To implement the seismic reinforcement of relevant SSC based on the valid UJD SR decision No. 100/2011, taking into account the set order.**	**Completed**	**In progress**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **EMO1,2: According to decision of UJD SR No. 100/2011 the required minimum peak ground acceleration is 0,15 g.** **Priorities of the tasks defined. Priority 1 (highest) contains buildings where equipment important for long-term residual heat removal after a seismic event are situated: Fire station, access point for external power supply, pipeline of emergency SG feed, emergency response centre, etc. (2016 – 2018).** **Additional measures:** **EMO and EBO: Draft seismic PSA was prepared: assessment of the seismic margins for mechanical systems and seismic margins of concrete and steel parts of the main reactor building.**			
7.	**ENSREG Compilation of recommendations 3.1.2**	**Secondary effects of earthquakes**	**To prepare a scenario for putting the NPP units into safe condition after a seismic event.** **Status:** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Re after a seismic event).** **(See ID 21)**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Additional measures: **Contract concluded with the Research institute of Transport on analysis of critical roads at the plant. Reports for EBO and EMO completed and the outcomes were analysed. Measures for putting the unit into safe condition after a seismic event have been adopted.** **(See ID 55)**			
8.	**ENSREG Compilation of recommendations 3.1.3** **Peer review country Report of the SR 4.3** **EC Communication Annex** **EC Communication – specific to Slovakia 5.11**	**Protection against penetration of water into buildings. Proving of protection against floods for identified rooms and**	**To evaluate resistance of selected systems, structures and components (SSC) at extreme external events (floods caused by heavy rain, high and low external temperatures, direct wind and other relevant events for the given locality) on the basis of updated new studies on meteorological conditions for Jaslovské Bohunice and Mochovce sites, and to consider events with intensity corresponding to the probability of occurrence once per 10,000 years or less; to prepare a plan for implementation of additional measures or to implement them.** **Status:** **Short term (immediate) measures:** **Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			performed. (Immediate measures - flood protection bags were implemented in buildings where safety systems are located). **Long-term measures:** **The procurement process and the implementation of measures in EBO and EMO is ongoing. Some of the measures are already implemented.** **Measures resulting from assessment of EMO1,2 civil structures are being incorporated into the ongoing seismic reinforcement documentation (project IPR 20400).** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O63: Unit Cool down after MDBE, 3-3,4LPS-001/O64: Activities of OP at Flooding of Structure).** **(See ID 3, 4, 12, 13, 14)**	**In progress**	**In progress**	
9.	**ENSREG Compilation of recommendations 3.1.4**	**Notices on time warning**	**To implement the warning and notification system in case of deteriorating weather and to implement procedures of NPP operating staff response.** **Status:** **The predictive regulation No. 0-HP/3006 – EMO12, 3,4LPS-064, 065 – EBO34 - For measures against extreme climatic conditions was prepared and implemented.**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Additional measures: **Contract concluded with the Hydrometeorological institute on providing data.**			
10.	**ENSREG Compilation of recommendations 3.1.5** **EC Communication Annex**	**Monitoring of seismicity**	**Arrangement of Bohunice, Mochovce seismic monitoring stations was proposed and built based on detailed seismic and geological survey prepared by the Geophysical Institute of the Slovak Academy of Science and reviewed by IAEA missions in 1998 and 2004. Monitoring results are summarized in quarterly reports.** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Reactor after a seismic event).** **Operating procedure developed EBO3,4 - ,4-LPS-001/O60, EMO12 - ,2-NS-0300/ES-0.4, 0.6, FR-H.1, 7-NS-0400/SD-E-2, 0.3, SD-FR-H.1: Activities after Earthquake including training.**	**Completed**	**Completed**	**Completed**
11.	**ENSREG Compilation of recommendations 3.1.6**	**Qualified walkdowns**	**To prepare regulations for qualified walk downs related to natural risks and to update them after preparation of an international guide.** **Status:** **Guidelines for the walk down checks of equipment which are defined for the**	**Completed**	**Completed**	**Before putting the respective unit into operation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			management of external events (seismicity, floods, low and high temperatures, wind) were updated (e. g. EMO/NA-332.0201). **Procedures for the actions necessary in response to EEE are developed, implemented and exercised in accordance with the plan of emergency exercises (e. g. EBO 2015).** **(See ID 21)**			
12.	**ENSREG Compilation of recommendations 3.1.7**	**<u>Assessment of reserves for floods</u>**	**To analyse maximal potential water levels in the locality on the basis of 10,000 annual values. To specify places where water collects. To immediately implement temporary solutions and to propose a final solution.** **<u>Status:</u>** **<u>Short term (immediate) measures:</u>** **Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed. (Immediate measures - flood protection bags were implemented in buildings where safety systems are located).** **New metrological studies for the site were developed for EBO /2/ and for EMO /3/.** **A time schedule of implementation of measures for 2014 - 2018 to enhance the resistance of selected EBO and EMO1,2 civil structures was prepared.**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Long-term measures: **The procurement process and the implementation of measures in EBO and EMO is ongoing. Some of the measures are already implemented.** **Measures resulting from assessment of EMO1,2 civil structures are being incorporated into the ongoing seismic reinforcement documentation (project IPR 20400).** **(See ID 3, 4, 8, 13, 14)**	**In progress**	**In progress**	
13.	**Peer review country report of the SR 2.3.3**	**Reserves at external risks**	**The National Action Plan covers all tasks in an integrated/comprehensive manner.** **Status:** **Short term (immediate) measures:** **Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed. (Immediate measures - flood protection bags were implemented in buildings where safety systems are located).** **Long-term measures:** **The procurement process and the implementation of measures in EBO and EMO**	 **Completed** **In progress**	 **Completed** **In progress**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			is ongoing. Some of the measures are already implemented. **Measures resulting from assessment of EMO1,2 civil structures are being incorporated into the ongoing seismic reinforcement documentation (project IPR 20400).** **Evaluation of the outcomes of the study on "Impact of extreme external temperatures in selected rooms of EBO, EMO NPPs after loss of cooling" has been completed without any need of additional measures.** **(See ID 3, 4, 8, 12, 14)**			
14.	**ENSREG Compilation of recommendations 3.1.8**	**<u>Protection against extreme weather conditions</u>**	**The National Action Plan covers all tasks in an integrated/comprehensive manner.** **<u>Status:</u>** **<u>Short term (immediate) measures:</u>** **Based on WANO recommendations during the period from April to October 2011 the non-standard tests and inspections of equipment important for coping with extreme conditions exceeding the basic design were successfully performed.** **<u>Long-term measures:</u>** **The procurement process and the implementation of measures in EBO and EMO**	**Completed** **In progress**	**Completed** **In progress**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			is ongoing. Some of the measures are already implemented. **Measures resulting from assessment of EMO1,2 civil structures are being incorporated into the ongoing seismic reinforcement documentation (project IPR 20400).** **Evaluation of the outcomes of the study on "Impact of extreme external temperatures in selected rooms of EBO, EMO NPPs after loss of cooling" has been completed without any need of additional measures** **(See ID 3, 4, 8, 12, 13)**			
15.	**Peer review country report of the SR 2.2.3** **EC Communication– specific to Slovakia 5.11** **XCNS**	**<u>Regulatory monitoring of actions (flooding)</u>**	**The activity is subject to regulatory review and inspection.** **<u>Status:</u>** **The inspection plans contained inspection activities. No deviation from the prepared actions has been identified.**	**Annually** **In progress**	**Annually** **In progress**	**Annually** **In progress**
16	**Peer review country report of the SR 2.3.3** **EC Communication– specific to Slovakia 5.11** **XCNS**	**<u>Regulatory monitoring of actions (extreme weather conditions)</u>**	**The activity is subject to regulatory review and inspection.** **<u>Status:</u>** **The inspection plans contained inspection activities.** *** Inspection activities of UJD SR identified deviations of the licensee from his originally**	**Annually** **In progress***	**Annually** **In progress***	**Annually** **In progress**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			proposed plan of actions. Corrective measures have been adopted. **(See ID 15)**			
17	**Peer review country Report of the SR 2.1.3**	**<u>Regulatory monitoring of actions (seismic upgrade)</u>**	**The activity is subject to regulatory review and inspection.** **<u>Status:</u>** **The inspection plans contained inspection activities.** *** Inspection activities of UJD SR identified deviations of the licensee from his originally proposed plan of actions. Corrective measures have been adopted.** **(See ID 15, 16)**	**Completed**	**Annually*** **In progress**	**Annually** **In progress**

RECOMMENDATIONS OF TOPIC 2 (LOSS OF SAFETY SYSTEMS)

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
18.	**ENSREG Compilation of recommendations 3.2.1**	**Alternative cooling and heat sink**	**a) To diversify the emergency feed water source to SG by assurance of mobile high-pressure sources.** **Status:** **Feed water make-up pumps to steam generators for each reactor units were purchased in 2012. The pumps are situated on a fire truck chassis.** **In 2014, flow rate sensors were additionally installed on the mobile feed water source high-pressure pump discharge pipe.** **The mobile feed water sources are regularly tested during operation and main overhauls as well.**	**Completed**	**Completed**	**Included in the design documentation**
			b) To review physical availability of technology needed for gravity filling of SG from feed water tanks in case of SBO. **Status:** **Physical access for gravity filling of SG was tested. Because of the necessity of physical manipulation with selected valves it was decided to procure power supply to ensure a remote operation of these valves. This measure is part of EOP.** **In addition: electricity generators for control of selected valves were tested.**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			c) To finish required modifications of existing equipment for connection of diverse mobile feed water and power sources resistant to external events. **<u>Status:</u>** **The project of feed water connection point to SG and diverse power sources in EBO and EMO completed.** **<u>Additional measures:</u>** *** Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO, EMO) has been completed.** **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG" – has been completed.**	**Completed***	**Completed***	**Included in the design documentation**
			d) To analyse and if needed to ensure means for cooling water make up from in-site and off-site water sources in the case of lack of cooling water, incl. preparation of respective procedures. **<u>Status:</u>** **Necessary equipment has been analysed and purchased for example: portable pumps, portable switchboards.** **Training programmes for the diverse mobile devices for cooling water make up from in-**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			site and off-site water sources were prepared implemented and through emergency exercises tested (e. g. EBO 2015). **<u>Additional measures:</u>** **Contract concluded with the Research Institute of Transport on analysis of critical roads at the plant. Reports for EBO and EMO completed. The outcomes were analysed. Measures for putting the unit into safe condition after a seismic event have been adopted.**			
19.	**ENSREG Compilation of recommendations 3.2.2**	**<u>AC Power supplies.</u>**	**a) To install a 400 kV circuit breaker in the local substation for disconnection of units from the power grid and thus to enable operation in the home consumption mode in the case of damaged transmission lines.** **<u>Status:</u>** **The project for completion of circuit breakers into the power output diagram and their positioning in the 400 kV substation in the EMO1,2 substation is completed. The procurement process has started.** *** Comm.: The national action plan required to submit a time schedule for the 400 kV circuit breaker installation (in EMO12). Installation is ongoing (2017 – 2018).**	**Completed**	**Completed ***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			b) To update the operating documentation for DG (in case of failure of DG connection to the 6 kV section of the emergency power supply of the 2nd category). **<u>Additional measures:</u>** **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG" – has been completed.**	**Completed**	**Completed**	**Included in the design documentation**
			c) To diversify emergency power sources by assurance of mobile DG. **<u>Status:</u>** **Mobile DG 0.4 kV with connecting cabling were purchased in 2012 for all units.** **(See also ID 18).**	**Completed**	**Completed**	**Included in the design documentation**
20.	**ENSREG Compilation of recommendations 3.2.3**	**<u>Power supply (DC)</u>**	**To diversify emergency power sources by assurance of mobile DG for charging of accumulator batteries.** **<u>Status:</u>** **Mobile DG 0.4 kV with connecting cabling were purchased in 2012 for all units.** **<u>Additional measures:</u>**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Mobile rectifiers 240 V, 24 V for each units to charge accumulators from the mobile 0.4 kV DG were supplied.			
21.	**ENSREG Compilation of recommendations 3.2.4**	**Operating and training activities**	**To prepare operating procedures and to implement training programmes for operators of diverse mobile devices.** **Status:** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Re after a seismic event).** **3,4-LPS-001/O63: Unit Cool down after MDBE, 3-3,4LPS-001/O64: Activities of OP at Flooding of Structure** **3,4-LPS-001/O65: Strong wind in SE-EBO locality** **3,4-LPS-001/O66: Loss of service water supply in PS Pecenady** **0HP/3001 Loss of external power supply, 0HP/3002 Loss of raw water supply,** **0HP/3003 Back-up water make-up** **0HP/3004 Transport of employees for non-standard and calamity situations,** **0HP/3005 External and internal floods, 1TP/6009 Cool down after seismic event** **0HP3006: Measures against extreme climatic conditions.** **Operating instructions for mobile DG 0,4kV: 6-TPP-332 and for feed water pump CAS30/10000-S2 prepared and implemented.**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Procedures for the actions necessary in response to EEE are developed, implemented and exercised in accordance with the plan of emergency exercises (e. g. EBO 2015).			
22.	**ENSREG Compilation of recommendations 3.2.5**	**Instrumentation and monitoring**	**To specify a list of important parameters needed for monitoring of safety functions.** **Status:** **a) EBO3,4, EMO1,2 - A list of important parameters needed for monitoring of safety functions has been defined.**	**Completed**	**Completed**	**Included in the design documentation**
			b) To analyse the availability of important parameters, and if needed, to ensure mobile measuring units which can use stabile sensors also without standard power supply. **Status:** **Analyses were completed.** *** The project "Implementation of mobile measuring unit" has been completed (IPR 10178/12, 51900/13, e.g. equipment for measuring of temperature and pressure in the primary circuit and water level in the SG).**	**Completed***	**Completed***	**During trial operation**
23.	**ENSREG Compilation of recommendations 3.2.6**	**Improvement of shutdown**	**a) To diversify emergency power sources by assurance of mobile DG.**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **Mobile DG 0.4 kV with connecting cabling were purchased in 2012 for all units.** **(See ID 19, 20)**			
			b) To finish required modifications of existing equipment to enable connection of diverse feed water sources and power sources ensuring physical access and resistance under conditions evoked by an external event. **Status:** **The project of feed water connection point to SG and diverse power sources in EBO and EMO completed.** **Additional measures:** *** Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO, EMO) has been completed.** **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG" – has been completed.** **(See ID 18c).**	**Completed***	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
24.	**ENSREG Compilation of recommendations 3.2.7**	**Seals of reactor coolant pumps (RCP)**	**a) To check if the existing procedures sufficiently solve the situation after de-sealing of RCP glands.** **Status:** **The sufficiency of existing procedures checked JSC VNIIAS-All Russian Scientific Institute for NPP Operation 109507, Russian Federation, Moscow, May 2013.**	**Completed**	**Completed**	**Completed**
			b) To obtain data documenting behaviour of RCP glands at long-term failure of cooling (more than 24 hours) and to prepare a plan of potential necessary measures. **Status:** **The analyses made by VNIIAS are available. Resistance of RCP glands GCN-317 for 72 hours confirmed.**	**Completed**	**Completed**	**Completed**
25.	**ENSREG Compilation of recommendations 3.2.8**	**Ventilation**	**To analyse conditions of the environment of rooms where equipment for control of events with long-term station blackout (SBO) and events with long-term loss of ultimate heat sink (UHS) and severe accidents is situated. To prepare a plan of required measures.** **Status:** **Environment of rooms, where safety systems ensuring fulfilment of key safety function in the main reactor building and safety systems**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			which are in direct contact with the external environment (ESW, AFWS, DGS) were analysed /6/. Impact of extreme external climate conditions in selected rooms (for both NPPs). **The SAM project includes also the habitability of the main control room and the control of selected equipment from the ERC.** **Preliminary analysis indicates that no additional measures are necessary.**			
26.	**ENSREG Compilation of recommendations 3.2.9**	**<u>Main control room and emergency control room</u>**	**a) To diversify emergency power sources by assurance of mobile DG.** **<u>Status:</u>** **Mobile DG 0.4 kV with connecting cabling are available for both EBO and EMO1,2 units.** **(See also ID 18)** **<u>Additional Measures</u>:** **Mobile rectifiers 240 V, 24 V for each unit to charge accumulators from the mobile 0,4 kV DG were supplied.**	**Completed**	**Completed**	**Included in the design documentation**
			b) Remote control of selected equipment installed within the SAM project in all EMO units in the ongoing project of EMO Emergency Centre modification. **<u>Status:</u>** **EMO1,2 - The SAM project requiring remote control of selected equipment installed**	**Completed**	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			within the project in all EMO units (1,2,3,4) has been considered in the ongoing project of EMO Emergency Response Centre upgrade. *** Implementation of the seismic reinforcement with qualification to extreme external conditions is in progress.**			
27.	**EC Communication Annex**	**<u>External hazard safety</u>**	**To analyse seismic margins of selected systems, structures and components (SSC). To evaluate the resistance of selected SSC at a seismic event with intensity corresponding to the probability of occurrence less than once per 10,000 years.** **<u>Status:</u>** **(See ID No. 4, 5, 6 and 7)** *** The time schedule of implementation of measures for 2014 - 2018 to enhance the resistance of selected EBO and EMO1,2 civil structures was prepared.**	**Completed***	**Completed***	**Included in the design documentation**
27.bis	**ENSREG Compilation of recommendations 3.2.10**	**<u>Spent fuel pool</u>**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.**			

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status:			
			a) SAMG are developed and implemented and cover all plant states (for single units) – full power, shut down, spent fuel pool, …	**Completed**	**Completed**	**Completed**
			b) The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").	**Completed**	**Completed**	**Completed**
			c) To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **Comm.: The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.**	**Completed**	**Completed**	**Completed**
			d) Necessary measures are being implemented and inspected by UJD. Post Fukushima SAMG update is in progress to implement Post Fukushima Westinghouse Owners Group /Pressurized Water Reactor Owners Group enhancement. **(See ID 32, 34. 39, 41, 43, 44**	**Completed**	**In progress**	**In progress**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
28.	**ENSREG Compilation of recommendations 3.2.11**	**<u>Isolation and independency</u>**	**a) To diversify the emergency feed water source to SG by assurance of mobile high-pressure sources.** **<u>Status:</u>** **Feed water make-up pumps to steam generators for each reactor unit were purchased in 2012.The pumps are situated on a fire truck chassis.** **In 2014, flow rate sensors were additionally installed on the mobile feed water source high-pressure pump discharge pipe.** **The mobile feed water sources are regularly tested during operation and main overhauls as well.**	**Completed**	**Completed**	**Included in the design documentation**
			b) To diversify emergency power sources by assurance of mobile DG. **<u>Status:</u>** **Mobile DG 0.4 kV with connecting cabling are available for both EBO and EMO1,2 units.** **(See also ID 18, 26)** **<u>Additional measures:</u>** **Mobile rectifiers 240 V, 24 V for each unit to charge accumulators from the mobile 0.4 kV DG were supplied and were tested.**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			c) To finish required modifications of existing equipment to enable connection of diverse feed water sources and power sources ensuring physical access and resistance under conditions evoked by an external event. **(See ID 18)** **<u>Status:</u>** **The project of feed water connection point to SG and diverse power sources in EBO and EMO completed.** **<u>Additional measures:</u>** *** Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO, EMO) has been completed.** **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG" – has been completed.** **(See ID 18c)**	**Completed***	**Completed***	**Included in the design documentation**
29.	**ENSREG Compilation of recommendations 3.2.12**	**<u>Flow path and access availability</u>**	**a) To prepare operating procedures and to implement training programmes for operators.**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Re after a seismic event).** **3,4-LPS-001/O63: Unit Cool down after MDBE, 3-3,4LPS-001/O64: Activities of OP at Flooding of Structures** **3,4-LPS-001/O65: Strong wind in SE-EBO locality** **3,4-LPS-001/O66: Loss of service water supply in PS Pecenady** **0HP/3001 Loss of external power supply, 0HP/3002 Loss of raw water supply,** **0HP/3003 Back-up water make-up** **0HP/3004 Transport of employees for non-standard and calamity situations,** **0HP/3005 External and internal floods, 1TP/6009 Cool down after seismic event** **0HP3006:Measures against extreme climatic conditions** **Training programmes for the diverse mobile devices were prepared implemented and through exercises tested at EBO and EMO.** **Procedures for the actions necessary in response to EEE are developed, implemented and exercised in accordance with the plan of emergency exercises (e. g. EBO 2015).** **(See ID 11, 21)**			
			b) To diversify emergency power sources by assurance of mobile DG.	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **Mobile DG 0.4 kV with connecting cabling are available for both EBO and EMO1,2 units.** **Additional Measures:** **Mobile rectifiers 240 V, 24 V for each unit to charge accumulators from the mobile 0.4 kV DG were supplied.** **(See ID 18, 26, 28)** **Physical access to critical equipment is ensured (e. g. bypass to turne stilles).**			
			c) To finish required modifications of existing equipment to enable connection of diverse feed water sources and power sources ensuring physical access and resistance under conditions evoked by an external event. **(See ID 18)** **Status:** **The project of feed water connection point to SG and diverse power sources in EBO and EMO completed.** **Additional measures:** *** Project documentation for sheltering of mobile DG and cabling between the 0.4 kV**	**Completed***	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			mobile DG and selected consumers (EBO, EMO) has been completed. **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG" – has been completed.** **(See ID 18, 28)**			
			d) To diversify the emergency feed water source to SG by assurance of mobile high-pressure sources. **(See ID 18a)** **<u>Status:</u>** **Feed water make-up pumps to steam generators for each reactor unit were purchased in 2012. The pumps are situated on a fire truck chassis.** **In 2014, flow rate sensors were additionally installed on the mobile feed water source high-pressure pump discharge pipe.** **The mobile feed water sources are regularly tested during operation and main overhauls as well.**	**Completed**	**Completed**	**Included in the design documentation**
30.	**ENSREG Compilation of recommendations 3.2.13**	**<u>Mobile devices</u>**	**a) To diversify the emergency feed water source to SG by assurance of mobile high-pressure sources.** **(See ID 18a, 28a, 29)**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **Feed water make-up pumps to steam generators for each reactor unit were purchased in 2012. The pumps are situated on a fire truck chassis. In 2014, flow rate sensors were additionally installed on the mobile feed water source high-pressure pump discharge pipe.** **The mobile feed water sources are regularly tested during operation and main overhauls as well.**			
			b) To diversify emergency power sources by assurance of mobile DG. **Status:** **Mobile DG 0.4 kV with connecting cabling are available for both EBO and EMO1,2 units.** **Additional Measures:** **Mobile rectifiers 240 V, 24 V for each unit to charge accumulators from the mobile 0.4 kV DG were supplied.** **(See ID 20, 26, 28, 29)**	**Completed**	**Completed**	**Included in the design documentation**
			c) To finish required modifications of existing equipment to enable connection of diverse feed water sources and power sources ensuring physical access and resistance under conditions evoked by an external event.	**Completed***	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **The project of feed water connection point to SG and diverse power sources in EBO and EMO completed.** *** Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO, EMO) has been completed.** **Additional measures:** **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG" – has been completed.** **(See ID 18, 28, 29)**			
			d) To prepare operating procedures and to implement training programmes for operators of diverse mobile devices. **Status:** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Re after a seismic event).** **3,4-LPS-001/O63: Unit Cool down after MDBE, 3-3,4LPS-001/O64: Activities of OP at Flooding of structures**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			3,4-LPS-001/O65: Strong wind in SE-EBO locality **3,4-LPS-001/O66: Loss of service water supply in PS Pecenady** **0HP/3001 Loss of external power supply, 0HP/3002 Loss of raw water supply,** **0HP/3003 Back-up water make-up** **0HP/3004 Transport of employees for non-standard and calamity situations,** **0HP/3005 External and internal floods, 1TP/6009 Cool down after seismic event** **0HP3006:Measures against extreme climatic conditions** **Training programmes for the diverse mobile devices were prepared implemented and through exercises tested at EBO and EMO.** **Procedures for the actions necessary in response to EEE are developed, implemented and exercised in accordance with the plan of emergency exercises (e. g. EBO 2015).** **(See ID 11, 21, 29)**			
31.	**ENSREG Compilation of recommendations 3.2.14**	**<u>Bunkered/Hardened systems</u>**	**To finish required modifications of existing equipment to enable connection of diverse feed water sources and power sources ensuring physical access and resistance under conditions evoked by an external event.** **<u>Status:</u>** **The project of feed water connection point to SG and diverse power sources in EBO and EMO has been completed.**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Project documentation for sheltering of mobile DG and cabling between the 0.4 kV mobile DG and selected consumers (EBO, EMO) has been completed. **<u>Additional measures:</u>** **EMO project "Autonomous cooling for emergency DG" – has been completed.** **EBO "Autonomous cooling for emergency DG" – has been completed.** **(See ID 18, 28, 29, 30)**			
32.	**ENSREG Compilation of recommendations 3.2.15**	**<u>Multiple accidents</u>**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.** **<u>Status:</u>** **a) The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			b) To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **Comm.: The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.**	**Completed**	**Completed**	**Completed**
			c) Necessary measures are being implemented and inspected by UJD. Post Fukushima SAMG update is in progress to implement Post Fukushima Westinghouse Owners Group /Pressurized Water Reactor Owners Group enhancement. **(See ID 27bis, 34. 39, 41, 43)**	**Completed**	**In progress**	**In progress**
33.	**ENSREG Compilation of recommendations 3.2.16**	**Equipment inspection and training programmes**	**To prepare operating regulations and to implement training programmes for operators of diversity mobile devices.** **Status:** **Updated scenarios were incorporated into Operating Instructions for Emergency Situations (3,4-LPS-001/O60 - EBO34, 1,2 TPP 004 EMO12: Cooling of Re after a seismic event).** **3,4-LPS-001/O63: Unit Cool down after MDBE, 3-3,4LPS-001/O64: Activities of OP at Flooding of structures**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			3,4-LPS-001/O65: Strong wind in SE-EBO locality **3,4-LPS-001/O66: Loss of service water supply in PS Pecenady** **0HP/3001 Loss of external power supply, 0HP/3002 Loss of raw water supply,** **0HP/3003 Back-up water make-up** **0HP/3004 Transport of employees for non-standard and calamity situations,** **0HP/3005 External and internal floods, 1TP/6009 Cool down after seismic event** **0HP3006:Measures against extreme climatic conditions** **Training programmes for the diverse mobile devices were prepared implemented and through exercises tested at EBO and EMO.** **Procedures for the actions necessary in response to EEE are developed, implemented and exercised in accordance with the plan of emergency exercises (e. g. EBO 2015).** **(See ID 11, 21, 29, 30)**			
34.	**ENSREG Compilation of recommendations 3.2.17**	**Further studies to address uncertainties**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.**			

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Status: **a) The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").** **(See ID 27bis, 32)** **Additional measures:** **Contract concluded with the Research institute of Transport on analysis of critical roads at the plant. Reports for EBO and EMO completed. The outcomes were analysed.** **Measures for putting the unit into safe condition after a seismic event have been adopted.** **(See ID 7, 18d)**	**Completed**	**Completed**	**Completed**
			b) To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **Comm.: The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			c) Necessary measures are being implemented and inspected by UJD. Post Fukushima SAMG update is in progress to implement Post Fukushima Westinghouse Owners Group /Pressurized Water Reactor Owners Group enhancement. (See ID 34. 39, 41, 43)	Completed	In progress	In progress
35.	EC Communication Annex	The time the operator has at disposal for recovery of safety functions in case of SBO and/or loss of UHS should be longer than an hour.(without human action)	Heat removal from PC: Due to interruption of feed water supply and failure of RCP after SBO, the residual heat removal from the core in the natural circulation regime is to the detriment of gradual reduction of the secondary circuit coolant. Exploitation of nominal inventory of coolant in SG occurs during 5 hours. Containment integrity: After two days, 60 ºC is expected in the containment wall centre. The containment integrity isn't endangered at this temperature. Coolant inventory in PC: Time reserve: PC coolant inventory is sufficient for fuel cooling for 24 hours.	Completed	Completed	Included in the design documentation

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
36.	**EC Communication Annex**	**EOPs should cover all conditions of a power plant (from full power to shut-down reactor)**	**Symptom oriented procedures for design basis and beyond design basis emergency conditions were fully implemented in EMO1,2 and EBO3,4 in 1999 (for events initiated during power operation) and in 2006 (for events initiated at shut-down reactor or in SFP). Long-term maintenance programme with Westinghouse provides for the cutting edge status of EOPs.**	**Completed**	**Completed**	**Included in the design documentation**

RECOMMENDATIONS OF TOPIC 3 (SEVERE ACCIDENT MANAGEMENT)

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
37.	**ENSREG Compilation of recommendations 3.3.1**	**Reference WENRA levels**	**A. In corporation of reference WENRA values related to severe accident management (SAM) to the national legal framework.** **B. To implement the SAM project.** **Status:** **Based on this evaluation full harmonisation of safety regulations with WENRA Reference Levels (2008) has been achieved in Slovakia.** **Additional measures:** **The amended Atomic Act takes into account new EU legal documents:** **e. g. Directive 2014/87/Euratom, Directive 2013/59/Euratom, as well as the latest WENRA Reference levels (2014) to the extent possible.**	**Implemented**	**Implemented**	**Implemented**
38.	**ENSREG Compilation of recommendations 3.3.2** **XCNS**	**SAM technical measures**	**To implement the SAM project.** **Status:** **SAM project implemented and completed at EBO and EMO.** **The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/. The plan of implementation of**	**Completed**	**Completed***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			additional measures has been implemented. *** Some minor deficiencies identified during implementation will be corrected and specific tests will be conducted in 2018.**			
39.	**ENSREG Compilation of recommendations 3.3.3**	**<u>Evaluation of SAM measures after severe external events</u>**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.** **<u>Status:</u>** **a) The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").**	**Completed**	**Completed**	**Completed**
			b) To prepare a plan of implementation of additional	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **Comm.: The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.**			
			c) Necessary measures are being implemented and inspected by UJD. Post Fukushima SAMG update is in progress to implement Post Fukushima Westinghouse Owners Group /Pressurized Water Reactor Owners Group enhancement. **(See ID 27bis, 34. 41, 43)**	**Completed**	**In progress**	**In progress**
40.	**ENSREG Compilation of recommendations 3.3.4**	**Update of severe accident management guidelines (SAMG)**	**To analyse the SAM project with regard to potential damage of infrastructure, including violation of communication at a level of power plant, branch and state, long-term accidents (taking several days) and accidents with an impact on several units and neighbouring industrial facilities.** **Status:** **Contract concluded with the Research institute of Transport on analysis of**	**Completed**	**In progress***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			critical roads at the plant. Reports for EBO and EMO completed. The outcomes were analysed. **Measures for putting the unit into safe state after a seismic event have been adopted.** *** Post Fukushima SAMG update is in progress with Westinghouse to implement up to date Post Fukushima Westinghouse Owners Group / Pressurized Water Reactor Owners Group enhancement.** **(See ID 7, 18, 34)**			
41.	**ENSREG Compilation of recommendations 3.3.5**	**<u>SAMG verification</u>**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.** **<u>Status:</u>** *** Comm.: A contract has been concluded with Westinghouse on**	**Completed**	**In progress***	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			verification and validation according to legal requirements. **The new deadline (2018) for completion of verification and validation has been set by UJD SR for Post Fukushima update.**			
42.	**ENSREG Compilation of recommendations 3.3.6**	**<u>SAM exercises</u>**	**a) To prepare conditions for cooperation with selected external organisations at emergency response control during external events and severe accidents.** **<u>Status:</u>** **Agreement with the Ministry of Interior of the Slovak Republic on mutual assistance and cooperation and its provision at occurrence of an extraordinary event in nuclear installation (No. SE/2012/22100-01).** **The cooperation tested during the emergency exercise (2014) in EBO and EMO (2015).** **(See ID 50)**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			b) Review of the national emergency arrangements based on the outcomes of the so called HAVRAN exercise. **<u>Status</u>** **(See ID 57)**	**Completed**	**Completed**	**Completed**
43.	**ENSREG Compilation of recommendations 3.3.7**	**<u>SAM training</u>**	**a) Based on the extended SAM to modify the SAM training taking into account the severe accident occurrence at multi (all) units at the same site.** **<u>Status:</u>** **The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site"). The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.** *** Comm.: The analyses has been completed and evaluated by the licensee. A plan of implementation of measures was developed. Necessary measures are being implemented and inspected by UJD SR.**	**Completed***	**Completed***	**Completed***

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			b) Modifications to training materials **Status:** **Modifications to training materials will start after completion of Post Fukushima SAMG update with Westinghouse.** **(See ID 27bis, 32, 34, 39, 41)**	**In progress**	**In progress**	**In progress**
44.	**ENSREG Compilation of recommendations 3.3.8** **EC Communication Annex**	**Extension of SAMG to all plant states**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented.** **Status:**			
			a) SAMG are developed and implemented and cover all plant states (for single units) – full power, shut down, spent fuel pool, …	**Completed**	**Completed**	**Completed**
			b) The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site").	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			c) To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **Comm.: The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.**	**Completed**	**Completed**	**Completed**
			d) Necessary measures are being implemented and inspected by UJD. Post Fukushima SAMG update is in progress to implement Post Fukushima Westinghouse Owners Group /Pressurized Water Reactor Owners Group enhancement. **(See ID 27bis, 32, 34. 39, 41, 43)**	**Completed**	**In progress**	**In progress**
45.	**ENSREG Compilation of recommendations 3.3.9**	**<u>Improved communications</u>**	**Remote control of selected equipment installed within the SAM project in all EMO units in the ongoing project of EMO Emergency Centre modification.** **<u>Status:</u>** **Remote control of selected equipment and technological information system installed.**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
46.	**ENSREG Compilation of recommendations 3.3.10** **EC Communication Annex**	**Presence of hydrogen in unexpected places**	**To implement the SAM project. To analyse the SAM project from the viewpoint of potential migration of hydrogen to other places.** **Status:** **a) Analyses completed. The main outcomes are as follows: the atmosphere of the reactor hall is inertized by steam and probability of hydrogen detonation is very low; migration to selected rooms outside the containment identified.**	**Completed**	**Completed**	**Included in the design documentation**
			b) Preparation of potential countermeasures.	**In progress**	**In progress**	
47.	**ENSREG Compilation of recommendations 3.3.11**	**Large volumes of contaminated water**	**To prepare solutions for treatment of large volumes of contaminated water after an accident at a study level from the conceptual viewpoint.** **Status:** **Study completed. The aim of the study was the preparation of a conceptual study for addressing issues, dealing with high activity liquid wastes after severe accident.**	**Completed**	**Completed**	**Completed**
48.	**ENSREG Compilation of recommendations 3.3.12**	**Radiation protection**	**To implement the SAM project. To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the**	**Completed***	**Completed***	**Completed***

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site. **<u>Status:</u>** **The analysis of severe accident management at all units on the site (including reactors at full power, reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site") The SAM project includes also the habitability of the main control room and the control of selected equipment from the ERC. The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/.** **This self-assessment contained a chapter dealing with local radiation conditions in those technological premises to which access is necessary for long term control of SAM.** **(See ID 27bis., 32, 34, 39, 41, 43, 44)**			

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			*** Comm.: The analyses has been completed and evaluated by the licensee. A plan of implementation of measures was developed. Necessary measures are being implemented and inspected by UJD.**			
49.	**ENSREG Compilation of recommendations 3.3.13** **EC Communication Annex**	**<u>On site emergency center</u>**	**Remote control of selected equipment installed within the SAM project in all EMO units in the ongoing project of EMO Emergency Centre modification.** **<u>Status:</u>** **Remote control of selected equipment for all EMO units (1,2,3,4) has been completed within the project of Emergency Response Centre upgrade.** **The seismic reinforcement project – technology in the emergency centre (e.g. reinforcement of air-condition, electrical cabinets, etc.) – has been completed.** **(See ID 45)**	**Completed**	**Completed**	**Included in the design documentation**
50.	**ENSREG Compilation of recommendations 3.3.14**	**<u>Support of local operators</u>**	**To prepare conditions for cooperation with selected external organisations at emergency response control during external events and severe accidents.** **<u>Status:</u>**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			Agreement with the Ministry of Interior of the Slovak Republic on mutual assistance and cooperation and its provision at occurrence of an extraordinary event in nuclear installation (No. SE/2012/22100-01). The cooperation was tested during the all-plant emergency exercise in EBO (2014) and EMO (2015). **(See ID 42)**			
51.	**ENSREG Compilation of recommendations 3.3.15**	**Level 2 Probabilistic Safety Assessment**	**The PSA Level 2 was prepared for EBO3,4 and for EMO1,2 and are continuously updated.**	**Completed**	**Completed**	**Included in the design documentation**
52.	**ENSREG Compilation of recommendations 3.3.16**	**Severe accident studies.**	**To analyse the SAM project from the viewpoint of severe accident management at multi units (all) at the same site (fuel situated in the reactor core and in the spent fuel pool); to modify the SAM project, if needed, so that sufficient measures can be implemented. To prepare a plan of implementation of additional measures for extension of the SAM project to improve the severe accident manageability at its simultaneous occurrence in all units at the same site.** **Status:** **The analysis of severe accident management at all units on the site (including reactors at full power,**	**Completed***	**Completed***	**Completed***

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			reactors in shutdown and spent fuel pool) has been prepared (Report No. CVV 12/2014-01 "Management of Severe Accidents on All Units on Site"). The licensee performed a self-assessment on the implementation of severe accident management /7/ and /8/. **(See ID 27bis, 32, 34, 39, 41, 43, 44)** *** Comm.: The analyses has been completed and evaluated by the licensee. A plan of implementation of measures was developed. Necessary measures are being implemented and inspected by UJD SR.**			
53.	**Peer review country Report of the SR 4.3** **EC Communication– specific to Slovakia 5.11**	**SAM modification implemented according to the proposed schedule**	**The activity is subject to regulatory review and inspection.**	**Annually** **In progress**	**Annually** **In progress**	**Annually**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
54.	**Peer review country Report of the SR 4.3**	**To verify leak-tightness of all penetrations (e.g. RPV cap, SG cap) through the containment under severe accident conditions (in particular leak-tightness of seals).**	**To analyse the SAM project from the viewpoint of resistance of seals and penetrations of the containment under severe accident conditions.** **Status:** **A study (including experimental verification) was prepared by UJV Řež to test the sealing under SA conditions. This study was prepared within the implementation of SAM project.** **Additional measures:** **Replacement of seals at the reactor pressure vessel cavity lids completed. Sealing of doors in line with the maintenance schedules.**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
55.	**Regulatory initiative**	**The concept of large-area fire control – (bigger than considered in the design)**	**To prepare the fire control documentation – operative plan of large-area fire control.** **Status:** **A report was prepared by the Technical University in Ostrava.** **Based on the analysis, the fire brigade on the site prepared an operative fire control plan. Plan of procurement of technology, training of the personnel in cooperation with external organisations in progress.** *** Additional measures:** **Purchase of special streamlines large-scale fire extinguishing flammable liquids, hose wagon with automatic laying, etc. for both EBO and EMO plant sites.**	**Completed***	**Completed***	**Completed***
56.	**Regulatory initiative**	**Physical protection**	**To harmonise the implementation of additional SAM measures with potential new increased requirements for physical protection in case of aggravated assaults.** **All equipment which are part of SAM measures are located within the physical protection barriers of the NPPs (e.g. fire brigade, mobile equipment)**	**Completed**	**Completed**	**Included in the design documentation**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
57.	**Regulatory initiative**	**<u>Emergency arrangements</u>**	**Comprehensive review of the national emergency arrangements based on the outcomes of the so called HAVRAN exercise.** **<u>Status:</u>** **Government Resolution No. 28/2013 requested the Minister of Interior to submit to the Government a report on the progress in implementing the measures resulting from the HAVRAN 2012 exercise. The report was submitted to the government in January 2014 and took note of the progress achieved.** **<u>Additional measures:</u>** **A comprehensive review of the civil protection and emergency management has been initiated. The Ministry of Interior proposes that an amendment to Law No. 42/1994 Coll. on Civil Protection of Citizens to be prepared. This amendment is also necessary to implement the Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances.** **The Government by its resolution No. 3/2016 approved "The National Strategy for the Management of Security Risks (Emergency situations)".**	**Completed**	**Completed**	**Completed**

ID	Source	Recommendation	Fulfilment of recommendation	EBO3&4	EMO1&2	MO34
			The material dealing with management of security/emergency risks, register and assessment of security/emergency risks, risk mitigation measures, financing options, processes of continuous improvement, etc. **The Government approved "The Assessment Report on the Conduct and Evaluation of the Crisis Management Exercise INEX 5 in the Slovak Republic" and adopted measures for further improvements in November 2015.**			

References

/1/ WENRA: Qualitative Reporting on Status of Harmonisation of Safety of Existing Reactors

/2/ Súhrnná správa SHMÚ pre lokalitu Jaslovské Bohunice, Bratislava, Január 2012

/3/ Súhrnná správa SHMÚ pre lokalitu Mochovce, Bratislava, Marec 2011

/4/ Report on estimation of limit seismic margin of civil structures for EBO, EMO12)

/5/ Seismic PSA for seismic re-evaluation of the 1st and 2nd NPP EMO-Final Report

/6/ Impact of extreme external climate conditions in selected rooms (for both NPPs) STMSE000015

/7/ Report on targeted self-assessment in the area of civil accidents according to WANO methodology (POC 2013 – 1) at EMO

/8/ Report on targeted self-assessment in the area of civil accidents according to WANO methodology (POC 2013 – 1) at EBO