Státní úřad pro jadernou bezpečnost

NATIONAL ACTION PLAN OF THE CZECH REPUBLIC ON AGEING MANAGEMENT

for the Purposes of Topical Peer-Review "Ageing Management" under the Nuclear Safety Directive 2014/87/EURATOM

Prague 2019

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1. Introduction

This national action plan has been prepared for the purposes of the first Topical Peer-Review (hereinafter referred to as the "TPR"), which arises from the European Union's Nuclear Safety Directive 2014/87/EURATOM [1]. The Directive requires undertaking the TPR thereunder every six years with the first starting in 2017. The "Ageing Management" has been decided as the topic for the first TPR. The objective of this Peer-Review was to undertake a peer review of practices and approaches in the area of ageing management, to identify strengths and weaknesses or good practices and to define areas for improvement, to share operating experience and to provide a transparent and open framework for developing and implementing appropriate follow-up measures to address areas for improvement.

The TPR included all nuclear power plants and research reactors with a thermal power equal to 1 $MW_{t,}$ or more that were in operation on 31 December 2017 or under construction on 31 December 2016. Research reactors with a power below than that stated above could also be included on a voluntary basis.

The groups of components were then set as examples of the implementation of the overall Ageing Management Programme, of which the following groups fell within the scope of the TPR for the Czech Republic: electrical cables, concealed pipework, reactor pressure vessels and concrete containment structures.

The first task of the peer review was to draw up the National Assessment Report. Based on that Czech Republic prepared its National Assessment Report [2] in December 2017. This was followed by a peer review of the national reports of each Member State in the form of questions and answers on the information referred to in each report. The second phase of the TPR was completed by conducting a peer-review workshop in May 2018 which was held in Luxembourg. This workshop was organize in order to discuss the results of the self-assessments, the questions and comments on the Natinal Assessment Reports and to reply the questions with a goal to identify and discuss both generic and country-specific findings on Ageing Management Programmes.

The last phase of the Topical Peer Review aims in definition and implementation of measures to address relevant findings from national assessment and peer review process. The TPR report [3] has been compiled addressing the generic findings of the TPR process. As decided by the Council Conclusions of the 18 March 2019 and the ENSREG decision of the 25 March 2019, countries that participated in the 1st TPR process should deliver their National Action Plans (NAcPs), for which the TPR report serves as an input, for Nuclear Power Plants and Research Reactors by the end of September 2019.

The NAcP has been prepared in accordance with the Template for the TPR National Action Plans (NAcPs) [4], which determined desired outline and content of the NAcP. Template for TPR NAcPs was prepared by ENSREG WG1. Template was approved during the ENSREG Plenary meeting of the 25th March 2019.

The NAcP includes the Czech Republic response on all findings allocated to the Czech Republic as a result of the peer-review process together with explanation of the position if particular findings were not relevant for the Czech Republic. It also includes the results of the self-assessment mentioned in the National assessment report or discussed during the national presentations within the peer review workshop. For the electrical tables, the findings were formulated generally and haven´t been allocated to countries. The NAcP includes position of the Czech Republic to every generic finding related to electrical cables.

The NAcP is intended to enable to monitor the progress of specified measures as a response on particular findings.

Regarding the proposal of ENSREG to address the AMPs for other significant nuclear installations on voluntary basis, the Czech Republic decided to briefly report on AMPs for other significant nuclear installations in this year revision of NaCP.

2. Findings resulting from the self-assessment

2.1. Overall Ageing Management Programmes (OAMPs)

2.1.1. State finding n°1 (area for improvement or challenge) from the self-assessment - NPPs

Regarding results of the self-assessment documented in the National assessment report [2] chapter 2.7.1. new international requirements concerning ageing management were fully implemented in the national legislative and regulatory framework on 1 January 2017, when new Atomic Act [5] entered into force. Transitional provisions included in the Atomic Act provided the holders of license the time limit to adapt to the new legal conditions (two years in general). Even though setting of the approach to ageing management matched the international good practice at the time of TPR, the entire process were being adapted to meet the new Atomic Act within the license holder´s managing areas.

2.1.2. Country position and action on finding n°1 (licensee, regulator, justification) - NPPs

All actions for fulfilment of new legislative requirements were implemented until the end of time limit for adaptation, which was the end of 2018. The overall ČEZ, a. s. AMP was submitted to the regulator by the end of 2018 as was required by new Atomic Act [5].

SÚJB position: SÚJB performed the brief rewiew and found the formal aspect of the programme update following the requirements of the new legislation to be fulfilled. The detailed review from the SÚJB side is going to be performed within the licencing process of Temelín NPP after 20 years of operation.

2.1.3. State finding n°2 (area for improvement or challenge) from the self-assessment – Temelín NPP

Regarding results of the self-assessment documented in the National assessment report [2] chapter 2.7.1. in the Temelín NPP, all activities were currently not terminated, which were a precondition for full implementation of the overall AMP (e.g. completion of the AMR for all components (i.e. not only selected equipment) included in the scope of equipment subject to ageing management); the implementation should be terminated by 2018.

2.1.4. Country position and action on finding n°2 (licensee, regulator, justification) – Temelín NPP

Implementation of activities necessary for full implementation of Temelín NPP overall AMP was finished by 2018. Overall AMP is updated annually according to the standard procedure of the programme and based on requirements of the regulatory body. No additional action is necessary at this moment.

SÚJB position: As mentioned in comment on previous finding, the comprehensive review of AMP implementation at the Temelín NPP from the perspective of fulfilling the new legislation is the subject of ongoing review due to the upcoming licencing process of Temelín NPP after 20 years of operation. This comprehensive review from the SÚJB side shall be finished by the 10/2020. This term is derived from the SÚJB strategy and defined priorities.

2.1.5. State finding n°3 (area for improvement or challenge) from the self-assessment – Research Reactor LVR-15

As mentioned in chapter 2.7.2. of the National assessment report [2], even the Ageing Management Programme for the LVR-15 nuclear research reactor has been prepared in the past, it wasn´t updated at the time of TPR and did not meet the requirements of the new legislation, which entered into force on 1 January 2017, on all points.

2.1.6. Country position and action on finding n°3 (licensee, regulator, justification) - Research Reactor LVR-15

The overall LVR-15 AMP was submitted to the regulator by the end of 2018 as was required by new Atomic Act [5].

SÚJB position: SÚJB is going to carry out the comprehensive review of the AMP implementation within the licencing process of LVR-15 in 2019-2020.

2.2. Electrical cables

The self-assessment didn´t identify any Areas for Improvement in National Assessment Report.

Cable ageing management programme is carried out for more than 20 years (for Temelín NPP from the beginning of operation) and it is implemented in a proper way. Programme is consistent with IAEA recommendations, applies international standards and takes into account international recommendations of EPRI, OECD/NEA and others. The main outputs are cable current knowledge about cable condition and residual life time determination for all cables important to safety, environmental parameters are monitored.

The intensive international cooperation regarding the cable AMP is in place.

The AMP is continuously updated according to the international good practice and operator needs. The cable AMP was confirmed as properly set within the IAEA mission and won the “EPRI Nuclear Transfer Award 2016” for the “Cable Ageing Management Programme Implementation”. The regulator considers the Cable Ageing Management Programme for the Dukovany and Temelín NPPs to be properly set and sufficiently effective and doesn´t require any changes to be made. All information is possible to find in chapter 3 of the National Assessment Report [2].

SÚJB position: No actions are necessary.

2.3. Concealed pipework

2.3.1. State finding n°4 (area for improvement or challenge) from the self-assessment

The self-assessment didn´t identify any Areas for Improvement in the area of Concealed pipwork. All information is possible to find in chapter 4 of the National Assessment Report [2]. However, after the analysis of National Assessment Reports from other countries, operator of Czech NPPs decided to add into their process good aproach from Bulgarian NAR to use results from regular monitoring of the condition of civil structures as input to the ageing management programme for concealed pipework.

2.3.2. Country position and action on finding n°4 (licensee, regulator, justification)

The Operator decided to establish a formal link between plant procedures handling civil structure inspections/walkdowns and Buried Pipe AMP. This link will allow revealing possible ground movement resulting in both civil structure wall cracks and buried pipe damage. To date there is no

OpEx related to relevant wall cracking on sites and the implementation is considered as low-priority item. The link will be implemented as binary criterion in the BP AMP triggering an evaluation of discovered wall crack and its possible consequences on underground piping. The implementation is already finished. Regarding the component specific AMP for concealed piping, regulator doesn´t have any requirements for improvement of this programme at this moment, programme is set up using international experience and regularly updated on the basis of operatin experience.

SÚJB position: No actions are necessary.

2.4. Reactor pressure vessel

The self- assessment does not identify any Areas for Improvement in National Assessment Report. All information is possible to find in chapter 5 of the National Assessment Report [2].The activities focused on the monitoring of current condition and lifetime assessment of reactor pressure vessel were carried out from the beginning of operation at both NPPs. The aging management activities have been gradually (since start of the operation) expanded based on the current state of knowledge, and external and internal feedback in area.

The current Component Specific Ageing Management Programme for Reactors, which was developed according to state of art requirements and recommendation of IAEA, covers all identified (expected) degradation mechanisms. The setup of the program is periodically verified according to the best international practices.

The evaluation of the RPV physical condition, ageing management process, lifetime assessment is performed periodically one time per year and documented in specific technical reports.

The comprehensive results from the Component Specific Ageing Management Program including life assessment of reactor are presented in the Final Safety Analysis Report updated once a year. The Final Safety Analysis Report is regularly reviewed by the SÚJB.

SÚJB position: The SÚJB considers the Component Specific Ageing Management Programme for Reactors of the Dukovany and Temelín NPPs to be properly set and sufficiently effective. No actions are necessary.

2.5. Concrete containment structure and pre-stressed concrete pressure vessels

The self- assessment does not identify any Challenges or Areas for Improvement in National Assessment Report. All information is possible to find in chapter 7 of the National Assessment Report [2].

The activities focused on the monitoring of current condition and lifetime assessment of civil structures were implemented in advance during Long Term Operation preparation process. The Ageing Management Programmes for the containments and other civil structures were introduced. The aging management activities have been based on the worldwide practice based on US NRC GALL, IGALL Safety Report, EPRI, IAEA, ACI documents and reflected current state of knowledge. Physical condition of civil structures is evaluated annually followed by documentation of results in specific technical reports. Ageing Management Programmes for civil structures were developed according to state of the art requirements and covers all identified (expected) degradation mechanisms. In accordance with licensee's internal processes, all ageing management programs are periodically verified.

SÚJB position: The SÚJB considers the Ageing Management Programmes for Civil Structures to be properly set and sufficiently effective. No actions are necessary.

3. Country specific findings resulting from the TPR

3.1. Overall Ageing Management Programmes (OAMPs)

3.1.1. TPR expected level of performance: finding 1

Delayed NPP projects and extended shutdown: During long construction periods or extended shutdown of NPPs, relevant ageing mechanisms are identified and appropriate measures are implemented to control any incipient ageing or other effects.

3.1.2. Country position and action (licensee, regulator, justification)

Requirements for identification of ageing mechanisms in case of extended shutdown and for implementation of appropriate measures will be added into the NPP management documentation. Currently there are no new NPP projects under construction in the Czech Republic. In case of start of construction of a new NPP, specific control documentation for AMP of this new build will be prepared, and it should contain also requirements on ageing management during delayed construction.

Action 1: Implementation of requirements for identification of ageing mechanisms and appropriate corrective actions in case of extended shutdown into the appropriate NPP AMP control documentation. Specifically, new annex will be added into the document ČEZ_PG_0001 Operational Ageing Management Programme or new document will be created. This new annex respectively new document will contain definition of extended shutdown, list of systems mostly sensitive for ageing during extended shutdowns, basic guidance for identification of potential ageing mechanisms and ageing effects which could occur during extended shutdown, basic guidance for implementation of necessary actions for mitigation and prevention of possible ageing mechanisms. This new annex will be updated after the new IAEA guidance for ageing management during extended shutdowns and delayed constructions which is currently under development in IGALL project will be published.

3.1.3. TPR expected level of performance: finding 2

Overall Ageing Management Programmes for research reactors: A systematic and comprehensive OAMP is implemented for research reactors, in accordance with the graded approach to risk, the applicable national requirements, international safety standards and best practices.

3.1.4. Country position and action (licensee, regulator, justification)

This finding was also identified as the AFI by self-assessment and is described in chapters 2.1.5 and 2.1.6 of this NAcP.

3.2. Concealed pipework

There was no finding in ENSREG Country specific findings rated as challenge or area for improvement in this area for the Czech Republic. All information about the AMP for the concealed pipework is possible to find in chapter 4 of the National Assessment Report [2].

No actions are necessary.

3.3. Reactor pressure vessel

There was no finding either in ENSREG Country specific findings rated as challenge or area for improvement in this area for the Czech Republic. Comperehensive information on the AMP for the reactor pressure vessels is in chapter 5 of the National Assessment Report [2]. No actions are necessary.

3.4. Concrete containment structure and pre-stressed concrete pressure vessels

There was no finding in ENSREG Country specific findings rated as challenge or area for improvement in this area for the Czech Republic. Comperehensive information on the AMP for the civil structures is possible to find in chapter 7 of the National Assessment Report [2]. No actions are necessary.

4. Generic findings related to Electrical cables

4.1. Good practice: characterize the state of the degradation of cables aged at the plant

Cables are aged within the actual power plant environment and tested to assess cables condition and determine residual lifetime.

4.1.1. Country implementation

This good practice has been already implemented and is described in chapter 3.1. of the National Assessment Report [2]. It is a common procedure and always is done according to existing standards and IAEA recommendations. Following activities for cables important to safety are carried out:

- Exists a list of all cables important to safety. It includes all necessary information, cable manufacturers, specifications, constructions, core and jacket insulation materials, types of ageing tests carried out for cables
- Changes in the characteristics of cables over time; i.e. accelerated ageing testing, measurement of mechanical, electrical and physico-chemical parameters, determination of activation energy
- Cables routing in NPP rooms
- Parameters of the environment in which the cables are laid
- Environmental parameters along the cable trays are known
- Special software system calculates residual life of all cables important to safety.
- Calculation is compared with cables harvested at the plant
- Lifetime calculations are précised by using cables from cable deposits

The AMPC in the Czech NPPs that is implemented by ČEZ, a.s. in cooperation with ÚJV Řež, a.s., won the “EPRI Nuclear Transfer Award 2016” for the “Cable Ageing Management Programme Implementation”.

4.1.2. Country planned action if relevant

No additional action is necessary.

4.2. TPR expected level of performance: documentation of the cable ageing management program

The AMP is sufficiently well-documented to support any internal or external reviews in a fully traceable manner.

4.2.1. Country implementation

As described in chapter 3.1. of the National Assessment Report [2], Cable ageing management programme of the Czech NPPs is properly documented. Documents, databases, list of cables, all the information about cables special software systems for data presentation, outputs for NPP personnel, for maintenance, for regulatory body etc. High level of the cable AMP, its implementation, maintenance and development was found during the IAEA pre-SALTO, SALTO and SALTO Follow-up missions to the Dukovany NPP.

4.2.2. Country planned action if relevant

No additional action is necessary.

4.3. TPR expected level of performance: methods for monitoring and directing all AMP-activities

Methods to collect NPP cable ageing and performance data are established and used effectively to support the AMP for cables.

4.3.1. Country implementation

Cable AMP has been in progress for more than 20 years. Many databases have been developed and used by NPP personnel. Main database system for cable AMP is a SW tool that is composed of three main program applications:

- Calculations and assessment of the lifetime of safety cables
- Environmental parameters monitoring
- Visual inspection reports

The system is the network application on NPP operator's computers. The application "Calculations and assessment of the life of safety cables" processes data from the Cable management system (SSK) database. Results from the cable AMP are implemented in overall AMP system LTO suite.

More information is possible to be found in chapter 3.1. of the National Assessment Report [2].

4.3.2. Country planned action if relevant

No additional action is necessary.

4.4. TPR expected level of performance: Systematic identification of ageing degradation mechanisms considering cable characteristics and stressors

Degradation mechanisms and stressors are systematically identified and reviewed to ensure that any missed or newly occurring stressors are revealed before challenging the operability of cables.

4.4.1. Country implementation

People involved in cable AMP are active within international projects coordinated by IAEA, OECD/NEA, EPRI, EU commission as well as by Czech agencies. They participate in IAEA IGALL project. Lot of information from other NPPs have been collected and implemented in cable AMP in Czech. Cables from heat and water plants have been evaluated as well. ÚJV Řež, which supports cable AMP, operates accredited equipment qualification laboratory. This laboratory provides information from qualification of large amount of cables.

Degradation mechanisms, stressors causing age-related degradation, other possible or accidental stressors have been identified and the effects on cables evaluated. Cables have been tested for these stressors, e.g. some cables were qualified while mechanically stressed during ageing. A lot of cables are installed in cable deposits, there are cables not only thermally and radiation aged. Some of them are subjected also to other stressors, that are identified at NPP – painting on cables, high bending, etc. More information is possible to be found in chapter 3.1. of the National Assessment Report [2].

4.4.2. Country planned action if relevant

No additional action is necessary.

4.5. TPR expected level of performance: prevention and detection of water treeing

Approaches are used to ensure that water treeing in cables with polymeric insulation is minimised, either by removing stressors contributing to its growth or by detecting degradation by applying appropriate methods and related criteria.

4.5.1. Country implementation

Water treeing is not a concern for the Czech Republic. All HV cables important to safety are in trenches in such a way, that direct contact with water is not a concern. Preventive actions prevent contact with water or flooding. A study on HV cables after they flooding and influence of cable ageing and water on voltage withstand has been performed. Real data from conventional plant were used.

Moreover, water treeing is concern mainly for XLPE cables. NPP in Czech operates minimum amount of HV cables with XLPE insulation.

4.5.2. Country planned action if relevant

No additional action is necessary.

4.6. TPR expected level of performance: consideration of uncertainties in the initial EQ

The accuracy of the representation of the stressors used in the initial Environmental Qualification is assessed with regard to the expected stressors during normal operation and Design Basis Accidents.

4.6.1. Country implementation

All the cables that need to perform function during LOCA have to be qualified. EQ test reports are available. Results are used for ageing management. Uncertainties and margins are known. In specific cases they can be used for reassessing. But not margins from accident simulation. This topic follows standards and IAEA recommendations.

Majority of the cables have been qualified in Czech in accredited EQ laboratory of ÚJV Řež, which also support cable AMP. Hence, this topic has been properly managed in Czech.

More information can be found in chapters 3.1.2. and 3.1.3. of the National Assessment Report [2].

4.6.2. Country planned action if relevant

No additional action is necessary.

4.7. TPR expected level of performance: determining cables' performance under highest stressors

Cables necessary for accident mitigation are tested to determine their capabilities to fulfil their functions under Design Extension Conditions and throughout their expected lifetime.

4.7.1. Country implementation

It is fulfilled through actions carried out within cable AMP and cable qualification process. Czech NPPs operates large number of cable deposit, some of them are located in areas with temperature and ionizing radiation extremes. These cables are regularly checked and compared with the results from qualification. Similar procedure is done with cables that are harvested from different areas of NPP, especially from steam generator box. Possible cable failures are checked by visual inspections as well. Old cables form Dukovany NPP (34 years in operation) were requalified within last

few years. Temelín NPP is new plant with environmental condition milder than for which cables have been qualified.

In 2014, the SALTO mission marked as good practice another part of the cable AMP: Environmental parameters monitoring. For more information see the chapter 3.1. of the National Assessment Report [2].

4.7.2. Country planned action if relevant

No additional action is necessary.

4.8. TPR expected level of performance: techniques to detect the degradation of inaccessible cables

Based on international experience, appropriate techniques are used to detect degradation of inaccessible cables.

4.8.1. Country implementation

There are not buried cables important to safety. However, the term inaccessible cables can be used also for old cables operated from the Dukovany NPP installation covered with fire-retardant layer. For such cables (not only), the NPP workers carry out additional inspections under the "In-service inspection programme". Testing covers such methods as partial discharge, loss factor tan delta, reflectometry, insulation resistance (e.g. using ECAD system). In the case of cable replacement, old cables are harvested and send to appropriate laboratory for evaluation. All information can be found in the chapter 3.1.3. of the National Assessment Report [2].

4.8.2. Country planned action if relevant

No additional action is necessary.

5. All other Generic Findings

5.1. Overall Ageing Management Programmes (OAMPs)

5.1.1. Good practice: External peer review services

External peer review services (e.g. SALTO, OSART-LTO, INSARR-Ageing) are used to provide independent advice and assessment of licensees' ageing management programmes.

5.1.1.1. Allocation by the TPR

The good practice is allocated to the Czech Republic by the TPR.

5.1.1.2. Country position

Czech NPPs use external peer review services, specifically IAEA SALTO Peer review missions for independent assessment of their ageing management programmes. Personnel from Czech NPPs, UJV Rez - Nuclear Research Institute and from regulator also participates in SALTO missions and workshops in foreign NPPs as experts and observers. Details of these activities are described in National Assessment Report [2] in chapter 2.4.1. The INSAAR mission, which is going to be held in 2020 on research reactor LVR-15, has been already invited.

No additional action is necessary.

5.1.2. TPR expected level of performance: Data collection, record keeping and international cooperation

Participation in international R&D projects, experience exchange within groups of common reactor design and the use of existing international databases are used to improve the effectiveness of the NPPs OAMP.

5.1.2.1. Allocation by the TPR

The good performance is allocated to the Czech Republic by the TPR.

5.1.2.2. Country position and action

Czech NPPs and their subsidiary company UJV Rez – Nuclear Research Institute participate in several activities for exchange of experience and knowledge in are of ageing management. The most important are:

- IAEA SALTO missions and workshops
- IAEA IGALL (International Generic Ageing Lessons Learned) project
- EPRI

In addition, Czech NPPs and UJV Rez – Nuclear Research Institute participated and participate in many R&D projects in area of Ageing management. Examples of these projects are described in National Assessment Report [2], chapters 3.1.2.1 and 5.1.2.1.

No additional action is necessary.

5.1.3. TPR expected level of performance: Methodology for scoping the SSCs subject to ageing management

The scope of the OAMP for NPPs is reviewed and, if necessary, updated, in line with the new IAEA Safety Standard after its publication.

5.1.3.1. Allocation by the TPR

The good performance is allocated to the Czech Republic by the TPR.

5.1.3.2. Country position and action

In chapter 2.1 of the National Assessment Report [2] the legislative requirements on the scope setting are described.

As it is stated in NAR [2] chapter 2.3.1.1 identification of equipment falling into the scope of AM is based on the entire list of all equipment registered in the plant's equipment register (the EAM Asset Suite system is now being used). From the list of all NPP equipment the following equipment is selected for the purposes of AM:

a. All selected equipment under the Atomic Act (equipment with the assigned Safety Class 1, 2, 3).
b. Equipment with the criticality level 1 and 2 assigned under ČEZ_ME_0608 and equipment fulfilling the safety function of category 1 or 2 important to nuclear safety (under ČEZ_ME_0901).
c. Equipment recommended from the PSA.
d. Other equipment recommended on the basis of global good practice and operating experience.

This approach ensures that all SSCs according new IAEA SSG-48, including SSCs needed to cope with design extension conditions or to mitigate the consequences of severe accidents, are included into the scope of AMP.

No additional action is necessary.

5.1.4. TPR expected level of performance: Delayed NPP projects and extended shutdown

During long construction periods or extended shutdown of NPPs, relevant ageing mechanisms are identified and appropriate measures are implemented to control any incipient ageing or other effects.

5.1.4.1. Allocation by the TPR

The area for improvement is allocated to the Czech Republic by the TPR.

5.1.4.2. Country position and action

Country position and action for this area for improvement is described in chapter 3.1.2. of this NaCP.

5.1.5. TPR expected level of performance: Overall Ageing Management Programmes of research reactors

A systematic and comprehensive OAMP is implemented for research reactors, in accordance with the graded approach to risk, the applicable national requirements, international safety standards and best practices.

5.1.5.1. Allocation by the TPR

The area for improvement (resulting also from self-assessment) is allocated to the Czech Republic by the TPR.

5.1.5.2. Country position and action

Country position and action for this area for improvement is described in chapter 3.1.2. (2.1.5 and 2.1.6 respectively) of this NaCP.

No additional action is necessary.

5.2. Concealed pipework

5.2.1. Good practice: use of results from regular monitoring of the condition of civil structures

In addition to providing information on soil and building settlement, the results from regular monitoring of the condition of civil structures are used as input to the ageing management programme for concealed pipework.

5.2.1.1. Allocation by the TPR

No finding was allocated to the Czech Republic by the TPR.

5.2.1.2. Country position

See paragraph 2.3. of this NaCP.

No additional action is necessary.

5.2.2. Good practice: performance checks for new or novel materials

In order to establish the integrity of new or novel materials, sections of pipework are removed after a period of operation and inspected to confirm the properties are as expected.

5.2.2.1. Allocation by the TPR

No finding was allocated to the Czech Republic by the TPR.

5.2.2.2. Country position

Both Dukovany and Temelin have a good operational experience with traditional materials, which are mostly steels. The new materials are introduced slowly and usually based on external experience. The CEZ is a member of EPRI and the results of collaborative research are used. These results often come together with recommendations for in-service testing and such recommendations are used in plant procedures regarding particular application of the novel material. Extraction of part of piping or piping surveillance sample is considered when appropriate, but not used as a rule of thumb.

No additional action is necessary.

5.2.3. TPR expected level of performance: inspection of safety-related pipework penetrations

Inspection of safety-related pipework penetrations through concrete structures are part of ageing management programmes, unless it can be demonstrated that there is no active degradation mechanism.

5.2.3.1. Allocation by the TPR

The good performance is allocated to the Czech Republic by TPR.

5.2.3.2. Country position and action

To date pipelines running through concrete walls are part of particular AMPs for these lines. The degradation mechanisms affecting lines from the inner surface are the same as mechanisms would manifest themselves at adjacent part of the line. These degradation mechanisms are maintained by existing plant activities such are FAC AMP, ISI program as well as maintenance program. Degradation mechanisms affecting outside surface of the lines in question are maintained generic inspection programs, walkdowns and maintenance, which is considered as adequate level of a care since no active degradation mechanism from outer surface was identified in Dukovany and Temelin plants to date. For more details see chapter 4.1. of the National Assessment Report [2].

No additional action is necessary.

5.2.4. TPR expected level of performance: scope of concealed pipework included in AMPs

The scope of concealed pipework included in ageing management includes those performing safety functions, and also non-safety-related pipework whose failure may impact SSCs performing safety functions.

5.2.4.1. Allocation by the TPR

The good performance is allocated to the Czech Republic by TPR.

5.2.4.2. Country position and action

The scope of concealed pipework included in ageing management follows IAEA recommendation, which is in full agreement with the TPR expected level of performance. More details are possible to be found in chapter 4.1.1. of the National Assessment Report [2].

No additional action is necessary.

5.2.5. TPR expected level of performance: opportunistic inspections

Opportunistic inspection of concealed pipework is undertaken whenever the pipework becomes accessible for other purposes.

5.2.5.1. Allocation by the TPR

The good performance is allocated to the Czech Republic by TPR.

5.2.5.2. Country position and action

The opportunistic inspections initiated by particular system owners are performed whenever is possible and practical to get deeper insight into pipework ageing. See the chapter 4.1.3. of the National Assessment Report [2].

No additional action is necessary.

5.3. Reactor pressure vessel

5.3.1. Good practice: Hydrogen water chemistry

Hydrogen Water Chemistry (HWC) is used in BWRs which may be sensitive to Intergranular Stress Corrosion Cracking.

5.3.1.1. Allocation by the TPR

NC – Not Concerned

5.3.1.2. Country position

The PWR (WWER) reactors are operated in the Czech Republic. The low hydrogen low oxygen water chemistry is used in BWR reactors.

5.3.2. Good practice: Implementation of a shield

Shielding in the core of PWRs with relatively high fluence is implemented to preventively reduce neutron flux on the RPV wall.

5.3.2.1. Allocation by the TPR

Good practice is not allocated to the Czech Republic by TPR

5.3.2.2. Country position

The reactor design does not include possibility of the shield implementation in the core. Instead of that the optimisation of fuel loading pattern to obtain the “low-leakage zone” with minimum neutron load of the reactor pressure vessel wall is used. This optimisation was carried out following campaign 12 at Dukovany NPP (see chapter 5.1.4. of the National Assessment Report [2].) After increase in power level to 500 MW, reduction in fluence is approximately 40% against the initial design value at Dukovany NPP. The same principle is applied for the Temelín NPP from the beginning of operation.

No additional action is necessary.

5.3.3. TPR expected level of performance: Volumetric inspection for nickel base alloy penetration

Periodic volumetric inspection is performed for nickel base alloy penetrations which are susceptible to Primary Water Stress Corrosion Cracking for PWRs to detect cracking at as early a stage as possible.

5.3.3.1. Allocation by the TPR

NC – Not Concerned

5.3.3.2. Country position and action

Nickel based alloys are not used in Czech reactors.

5.3.4. TPR expected level of performance: Non-destructive examination in the base material of beltline region

Comprehensive NDE is performed in the base material of the beltline region in order to detect defects.

5.3.4.1. Allocation by the TPR

Good performance is allocated to the Czech Republic by TPR.

5.3.4.2. Country position and action

The scope of NDT inspections was extended for Dukovany NPP on the basis of the hydrogen flakes identification in base material of Belgian PWR Doel and Tihange NPP. At present the whole cylindrical part of RPV area in core region is inspected during ISI program.

The whole cylindrical part of RPV Temelin NPP has been included in ISI since start of the operation.

In-service inspections ET (Eddy Current Testing) and UT (Ultrasonic Testing) of RPVs VVER in Czech Republic are qualified according to ENIQ. The quality and scope of the inspection is sufficient for identification of all known types of discontinuities, defects and manufacturing defects in VVER RPVs.

Information is possible to find in chapter 5.1.3 of the National Assessment Report [2], other detail information was provided in Czech position on allocated finding in Septermber 2018.

No additional action is necessary.

5.3.5. TPR expected level of performance: Environmental effect of the coolant

Fatigue analyses have to take into account the environmental effect of the coolant.

5.3.5.1. Allocation by the TPR

Good performance is allocated to the Czech Republic by TPR.

5.3.5.2. Country position and action

Fatigue analyses are determined in accordance with the NTD (Standard) of the Association of Mechanical Engineers. The methodology used includes influence of the environment (primary water coolant). Increase in fatigue damage is assessed periodically once a year, it is trended and predicted up to the required end of life (see chapter 5.1.2. of the National Assessment Report [2]).

No additional action is necessary.

5.3.6. TPR expected level of performance: Suitable and sufficient irradiation specimens

For new reactors, suitable and sufficient irradiation specimens and archive materials are provided to support the reactor through its full operational life.

5.3.6.1. Allocation by the TPR

NC - Not Concerned

5.3.6.2. Country position and action

Actually no new reactors are built in Czech Republic.

5.4. Concrete containment structure and pre-stressed concrete pressure vessel

5.4.1. Good practice: monitoring of concrete structures

Complementary instrumentation is used to better predict the mechanical behaviour of the containment and to compensate for loss of sensors throughout the life of the plant.

5.4.1.1. Allocation by the TPR

Current system of monitoring of concrete structures was rated as Good practice in country specific findings report.

5.4.1.2. Country position

Current system of monitoring of concrete structures was found to be Good practice which goes beyond what is required in meeting the appropriate international standard, therefore there is no necessity for new actions.
Licensee will continue with present measurements in order to obtain all necessary data to provide comprehensive understanding and predict of physical condition and mechanical behaviour of the containment throughout the life of the plant. Detailed information is possible to be found in chapter 7.1.3. of the National Assessment Report [2].

5.4.2. Good practice: assessment of inaccessible and/or limited access structures

A proactive and comprehensive methodology is implemented to inspect, monitor and assess inaccessible structures or structures with limited access.

5.4.2.1. Allocation by the TPR

The safety significance of these civil structures is high, since they are generally the last barrier between the reactor contents and the environment and are one of the few irreplaceable structures in NPPs. Therefore, TPR identified above mentioned Good practice which is considered to go beyond what is required in meeting the appropriate international standard.

5.4.2.2. Country position

Licensee will continue with present ageing management and maintenance system in order to obtain as much data as reasonably achievable to ensure knowledge of physical condition of inaccessible structures or structures with limited access. A licensee has invested in NDT device and testing procedure for the inspection of inaccessible side of hermetic liner.
Further, it is recognized, that structural modifications during the life of an NPP may provide occasions to access formerly inaccessible parts of the structure. These opportunities should be used to inspect inaccessible areas and/or perform material sampling for laboratory testing.

5.4.3. TPR expected level of performance: monitoring of pre-stressing forces

Pre-stressing forces are monitored on a periodic basis to ensure the containment fulfils its safety function.

5.4.3.1. Allocation by the TPR

Current system of monitoring of pre-stressing forces was rated as Good performance in country specific findings report. There is no necessity for further new actions because current system of monitoring of concrete structures ensures consistent, acceptable approach that fulfils TPR expected level of performance.

5.4.3.2. Country position and action

Licensee will continue with present measurements and maintenance of prestressing tendons as described in NAR, in order to obtain all necessary data to ensure comprehensive understanding of prestressing system throughout the life of the plant.
Prestressing forces are monitored on a periodic basis to ensure the containment fulfils its safety function. Prestressing monitoring system is properly maintained and, if necessary, upgraded to meet all relevant requirements. Also, verification tests such as lift-off tests and chemical analysis of protective grease will continue to be performed. All information are included in chapter 7.1.3.1. (Activities under the Ageing Management Programmes in the Temelín NPP) of the National Assessment Report [2].

No additional action is necessary.

6. Status of the regulation and implementation of AMP to other risk significant nuclear installations

6.1. Board recommendation

The Board recommends that countries explore the regulation and implementation of Ageing Management Programmes of other risk significant nuclear installations while developing and implementing National Action Plans to ensure they exist and are effective.

6.2. Country position and action (fuel cycle facilities, installations under decommissioning, waste facilities, etc.)

Regarding the proposal of ENSREG to address the AMPs for other significant nuclear installations on voluntary basis, the Czech Republic decided to briefly report on AMPs for other significant nuclear installations.

The legal framework in the area of ageing management is valid for all nuclear installation in the Czech Republic without exception, using the graded approach.

Within Dukovany NPP area there are two more nuclear facilities operated by ČEZ, a. s.: Interim spent fuel storage facility and Spent fuel storage facility. Temelín NPP area includes Fresh fuel storage part and Spent fuel storage facility. All of these facilities fall to the scope of the Overall Ageing management programme ČEZ_PG_0001, which was throughouly described in chapter 2.3.1.1 of the National assessment report [2].

Except the research reactor LVR-15, the research reactor LR-0 is also operated in Řež area. As mentioned in the first paragraph of this chapter, the legal framework in the area of ageing management addresses all nuclear installations. The holder of the licence prepared the Ageing management programme for LR-0 and submitted it to regulator by the end of 2018 (in accordance with the transitional provision of the new Atomic Act [5]).

The ageing management programme for educational reactor VR-1 in Nuclear Faculty of ČVUT (FJFI ČVUT) was prepared by the licence holder and it was reviewed by SÚJB within the licencing process in 2017.

7. Table: Summary of the planned actions

Installation	Thematics	Finding	Planned action	Deadline	Regulator's Approach to Monitoring
NPP 1	OAMP	Delayed NPP projects and extended shutdown: During long construction periods or extended shutdown of NPPs, relevant ageing mechanisms are identified and appropriate measures are implemented to control any incipient ageing or other effects.	Implementation of requirements for identification of ageing mechanisms and appropriate corrective actions in case of extended shutdown into the appropriate NPP AMP control documentation. Specifically, new annex will be added into the document ČEZ_PG_0001 Operational Ageing Management Programme or new document will be created. This new annex respectively new document will contain definition of extended shutdown, list of systems mostly sensitive for ageing during extended shutdowns, basic guidance for identification of potential ageing mechanisms and ageing effects which could occur during extended shutdown, basic guidance for implementation of necessary actions for mitigation and prevention of possible ageing mechanisms. This new annex will be updated after the new IAEA guidance for ageing management during extended shutdowns and delayed constructions which is currently under development in IGALL project will be published.	12/2021	SÚJB´s review of the new revision of ČEZ Ageing management programme (licencing documentation)

8. References

[1] European Union's Nuclear Safety Directive 2014/87/EURATOM
[2] National Report of the Czech Republic for the Purposes of Topical Peer-Review "Ageing Management" under the Nuclear Safety Directive 2014/87/EURATOM; State Office for Nuclear Safety, Prague, December 2017
[3] HLG_p(2018-37)_160 1st Topical Peer Review Report.pdf
[4] HLG_M(2019-38)_437 ENSREG_WG1_TPR NAcP_final_draft-20190722.docx
[5] Act No. 263/2016 Coll., Atomic Act

9. List of abbreviations

ACI	American Concrete Institute
AFI	Area for improvement
AMP	Ageing Management Programme
AMPC	Component Specific Ageing Management Programme for Cables
AMR	Ageing Management Review
BP	Buried Piping
ENIQ	The European Network for Inspection Qualification
ENSREG	The European Nuclear Safety Regulators Group
EPRI	Electric Power Research Institute
EQ	Equipment qualification
ET	Eddy Current Testing
EU	European Union
GALL	Generic ageing lessons learned
HV	High Voltage
HWC	Hydrogen Water Chemistry
IAEA	International Atomic Energy Agency
IGALL	International generic ageing lessons learned
INSARR	Integrated Safety Assessment of Research Reactors
LOCA	Loss-of-coolant accident
NAcP	National Action Plan
NAR	National Assessment Report
NC	Not Concerned
NEA	Nuclear Energy Agency
NPP	Nuclear Power Plant
NTD	Normative Technical Documentation
OAMP	Overall Ageing Management Programme
OECD	Organisation for Economic Co-operation and Development
OSART	Operational Safety Review Team
PSA	Probabilistic safety assessment
PWR	Pressurized Water Reactor
RPV	Reactor Pressure Vessel
SALTO	Safe Long Term Operation
SSCs	Systems, Structures and components
SÚJB	State Office for Nuclear Safety
TPR	Topical Peer Review
UT	Ultrasonic Testing
VVER	Water-cooled and water-moderated reactor (Russian design)
WG	Working Group