IAEA Safety Aspects of Long Term Operation SALTO

REPORT

OF THE

PRE-SAFETY ASPECTS OF LONG TERM OPERATION MISSION

(Pre-SALTO)

TO THE

BORSSELE NUCLEAR POWER PLANT

Borssele, Netherlands

19 – 28 November 2024

DIVISION OF NUCLEAR INSTALLATION SAFETY
SAFETY ASPECTS OF LONG TERM OPERATION MISSION
IAEA-NSNI/SALTO/60/2024

This page is intentionally left blank

PREAMBLE

This report presents the results of the IAEA Safety Aspects of Long Term Operation (SALTO) team review of Borssele Nuclear Power Plant in the Netherlands. It includes recommendations and suggestions for improvements affecting ageing management and safe long term operation for consideration by the responsible Dutch authorities and identifies good practices for consideration by other nuclear power plants. Each recommendation, suggestion, and good practice is identified by a unique number to facilitate communication and tracking.

Any use of or reference to this report that may be made by the competent Dutch organizations is solely their responsibility.

This page is intentionally left blank

EXECUTIVE SUMMARY

At the invitation of the Dutch regulatory authority (Authority for Nuclear Safety and Radiation Protection – ANVS) in the Netherlands, the IAEA conducted a Pre-SALTO (Safety Aspects of Long Term Operation) mission at Borssele Nuclear Power Plant (NPP) Unit 1 (further referred to as 'the plant') from 19 to 28 November 2024.

Borssele NPP is a single-unit nuclear power plant that went into commercial operation in 1973. It is a pressurized water reactor of KWU (Kraftwerk Union AG) design with 512 megawatt electrical (MW(e)) capacity. The plant concluded an LTO-project in 2012 which led to the currently licensed design life of 60 years, expiring on 31 December 2033. On the request of the government the operator Elektriciteits-Productiemaatschappij Zuid-Nederland (EPZ) is investigating the possibility to keep the plant in operation beyond 2033.

The Pre-SALTO mission reviewed the status of activities related to the subsequent long term operation (LTO) assessment of the plant against IAEA Safety Standards and international best practices. The review team consisted of two IAEA staff members (team leader and deputy team leader), six international experts, and four observers, covering all six areas of the standard scope of a Pre-SALTO mission. The team reviewed the completed, in-progress and planned activities related to subsequent LTO, including ageing management programmes (AMPs) of the structures, systems and components (SSCs) important to safety, revalidation of time limited ageing analyses (TLAAs) and the ageing management review (AMR). Through the review of available documents, presentations and discussions with counterparts and other members of the plant staff, the IAEA team observed, in the field of ageing management and safe subsequent LTO, that some ageing management and LTO activities are already in compliance with IAEA safety standards and other topics are planned to be addressed in upcoming years.

The team found the plant staff to be professional, open, and receptive to suggestions for improvement. The mission team observed that plant management is committed to improving plant activities for LTO. Walkdowns showed the plant to be in good condition. In addition, the team noted 2 good practices and several good performances including the following:

- Use of the Cloudia Explorer system for enhanced planning of ageing management activities to decrease radiation doses to plant personnel.
- Use of a portable tablet for field inspectors to conduct ageing management inspections of civil structures and record findings.

The team recognized that the plant's intention is to follow the IAEA Safety Standards in preparation for safe subsequent LTO. There are some areas which should be improved to reach the level of IAEA Safety Standards and international best practices. Fifteen issues were raised, including the following:

- The plant should complete the development and implementation of the ageing management programmes for mechanical and electrical components.
- The plant should enhance ageing management of civil structures.
- The plant should effectively update and implement the human resources strategy to support LTO.

A summary of the review was presented to the plant management during the exit meeting held on 28 November 2024. The plant management expressed a determination to address the areas identified for improvement and indicated their intention to continue cooperating with the IAEA on the review of progress in preparing the plant for safe subsequent LTO and to invite a SALTO Mission in the future.

This page is intentionally left blank

CONTENTS

This page is intentionally left blank

1. INTRODUCTION

1.1. OBJECTIVES

As agreed during the preparatory meeting held on 29 May 2024, a Pre-SALTO Peer Review Mission for Borssele Nuclear Power Plant ([19]-[20]) was conducted between 19 – 28 November 2024. The objective was to review the status and future plans for safe LTO programmes and activities performed at the plant against the relevant IAEA Safety Standards, guidance documents and internationally accepted practices and to provide recommendations and suggestions for improvement of the preparations for safe LTO.

1.2. SCOPE

In accordance with Section 3 of IAEA SALTO Guidelines [18] and the Working Note Outlines (WNO), the scope of this pre-SALTO mission agreed during the preparatory meeting was as follows:

A. Organization of ageing management and LTO activities;

B. Scope setting, plant programmes and corrective action programme;

C. Ageing management of mechanical SSCs;

D. Ageing management of electrical and I&C SSCs;

E. Ageing management of civil SSCs;

F. Human resources, competence and knowledge management for LTO.

1.3. CONDUCT OF THE MISSION

The following documents and information were used as the basis for the review:

- IAEA Safety Standards [1-16];
- IAEA Safety Report and Review Guidelines [17-18];
- Advance Information Package [21];
- Technical experience of the team.

IAEA Safety Requirements SSR-2/1 (Rev.1) [2], Safety Requirements SSR-2/2 (Rev.1) [3], Safety Guide SSG-48 [15], Safety Guide SSG-25 on ‘Periodic Safety Review’ [14] and Safety Report No. 82 [17] were the basic references for the peer review.

The list of participants in the mission, including their functions during the Pre-SALTO mission is given in Section 7.

The mission was conducted through reviews of plant documentation, meetings and discussions between the IAEA review team and counterpart specialists and other staff from the plant. All meetings were held at the plant and plant walkdowns were arranged as required.

Plenary sessions and parallel discussions were organized as needed. The discussions between IAEA experts and the plant counterparts were conducted in parallel for all the areas identified above in Section 1.2.

Counterparts and the plant management were informed of the review team’s observations daily. Each reviewer and counterpart reached agreement on the observed facts. The host plant peer attended the daily team meetings. The day before the exit meeting, reviewers delivered to the team leader their parts of the mission report, already discussed and agreed with counterparts.

This mission report summarizes the findings within the review scope, according to the SALTO Guidelines document [18]. The text reflects only those areas in which the team considered that a recommendation, a suggestion, an encouragement, a good practice or a good performance is

appropriate. No text is included for areas of the review scope where the review did not reveal any safety related conclusions.

A formal exit meeting was held on the last day of the mission. At the exit meeting, all the team members provided short conclusive statements summarizing the conclusions in their given review area.

1.4. SUMMARY INFORMATION ON THE PLANT

1.4.1. General information

EPZ, the owner/operator of the Borssele Nuclear Power Plant (NPP), is an electricity-producing company with only two customers, the shareholders are ZEH and RWE. The total installed net capacity of EPZ is 540 MWe, coming from Borssele NPP, wind turbines and a solar park. All production units and the EPZ administration buildings are located at the Borssele site.

The NPP has the following characteristics:

- Locally known as Kerncentrale Borssele (KCB);
- Construction started in 1969, in commercial operation since 1973;
- Turnkey construction contract with Kraftwerk Union (KWU, now FRAMATOME);
- 2-loop Pressurized Water Reactor, thermal power 1365 MWth;
- Gross rated capacity 512 MWe, net 485 Mwe;
- The plant concluded an LTO-project in 2012 which led to the currently licensed design life of 60 years, expiring on 31 December 2033;
- A clause in the Dutch nuclear energy act prohibits power operations after 2033;
- Closed fuel cycle: used fuel is being reprocessed and plutonium is re-used as MOX fuel and reprocessed uranium is re-used after re-enrichment;
- Radioactive waste is managed by the government owned COVRA which is located in the same industrial area.

The NPP is situated in the south-western province of Zeeland, on the northern shore and directly behind the embankment of the Westerschelde River, about 1.4 km north-west of the village of Borssele. The Westerschelde water is locally quite deep with sufficient flow, so there is no need for cooling towers. The NPP ensures the equivalent of 1000 full time jobs in the province of Zeeland, which makes it one of the major employers in this region.

1.4.2. Regulatory framework for ageing management and LTO

The national nuclear regulatory body in the Netherlands is the Authority for Nuclear Safety and Radiation Protection (ANVS). An application for an operation licence extension shall be submitted to ANVS demonstrating the compliance with the "Nuclear Energy Act" (Kernenergiewet). This is a so-called framework act, which means that the more detailed legislation regarding nuclear safety and radiation protection is implemented in decrees, especially for the implementation of supranational law. Relevant decrees for application for an operation licence extension include:

- Decree on nuclear installations, fissile material and ores (Bkse);
- Decree on basic safety standards on radiation protection (Bbs);
- Decree on environment, chapter 11, environmental impact analysis;
- Dutch regulation on safety of nuclear installations (RnvK).

1.4.3. Plant's LTO policy

The first comprehensive design and safety review of the plant was performed in the 1980s. At that time the focus was on post-Three Mile Island issues and the evaluation resulted in considerable design upgrades to remain in line with then current safety practices (i.e., to manage conceptual ageing).

The first formal periodic safety review (PSR) covered the period 1983-1992 and resulted in a project for extensive safety upgrades, called 'Project Modifications', which were implemented in 1997 during a five-month outage. The second PSR was reported in 2004 and covered the period 1993-2002. The turbine-set as well as several reheaters were retrofitted in 2006 to improve thermal efficiency. This improvement project added 35 MW to the gross electrical power output, resulting from the same thermal power output.

In 2006 the plant entered a trajectory with the regulatory body to apply for a design life extension. It was agreed with the regulator to focus preparations on ageing management and human factors and base the safety justification on then current IAEA standards. This first LTO project was supported by SALTO missions. It was concluded in 2012 and led to the currently licensed design life of 60 years, expiring on 31 December 2033.

In parallel, the third periodic safety review was conducted. From 2011 onwards, several projects were undertaken as a result from this third PSR and the complementary safety assessment following the Fukushima accident, to increase both nuclear safety and economic reliability. The largest realized project was the renewal and digitalization of the reactor control and protection electronics in 2016/2017.

The most recent periodic safety review was concluded in 2023. A conscious decision was taken at the start of the review to only take the formal end-of-licence as embedded in the Nuclear Energy Act into account for the scope of the review (i.e., an end date of 31-12-2033). Since then, the Dutch government requested EPZ to investigate the possibility to remain in operation beyond 2033 (second LTO phase – LTO-2). Besides a change of the relevant legislation, this also requires that relevant parts of the PSR need to be re-evaluated with the newly anticipated period of long term operation taken into account.

The Dutch regulatory framework is based on IAEA safety standards from before 2011; however, EPZ will conduct a LTO programme using the relevant requirements of the following current IAEA safety standards for the Safety assessment and development of the LTO programme in preparation of a LTO period beyond 60 years:

- IAEA Specific Safety Requirements (SSR-2/1 Rev.1): Safety of Nuclear Power Plants: Design
- IAEA Specific Safety Requirements (SSR-2/2 Rev.1): Safety of Nuclear Power Plants: Commissioning and Operation
- IAEA General Safety Requirements (GSR Part Part 2): Leadership and Management for Safety
- IAEA General Safety Requirements (GSR Part 4 Rev.1): Safety Assessment for Facilities and Activities

2. MAIN CONCLUSIONS

Through the review of available documents, presentations and discussions with counterparts and other members of the plant staff, the IAEA team observed in the field of ageing management and preparedness for safe subsequent LTO that some topics are managed as recommended by IAEA and other topics are planned to be addressed in upcoming years. The Pre-SALTO team encouraged the plant management to facilitate implementation of all remaining activities for safe subsequent LTO.

The team found the plant staff to be professional, open, and receptive to suggestions for improvement. The mission team observed that plant management is committed to improving plant preparedness for LTO. Walkdowns showed the plant to be in good condition. The two good practices noted by the team were in the following areas:

- Use of the Cloudia Explorer system for enhanced planning of ageing management activities to decrease radiation doses to plant personnel.
- Use of a portable tablet for field inspectors to conduct ageing management inspections of civil structures and record findings.

The team recognized that the plant's intention is to follow the IAEA Safety Standards in preparation for safe subsequent LTO. There are some areas which should be improved to reach the level of IAEA Safety Standards and international best practices. The team identified fifteen issues resulting in either a recommendation or suggestion for improvement:

- The regulatory framework for LTO-2 licensing is incomplete.
- Roles and responsibilities for ageing management are not completely defined for LTO.
- The LTO-2 project risk assessment is incomplete.
- The licensing basis documents do not completely describe ageing management activities and results.
- Scope of structures, systems and components related to ageing management and LTO is incomplete.
- The quality management of plant programmes supporting LTO is insufficient to demonstrate effectiveness for ageing management.
- Methodology and implementation of AMR is not complete for LTO for mechanical and electrical SSCs.
- Development and implementation of AMPs for mechanical and electrical and I&C components are not complete for LTO.
- A comprehensive identification and revalidation of TLAAs has not been performed for LTO for mechanical and civil SSCs.
- The plant has not established a complete equipment qualification programme to support LTO.
- The plant has not established and implemented a proactive technological obsolescence management programme.
- Consistency and completeness of data management in support of LTO are not fully ensured.
- Ageing management for civil structures and components is not adequately developed and implemented.
- The human resources strategy is not effectively updated and implemented to support LTO.
- Systematic training and qualification of staff involved in performing LTO activities are not fully implemented.

An evaluation of each review area is contained within the relevant subsections of Section 3. Recommendations and suggestions are introduced in Section 3 and described in detail in the individual issue sheets in Appendix I.

The plant management expressed a determination to address the areas identified for improvement and indicated the intention to continue in cooperation with the IAEA on review of the progress of preparation for safe subsequent LTO and to invite a SALTO Mission in the future.

3. DETAILED CONCLUSIONS FOR REVIEW AREAS

3.1. ORGANIZATION OF AGEING MANAGEMENT AND LTO ACTIVITIES

Related regulatory requirements, codes and standards for AM and LTO and regulatory review

The regulatory requirements for ageing management and the LTO-2 license are not well defined. The requirements, including relevant IAEA Safety Standards, are being developed based on engagements between the plant and the regulatory body. The regulatory body has plans to update the requirements, but it is unclear if they will be available prior to the plant's LTO-2 licence application submittal. The lack of a complete and clear regulatory framework could impair the plant's preparation of a full safety justification for LTO-2. The team made a **suggestion** in this area (issue A-1).

Principles and approach to AM and LTO

No recommendations, suggestions, encouragements, good practices or good performances were identified in this area.

Organizational arrangements for AM and LTO

The LTO organizational responsibilities and coordination between different roles are often not fully defined. For example, personnel job descriptions do not identify their ageing management responsibilities, and handbooks and procedures with ageing relevance are not always clearly linked to ageing management processes. Incompletely defined roles and responsibilities may degrade the effectiveness of ageing management and safety of long term operation of the plant. The team made a **suggestion** in this area (issue A-2).

In addition, the LTO-2 project may be subject to risks that have not been evaluated. Examples include the potential retirement of experienced LTO personnel, reliance on external support organizations with an uncertain operating future, and an LTO-2 project organization that relies on some personnel who do not directly report to the project manager and have other job duties. The plant does not maintain living risk assessment for LTO-2 that is continually tracked and assessed for mitigative measures. Without a complete risk assessment, the risks might delay and negatively impact the ability to complete the preparations for a safe LTO-2. The team made a **suggestion** in this area (issue A-3).

Periodic Safety Review

In the recent PSR in 2023, the plant agreed with the regulatory body to perform a more limited evaluation than recommended in the IAEA guidance. The plant plans to use that 2023 PSR as a basis in the development of the new PSR that will support the LTO-2 license application. The team **encouraged** the plant to perform the LTO-2 PSR in a manner fully consistent with IAEA guidance, noting the limitations of the prior PSR, and reach formal agreement with the regulatory body to clearly establish expectations.

Programme for LTO

The plant does not have a documented process to periodically evaluate the effectiveness of AMPs, and not all programmes have been evaluated against the IAEA guidance. This is addressed in issues in areas B and C (issues B-2 and C-2).

Configuration/modification management and design basis documentation

The coordination of configuration management and ageing management processes is not well documented. In addition, the plant noted that access to design basis documentation in the LTO-2 period is uncertain, given the future of the original equipment manufacturer. These issues are described in the Organization Arrangements discussion (issues A-2 and A-3).

Safety Analysis Report

The licensing basis documents do not completely describe ageing management activities. The plant's Technical Information Package (TIP) does not describe the plant systems in the scope of ageing management, the AMR results, or the AMPs. As a result, the safety demonstration may not be fully documented for LTO-2, and licencing basis documents may not support appropriate management of changes to the safety bases. The team made a **recommendation** in this area (issue A-4).

3.2. SCOPE SETTING, PLANT PROGRAMMES AND CORRECTIVE ACTION PROGRAMME

Methodology and criteria for scope setting of SSCs for AM and LTO

The walkdowns to identify non-safety affecting safety (NSAS) components have been performed for the first long term operation phase (LTO-1) but the reports are not available. Some systems important to safety are missing in the current scope for ageing management, like secondary side parts of steam generators, the polar crane, the fire protection zoning system or splices which are not included in the description of passive commodity groups. Without a complete scope, the plant may not provide proper ageing management to some SSCs important for LTO. The team made a **suggestion** in this area (issue B-1).

Maintenance programme

The maintenance of passive components programme as well as the equipment reliability programme have not been evaluated against the nine attributes of an effective AMP for the intended period of operation. This is addressed below in issue B-2.

In-service inspection programme

No recommendations, suggestions, encouragements, good practices or good performances were identified in this area.

Surveillance programme

The surveillance and monitoring programme has not been evaluated against the nine attributes of an effective AMP for the intended period of operation. This is addressed below in issue B-2.

Water Chemistry Programme

No recommendations, suggestions, encouragements, good practices or good performances were identified in this area.

Corrective action programme

There is no evidence that modifications of existing AMPs have been issued after evaluations through the corrective action programme or based on operating experience feedback. The plant is using a specific database named VOB to collect operating experience related to ageing (domestic as well as external), distinct from the general corrective action programme database of the plant named TAShelix. A lot of events are duplicated between both databases without a consistency check. The comprehensiveness of the AMR master matrix (linking the equipment, commodity groups and degradation mechanisms) has not been demonstrated and has not been compared to the IGALL data. There is no quality assurance procedure for reviewing the changes made in the COMSY database. The quality management of plant programmes supporting LTO is insufficient to demonstrate effectiveness for ageing management. Without adequate quality management of plant programmes supporting ageing management, safety functions of SSCs may be degraded during LTO. The team made a **suggestion** in this area (issue B-2).

The system health index is an in-house development that displays every system of the plant and how their reliability is evolving. As a basis for this index, system health reports are developed for all the systems of the plant, and in priority for systems important to safety. The process of system health diagnosis includes a systematic walkdown. It also uses the results of the ISI and surveillance programmes as well as the reports from the maintenance programmes, and it is revised on a yearly basis for most relevant safety systems. The plant reorganized to reinforce the resources for creating and maintaining the system health report programme by creating the new equipment reliability department (KE). The system health report process and the system health index both appear to be useful and of great value for ageing management as it puts together information provided by the different plant programmes. The team considered this a **good performance**.

The plant employs the advanced informatic tool "Cloudia Explorer" to significantly enhance the preparation and verification of ageing management related activities. Cloudia Explorer provides a comprehensive visual representation of the nuclear installation through 3-D lidar scans which are updated regularly, including areas that are not easily accessible. It is used for training purposes, work preparation, and task briefings, ensuring that all personnel have a clear understanding of the layout and potential hazards before starting and verifying any activities. It also allows considering already identified hotspots and other specific component information as well as fast and accurate identification of NSAS components within the scope of ageing management, considering that spatial interaction between SSCs is made visible. Accessible from any workstation, Cloudia Explorer facilitates access to crucial information, promoting a culture of safety and preparedness within the NPP. By providing clear and detailed visual information on system interaction, Cloudia Explorer helps reduce the risk of human errors during and after maintenance, as well as for all ageing management related programme activities, enhancing overall safety and operational efficiency.

In both nuclear and conventional areas of the plant, the strategic placement of Piping and Instrumentation (P&I) diagrams and building overviews plays a crucial role in field operations. These diagrams are controlled by configuration management to ensure accuracy and relevance. Each diagram is protected by a transparent plastic plate, facilitating easy cleaning and minimizing the risk of contamination.

By integrating Cloudia Explorer for office-based planning and P&I diagrams for field operations, the plant not only enhances operational efficiency and safety but also significantly reduces job duration. This reduction in job time consequently minimizes personnel exposure to radiation. Additionally, the use of these tools mitigates the risk of human errors in actions required by programmes contributing to ageing management by providing clear, accurate, and easily accessible information, ensuring that tasks are performed correctly and safely.

The team recognized this as a **good practice**.

3.3. AGEING MANAGEMENT OF MECHANICAL SSCS

AMR of mechanical SSCs

The team found that there is no specific guide or methodology describing the AMR process for LTO. The AMR evaluation for external surfaces of different systems important to safety is not performed and during walkdowns the team observed external corrosion in several locations. In addition, for several mechanical systems in scope, the AMR has not been performed and not all applicable degradation mechanisms such as "fouling" and "selective leaching" have been considered. Without a complete AMR for mechanical components, the plant may be unable to demonstrate that affected SSCs will remain capable of fulfilling their intended functions throughout the LTO period. The team made a **recommendation** in this area (issue C-1).

AMPs of mechanical SSCs

The team found that several AMPs, for example: reactor pressure vessel, containment metallic system, spent fuel pool racks, secondary side of steam generators, buried piping, and some related to One-Time inspections, do not exist. An AMP for management of external surfaces is defined but the scope of the programme has not been identified. A process to assess the effectiveness of AMPs is not in place and performance indicators have not been defined for most of the mechanical AMPs. Several AMPs involve inspection by sampling, however, a process for defining samples is not in place for LTO. Without a complete development and implementation of AMPs for mechanical components, ageing effects may not be properly managed for LTO. The team made a **recommendation** in this area (issue C-2).

TLAAs of mechanical SSCs

The team found that there is no specific guide or procedure which describes the methodology for the identification of TLAAs and the completeness of TLAAs has not been demonstrated. Some TLAAs, for example, fatigue of cranes and metallic containment, airlocks and electrical and mechanical penetrations have not been put in place for the period of LTO. Additionally, for some locations involved in the TLAA of fatigue, where cumulative usage factor was calculated to be higher than 1, no plan/programme has been established for periodic inspections. Without comprehensive identification and revalidation of TLAAs, the fulfilment of safety functions of relevant mechanical SSCs cannot be demonstrated for LTO. The team made a **recommendation** in this area (issue C-3).

An action plan aimed to reduce the number of SCRAM transients affecting fatigue has been successfully implemented in the past years, to realign the actual number of transients with the projection extrapolated for LTO. The team considered this a **good performance**.

Scope setting results verification for mechanical SSCs

The plant did not consider within the scope of the ageing management plan the polar crane and some secondary side parts of steam generators (e.g. the separator system). Without a complete scope, the plant may not provide proper ageing management to some mechanical SSCs important for LTO. The team made a **suggestion** in this area (issue B-1).

Data collection and record keeping for mechanical SSCs

No recommendations, suggestions, encouragements, good practices or good performances were identified in this area.

Documentation of AM and documentation in support of LTO for mechanical SSCs

No recommendations, suggestions, encouragements, good practices or good performances were identified in this area.

3.4. AGEING MANAGEMENT OF ELECTRICAL AND I&C SSCS

AMR of electrical and I&C SSCs

The AMR document for ageing management of electrical installations contains descriptions of materials of in-scope SSCs but does not link the relevant stressors, degradation mechanisms and ageing effects. Without a complete AMR for electrical components, the plant may be unable to demonstrate that affected SSCs will remain capable of fulfilling their intended functions throughout the LTO period. The team made a **recommendation** in this area (issue C-1).

AMPs of electrical and I&C SSCs

The plant has no database that contains cable routing. The plant could not demonstrate that the worst cable conditions are taken into account in the ageing related calculations when measuring environmental conditions in separate rooms. The plant did not describe scheduling of

environmental (temperature and does) measurement campaigns as part of the ageing management programme. Without a complete development and implementation of AMPs, ageing effects may not be properly managed for LTO. The team made a **recommendation** in this area (issue C-2).

Equipment qualification programme for all SSCs

The plant has not established a consistent approach for defining applicable standards and guidelines for a complete implementation of the Equipment Qualification Programme. The qualification approach is not comprehensive regarding EMC (Electromagnetic Compatibility) for Electrical and I&C nor regarding mechanical equipment in scope of Equipment Qualification. Without a complete equipment qualification programme, the capability of equipment important to safety to perform its safety function cannot be demonstrated. The team made a **recommendation** in this area (issue D-1).

In accordance with the civil maintenance plan, all coating systems in the nuclear area are periodically inspected and assessed. The coatings in the inaccessible areas must meet special requirements related to adhesion strength tests conducted according to proven standards. The plant has established an acceptance criterion for assessing the qualified condition of coatings. If the strength test does not reach the minimum values, corrective actions are implemented such as re coating. The ongoing trend is that the average adhesion has improved over time. The team considered this as a **good performance**.

Technological obsolescence management for all SSCs

The plant has no proactive and effective methodology for identification and prioritization of safety related items approaching technical obsolescence, nor defined roles and responsibilities of the involved parties of the organization. Storage control has been established for the warehouse to prevent falling below minimum temperature, but no maximum temperature was defined. The plant has considered establishing warehouse practice for elastomeric components according to ISO 2230. This would involve the development of maximum temperature control, lowering the already defined shelf life and developing procedures for modification of shelf life. Documentation is still under development. Without a proactive technological obsolescence management programme, the plant risks unavailability of SSCs important to safety. The team made a **recommendation** in this area (issue D-2).

Scope setting results verification for electrical and I&C SSCs

Splices are mentioned in the table of commodity groups of electrical and I&C but they are not included in the description of passive commodity groups. The AMR of electric components includes junction boxes (many of them are made of polymer). The structural material has been identified but not the sealing materials. Without a complete scope, the plant may not provide proper ageing management to some SSCs important for LTO. The team made a **suggestion** in this area (issue B-1).

Data collection and record keeping for electrical and I&C SSCs

The plant uses several databases in support of ageing management and LTO; however, relevant information for ageing management in the databases is incomplete or under development. The team identified that definition of interaction between databases and a process to ensure data consistency between the COMSY and environmental qualification database (OBA) are still undefined. Update and maintenance of the OBA database is performed by a small number of personnel that requires special knowledge. Without consistent and complete data management, some ageing management activities might not be effective for LTO. The team made a **suggestion** in this area (issue D-3).

Documentation of AM and documentation in support of LTO for electrical and I&C SSCs

The team identified several documents with expired dates for revision. For several of them the revision was still in progress. Without adequate quality management of plant programmes supporting ageing management, the safety functions of SSCs may be degraded during LTO. The team made a **suggestion** in this area (issue B-2).

3.5. AGEING MANAGEMENT OF CIVIL SSCS

AMR of civil SSCs

No recommendations, suggestions, encouragements, good practices or good performances were identified in this area.

AMPs of civil SSCs

The ageing management of civil structures and components is not adequately developed and implemented for LTO. Civil AMPs do not comply with the generic attributes of an effective AMP. Acceptance criteria are not set for multiple civil structures and components in scope of ageing management. Civil AMPs have no requirements set for addressing inspection results, corrective actions and operating experience. The lack of adequately developed and implemented ageing management activities for civil structures and components could lead to the loss of the intended function of civil structures and components. The team made a **recommendation** in this area (issue E-1).

The field inspections of civil structures and components are performed using a tablet. When the room identifier is entered into the tablet, the scope of the inspection is automatically listed on the tablet, based on the required frequency and the room information. This includes pre-defined inspection guidance that must be followed. If degradation is detected, a photo and additional information on the degradation must be entered into the tablet. The inspections can be timely managed by the plant personnel as the inspection results are automatically uploaded and can be reviewed shortly after the inspection. Since clear inspection guidance is automatically provided for each room, the inspections are independent of the contracted inspectors, as pre-defined questions must be followed. The requirement to take photos of degradation allows for easy trending over time. With such a systematic approach for field inspections, the inspectors must have civil expertise; however, they do not have to go through the comprehensive training on scope of civil structures and components and ageing effects before being able to conduct the inspections. The team recognized this as a **good practice**.

TLAAs of civil SSCs

The plant did not consider the effects of time-limited assumptions for irradiation of the biological shield wall in its current ageing management documents. Without complete identification and revalidation of the TLAAs, the fulfilment of safety functions of relevant civil structures and components cannot be demonstrated for LTO. The team made a **recommendation** in this area (issue C-3).

Scope setting results verification for civil SSCs

No recommendations, suggestions, encouragements, good practices or good performances were identified in this area.

Data collection and record keeping for civil SSCs

The plant uses the COMSY database for managing ageing of civil structures and components. Information about civil structures and components were uploaded to the database, however the data is incomplete. The team **encouraged** the plant to complete the process and implement all relevant information of civil structures and components.

Documentation of AM and documentation in support of LTO for civil SSCs

The plant performs inspections of the civil structures and components; however, a condition assessment of the civil structures and components is not performed. The plant has defined inspections that have to be performed on a yearly basis, however some inspections were not performed. A contingency plan for inspections that are not performed in time is not developed by the plant. The lack of adequately developed and implemented ageing management activities and condition assessments for civil structures and components could lead to the loss of the intended function of civil structures and components. The team made a **recommendation** in this area (issue E-1).

3.6. HUMAN RESOURCES, COMPETENCE AND KNOWLEDGE MANAGEMENT FOR LTO

Human resources policy and strategy to support LTO

The human resources strategy is not effectively updated and implemented to support LTO. Exact expectations are not defined about the target LTO organization, the current number of staff does not meet LTO related needs, and the HR strategy does not completely reflect LTO. Without an effectively updated and implemented strategy the human resources support for LTO cannot be assured. The team made a **recommendation** in this area. (issue F-1).

A long-term scenario planning tool has been implemented as part of a strategic process to analyse impacts of LTO, and other possible scenarios, on planning of future human resources needs. The tool identifies different driving forces and critical uncertainties, develops plausible scenarios, and provides action plans. Use of this tool enables planning of future human resources needs based on political, economic, social, technical, environment and legal factors. The team considered this as a **good performance.**

Competence management for LTO and recruitment and training/ qualification processes for personnel involved in LTO activities

Systematic training and qualification of staff involved in performing LTO activities are not fully implemented. The training programmes related to equipment reliability, obsolescence management and ageing processes are not comprehensive. Staff involved in ageing management and LTO activities are not required to be qualified nor trained specifically in these subjects. New staff employed during the last two years to support the LTO-2 project have not been trained in LTO specifics. Without implementing systematic training and qualification of the staff involved in performing LTO activities the plant cannot ensure its preparation for safe LTO-2. The team made a **suggestion** in this area (issue F-2).

Knowledge management and knowledge transfer for LTO

The knowledge management process incorporates the analysis of knowledge loss risks that are reported through balanced scorecards prepared separately for specific processes. The analyses were started in 2022 and only nine scorecards were completed by the time of the mission, none of them related to LTO processes. The team **encouraged** the plant to continue its efforts in this area to complete the knowledge loss risk analysis.

4. SUMMARY OF RECOMMENDATIONS AND SUGGESTIONS

The following table summarizes the issues identified by the hosting organization (Self R/ Self S) and by the IAEA team (R/ S) in the six mains 'Review Areas': The complete set of issue sheets is presented in Appendix I of this report.

Issue No.	**Fundamental Overall Problem**	**Rec./Sugg.**
Review Area A: Organization of ageing management and LTO activities		
A-1	The regulatory framework for LTO-2 licensing is incomplete.	**S**
A-2	Roles and responsibilities for ageing management are not completely defined for LTO.	**S**
A-3	The LTO-2 project risk assessment is incomplete.	**S**
A-4	The licensing basis documents do not completely describe ageing management activities and results.	**R**
Review Area B: Scope setting, plant programmes and corrective action programme		
B-1	Scope of structures, systems and components related to ageing management and LTO is incomplete.	**S**
B-2	The quality management of plant programmes supporting LTO is insufficient to demonstrate effectiveness for ageing management.	**S**
Review Area C: Ageing management of mechanical SSCs		
C-1	Methodology and implementation of AMR is not complete for LTO for mechanical and electrical SSCs.	**R**
C-2	Development and implementation of AMPs for mechanical and electrical and I&C components are not complete for LTO.	**R**
C-3	A comprehensive identification and revalidation of TLAAs has not been performed for LTO for mechanical and civil SSCs.	**R**
Review Area D: Ageing management of electrical and I&C SSCs		
D-1	The plant has not established a complete equipment qualification programme to support LTO.	**R**
D-2	The plant has not established and implemented a proactive technological obsolescence management programme.	**R**
D-3	Consistency and completeness of data management in support of LTO are not fully ensured.	**S**
Review Area E: Ageing management of civil SSCs		

E-1	Ageing management for civil structures and components is not adequately developed and implemented.	**R**
Review Area F: Human resources, competence and knowledge management for LTO		
F-1	The human resources strategy is not effectively updated and implemented to support LTO.	**R**
F-2	Systematic training and qualification of staff involved in performing LTO activities are not fully implemented.	**S**

5. DEFINITIONS

Recommendation

A recommendation is advice on what improvements in operational safety should be made in the activity or programme that has been evaluated. It is based on inadequate conformance with the IAEA Safety Requirements and addresses the general concern rather than the symptoms of the identified concern. Recommendations are specific, realistic and designed to result in tangible improvements.

Suggestion

A suggestion is advice on an opportunity for safety improvement not directly related to inadequate conformance with the IAEA Safety Requirements. It is primarily intended to make performance more effective, to indicate useful expansions to existing programmes and to point out possible superior alternatives to ongoing work.

Good Practice

A good practice is an outstanding and proven programme, activity or equipment in use that contributes directly or indirectly to operational safety and sustained good performance. A good practice is markedly superior to that observed elsewhere, not just the fulfilment of current requirements or expectations. It should be superior enough and have broad enough application to be brought to the attention of other nuclear power plants and be worthy of their consideration in the general drive for excellence. A good practice:

- is novel;
- has a proven benefit;
- is replicable (it can be used at other plants); and
- does not contradict an issue.

Normally, good practices are brought to the attention of the team on the initiative of the plant.

Encouragement

If an item does not have sufficient safety significance to meet the criteria of a ‘recommendation’ or ‘suggestion’, but the expert or the team feels that mentioning it is still desirable, the given topic may be described in the text of the report using the phrase ‘encouragement’ (e.g., the team encouraged the plant/research reactor to…).

Good performance

A good performance is a superior objective that has been achieved or a good technique or programme that contributes directly or indirectly to operational safety and sustained good performance, that works well at the nuclear installation. However, it might not be necessary to recommend its adoption by other nuclear installation, because of financial considerations, differences in design or other reasons.

6. REFERENCES

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Leadership and Management for Safety, General Safety Requirements No. GSR Part 2, IAEA, Vienna (2016).

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Design, Specific Safety Requirements No. SSR-2/1 (Rev.1), IAEA, Vienna (2016).

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Commissioning and Operation, Specific Safety Requirements No. SSR-2/2 (Rev.1), IAEA, Vienna (2016).

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Application of Management system for Facilities and Activities, Safety Guide No. GS-G-3.1, IAEA, Vienna (2006).

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Management System for Nuclear Installations, Safety Guide No. GS-G-3.5, IAEA, Vienna (2009).

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, Format and Content of the Safety Analysis Report for Nuclear Power Plants, Specific Safety Guide No. SSG-61, IAEA, Vienna (2021).

[7] INTERNATIONAL ATOMIC ENERGY AGENCY, Modifications to Nuclear Power Plants, Specific Safety Guide No. SSG-71, IAEA, Vienna (2022).

[8] INTERNATIONAL ATOMIC ENERGY AGENCY, The Operating Organization for Nuclear Power Plants, Specific Safety Guide No. SSG-72, IAEA, Vienna (2022).

[9] INTERNATIONAL ATOMIC ENERGY AGENCY, Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants, Specific Safety Guide No. SSG-74, IAEA, Vienna (2022).

[10] INTERNATIONAL ATOMIC ENERGY AGENCY, Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, Specific Safety Guide No. SSG-75, IAEA, Vienna (2022).

[11] INTERNATIONAL ATOMIC ENERGY AGENCY, Operating Experience Feedback for Nuclear Installations, Specific Safety Guide SSG-50, IAEA, Vienna (2018).

[12] INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of Seismic Safety for Existing Nuclear Installations, Safety Guide No. NS-G-2.13, IAEA, Vienna (2009).

[13] INTERNATIONAL ATOMIC ENERGY AGENCY, Chemistry Programme for Water Cooled Nuclear Power Plants, Specific Safety Guide No. SSG-13, IAEA Vienna (2012).

[14] INTERNATIONAL ATOMIC ENERGY AGENCY, Periodic Safety Review for Nuclear Power Plants, Specific Safety Guide No. No. SSG-25, IAEA, Vienna (2013).

[15] INTERNATIONAL ATOMIC ENERGY AGENCY, Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, Specific Safety Guide No. SSG-48, IAEA, Vienna (2018).

[16] INTERNATIONAL ATOMIC ENERGY AGENCY, Equipment Qualification for Nuclear Installations, IAEA Specific Safety Guide No. SSG-69, IAEA, Vienna, (2021).

[17] INTERNATIONAL ATOMIC ENERGY AGENCY, Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL), Safety Report Series No. 82 (Rev. 2), IAEA, Vienna (2024).

[18] INTERNATIONAL ATOMIC ENERGY AGENCY, SALTO Peer Review Guidelines, Guidelines for Peer Review of Safety Aspects of Long Term Operation of Nuclear Power Plants and Research Reactors, IAEA Services Series No. 26 (Rev.1), IAEA, Vienna (2021).

[19] INTERNATIONAL ATOMIC ENERGY AGENCY, Preparatory Meeting Report, Safety Aspects of Long Term Operation (SALTO) Peer Review Service Terms of Reference for Borssele Nuclear Power Plant in the Netherlands, IAEA, Vienna, 2024.

[20] INTERNATIONAL ATOMIC ENERGY AGENCY, Virtual Preparatory Meeting Minutes of a 'Pre-SALTO Peer Review Service to Borssele Nuclear Power Plant in the Netherlands', IAEA, Vienna, 2024.
[21] BORSSELE NUCLEAR POWER PLANT, Borssele NPP Advance Information Package Pre-SALTO November 2024, Borssele, October 2024.

7. TEAM COMPOSITIONS

7.1. IAEA SALTO REVIEW TEAM

IAEA STAFF MEMBER:		
Mr. Gabor Petofi	Team Leader	IAEA, NSNI, OSS
Mr. Bryce Lehman	Deputy Team Leader	IAEA, NSNI, OSS
IAEA EXTERNAL EXPERTS:		
Mr. John Wise	Reviewer A	US NRC, USA
Mr. Olivier Loiseau	Reviewer B	IRSN, France
Mr. Victor Garcia	Reviewer C	IDOM, Spain
Mr. Jorge Zorrilla	Reviewer D	CNEA, Argentina
Mr. Darijan Vukas	Reviewer E	NEK – Krsko NPP, Slovenia
Mr. Igor Fifnja	Reviewer F	NEK – Krsko NPP, Slovenia
OBSERVERS:		
Mr. Mihaly Czibula	Observer A	MVM Paks NPP, Hungary
Mr. Daniel Reitz	Observer C	ENSI, Switzerland
Mr. Mauri Takala	Observer D	Forsmark NPP, Sweden
Mr. Kim Ji-Min	Observer F	KHNP, Korea

7.2. THE PLANT AND OTHER ORGANIZATIONS

BORSSELE NUCLEAR POWER PLANT COUNTERPARTS:	
	Host Plant Peer
	Area A
	Area B
	Area C
	Area D
	Area E
	Area F

APPENDIX I - ISSUE SHEETS

1. ISSUE IDENTIFICATION	**Issue Number: A-1**
NPP: Borssele	**Unit: 1**
Reviewed Area: Organization of ageing management and LTO activities	
1.1 – ISSUE TITLE: Incomplete regulatory framework for LTO-2	
1.2 – FUNDAMENTAL OVERALL PROBLEM: The regulatory framework for LTO-2 licensing is incomplete.	
2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024
2.1 – FACTS: F1) Neither the Nuclear Energy Act, nor the current covenant between the State, operator, and the shareholders, allow operation beyond 2033. F2) The national regulations do not define the requirements for the safety demonstration needed to support the LTO-2 licence application. F3) The regulations do not define the requirements for the periodic safety review that will support the LTO-2 licence application. F4) The Nuclear Safety Requirements and Nuclear Safety Guidelines included in the LTO-1 licence are based on outdated IAEA guidance (e.g. NS-G-2.12, Ageing Management for Nuclear Power Plants). F5) The team noted that the regulatory body has plans to update the Nuclear Safety Requirements and Nuclear Safety Guidelines, but it is unclear if they will be available prior to the plant's LTO-2 licence application submittal. F6) The plant is engaged with the regulatory body to define acceptable requirements, methodology, and deliverable schedule for LTO-2 licensing, but the plant has not yet received preliminary approval ("positive judgement") that its proposed licensing approach is acceptable.	
2.2 – SAFETY CONSEQUENCE: The lack of a complete and clear regulatory framework could impair the plant's preparation for a full safety justification for LTO-2.	
2.3 – RECOMMENDATION/SUGGESTION: S) The plant should consider continuing to engage with the regulatory body to clarify the expectations for an LTO-2 licence.	
2.4 – IAEA BASIS: SSR-2/2 (Rev. 1) Requirement 1: Responsibilities of the operating organization	

The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant.

3.3. The operating organization shall establish liaison with the regulatory body and with relevant authorities to ensure a common understanding of, and to ensure compliance with, safety requirements and their interface with other requirements, such as those for security, protection of health or protection of the environment.

Requirement 16: Programme for long term operation

Where applicable, the operating organization shall establish and implement a comprehensive programme for ensuring the long term safe operation of the plant beyond a time-frame established in the license conditions, design limits, safety standards and/or organization.

4.53. The justification for LTO shall be prepared on the basis of the results of a safety assessment, with due consideration of the ageing of structures, systems, and components. The justification for LTO shall utilize the results of periodic safety review and shall be submitted to the regulatory body, as required, for approval on the basis of an analysis of the ageing management programme, to ensure the safety of the plant throughout its extended operating lifetime.

SSG-48

3.2. Regulatory requirements for ageing management should be established and guidance should be developed to ensure that the operating organization of the nuclear power plant implements effective ageing management at each stage of the lifetime of the nuclear power plant.

7.2 Requirements for LTO should be specified within the national regulatory framework. They should cover, as appropriate, interfaces with the requirements for periodic safety review.

7.40. The demonstration of safety for LTO should be provided to the regulatory body for review and approval at a level of detail, and in a manner, defined by national regulatory requirements. …

2.5 – DOCUMENTS REVIEWED:

- BWBR0002402, Act of 21 February 1963 Laying Down Rules on the Release of Nuclear Energy and the Use of Radioactive Materials and Equipment Emitting Ionising Radiation (Nuclear Energy Act), Article 15a, 01.07.2024;
- Borssele Nuclear Power Plant Covenant, July 2006;
- R230034, Rev. 1.0 Final Concept, LTO-2 Project Plan, 31.07.2023;
- Feasibility Study of the Lifetime Extension KCB, 09.12.2022;
- BD-01-03, Draft document, Policy Preparation for the Realisation of LTO-2 (Principles and Approach to AM and LTO);
- 2.7181/24.293371, First draft, Concept of KCB LTO-2 Safety Demonstration, 11.11.2024.

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:		
n.a.		
4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM		**Date:** D3/M3/YYY3
4.1 – FACTS:		
F1) n.a.		
4.2 – DOCUMENTS REVIEWED:		
n.a.		
4.3 – RESOLUTION DEGREE:		
1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: A-2**
NPP: Borssele	**Unit: 1**
Reviewed Area: Organization of ageing management and LTO activities	
1.1 – ISSUE TITLE:	
Incomplete roles and responsibilities for ageing management	
1.2 – FUNDAMENTAL OVERALL PROBLEM:	
Roles and responsibilities for ageing management are not completely defined for LTO.	
2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024
2.1 – FACTS:	
F1) Personnel involved in ageing management activities do not have job descriptions and defined task responsibilities that identify their role in ageing management (other than the engineering (KTE) leader).	
F2) Personnel involved in ageing management activities do not have defined competency requirements for those functions in their job descriptions.	
F3) The Ageing Management Handbook (HB-N12-2) and executing procedure (PU-N12-50) do not fully identify the organizations and personnel positions that participate in ageing management, but rather includes references to role titles (e.g. “ageing coordinator) that are not defined to particular personnel.	
F4) The Ageing Management Civil Structures procedure (PU-N12-50-330) and Civil Structures Maintenance Programme (N12-77-ONDC) define responsibilities on the	

department level; however, the responsibilities are not defined for the individual department personnel.

F5) The Equipment Reliability department (KE) has tasks related to civil structures; however, those responsibilities are not defined in the Ageing Management Civil Structures procedure.

F6) The KE manager noted the lack of sufficient integration and understanding of ageing management in that department.

F7) The Configuration Management Handbook (HB-N13) does not identify a clear link to ageing management, other than the inclusion of the ageing management procedure in the reference list.

F8) There is no direct role defined for the Human Resources department (EHR) in the current LTO-2 project organization.

F9) The review of modification plans does not require a review by ageing management personnel to identify ageing implications. The KTO (design) manager selects the review departments, based on the manager's knowledge and judgment.

F10) The scope setting ageing management procedure (PU-N12-50-201) was revised less than two months after the prior revision (15-11-2024 (rev 4) vs. 30-09-2024 (rev 3)) because the electrical and I&C specialist did not participate in the previous revision.

F11) An inspection related to the wall thickness measurement of the metallic containment was performed in June 2024; however, the results were not evaluated by the ISI or ageing management personnel by the time of the mission.

F12) The COMSY tool allows notification to plant staff responsible for the ageing management of civil structures when degradation is found; however, the process is not described in the plant documents.

2.2 – SAFETY CONSEQUENCE:

Incompletely defined roles and responsibilities may degrade the effectiveness of ageing management and safety of long term operation of the plant.

2.3 – RECOMMENDATION/SUGGESTION:

S) The plant should consider completely defining roles and responsibilities for ageing management for LTO.

2.4 – IAEA BASIS:

SSR-2/2 (Rev.1)

Requirement 3: Structure and functions of the operating organization

The structure of the operating organization and the functions, roles and responsibilities of its personnel shall be established and documented.

3.8. Functional responsibilities, lines of authority, and lines of internal and external communication for the safe operation of a plant in all operational states and in accident conditions shall be clearly specified in writing. Authority for the safe operation of the plant may be delegated to the plant management. In this case, the necessary resources and support shall be provided.

3.9. Documentation of the plant's organizational structure and of the arrangements for discharging responsibilities shall be made available to the plant staff and, if required, to the regulatory body. The structure of the operating organization shall be specified so that all roles

that are critical for safe operation are specified and described. Proposed organizational changes to the structure and associated arrangements, which might be of importance to safety, shall be analysed in advance by the operating organization. Where so required by the State's regulations, proposals for such organizational changes shall be submitted to the regulatory body for approval.

GSR Part 2

4.11. The organizational structures, processes, responsibilities, accountabilities, levels of authority and interfaces within the organization and with external organizations shall be clearly specified in the management system.

4.23. Senior management shall ensure that competence requirements for individuals at all levels are specified and shall ensure that training is conducted, or other actions are taken, to achieve and to sustain the required levels of competence. An evaluation shall be conducted of the effectiveness of the training and of the actions taken.

SSG-72

2.14. Job descriptions or equivalent information should be used to supplement the organizational chart. Job descriptions should clearly define the authorities, responsibilities and competences and qualification for each job or category of job within the operating organization as a whole, and within individual departments in the plant.

2.15. Job descriptions should form the basis for defining qualification and training needs for personnel, in accordance with Requirement 7 of SSR-2/2 (Rev. 1) [1]. Further recommendations on the recruitment and selection of personnel are provided in SSG-75 [8].

SSG-48

3.5. The roles of all organizations that participate in the ageing management of SSCs at different stages and in different activities should be properly defined and coordinated.

5.2. Suitable organizational and functional arrangements should be established, such as those shown in Fig. 2, in which all necessary members of staff of the operating organization of the plant and of external organizations are involved with and support ageing management.

5.3. An authorized organizational entity (e.g. an ageing management unit, manager or task force) should be assigned responsibilities for ageing management, as specified in para. 5.4. This ageing management entity should work closely with other organizational units at the plant, such as the operations, maintenance, engineering and management system units. Interdisciplinary ageing management teams consisting of members of different units of the plant and external experts may be established if necessary, on either a permanent or ad hoc basis.

5.6. Responsibilities for the implementation of ageing management programmes and for reporting on the performance of SSCs should be defined and allocated within the operating organization (e.g. operations, maintenance and engineering units).

7.10. The operating organization's staff, in particular plant personnel, should be familiar with long term operation and should understand its principles and concept.

2.5 – DOCUMENTS REVIEWED:

- PU-A02-10-002, version 13, Determine Business Processes, Process Owners and Process Managers, 02.07.2024;
- HB-N12-2, version 3, Ageing Management Handbook, 30.09.2021;
- PU-N12-50, version 3, Ageing Management executing procedure, 31.01.2022;
- PU-N12-50-330, version 1, Ageing Management Civil Structures, 01.07.2022;

– PU-N12-50-201, version 4, Scope Setting Ageing Management procedure, 15.11.2024; – N12-77-ONDC, version 14, Civil Structures Maintenance Programme, 16.03.2018; – HB-N13, Version 1, Configuration Management Handbook, 19.12.2022.
3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE — **Date:** D2/M2/YYY2
3.1 – RESULTS OF THE ISSUE ANALYSIS: n.a.
3.2 – CORRECTIVE ACTIONS: n.a.
3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION: n.a.
4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM — **Date:** D3/M3/YYY3
4.1 – FACTS: F1) n.a.
4.2 – DOCUMENTS REVIEWED: n.a.
4.3 – RESOLUTION DEGREE:

1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: A-3**
NPP: Borssele	**Unit: 1**
Reviewed Area: Organization of ageing management and LTO activities	
1.1 – ISSUE TITLE: LTO-2 project risks not completely assessed	
1.2 – FUNDAMENTAL OVERALL PROBLEM: The LTO-2 project risk assessment is incomplete.	
2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024

2.1 – FACTS:

F1) The project risk matrix in the initial proposal for the LTO-2 feasibility study has not been updated since 2022.

F2) LTO-2 steering committee action no. 54 to create a more detailed project plan (with an updated project risk assessment) was due 23 October 2024; however, it has not been completed.

F3) There are not assigned owners to track and mitigate each of the LTO-2 project risks.

F4) The plant's policy for the preparation of LTO-2 has not yet been approved and posted in the Integrated Management System.

F5) Experienced plant experts in LTO preparation, ageing management, and specific technical areas (e.g. polymer degradation) are eligible to retire soon, and the possible risk to the project due to loss of knowledge has not been addressed.

F6) The plant relies on the original equipment manufacturer (OEM) for support of engineering, inspections, access to plant design basis information, and reconstitution of lacking design basis information. The plant is uncertain if the OEM can continue to support these roles for the LTO-2 period.

F7) Any equipment reliability decisions to make more limited repairs/replacements due to the approaching end of the licence are encouraged to be noted in system health reports, but there is no requirement that they be documented to allow easy retrieval if LTO-2 is approved.

F8) By law, the plant cannot operate in the LTO-2 period. Neither the Nuclear Energy Act, nor the covenant between the State, operator, and shareholders, allow operation beyond 2033. This is a recognized risk of the project, but the plant does not have tools to mitigate it.

2.2 – SAFETY CONSEQUENCE:

Without complete risk assessment, the risks might delay and negatively impact the ability to complete the preparations for a safe LTO-2.

2.3 – RECOMMENDATION/SUGGESTION:

S) The plant should consider completely assessing risks on an ongoing basis for the LTO-2 project.

2.4 – IAEA BASIS:

GS-G-3.5

5.43. Project management can be described as managing a project in accordance with the agreed scope, schedule, cost and quality requirements, and dealing with all the challenges and risks encountered from the pre-planning phase to the completion of the project. This is achieved by performing various planned tasks in sequence and by deploying resources effectively and efficiently.

5.44. The success of a project depends on its project manager leading a team of dedicated individuals to achieve its objectives. The characteristics of an effective project manager include:

(e) Ability to deal with uncertainties and risks and to take good decisions in a timely manner;

5.56. All projects are inherently risky ventures. Factors that contribute to risk include:

(a)Poorly defined scope and goals or objectives;

(b)Poorly defined project and technical requirements;

(c)Lack of qualified resources;

(d)Poor estimating;

(e)Lack of management support;

(f)Inadequate work breakdown or poor planning;

(g)Unrealistic scheduling;

(h)Poor methodology for change control;

(i)Poor methodology for control of corrective actions;

(j)Unproven equipment and facilities;

(k)Poor information management and/or configuration management.

5.57. A risk management plan to define the methodology and tools for identifying and evaluating risk should be prepared. …

SSG-48

7.9. The concept (strategy) for long term operation should address basic goals and objectives, milestones, activities, organizational roles and responsibilities, interactions with other major projects, and interactions with external organizations.

2.5 – DOCUMENTS REVIEWED:

- BWBR0002402, Act of 21 February 1963 Laying Down Rules on the Release of Nuclear Energy and the Use of Radioactive Materials and Equipment Emitting Ionising Radiation (Nuclear Energy Act), Article 15a, 01.07.2024;
- Borssele Nuclear Power Plant Covenant, July 2006;
- PU-A32-01-001, EPZ Company risk matrix, 26.01.2022;
- R230034, Rev. 1.0 final concept, LTO-2 Project plan, 31.07.2023;
- Feasibility Study of the Lifetime Extension KCB, 09.12.2022;
- BD-01-03, Draft document, Policy preparation for the realisation of LTO-2 (Principles and approach to AM and LTO);
- 2.7181/24.293371, First draft, Concept of KCB LTO-2 Safety Demonstration, 11.11.2024;
- PU-A02-10-002, version 13, Determine business processes, process owners and process managers, 02.07.2024.

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3
4.1 – FACTS: F1) n.a.	
4.2 – DOCUMENTS REVIEWED: n.a.	
4.3 – RESOLUTION DEGREE:	

1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: A-4**
NPP: Borssele	**Unit: 1**
Reviewed Area: Organization of ageing management and LTO activities	
1.1 – ISSUE TITLE: Incomplete licencing basis documentation for ageing management	
1.2 – FUNDAMENTAL OVERALL PROBLEM: The licencing basis documents do not completely describe ageing management activities and results.	
2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024

2.1 – FACTS:

F1) Neither the Safety Report nor the Technical Information Package describe the AMPs that support LTO.

F2) Neither the Safety Report nor the Technical Information Package identify all structures, systems, and components that could be affected by ageing and are in the scope of ageing management for LTO.

F3) Neither the Safety Report nor the Technical Information Package describe the results of the AMR for LTO.

F4) The plant does not currently have plans to describe the AMPs, scoping results, and AMR results in the licencing basis documents for LTO-2.

F5) The Technical Information Package was not updated to include the results of the 2017 reactor pressure vessel embrittlement surveillance tests.

F6) Neither the Safety Report nor the Technical Information Package describe the bases for the mandatory and non-mandatory aspects of AMPs that are introduced in the plant.

2.2 – SAFETY CONSEQUENCE:

Without completely describing ageing management activities and results, the licencing basis documents cannot properly document the current state of the safety demonstration and manage impacts of changes to the safety bases.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should ensure that the licensing basis documents contain a complete description of the ageing management activities and results.

2.4 – IAEA BASIS:

SSR-2/2 (Rev.1)

3.2. The management system, as an integrated set of interrelated or interacting components for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner, shall include the following activities:

(e) Review activities, which include monitoring and assessing the performance of the operating functions and supporting functions on a regular basis. The purpose of monitoring is: to verify compliance with the objectives for safe operation of the plant; to reveal deviations, deficiencies and equipment failures; and to provide information for the purpose of taking timely corrective actions and making improvements. Reviewing functions shall also include review of the overall safety performance of the organization to assess the effectiveness of management for safety and to identify opportunities for improvement. In addition, a safety review of the plant shall be performed periodically, including design aspects, to ensure that the plant is operated in conformance with the approved design and safety analysis report, and to identify possible safety improvements.

SSG-48

3.11. Ageing management should be addressed in the safety analysis report and other licensing documents. The description of ageing management in the safety analysis report should include general information on the following topics:

(a) The strategy for ageing management and prerequisites for its implementation;

(b) Identification of all SSCs that could be affected by ageing and are in the scope of the ageing management;

(c) Proposals for appropriate materials monitoring and sampling programmes in cases where it is found that ageing effects might occur that could affect the capability of SSCs to perform their intended functions throughout the lifetime of the plant;

(d) Ageing management for different types of in-scope SSCs (e.g. concrete structures, mechanical components and equipment, electrical equipment and cables, and instrumentation and control equipment and cables) and the means to monitor their degradation;

(e) Design inputs for equipment qualification (see paras 4.23–4.31) of the in-scope SSCs, including required equipment and equipment functions that need to be qualified for service conditions in normal operation and associated with postulated initiating events;

(f) General principles stating how the environment of an SSC is to be maintained within specified service conditions (e.g. by means of proper location of ventilation, insulation of hot SSCs, radiation shielding, damping of vibrations, avoiding submerged conditions, and proper selection of cable routes);

(g) Appropriate consideration of the analysis of feedback on operating experience with respect to ageing.

4.2 Each plant programme and analysis should be properly documented in safety analysis reports or in other current licensing basis documents, which should clearly and adequately describe the current licensing basis or the current design basis requirements for operation of the nuclear power plant.

4.3. The policy on ageing management and the justification for long term operation should be properly documented in the current licensing basis, in particular in documents such as the safety analysis report, reports of periodic safety reviews (if applicable) or other licensing basis documents.

4.4. The safety analysis report should be kept up to date to reflect the results of the ageing management review.

5.64 Time limited ageing analyses should meet all six of the following criteria:

(6) Time limited ageing analyses should be contained or incorporated by reference in the current licensing basis. The current licensing basis includes the technical specifications and the design basis information, or the commitments of the operating organization documented in the plant specific documents contained or incorporated by reference in the current licensing basis, including, but not limited to: safety analysis reports, regulatory safety evaluation reports, the fire protection plan or hazard analysis, correspondence with the regulatory body, the documentation of the management system, and topical reports included as references in the safety analysis reports. If a code of record is in the safety analysis report for a particular group of structures or components, the reference material should include all the calculations called for by that code of record for those structures or components.

7.36. The documentation should include an update of the safety analysis report and other documents required by the licensing process reflecting the assumptions, activities and results of the plant programme for long term operation. The update to the safety analysis report should also include documentation of the revalidation of the time limited ageing analyses for the period of long term operation.

SSG-61

2.18. Since the safety analysis report is an essential part of the overall justification of the safety of the nuclear power plant, it should always reflect the state of knowledge of the methods for safety assessment as well as the status of the plant configuration. The safety analysis report should therefore be reviewed at appropriate intervals and should be updated accordingly. The updating of the safety analysis report should reflect, as appropriate, all safety related activities performed during the lifetime of the nuclear power plant, including the following:

(h) Ageing management of the SSCs;

Design provisions for ageing management

3.3.30. This section of the safety analysis report should define the design life of items important to safety and should describe how relevant mechanisms of ageing and wear were taken into account in the design of the nuclear power plant to ensure the adequate performance of the most important plant components. Special attention should be devoted to the reactor pressure vessel, in particular to the effects of neutron embrittlement.

3.3.31. It should be described how adequate margins are maintained, with account taken of degradation mechanisms relevant to ageing, including those caused by testing and

maintenance, by plant states during a postulated initiating event and by plant states following a postulated initiating event.

3.3.32. It should be described how ageing effects caused by environmental factors (e.g. vibration, irradiation, humidity, temperature) over the expected service life of items important to safety have been considered in the qualification programme for such items. Reference should be made to a comprehensive ageing management programme (see paras 3.13.1–3.13.30).

Ageing management and long term operation

3.13.16. This section should describe all the parts of the plant that can be affected by ageing and should present the proposals made for addressing any ageing issues that have been identified, according to the safety relevance of the SSCs. The description should cover appropriate material monitoring and sampling programmes necessary to verify the ability of equipment and SSCs to fulfil their safety functions throughout the lifetime of the plant. Appropriate consideration should be given to the feedback of operating experience (see Requirement 24 of SSR-2/2 and para. 3.13.20 of this Safety Guide) with respect to ageing. Recommendations are provided in IAEA Safety Standards Series No. SSG-48, Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants.

3.13.17. The long term operation programme focused on ageing management should be described, if applicable. The description should cover the additional measures necessary to verify the capability of SSCs to fulfil their safety functions and to meet their qualification requirements during the period of long term operation.

2.5 – DOCUMENTS REVIEWED:

- VR15-KCB, Version 1, Safety Report, July 2016;
- TIP-09-04-01, Technical Information Package, Aging Management chapter 13.10.2022;
- TIP-05-04-01, Technical Information Package, Long Term Operation chapter 28.1.2015;
- STRAT-ISH, version 1, Strategy for the Maintenance/Surveillance/In-Service Inspection process, 29.9.2021.

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3

4.1 – FACTS:

F1) n.a.		
4.2 – DOCUMENTS REVIEWED: n.a.		
4.3 – RESOLUTION DEGREE:		
1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: B-1**
NPP: Borssele	**Unit: 1**
Reviewed Area: Scope setting, plant programmes and corrective action programme	
1.1 – ISSUE TITLE: Incomplete scope for ageing management and LTO	
1.2 – FUNDAMENTAL OVERALL PROBLEM: Scope of structures, systems and components related to ageing management and LTO is incomplete.	
2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024
2.1 – FACTS: F1) The walkdowns necessary to identify non-safety affecting safety (NSAS) components have been performed for LTO-1 but the reports are not available. F2) Some secondary side parts of steam generators (which are NSAS components) are not included in the scope of ageing management (e.g. the separator system). F3) The UQ system (which includes the polar crane) is not included in the scope of ageing management. F4) The fire protection zoning system (ZD) is not included in the scope of ageing management. F5) Splices are mentioned in the table of commodities but they are not included in the description of passive commodity groups. F6) The AMR of electric components (PU-N12-50-323) includes junction boxes (many of them are made of polymer). The structural material has been identified but not the sealing materials.	
2.2 – SAFETY CONSEQUENCE: Without a complete scope, the plant may not provide proper ageing management to some SSCs important for LTO.	

2.3 – RECOMMENDATION/SUGGESTION:

S) The plant should consider ensuring a complete scope of SSCs for ageing management and LTO.

2.4 – IAEA BASIS:

SSR-2/2 (Rev.1)

Requirement 16:

4.54. The comprehensive programme for long term operation shall address:

…

(b) Setting the scope for all structures, systems and components important to safety;

…

SSG-48

5.16. The following SSCs should be included in the scope of ageing management:

(a) SSCs important to safety that are necessary to fulfil the fundamental safety functions :

– Control of reactivity;
– Removal of heat from the reactor and from the fuel store;
– Confinement of radioactive material, shielding against radiation and control of planned radioactive releases, and limitation of accidental radioactive releases.

(b) Other SSCs whose failure may prevent SSCs important to safety from fulfilling their intended functions. Examples of such potential failures are:

– Missile impact from rotating machines;
– Failures of lifting equipment;
– Flooding;
– High energy line break;
– Leakage of liquids (e.g. from piping or other pressure boundary components).

(c) Other SSCs that are credited in the safety analyses (deterministic and probabilistic) as performing the function of coping with certain types of event, consistent with national regulatory requirements, such as:

– SSCs needed to cope with internal events (e.g. internal fire and internal flooding);
– SSCs needed to cope with external hazards (e.g. extreme weather conditions, earthquakes, tsunamis, external flooding, tornados and external fire);
– SSCs needed to cope with specific regulated events (e.g. pressurized thermal shock, anticipated transient without scram and station blackout);
– SSCs needed to cope with design extension conditions or to mitigate the consequences of severe accidents.

2.5 – DOCUMENTS REVIEWED:

– N13-51-001, Rev. 39, Electrical and I&C Safety Classification, 21-08-2024;
– PU-N12-50, Rev. 3, Ageing management process, 31-01-2022;

- STRAT-KWAL, Rev.9, Strategy for qualification of safety relevant components 21-11-2022;
- PU-N12-40, Rev. 1, Spare Parts, 18-12-2020;
- HB-N12, Rev. 5, Handbook for maintenance, 27-01-2021;
- PU-N12-50-201, Rev. 4, Scope setting for ageing management: systems commodity groups and components, 15-11-2024;
- TIP-05-01-01, Rev. 6, Safety objectives and design principles, 30-08-2024;
- PU-N12-50-302, Rev. 10, Ageing Management Review for Steam Generators, 23-07-2024;
- HB-N12-2, Rev. 3, Handbook of ageing management, 30-09-2021;
- PU-A02-20, Rev. 12, Document management system, 02-10-2022;
- PU-N12-50-309, Rev. 3, Ageing management review for safety and closed cycle cooling water systems, 21/09/2022;
- PU-N12-50-309, Rev. 4, Ageing management review for safety and closed cycle cooling water systems, in progress;
- PU-N12-50-101, Rev. 3, Catalogue of ageing mechanisms, 23-01-2023;
- KT/HtL.JKr/R201335, "Basis document for PSR 2023 (Evaluation framework and plan of approach for the 4th 10-yearly evaluation)", 04-05-2021;
- PU-A32-01-001, Rev. 3.1, Business Risk Matrix, 25-10-2018;
- PU-N12-60-001, Rev. 3, Component classification for maintenance, 27-03-2023;
- N12-77-ONDW, Rev. 7, Justification report of the mechanical maintenance, 03-09-2024;
- PU-N12-50-400, Rev. 1, Assessment of the maintenance programme for in-service inspection for the purpose of ageing management, 20-01-2022;
- WNW-OO-018, Rev. 6, Condition monitoring by means of oil analysis, 04-11-2024;
- KO 021 134, System Health Report of the emergency feedwater system (RL), 22-11-2021;
- KWU NT13/94/139, Leak-before-break assessment of the main cooling lines, 14-12-1994;
- KE/FHe/R230330, Annual report on surveillance 2023, 26-02-2024;
- STRAT-ISH, Rev. 1, KCB Conservation strategy, 29-09-2023;
- PU-N12-50-307, Rev. 2, Ageing management of primary containment, 17-03-2020;
- KTE/Adj/Rnh/R106188_Rev. B, IAEA Safety report 57 – Verification of preconditions – Surveillance and monitoring, 10-07-2013;
- PU-N12-50-405, Rev. 1, Ageing management programme of active components, 04-10-2024;
- PU-N12-50-308, Rev. 9, Ageing management of the reactor internals, 05-09-2024;
- PU-N12-50-480, Rev. 1, Ageing management programme: Reactor pressure vessel internals, under progress;
- N13-51-005, Rev. 3, Safety classification of lifting equipment at the Borssele NPP, 15-11-2024;
- STRAT-ISI, Rev. 13, Strategy of In-service inspection of the Borssele NPP, 08-12-2022;
- PU-N12-50-303, Rev. 7, Ageing management review of the reactor pressure vessel (YC), 25-11-2021;
- ANVS-2021/5378, Regulatory Approval of the ISI Programme EPZ interval 6, 2020-2029, 13-04-2021;
- PU-N12-50-323, Rev. 3, Ageing management of construction in electrical installation, 03-03-2021;
- PU-N12-50-403, Rev. 1, Ageing management programme water chemistry, 18-08-2024

– PU-N12-50-470, Rev. 5, Ageing management programme: stress corrosion cracking, 17-06-2024; – PU-N12-50-471, Rev. 2, Ageing management programme: primary water stress corrosion cracking (PWSCC), 28-02-2024; – HB-A27, Rev. 2, Handbook of continuous improvement, 12-07-2024; – PU-A27-04. Cf. EPZ Business risk matrix associated to events; – PU-A27-02, Rev. 14, Operating experience process, 31-10-2024; – PEPA-G/2012/en/0092, Rev. A, Long Term Pressure and Temperature Development in Containment, 31-07-2013; – N13-78-050, Rev.8, Electric and Instrumentation specification basis, 01-09-2022; – D02-ARV-01154-486, Rev. A, Pressure and Temperature Development inside Containment for a 2A Hot Leg Break and a Small Main Steam Line Break, 15-11-2019;

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2
3.1 – RESULTS OF THE ISSUE ANALYSIS: n.a.	
3.2 – CORRECTIVE ACTIONS: n.a.	
3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION: n.a.	
4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3
4.1 – FACTS: F1) n.a.	
4.2 – DOCUMENTS REVIEWED: n.a.	

4.3 – RESOLUTION DEGREE:

1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: B-2**
NPP: Borssele	**Unit: 1**
Reviewed Area: Scope setting, plant programmes and corrective action programme	

1.1 – ISSUE TITLE:

Insufficient quality management of plant programmes supporting LTO

1.2 – FUNDAMENTAL OVERALL PROBLEM:

The quality management of plant programmes supporting LTO is insufficient to demonstrate effectiveness for ageing management.

2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024

2.1 – FACTS:

F1) The review of the handbook of ageing management (HB-N12-2, REV. 3), which is a fundamental basis document in the perspective of LTO, was due by September 2024 but the review is still in progress.

F2) The team identified several documents with expired dates for revision:

- Maintenance handbook (HB-N12, Rev. 5);
- Ageing management procedure (PU-N12-50, Rev. 3);
- STRAT-KWAL equipment qualification strategy (Rev. 9);
- Spare parts procedure (PU-N12-40, Ver.1).

F3) The comprehensiveness of the AMR master matrix (linking the equipment, commodity groups and degradation mechanisms) has not been demonstrated and systematically compared to the IGALL data.

F4) There is no quality assurance procedure for reviewing the changes made in the COMSY database.

F5) The plant has not evaluated the following programmes against the nine attributes of an effective AMP for the intended period of operation:

- Surveillance and monitoring programme,
- Maintenance of passive components programme,
- Equipment reliability programme.

F6) The ISI programme is based on ASME Section XI with specific additional inspections based on the KTA standards, including further improvements such as the leak-before-break concept. However, the AMP of the ISI programme does not mention these additions and how these were justified.

F7) There is no requirement for the civil AMPs to be periodically reviewed. The review frequency for civil AMPs is marked as “not required”.

F8) The ageing management for active mechanical component document (PU-N12-50-405) contains a review of the existing preventive maintenance programme against the nine attributes. Improvements were identified, such as the development of (commodity) component health reports, however, the document is still a draft version and the recommended improvements have not been implemented.

F9) Measurements of the primary containment thickness showed a local thinning of more than 1 mm between 2011 and 2021. The plant considered this as significant and decided to change the frequency of the measurements from every-10-years to every-3-years in accordance with ASME XI. However, these observations and changes of the ISI programme are not tracked in the AMR relating to the primary containment, due to the outstanding review of this document.

F10) There is no evidence that modifications of existing AMPs have been issued after evaluations through the corrective action programme or the operating experience showed a need for such modifications.

F11) The plant is using a specific database named VOB to collect operating experience relating to ageing (domestic as well as external), distinct from the general corrective action programme database of the plant named TasHelix. A lot of events are duplicated between both databases without a consistency check.

2.2 – SAFETY CONSEQUENCE:

Without adequate quality management of plant programmes supporting ageing management, safety function of SSCs may be degraded during LTO.

2.3 – RECOMMENDATION/SUGGESTION:

S) The plant should consider improving quality management of plant programmes supporting LTO.

2.4 – IAEA BASIS:

SSR-2/2 (Rev.1):

Requirement 31: Maintenance, testing, surveillance and inspection programmes

The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented.

8.1. Maintenance, testing, surveillance and inspection programmes shall be established that include predictive, preventive and corrective maintenance activities. These maintenance activities shall be conducted to maintain availability during the service life of structures, systems and components by controlling degradation and preventing failures. In the event that failures do occur, maintenance activities shall be conducted to restore the capability of failed structures, systems and components to function within acceptance criteria.

8.3. The operating organization shall develop procedures for all maintenance, testing, surveillance and inspection tasks. These procedures shall be prepared, reviewed, modified when required, validated, approved and distributed in accordance with procedures established under the management system.

GSR Part 2:

Requirement 6: Integration of the management system

The management system shall integrate its elements, including safety, health, environmental, security, quality, human-and-organizational-factor, societal and economic elements, so that safety is not compromised. 4

4.8. The management system shall be developed, applied and continuously improved. It shall be aligned with the safety goals of the organization.

4.9. The management system shall be applied to achieve goals safely, to enhance safety and to foster a strong safety culture by:

(a) Bringing together in a coherent manner all the necessary elements for safely managing the organization and its activities;

(b) Describing the arrangements made for management of the organization and its activities;

(c) Describing the planned and systematic actions necessary to provide confidence that all requirements are met;

(d) Ensuring that safety is taken into account in decision making and is not compromised by any decisions taken.

Requirement 8: Documentation of the management system

The management system shall be documented. The documentation of the management system shall be controlled, usable, readable, clearly identified and readily available at the point of use.

4.16. The documentation of the management system shall include as a minimum: policy statements of the organization on values and behavioural expectations; the fundamental safety objective; a description of the organization and its structure; a description of the responsibilities and accountabilities; the levels of authority, including all interactions of those managing, performing and assessing work and including all processes; a description of how the management system complies with regulatory requirements that apply to the organization; and a description of the interactions with external organizations and with interested parties.

4.17. Documents shall be controlled. All individuals responsible for preparing, reviewing, revising and approving documents shall be competent to perform the tasks and shall be given access to appropriate information on which to base their input or decisions.

SSG-48:

3.21. The operating organization should ensure that programmes and documentation relevant to the management of ageing (see Sections 4 and 5) and technological obsolescence (see Section 6) are implemented during the operation stage. Where necessary, new programmes and documentation should be developed or existing programmes and documentation should be reviewed and modified to ensure that they will be effective for managing ageing.

4.17. Existing programmes that are credited for ageing management and used in evaluations for long term operation should be consistent with the nine attributes listed in Table 2, in Section 5.

2.5 – DOCUMENTS REVIEWED:

- PU-N12-50, Rev. 3, Ageing management process, 31-01-2022;
- STRAT-KWAL, Rev.9, 21-11-2022;
- PU-N12-40, Rev. 1, Spare Parts, 18-12-2020;
- HB-N12, Rev. 5, Handbook for maintenance, 27-01-2021;
- PU-N12-50-201, Rev. 4, Scope setting for ageing management: systems commodity groups and components, 15-11-2024;
- TIP-05-01-01, Rev. 6, Safety objectives and design principles, 30-08-2024;
- PU-N12-50-302, Rev. 10, Ageing Management Review for Steam Generators, 23-07-2024;
- HB-N12-2, Rev. 3, Handbook of ageing management, 30-09-2021;
- PU-A02-20, Rev. 12, Document management system, 02-10-2022 ;
- PU-N12-50-309, Rev. 3, Ageing management review for safety and closed cycle cooling water systems, 21/09/2022;
- PU-N12-50-309, Rev. 4, Ageing management review for safety and closed cycle cooling water systems, in progress;
- PU-N12-50-101, Rev. 3, Catalogue of ageing mechanisms, 23-01-2023;

- KT/HtL.JKr/R201335, "Basis document for PSR 2023 (Evaluation framework and plan of approach for the 4th 10-yearly evaluation)", 04-05-2021;
- PU-A32-01-001, Rev. 3.1, Business Risk Matrix, 25-10-2018;
- PU-N12-60-001, Rev. 3, Component classification for maintenance, 27-03-2023;
- N12-77-ONDW, Rev. 7, Justification report of the mechanical maintenance, 03092024;
- PU-N12-50-400, Rev. 1, Assessment of the maintenance programme for in-service inspection for the purpose of ageing management, 20-01-2022;
- WNW-OO-018, Rev. 6, Condition monitoring by means of oil analysis, 04-11-2024;
- KO 021 134, System Health Report of the emergency feedwater system (RL), 22112021;
- KWU NT13/94/139, Leak-before-break assessment of the main cooling lines, 14121994;
- KE/FHe/R230330, Annual report on surveillance 2023, 26-02-2024;
- STRAT-ISH, Rev. 1, KCB Conservation strategy, 29-09-2023;
- PU-N12-50-307, Rev. 2, Ageing management of primary containment, 17-03-2020;
- KTE/Adj/Rnh/R106188_Rev. B, IAEA Safety report 57 – Verification of preconditions – Surveillance and monitoring, 10-07-2013;
- PU-N12-50-405, Rev. 1, Ageing management programme of active components, 04102024;
- PU-N12-50-308, Rev. 9, Ageing management of the reactor internals, 05-09-2024;
- PU-N12-50-480, Rev. 1, Ageing management programme: Reactor pressure vessel internals, under progress;
- N13-51-005, Rev. 3, Safety classification of lifting equipment at the Borssele NPP, 15-11-2024;
- STRAT-ISI, Rev. 13, Strategy of In-service inspection of the Borssele NPP, 08122022;
- PU-N12-50-303, Rev. 7, Ageing management review of the reactor pressure vessel (YC), 25-11-2021;
- ANVS-2021/5378, Approval of the ISI Programme EPZ interval 6, 20202029, 13042021;
- PU-N12-50-323, Rev. 3, Ageing management of construction in electrical installation, 03-03-2021;
- PU-N12-50-403, Rev. 1, Ageing management programme water chemistry, 18082024
- PU-N12-50-470, Rev. 5, Ageing management programme: stress corrosion cracking, 17-06-2024;
- PU-N12-50-471, Rev. 2, Ageing management programme: primary water stress corrosion cracking (PWSCC), 28-02-2024;
- HB-A27, Rev. 2, Handbook of continuous improvement, 12-07-2024;
- PU-A27-04. Cf. EPZ Business risk matrix associated to events;
- PU-A27-02, Rev. 14, Operating experience process, 31-10-2024;
- PEPA-G/2012/en/0092, Rev. A, Long Term Pressure and Temperature Development in Containment, 31-07-2013;
- N13-78-050, Rev.8, Electric and Instrumentation specification basis, 01-09-2022;
- D02-ARV-01154-486, Rev. A, Pressure and Temperature Development inside Containment for a 2A Hot Leg Break and a Small Main Steam Line Break, 15-11-2019;

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS: n.a.		
3.2 – CORRECTIVE ACTIONS: n.a.		
3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION: n.a.		
4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3	
4.1 – FACTS: F1) n.a.		
4.2 – DOCUMENTS REVIEWED: n.a.		
4.3 – RESOLUTION DEGREE:		
1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: C-1**
NPP: Borssele	**Unit: 1**
Reviewed Area: Ageing Management of mechanical SSCs	
1.1 – ISSUE TITLE: Incomplete AMR for mechanical and electrical SSCs	
1.2 – FUNDAMENTAL OVERALL PROBLEM: Methodology and implementation of AMR is not complete for LTO for mechanical and electrical SSCs.	
2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024
2.1 – FACTS: F1) There is no specific guide or methodology describing the AMR process. F2) The AMR evaluation for external surfaces of the following systems important to safety is not performed: backup cooling water system (VE), conventional emergency cooling water system (VF), component cooling water system (TF), and volume control system (TA).	

F3) During walkdowns the team observed external corrosion on different systems in scope of ageing management, namely valve TN040S001 and pipe UV032Z002.

F4) An AMR for the refuelling machine system (PL), low pressure fire extinguishing system (UJ), demineralized water plant system (UA), high pressure fire extinguishing system (UF), transformer fire extinguishing system (UG), and normal service water system (UK) has not been performed, although the systems have been determined to be within the scope of ageing management.

F5) The AMR for cranes (UQ system) has not been performed and so fatigue has not been identified as an applicable degradation mechanism e.g. for polar crane (UQ010D001).

F6) The catalogue of ageing effects of mechanical components (PU-N12-50-101) describes potential ageing effects and degradation mechanisms applicable to mechanical components. The catalogue does not consider "fouling".

F7) In the catalogue of ageing effects of mechanical components, selective leaching is indicated as a potential degradation mechanism for LTO-1. TF001B001 heat exchanger is made of copper alloy which potentially can be subject to selective leaching. However, this degradation mechanism has not been considered in the AMR evaluation (PU-N12-50-309) and therefore an AMP to manage it is not assigned.

F8) The CODAP (OECD NEA's Component Operational Experience, Degradation and Ageing Programme) database is not considered as a source for external operating experience.

F9) The AMR document for ageing management of electrical installations (PU-N12-50-323) contains descriptions of materials of in-scope SSCs but does not link the relevant stressors, degradation mechanisms and ageing effects.

F10) The AMR document for ageing management of electrical installations includes junction boxes. The structure of several junction boxes is made of polymer. There is no description of thermal ageing for this material.

2.2 – SAFETY CONSEQUENCE:

Without a complete AMR for mechanical and electrical components, the plant may be unable to demonstrate that affected SSCs will remain capable of fulfilling their intended functions throughout the LTO period.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should ensure a complete AMR of mechanical and electrical SSCs for LTO.

2.4 – IAEA BASIS:

SSR-2/2 (Rev. 1)

Requirement 14: Ageing management

The operating organization shall ensure that an effective ageing management programme is implemented to ensure that required safety functions of systems, structures and components are fulfilled over the entire operating lifetime of the plant.

4.51. Long term effects arising from operational and environmental conditions (i.e. temperature conditions, radiation conditions, corrosion effects or other degradations in the plant that may affect the long term reliability of plant equipment or structures) shall be evaluated and assessed as part of the ageing management programme. Account shall be taken in the programme of the safety relevance of structures, systems and components.

Requirement 16: Programme for long term operation

Where applicable, the operating organization shall establish and implement a comprehensive programme for ensuring the long term safe operation of the plant beyond a time-frame established in the licence conditions, design limits, safety standards and/or regulations.

4.54. The comprehensive programme for long term operation shall address:

(c) Categorization of structures, systems and components with regard to degradation and ageing processes;

SSG-48

5.25. A process to identify relevant ageing effects and degradation mechanisms for each structure or component should be established, and the programmes to manage the identified ageing effects and degradation mechanisms should be in place:

(1) Time limited ageing analyses associated with these structures or components should be evaluated to determine the continued validity of the analyses for the intended period of operation. Results of the evaluation of the time limited ageing analyses should be taken into account in the ageing management review.

(2) All relevant ageing effects and degradation mechanisms should be identified.

…

5.27. All relevant ageing effects and degradation mechanisms for each in-scope structure or component should be identified on the basis of the understanding of ageing set out in paras 5.28 and 5.29.

7.18. The programme for long term operation should include the following activities, evaluations, assessments and results:

(b) Demonstration that the programmes credited for long term operation support the conclusion that the intended functions of the SSCs and the required safety margins will be maintained. This demonstration should address the following topics:

- Identification of applicable ageing effects and degradation mechanisms based on, for example, the materials used, the environment and operating experience;
- Specification and description of operational programmes and ageing management programmes that manage the identified ageing effects;

7.21. The ageing management review for long term operation should follow the approach set out in paras 5.22–5.36, accounting for differences in regulatory requirements, codes and standards, knowledge and operating experience for the period of long term operation.

7.22. The process set out in paras 5.30–5.32 should be used to identify programmes to manage the ageing of in-scope structures or components.

7.23. The ageing management review for long term operation should focus on the following issues:

(a) Whether any new ageing effect or degradation mechanism is anticipated in the course of the planned period of long term operation;

(b) Whether the significance, degradation rate or susceptible sites of degradation mechanisms are expected to change during the planned period of long term operation;

(c) Whether current relevant operating experience and research findings have been incorporated into ageing management programmes.

7.24. If the operating organization has not performed an ageing management review, the results of an ageing management review for long term operation should be used to identify or develop effective ageing management programmes in order to detect and mitigate those ageing effects identified in the ageing management review before the integrity and the functional capability of the SSCs are compromised.

2.5 – DOCUMENTS REVIEWED:

- PU-N12-50-101, Rev. 3, Catalogue of ageing effects of mechanical components;
- PU-N12-50-309, Rev. 2, Ageing management review of safety systems;
- PU-N12-50-323, Rev. 3, Ageing management of electrical installations.

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3

4.1 – FACTS:

F1) n.a.

4.2 – DOCUMENTS REVIEWED:

n.a.

4.3 – RESOLUTION DEGREE:

1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: C-2**
NPP: Borssele	**Unit: 1**
Reviewed Area: Ageing management of mechanical SSCs	

1.1 – ISSUE TITLE:

Incomplete development and implementation of AMPs

1.2 – FUNDAMENTAL OVERALL PROBLEM:

Development and implementation of AMPs for mechanical and electrical and I&C components are not complete for LTO.

2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024

2.1 – FACTS:

F1) The first version of the AMP for reactor pressure vessel internals (PU-N12-50-480) has not been approved.

F2) The AMR analysis for metallic containment systems (steel containment XA, equipment air lock XB, personnel air lock XC, emergency air lock XD, mechanical penetrations XF, electrical penetrations XG, construction opening XE) is included in the document PU-N12-50-307. In that document, PU-N12-50-482 is indicated as the AMP to manage corrosion of the primary containment. However, it only addresses ageing management of hangers and supports so there is not an AMP for containment metallic systems.

F3) There is not an AMP put in place to manage ageing of the spent fuel pool racks. There is an inspection activity (PMRQ 15004-04) by which spent fuel racks are inspected with a submarine device and water chemistry is monitored by the water chemistry programme (PU-N12-50-403). However, it is not formulated as an AMP, e.g. comparison with the nine attributes of an effective AMP has not been performed.

F4) The plant does not have a programme for managing the ageing of some NSAS subcomponents of the secondary side internals of SGs.

F5) In the AMR analysis for safety systems (PU-N12-50-309), the water chemistry programme is indicated as the existing AMP for managing microbiologically induced corrosion (MIC) in pipe VE030Z003. However, the backup cooling water system (VE) is not addressed in the aforementioned document.

F6) The plant uses jockey pumps as preventive measure which can indicate the presence of leaks in buried piping of backup cooling water system (VE) and fire extinguishing system (UJ) and has implemented a cathodic protection system for buried piping of conventional emergency cooling water system (VF), but there is not a formal AMP to manage ageing of buried piping.

F7) There is an existing AMP for the management of external surfaces in the plant (PU-N12-50-442), but no specific components have been identified to be connected to it. This means Attribute 1 of the AMP has not been addressed.

F8) There is not a documented methodology for assessing the effectiveness of AMPs in their 3-year updates. A process to ensure that non-effective AMPs are improved is not put in place and there is no requirement to document the assumptions and assessments that lead to revisions of AMPs.

F9) Several IGALL AMPs, for example AMP117 ‘Closed treated water systems’, involve inspection by sampling. In the plant’s AMP there is not a process in place to develop such kind of samples.

F10) There was no AMP for One-Time inspection put in place in the plant for the period of LTO-1, and for the period of LTO-2, the sample has not started to be configured yet. However, for LTO-1 a list of 29 one-time inspections related to main components was defined and executed.

F11) There was no AMP for One-Time inspection for Class 1 Small Bore Piping put in place in the plant for the period of LTO-1, and for the period of LTO-2, the sample has not started to be configured yet.

F12) Performance indicators have been defined for SGs, however, an approach to define performance indicators still has to be developed for all other mechanical AMPs.

F13) The plant has no database that contains cable routing. The plant could not demonstrate that the worst cable conditions are taken into account in the ageing related calculations when measuring environmental conditions in separate rooms. When high temperatures or dose rates are measured, the plant does not have a standard approach for evaluating the effects on the cables."

F14) The plant measured environmental temperature and dose rate for LTO-1 in 2007-2009. This measurement was repeated in 2022-2023. In both cases, the measurement campaigns were for the entire plant. The plant did not describe scheduling these measurement campaigns as part of their ageing management programme or considered smaller scope measurement campaigns on a more frequent basis. No thermography is being performed prior to outages.

2.2 – SAFETY CONSEQUENCE:

Without a complete development and implementation of AMPs for mechanical and electrical and I&C components, ageing effects may not be properly managed for LTO.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should complete the development and implementation of the AMPs for mechanical and electrical and I&C components.

2.4 – IAEA BASIS:

SSG-2/2 (Rev. 1)

Requirement 14: Ageing management

The operating organization shall ensure that an effective ageing management programme is implemented to ensure that required safety functions of systems, structures and components are fulfilled over the entire operating lifetime of the plant.

4.50. The ageing management programme shall determine the consequences of ageing and the activities necessary to maintain the operability and reliability of structures, systems and components. The ageing management programme shall be coordinated with, and be consistent with, other relevant programmes, including the programme for periodic safety review. A systematic approach shall be taken to provide for the development, implementation and continuous improvement of ageing management programmes.

Requirement 16: Programme for long term operation

Where applicable, the operating organization shall establish and implement a comprehensive programme for ensuring the long term safe operation of the plant beyond a time-frame established in the licence conditions, design limits, safety standards and/or regulations.

(e) Review of ageing management programmes in accordance with national regulations

(f) The implementation programme for long term operation.

SSG-48

3.33. Concerning ageing management, the operating organization should review and validate the existing programmes and processes (or elements thereof) relevant to ageing for all in-scope structures or components.

3.35. Since long term operation is operation beyond the originally established time frame and evaluations for long term operation are based on assumptions, the operating organization should periodically perform the following activities to validate or correct the ageing related assumptions so that plant safety during long term operation is ensured and improved:

(b) Analysis of trends in ageing effects

(c) Review of the effectiveness of the ageing management programmes and existing plant programmes for long term operation

5.38. Each ageing management programme should be consistent with the generic attributes of an effective ageing management programme.

5.41. If the programme used to manage ageing effects involves inspection by sampling from a specific population of structures or components, the programme should describe and justify the methods used for selecting the samples to be inspected and the sample size, and should demonstrate that the sampling is adequate to provide reasonable assurance that ageing effects on the structure or component will not prevent the performance of its intended function(s) throughout its lifetime.

5.45. The development of the ageing management programmes should be based on the results of the ageing management review.

5.47. Appropriate acceptance criteria for the inspection and monitoring of ageing effects should be established for ageing management programmes.

5.48. Particular attention should be paid when developing ageing management programmes to ensuring that the programme has in place provisions to prevent, detect, evaluate and mitigate the ageing effects of anticipated degradation mechanisms, based on the findings from the ageing management review.

5.49. Information on the current status of in-scope structures or components should be collected for subsequent review of the effectiveness of the ageing management programmes. Performance indicators representing the effectiveness of the ageing management programmes should be developed along with the development of the ageing management programmes (see para. 5.56).

5.51. The ageing management programmes should be implemented in a timely manner to ensure that the intended functions of structures or components continue to be performed.

5.62. Requirements for modifications to existing plant programmes or the development of any new programmes should be specified and applied.

7.26. On the basis of the results of the ageing management review for long term operation, the existing plant programmes used for ageing management and existing ageing management programmes should be reviewed to ensure that they will remain effective in managing the effects identified for the planned period of long term operation. This review should identify programme modifications and/or new programmes necessary to ensure that the structures or components will be able to perform their intended functions for the planned period of long term operation.

SSG-74

7.6. The ageing management programme is required to be coordinated with other relevant programmes at the plant (see para. 4.50 of SSR-2/2 (Rev. 1). This should include coordination with the programmes of MTSI activities, which should contribute to the identification,

prevention, monitoring, minimization and mitigation of ageing effects of SSCs, including technological obsolescence.

2.5 – DOCUMENTS REVIEWED:

- PU-N12-50-480 AMP for Reactor pressure vessel internals (Document in preparation);
- PU-N12-50-307, Rev. 2, Ageing management review of the primary containment;
- PU-N12-50-482, Rev. 1, Ageing management programme of hangers and supports;
- PU-N12-50-309, Rev. 2, Ageing management review of safety systems;
- PU-N12-50-403, Rev. 1, Ageing management programme Water chemistry;
- PU-N12-50-442, Rev. 1, Ageing management programme for monitoring of external surfaces of mechanical components;
- STRAT-ISI, In-Service Inspection programme at Borssele NPP;
- PU-N12-50-302, Rev. 10, Ageing management review of the steam generator;
- PU-N12-50-323, Rev. 3, Ageing management of electrical installations.

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE- ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3

4.1 – FACTS:

F1) n.a.

4.2 – DOCUMENTS REVIEWED:

n.a.

4.3 – RESOLUTION DEGREE:

1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: C-3**
NPP: Borssele	**Unit: 1**

Reviewed Area: Ageing management of mechanical SSCs

1.1 – ISSUE TITLE:

Not comprehensively identified and revalidated TLAAs

1.2 – FUNDAMENTAL OVERALL PROBLEM:

A comprehensive identification and revalidation of TLAAs has not been performed for LTO for mechanical and civil SSCs.

2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024

2.1 – FACTS:

F1) There is no guide or procedure at the plant which describes the methodology to identify TLAAs.

F2) The plant has not demonstrated the completeness of TLAAs.

F3) For locations 'Thermal Sleeves in the Feedwater line in SGs' evaluated for TLAA of fatigue, the value of the CUF was higher than 1. It was confirmed that an inspection was conducted in these areas in 2018 (NRG-P24159-18-49). However, no plan/programme has been established to perform periodic inspections in those locations.

F4) A TLAA for the evaluation of fatigue of cranes has been identified for LTO-2 project, however there is no TLAA in place for LTO-1, only monitoring/inspection is being credited to address the fatigue for cranes.

F5) The plant did not consider the effects of time-limited assumptions for irradiation of the biological shield wall in its currently approved ageing management document (PU-N12-50-330).

F6) The plant has not identified TLAAs for metallic containment and airlocks nor for electrical and mechanical penetrations for LTO-1 because the designer considers in document PESS-G/2010/en/0048 that fatigue is not 'relevant for the Steel Containment, also considering the mechanical load cycles by the integrated leak rate test'. However, for LTO-2 Project, IGALL TLAA303 of 'Cumulative Fatigue Damage of Containment Liners and Penetrations', has been identified as a "possible" TLAA.

2.2 – SAFETY CONSEQUENCE:

Without comprehensive identification and revalidation of TLAAs, the fulfilment of safety functions of relevant mechanical and civil SSCs cannot be demonstrated for LTO.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should ensure comprehensive identification and revalidation of all TLAAs for mechanical and civil SSCs.

2.4 – IAEA BASIS:

SSR-2/2 (Rev. 1)

Requirement 16: Programme for long term operation

Where applicable, the operating organization shall establish and implement a comprehensive programme for ensuring the long term safe operation of the plant beyond a time-frame established in the licence conditions, design limits, safety standards and/or regulations.

4.54. The comprehensive programme for long term operation shall address:

(d) Revalidation of safety analyses made on the basis of time limited assumptions.

SSG-48

3.34. For in-scope structures or components, the operating organization should identify all time limited ageing analyses and should demonstrate either that all these analyses will remain valid for the planned period of long term operation, or that the structures or components will be replaced, or that further operation, maintenance or ageing management actions will be implemented.

5.68. If the time limited ageing analyses cannot be found acceptable using the criteria in para. 5.67, then corrective actions should be implemented. Depending on the specific analysis, corrective actions could include:

(a) Refinement of the analysis to remove excess conservatism;

(b) Implementation of further actions in operations, maintenance or the ageing management programme;

(c) Modification, repair or replacement of the structure or component.

7.17. Time limited ageing analyses should be re-evaluated for the planned period of long term operation, and it should be demonstrated that they meet the criteria in para. 5.67.

7.18. The programme for long term operation should include the following activities, evaluations, assessments and results:

(d) Demonstration that the time limited ageing analyses have been revalidated and that the evaluation includes:

- Identification of time limited ageing analyses in accordance with the definition specified in para. 5.64
- Revalidation of each identified time limited ageing analysis in accordance with the recommendations provided in para. 7.28 to demonstrate that the intended function(s) of the structure or component will be maintained throughout the planned period of long term operation in a manner that is consistent with the current licensing basis

7.28. Time limited ageing analyses should be reviewed to determine the continued acceptability of the analysed structure or component for the planned period of long term operation, in accordance with para. 5.67.

2.5 – DOCUMENTS REVIEWED:

- NRG-P24159-18-49, Rev. 0 Attachment of the thermal sleeve to the feed water nozzle YB02 EPZ 2018;
- PU-N12-50-330, Rev. 2, Ageing management review document for civil structures;
- PESS-G/2010/en/0048, Rev. A, Ageing Management Review to support Long-term Operation for KCB Steel Containment Structure, 2011.

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.
3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION: n.a.
4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM | **Date:** D3/M3/YYY3
4.1 – FACTS: F1) n.a.
4.2 – DOCUMENTS REVIEWED: n.a.
4.3 – RESOLUTION DEGREE:

1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: D-1**
NPP: Borssele	**Unit: 1**
Reviewed Area: Ageing management of electrical and I&C SSCs	
1.1 – ISSUE TITLE: Incomplete equipment qualification programme	
1.2 – FUNDAMENTAL OVERALL PROBLEM: The plant has not established a complete equipment qualification programme to support LTO.	
2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024

2.1 – FACTS:

F1) The plant has not established a consistent approach for defining applicable standards and guidelines for qualification of electrical and I&C equipment and active mechanical equipment.

- The outdated IAEA SRS No. 3 is considered as a basis instead of the current IAEA SSG-69 in the strategy document for equipment qualification (STRAT-KWAL).
- Equipment specific standards are defined for cables, and actuators, but not for connection assemblies. (STRAT-KWAL; N13-78-050)
- The plant has identified updated standards for replacing qualified obsolete electrical and I&C components, however the specification defined in the qualification strategy for mechanical equipment refers to a no longer updated standard, and there is no general strategy to update the relevant requirements.

- The version of the standards used is not defined. Replacement of the superseded single organization standards by the so-called dual logo standards (e.g. IEC/IEEE 60780-323, IEC/IEEE 60980-344) is not addressed in the plant's documentation.

F2) Electromagnetic compatibility (EMC) qualification is not comprehensively addressed at the plant. EMC requirements are not directly addressed, and the plant has not established a strategy for electromagnetic environment monitoring, severity determination or other activities required by the relevant IEC 62003 standard.

F3) Requirements for qualification assessment are not completely addressed.

- Assessment of qualification status (reported every year according to PU-N12-81) is generated to report and summarize calculation of residual lifetime. It considers thermal and radiation ageing however there is no consideration for thermal cycling and/or connection-disconnection cycles.
- The plant has grouped mission time requirements for equipment under accident conditions in three groups according to international practice (short: 0-2 hours; medium 0-24 hours; long 0-1 year). Requirements of accident condition are informed only with temperature and pressure peak values in the OBA (Environmental Qualification Database) database. The OBA database refers to a document that contains long term simulations; however, in the technical specification for electrical and I&C components, the referenced document only refers to short term temperature/pressure versus time profiles.
- Test reports for qualification of penetrations including test logs with temperature/pressure versus time and equipment performance are not available at the plant.
- A drawing of the medium voltage penetration that has no electrical safety function in case of LOCA was reviewed (30-W-XG-00126) by the team. A polymeric seal referred to as 'rubber ring' was installed between the penetration assembly and containment flange in order to assure tightness. The information related to qualification of this model was not in the OBA database, nor was its activation energy included in the AUREST (Automated Residual Life Estimation) database. The plant provided qualification certificates from 1982 according to KTA 3403. No detailed information about the polymeric material used in the penetration seal or references to document that contains this information (so-called EQ file) was available.
- Data used for calculation of residual qualified life of electrical penetration is available in AUREST data base (PTCQ-G/2012/de/0184 section 5). Documentation includes identification of the most sensitive polymeric component to ageing for several penetration type. The Tyco Raychem shrinkable tube is identified as the most sensitive component but polymeric sealing between the penetration and the containment is not considered.
- The plant has established an AMP for qualified cables consistent with IGALL AMP210. Tests were performed on cable deposits from another plant no longer in operation. The analysis results show that cables will remain qualified until 2034. The plant recovered cable samples from that plant's cable deposit and stored them in the warehouse; however, clear proposals for a future AMP considering several scenarios (cooperation with other NPPs, definition of test to be performed, testing laboratory etc.) have not been developed.

2.2 – SAFETY CONSEQUENCE:

Without a complete equipment qualification programme, the capability of equipment important to safety to perform its safety function cannot be demonstrated.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should ensure a complete equipment qualification programme for LTO period.

2.4 – IAEA BASIS:

SSR-2/2 (Rev. 1)

Requirement 13. The operating organization shall ensure that a systematic assessment is carried out to provide reliable confirmation that safety related items are capable of the required performance for all operational states and for accident conditions.

4.48. Appropriate concepts and the scope and process of equipment qualification shall be established, and effective and practicable methods shall be used to upgrade and preserve equipment qualification. A programme to establish, to confirm and to maintain required equipment qualification shall be launched from the initial phases of design, supply and installation of the equipment. The effectiveness of equipment qualification programmes shall be periodically reviewed.

4.49. The scope and details of the equipment qualification process, in terms of the required inspection area(s), method(s) of non-destructive testing, possible defects inspected for and required effectiveness of inspection, shall be documented and submitted to the regulatory body for review and approval. Relevant national and international experience shall be taken into account in accordance with national regulations.

SSG-48

4.23. An equipment qualification programme to achieve and maintain the qualified status of in-scope SSCs should be in place in order to meet Requirement 30 of SSR-2/1 (Rev. 1) and Requirement 13 of SSR-2/2 (Rev. 1).

4.25. Environmental qualification should demonstrate that, at the end of its qualified life, the equipment will still be capable of performing its intended function(s) under the full range of specified service conditions.

7.17. Time limited ageing analyses should be re-evaluated for the planned period of long term operation and it should be demonstrated that they meet the criteria of para. 5.67.

SSG-69

2.14. Qualified life is the period for which a structure, system or component has been demonstrated, through testing, analysis or experience, to be capable of functioning within acceptance criteria during specific operating conditions while retaining the ability to perform its safety functions in accident conditions for a design basis accident or a design basis earthquake.

2.15. A qualified life should be established for all equipment that is subject to significant performance degradation mechanisms that could occur under the range of specified service conditions for operational states.

3.23. Harsh environments result from design basis accidents such as loss of coolant accidents, high energy line breaks and main steam line breaks. The accident conditions for design basis accidents are characterized by changes in temperature, pressure, humidity, radiation levels, submergence and vibrations or by simultaneous changes in process fluid conditions, chemical composition and mechanical loads. Other postulated initiating events might need to be considered in the equipment qualification programme if they produce conditions that are more severe than those produced by loss of coolant accidents or high energy line breaks.

3.24. The bounding thermodynamic profiles and chemical effects associated with each postulated initiating event should be derived from the design basis and the safety analysis report for the nuclear installation.

3.25. Service conditions resulting from postulated initiating events such as an SL-2 earthquake or aircraft crash should be considered in the equipment qualification programme.

3.26. Equipment qualification should take into account the mission time for the equipment in applicable accident conditions.

5.26. As qualified equipment approaches the end of its qualified life, additional periodic monitoring of its condition should be implemented to determine whether actual ageing is occurring at a slower rate than expected, which would indicate that it may be possible to extend the qualified life of the equipment.

5.27. The combination of monitoring environmental conditions and monitoring the condition of equipment should be used to support the reassessment of the qualified life of equipment.

2.5 – DOCUMENTS REVIEWED:

- STRAT-KWAL, Rev 9, Strategy for qualification of Safety Related components, 21-11-2022
- N13-78-050, Rev.8, Electric and Instrumentation specification basis, 1-9-2022
- PU-N12-81, rev 5, Environmental Qualification DBA proof component, 27-3-2023
- PEPA-G/2012/en/0092, Rev.A, Long Term Pressure and Temperature Development in Containment, 2013-07-31
- D02-ARV-01154-486, Rev.A, Pressure and Temperature Development inside Containment for a 2A Hot Leg Break and a Small Main Steam Line Break, 2019-11-15
- D02-ARV-01-097-194, Rev B, Data sheet of TG000S006.24-02-2016.
- Z 0078638 001 01, Electrical Penetration Assembly, 29/01/1982
- 30-W-XG-00126, Rev , Single conductor medium voltage Electrical Penetration Assembly, 7-01-1977.
- KTE/JHau/SAL/R241360, Qualification status DBA resistant Electrical and I&C components after Outage of 2023, 19-03-2024.
- PZEM.30NP/BBS.192, (Z 0079284001), Proposal to improve the DBA resistant equipment in KCB30, 24 January 1985
- PTCQ-G/2012/de/0184, Rev C, Application of Activation Energy on DBA proof polymeric component of electrical and I&C equipment. Part 2 Activation Energy values. 2015-04-20
- PU-N12-50-320, Rev 4, Ageing Management Programme of cables, 22-3-2022
- OBA database
- AUREST database.
- N13-51-001, rev 39, Safety class determination of Electrical and Instrumentation components, 21-8-2024

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:		
n.a.		
4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM		**Date:** D3/M3/YYY3
4.1 – FACTS:		
F1) n.a.		
4.2 – DOCUMENTS REVIEWED:		
n.a.		
4.3 – RESOLUTION DEGREE:		
1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: D-2**
NPP: Borssele	**Unit: 1**
Reviewed Area: Ageing management of electrical and I&C SSCs	
1.1 – ISSUE TITLE:	
Lack of a proactive technological obsolescence management programme	
1.2 – FUNDAMENTAL OVERALL PROBLEM:	
The plant has not established and implemented a proactive technological obsolescence management programme.	
2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024
2.1 – FACTS:	
F1) The plant does not have a detailed methodology for proactive technological obsolescence, including the methodology for prioritization of items for identification of technological obsolescence and roles and responsibilities of the involved part of the organization.	
F2) The plant has an obsolescence list, an Excel spreadsheet, which is used for reactive approach on obsolete components. The obsolescence list contains components that have been identified and issued by plant personnel as obsolete components, but it does not contain all components in scope of a graded approach for obsolescence.	
F3) The plant has not established a maximum temperature for the main warehouse, just a minimum (15°C) temperature (‘Storage Instruction for Warehouse Items’ (PU-A05-50-002	

version 2)). The plant does not control maximum temperature nor has cooling facilities for the warehouse.

F4) The established shelf life for elastomeric components is not conservative compared with the standard ISO 2230 that the plant selected to use. The plant did not develop a procedure for extending/shortening shelf life of elastomeric material. The plant has developed draft procedures for fulfilling ISO 2230 requirements that will require the establishment of maximum temperature values (25°C), but this procedure is still under development. The plant has not evaluated the impact of decreasing shelf life in existing stock of spare parts, due to the adoption of ISO 2230.

F5) In the existing obsolescence management programme, when the equipment manufacturer, and/or the related equipment codification identifier (AKS) of an obsoleted item are uncertain, a neutral critical factor (equal to 1) is assigned, that is not a conservative approach.

F6) The general technological obsolescence procedure (PU-N12-45) is still under development. The methodology for establishment of 'solution paths' is still under development. Methodologies for commercial grade dedication (CGD) and reverse engineering are listed as possible solutions but not yet developed.

F7) The plant has established condition indicators for effectiveness of the technological obsolescence management programme. There are draft results from the reactive approach, however, the relevant documentation is still under development.

F8) The plant has identified a limitation in the ASSET SUITE database: a component cannot be identified as obsolete before the stock level is zero. A strategy has been established for addressing this limitation but not yet implemented.

2.2 – SAFETY CONSEQUENCE:

Without a proactive technological obsolescence management programme, the plant risks unavailability of SSCs important to safety.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should establish and implement a proactive technological obsolescence management programme.

2.4 – IAEA BASIS:

SSG-48

6.1 Technological obsolescence of the SSCs in the plant should be managed through a dedicated plant programme with foresight and anticipation and should be resolved before any associated decrease in reliability and availability occur.

6.2 A technological obsolescence programme should be prepared and implemented to address all SSCs important to safety and spare parts required to maintain those SSCs.

6.3 The technological obsolescence programme should involve participation of the engineering, maintenance, operations and work planning units, plant senior management, and supply chain organizations

6.5 The technological obsolescence programme should be made available to the regulatory body for review and assessment at a level of detail defined by national regulatory requirements.

6.8 For the prioritization (see step 2 of para. 6.6), suitable criteria should be used, such as: safety relevance; plant demand; quantity in stock; safety classification of components; failure

history; reliability of structures or components; work order information; stock history; and uncertainty (spare parts with insufficient data).

6.9 Training should be conducted on obsolescence to educate personnel involved in understanding obsolescence management.

6.10 The operating organization should exchange information and should participate in collaboration within the nuclear industry and should make use of industry tools to identify and resolve common occurrences of technological obsolescence.

6.11 The operating organization should periodically assess the effectiveness of the technological obsolescence programme and should continuously seek to improve performance and efficiency. Self-assessments should be performed concerning the obsolescence programme, its implementation and its effectiveness and any lessons learned should be acted on.

2.5 – DOCUMENTS REVIEWED:

- PU-N12-45, Rev.1 (Draft), Technological Obsolescence Management;
- "Obsolescence Management Overview", version 1.2, (Excel file available in the document management system of the plant);
- PU-A05-50, Rev 4, Inventory Management, 16-10-2024;
- ISO 2230:2002, Rev. 2, Rubber products – Guidelines for storage, 2002-10-11;
- PU-A05-50-002, Rev. 2, Storage instruction for warehouse items, next review 5-11-2023;
- ARP5316, Storage of Aerospace Elastomeric Seals and Seal Assemblies Which Include an Elastomer Element Prior to Hardware Assembly, 1998-11-01.

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3

4.1 – FACTS:

F1) n.a.

4.2 – DOCUMENTS REVIEWED:

n.a.

4.3 – RESOLUTION DEGREE:

1.	**Insufficient progress to date**	n.a.

2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: D-3**
NPP: Borssele	**Unit: 1**
Reviewed Area: Ageing management of electrical and I&C SSCs	

1.1 – ISSUE TITLE:

Inconsistent and incomplete data management supporting LTO

1.2 – FUNDAMENTAL OVERALL PROBLEM:

Consistency and completeness of data management in support of LTO are not fully ensured.

2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024

2.1 – FACTS:

F1) The plant uses several databases in support of ageing management and LTO; however, the following information is incomplete or under development:

- Regarding passive electrical and I&C commodity groups, COMSY contains only a commodity group for cables but does not contain commodity groups for electrical penetrations, connectors or cabinets.
- The OBA database for environmental qualification only contains information for electrical and I&C equipment. For example, the actuator is addressed but not the mechanical part of a valve that contains polymers.
- The plant has no database that contains cable routing. COMSY contains rooms of end points of the cables, but it does not contain the rooms that cables pass through.
- Qualification requirements of cables are not uploaded in COMSY. COMSY has incomplete information for some cables, such as cable manufacturer, insulation/jacket material, etc. The plant uses only general material definition (PEEK, PVC, PTFE, etc.) with a selected single associated parameter (such as activation energy, design temperature, design dose, etc.).
- The use of COMSY as a support tool for ageing management activities (record of test result, inspection, etc.) is still under development.
- The OBA database contains peak values of temperature and radiation but not the temperature and pressure versus time profile (e.g. for electrical penetrations).

F2) The team identified the following inconsistencies:

- The OBA database contains peak values of temperature (134.45˚C) and pressure (4,34 bar (abs)) with a reference to a document, PEPA-G/2012/en/0092, from 2013. However, there are more recent data simulations for pressure and temperature in document D02-ARV-01154-486, that were not uploaded in the OBA database.
- The plant uses the COMSY database for cables, the OBA database for EQDBA electrical components and the AUREST database for qualified life evaluation on components with an electrical function. The process of interaction of these two database is not finalized.

F3) Knowledge transfer for the updating of the OBA database is under development. This database is based on Microsoft Access, and the maintenance of the programme is performed by a small number of personnel.

2.2 – SAFETY CONSEQUENCE:

Without consistent and complete data management, some ageing management activities might not be effective for LTO.

2.3 – RECOMMENDATION/SUGGESTION:

S) The plant should consider ensuring consistent and complete data management for LTO.

2.4 – IAEA BASIS:

SSR-2/2 (Rev.1)

Requirement 15: Records and reports

The operating organization shall establish and maintain a system for the control of records and reports.

4.52. The operating organization shall identify the types of record and report, as specified by the regulatory body, that are relevant for the safe operation of the plant. Records of operation, including maintenance and surveillance, shall be kept available from initial testing during the startup of each plant system important to safety, including relevant off-site tests. The records of operation shall be retained in proper archives for the periods required by the regulatory body. All records shall be kept readable, complete, identifiable and easily retrievable. Retention times for records and reports shall be commensurate with their level of importance for the purposes of operation and plant licensing and for future decommissioning.

SSG-48

3.14. The operating organization should ensure that:

(c) All relevant reference (baseline) data are collected and documented (e.g. information and data on material chemistry and material properties);

5.9. A data collection and record keeping system should be in place as a necessary base for the support of ageing management. …

5.10. The data collection and record keeping system should be established in the early stages of the lifetime of the plant (ideally, data should be collected from the construction stage onwards) in order to provide information for the following activities:

(a) Identification of fabrication, construction and environmental conditions that could adversely affect the ageing of SSCs, including any periods of delayed construction or suspended operation;

(b) Identification of relevant fabrication records, such as heat treatment history and certified reports on material tests;

(c) Identification and evaluation of degradation, failures and malfunctions of components caused by ageing effects;

(d) Decisions on the type and timing of maintenance actions, including calibration, repair, refurbishment and replacement;

(e) Optimization of operating conditions and practices that prevent or minimize ageing effects;

(f) Identification of all ageing effects before they jeopardize plant safety or reduce the service life of SSCs;

(g) Records of configuration and modification management, maintenance, surveillance and in-service inspection results, as well as chemistry control records.

5.11. To facilitate obtaining the necessary quality and quantity of ageing related data from plant operation, maintenance and engineering, representatives of the operations, maintenance and engineering units should be involved in the development and maintenance of the data collection and record keeping system.

5.12. Design documentation, including documentation from suppliers, should be made available, as this is essential in supporting effective ageing management.

5.13. The use of available generic data should be considered until the plant has developed its own data from the construction stage onwards.

2.5 – DOCUMENTS REVIEWED:

- PEPA-G/2012/en/0092, Rev.A, Long Term Pressure and Temperature Development in Containment, 2013-07-31;
- N13-78-050, Rev.8, Electric and Instrumentation specification basis, 1-9-2022;
- D02-ARV-01154-486, Rev.A, Pressure and Temperature Development inside Containment for a 2A Hot Leg Break and a Small Main Steam Line Break, 2019-11-15.

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3

4.1 – FACTS:

F1) n.a.

4.2 – DOCUMENTS REVIEWED:

n.a.

4.3 – RESOLUTION DEGREE:

1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.

3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: E-1**
NPP: Borssele	**Unit: 1**
Reviewed Area: Ageing management of civil SSCs	
1.1 – ISSUE TITLE: Inadequate ageing management for the civil structures and components	
1.2 – FUNDAMENTAL OVERALL PROBLEM: Ageing management for civil structures and components is not adequately developed and implemented.	
2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024

2.1 FACTS:

F1) Civil AMPs do not comply with the generic attributes of an effective AMP.

F2) Acceptance criteria are not set for the civil structures and components in scope of ageing management:

- Allowable limits (e.g. maximum crack dimensions, maximum spall size) are not set for concrete structures and components;
- Allowable limits are not set for settlement monitoring of civil structures and components;
- Acceptance criteria (e.g. blistering, delamination) are not provided for coatings of civil structures and components.

F3) Corrective actions are not defined and implemented in the civil AMPs:

- Historic inspection results of alignment of the polar crane show misalignment of the polar crane, however the plant did not perform any actions to address this issue.
- The inspection of the polar crane in 2023 found loose bolts on all positions and a missing bolt on position 71, however the plant did not perform any actions to identify the root cause.
- Historic results of groundwater analysis show concentrations of the chlorides above limits defined by industry standards, however the plant did not perform any actions to address this issue.

F4) The civil AMPs do not have requirements set for the chemical analysis of the groundwater for the civil structures and components exposed to groundwater.

F5) Operating experience is not incorporated into the civil AMPs.

F6) The plant has a database (VOB) for analysis of operating experience set in place, however there is no evidence that the found degradations on civil structures and components are entered into the database and the results shared among other plant departments.

F7) The plant did not perform an evaluation of the existing civil AMPs for consistency with IGALL AMPs.

F8) The plant does not perform condition assessments of the civil structures based on the results of the inspections.

F9) A contingency plan is not set for the inspections of the civil structures and components that were not performed in time.

F10) The design department (KQ) did not recognize the impact on monitoring of settlement in the project of old coal power plant demolition. The reference benchmarks located at the old coal power plant, which were used for settlement monitoring of civil structures and components, were demolished, and consequently the plant lost continuity of the settlement measurements.

F11) Evaluation of the effectiveness of the civil AMPs is not performed.

F12) The departments KTE and KOC, responsible for tasks in civil ageing management, do not have civil engineers.

2.2 – SAFETY CONSEQUENCE:

The lack of adequately developed and implemented ageing management activities for civil structures and components could lead to the loss of the intended function of civil structures and components.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should adequately develop and implement ageing management of the civil structures and components for LTO.

2.4 – IAEA BASIS:

SSR-2/2 (Rev. 1)

Requirement 14: Ageing management

The operating organization shall ensure that an effective ageing management programme is implemented to ensure that required safety functions of systems, structures and components are fulfilled over the entire operating lifetime of the plant.

SSG-25, Safety factor 2: Actual condition of SSCs important to safety

5.27 The actual condition of SSCs important to safety within the nuclear power plant is an important factor in any review of the safety of the plant design. Hence, it is important to document thoroughly the condition of each SSC important to safety. …

SSG-48

5.37 The identified ageing effects and degradation mechanisms that require ageing management should be managed using existing ageing management programmes or existing plant programmes (possibly with improvements or modifications), or new programmes should be developed. These programmes should be coordinated, implemented and periodically reviewed for improvements …

5.38 Each ageing management programme should be consistent with the generic attributes of an effective ageing management programme …

5.46 … If a programme is of such a nature that it does not meet all nine attributes, its use should be properly justified and the justification should be documented.

5.47 Appropriate acceptance criteria for the inspection and monitoring of ageing effects should be established for ageing management programmes… so that a corrective action can be implemented sufficiently before loss of the intended function(s) of the structure or

component. The need for sufficient margins should be taken into account in these acceptance criteria.

5.49 Information on the current status of in-scope structures or components should be collected for subsequent review of the effectiveness of the ageing management programmes. Performance indicators representing the effectiveness of the ageing management programmes should be developed …

5.52 Detailed implementation procedures that describe preventive and mitigatory actions, monitoring or inspection and assessment actions, acceptance criteria, and corrective actions should be established and shared among the different units of the nuclear power plant (e.g. operations, maintenance and engineering units) that are responsible for implementing ageing management programmes.

5.56 To evaluate the effectiveness of the ageing management programmes, performance indicators should be developed …

2.5 – DOCUMENTS REVIEWED:

- PU-N12-50-330, Rev. 2, Ageing management of civil structures, 2022;
- PU-N12-19, Rev. 13, Analysing and evaluation of ageing reports, 2024;
- N12-77-ONDC, Rev. 14, Civil maintenance substantiation report, 2018;
- WNC-ZF-002, Rev.2, Inspection of coatings on concrete, 2015;
- WNC-ZF-010, Rev. 2, Visual inspection of existing concrete structures, 2015;
- WNC-ZF-027, Rev. 4, Settlement measurements of buildings, 2014;
- WNC-ZF-065, Rev. 3, Inspection of building foundations, 2016;
- WN-ZF-066, Rev. 3, Inspection of building foundations with specific requirements, 2016;
- WNC-UQ-002, Rev. 4, Inspection of crane rails, 2019;
- COMSY, AM tool for civil structures and components;
- VOB, Plant tool for evaluation of the operating experience;
- Results of the groundwater chemistry analysis (N04-26-173) for years 2017 and 2024;
- Report No. 502747 Kraanbaan-NEN2019-UQ010, Inspection of the polar crane, 2023;
- Results of the inspection of building 1, insulation rooms, concrete floors, walls, and other civil structure inside the building, 2019 and 2021;
- DOC 26631 0094 18, Results of the settlement monitoring, 2007.

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3

4.1 – FACTS:

F1) n.a.		
4.2 – DOCUMENTS REVIEWED: n.a.		
4.3 – RESOLUTION DEGREE:		
1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: F-1**
NPP: Borssele	**Unit: 1**
Reviewed Area: Human resources, competence and knowledge management for LTO	
1.1 – ISSUE TITLE: Ineffective human resources strategy to support LTO	
1.2 – FUNDAMENTAL OVERALL PROBLEM: The human resources strategy is not effectively updated and implemented to support LTO.	
2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024

2.1 – FACTS:

F1) The HR expectations for the target LTO organization are not defined.

F2) The current number of plant staff does not meet LTO related needs. The HR strategy does not completely reflect LTO, since the 2025 business plan has not yet been approved by shareholders.

F3) The plant currently faces several different future operation scenarios (e.g. LTO-2, decommissioning, new reactors), which bring many unknowns and uncertainties to the process of planning HR needs.

F4) The HR needs for new employees in future years are based on an estimate of 10% personnel annual turnover. Preparations for addition hiring and training for LTO-2 project staff on top of this annual turnover have not been yet addressed by the plant.

F5) Approved AMPs for reactor pressure vessel internals, metallic containment and spent fuel pool racks, and AMRs for external surfaces of safety related systems of the ultimate heat sink, other cooling systems and the fire protection systems are not available. The responsible person has stated that resources are insufficient to produce and maintain all needed AMR and AMP documents in a timely manner.

F6) Currently there are two team leader positions not appropriately covered by successors.

F7) The plant has few experienced civil engineers who can recognize ageing relevance for civil structures and components. For example, the technical department (KT) and the incident evaluation group (SWG) do not have civil engineers.

F8) There is one vacancy in the training organization that needs to be adequately staffed, while one experienced instructor has announced his retirement, and two previous simulator instructors are expected to terminate their contract. Actions to train new instructors have been initiated but more time is needed before they are fully qualified.

2.2 – SAFETY CONSEQUENCE:

Without an effectively updated and implemented strategy the human resources support for LTO cannot be assured.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should effectively update and implement the human resources strategy to support LTO.

2.4 – IAEA BASIS:

GSR Part 2

4.5. Senior management shall ensure that goals, strategies and plans are periodically reviewed against the safety objectives, and that actions are taken where necessary to address any deviations.

4.21. Senior management shall make arrangements to ensure that the organization has in-house, or maintains access to, the full range of competences and the resources necessary to conduct its activities and to discharge its responsibilities for ensuring safety at each stage in the lifetime of the facility or activity, and during an emergency response.

4.22. Senior management shall determine which competences and resources the organization has to retain or has to develop internally, and which competences and resources may be obtained externally, for ensuring safety.

4.27. The knowledge and the information of the organization shall be managed as a resource.

SSR-2/2 (Rev.1)

Requirement 4: Staffing of the operating organization

3.10. The operating organization shall be responsible for ensuring that the necessary knowledge, skills, attitudes and safety expertise are sustained at the plant, and that long term objectives for human resources policy are developed and are met.

3.11. A long term staffing plan aligned to long term objectives of the operating organization shall be developed in anticipation of future needs of the operating organization for personnel and skills.

SSG-48

5.1. For the implementation of the plant programme for ageing management, the policy and objectives of the programme should be established, and the necessary resources (human resources, financial resources, tools and equipment, and external resources) should be identified and allocated. The organizational arrangements, such as the organizational structure and the policies of the operating organization should meet national requirements and IAEA safety standards [2, 8, 18, 19, 20], and should be in accordance with national practices.

2.5 – DOCUMENTS REVIEWED:

- HB-A11, Personnel management, September 2023;
- HB-A27, Continuous improvement handbook, July 2024;
- Scenario planning tool for future HR needs, October 2024;
- 2025 Business plan.

3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3

4.1 – FACTS:

F1) n.a.

4.2 – DOCUMENTS REVIEWED:

n.a.

4.3 – RESOLUTION DEGREE:

1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

1. ISSUE IDENTIFICATION	**Issue Number: F-2**
NPP: Borssele	**Unit: 1**

Reviewed Area: Human resources, competence and knowledge management for LTO

1.1 – ISSUE TITLE:

Systematic LTO training and qualification not fully implemented

1.2 – FUNDAMENTAL OVERALL PROBLEM:

Systematic training and qualification of staff involved in performing LTO activities are not fully implemented.

2. ASSESSMENT OF THE STATUS	**Date:** 28/11/2024

2.1 – FACTS:

F1) The plant has recognized that LTO training will need to be further developed, ensuring that the LTO knowledge is expanded throughout the organization, rather than residing with a core group of experts, however it has not been initiated.

F2) Staff involved in ageing management and LTO activities are not required to be qualified nor trained specifically in these subjects.

F3) There are several planned training courses that were not yet delivered to the staff that was set up as a core group for the LTO-2 project.

F4) New staff employed during the last two years to support the LTO-2 project have completed only the general training courses but were not yet trained in LTO specifics.

F5) The equipment reliability department staff did not receive training in ageing management yet.

F6) The need for training of several staff involved in the obsolescence management process development was identified by the plant, but the training was not yet implemented.

F7) Maintenance and operations staff are initially trained to perform their duties, but there is no systematic knowledge transfer on related LTO specifics.

2.2 – SAFETY CONSEQUENCE:

Without implementing systematic training and qualification of staff involved in performing LTO activities the plant cannot ensure its preparation for safe LTO.

2.3 – RECOMMENDATION/SUGGESTION:

S) The plant should consider implementing a systematic training and qualification process for staff involved in LTO activities.

2.4 – IAEA BASIS:

GSR-Part 2

Requirement 9: Provision of resources

Senior management shall determine the competences and resources necessary to carry out the activities of the organization safely and shall provide them.

4.21. Senior management shall make arrangements to ensure that the organization has in-house, or maintains access to, the full range of competences and the resources necessary to conduct its activities and to discharge its responsibilities for ensuring safety at each stage in the lifetime of the facility or activity, and during an emergency response.

4.22. Senior management shall determine which competences and resources the organization has to retain or has to develop internally, and which competences and resources may be obtained externally, for ensuring safety.

4.23. Senior management shall ensure that competence requirements for individuals at all levels are specified and shall ensure that training is conducted, or other actions are taken, to achieve and to sustain the required levels of competence. An evaluation shall be conducted of the effectiveness of the training and of the actions taken.

SSR 2/2 (Rev.1)

Requirement 4: Staffing of the operating organization

The operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the plant.

3.10. The operating organization shall be responsible for ensuring that the necessary knowledge, skills, attitudes and safety expertise are sustained at the plant, and that long term objectives for human resources policy are developed and are met.

3.11. The organization, qualifications and number of operating personnel shall be adequate for the safe and reliable operation of the plant in all operational states and in accident conditions. Succession planning shall be an established practice for the operating personnel. The recruitment and selection policy of the operating organization shall be directed at retaining competent personnel to cover all aspects of safe operation. A long term staffing plan aligned to the long term objectives of the operating organization shall be developed in anticipation of the future needs of the operating organization for personnel and skills.

Requirement 7: Qualification and training of personnel

The operating organization shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons.

4.21. The training programmes shall be assessed and improved by means of periodic review. In addition, a system shall be put in place for the timely modification and updating of the training facilities, computer models, simulators and materials to ensure that they adequately reflect current plant conditions and operating policy, and that any differences are justified.

4.22. Operating experience at the plant, as well as relevant experience at other plants, shall be appropriately incorporated into the training programme. It shall be ensured that training is conducted on the root cause(s) of the events and on the determination and implementation of corrective actions to make their recurrence less likely.

GS-G-3.1

MANAGEMENT COMMITMENT

3.4. Managers should be held responsible for ensuring that individuals working under their supervision have been provided with the necessary training, resources and direction. These elements should be provided before any work begins.

Awareness and training

4.8. In planning for education and training needs, account should be taken of changes caused by the nature of the organization’s processes, the competence levels of individuals and the culture of the organization. The objective should be to provide individuals with knowledge and skills that, together with attitudes and experience, will enhance their competence. In education and training, emphasis should be placed on the importance of safety, of meeting requirements and of the needs and expectations of interested parties. Training should also cover awareness of the consequences for the organization and individuals of failing to meet the requirements.

4.18. Consideration should be given to the qualification and training of individuals performing work that needs special competence. In some cases this should involve individuals taking a practical and a written examination to demonstrate proficiency before they begin work.

2.5 – DOCUMENTS REVIEWED:

- HB-A31, Training and qualification manual, August 2023;
- Leadership development programme diagram, January 2024;
- Annual training plan 2024-2026;

– SAT process diagram; – Weekly training schedule for the week of November 18th.	
3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE	**Date:** D2/M2/YYY2
3.1 – RESULTS OF THE ISSUE ANALYSIS: n.a.	
3.2 – CORRECTIVE ACTIONS: n.a.	
3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION: n.a.	
4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** D3/M3/YYY3
4.1 – FACTS: F1) n.a.	
4.2 – DOCUMENTS REVIEWED: n.a.	
4.3 – RESOLUTION DEGREE:	

1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.