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REPORT

PEER REVIEW SERVICE ON SAFE LONG TERM OPERATION (SALTO PEER REVIEW SERVICE)

SALTO PEER REVIEW MISSION FOR BORSSELE NUCLEAR POWER PLANT

IN THE NETHERLANDS

Borssele, the Netherlands
2 – 11 May 2012

and

FOLLOW-UP MISSION

4 – 7 February 2014

DEPARTMENT OF NUCLEAR SAFETY AND SECURITY
Division of Nuclear Installation Safety
"SAFE LONG TERM OPERATION REVIEW SERVICES (SALTO)"

SALTO PEER REVIEW MISSION FOR BORSSELE NUCLEAR POWER PLANT IN THE NETHERLANDS

REPORT TO

THE GOVERNMENT OF THE NETHERLANDS

Mission date:	02 – 11 May 2012
Follow-up mission date:	04 – 07 February 2014
Location:	Borssele, the Netherlands
Facility:	Borssele Nuclear Power Plant
Organized by:	International Atomic Energy Agency (IAEA) Borssele Nuclear Power Plant

"Findings, conclusions and recommendations resulting from the IAEA Programme are intended only to assist national decision makers who have the sole responsibility for the regulation and the safe operation of their nuclear power plants. Moreover, they do not replace a comprehensive safety assessment which needs to be performed in the framework of the national licensing process."

IAEA-2014 Issue date: 2014-03-17

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EXECUTIVE SUMMARY

Upon the invitation of the Inspectorate of the Ministry of Economic Affairs, Agriculture and Innovation (EL&I), a peer review mission on safe long term operation (SALTO) was provided to review programmes/activities of the Borssele nuclear power plant (further referred as "the plant").

The plant (in Dutch: Kernenergie Centrale Borssele or KCB) is located on the estuary of the Schelde River in the south of the Netherlands. The plant lies just behind a sea dyke in the industrial area Vlissingen-Oost. The plant is located near the village of Borssele in the Borsele municipality. The plant is owned and operated by N.V. Elektriciteits–Produktiemaatschappij Zuid-Nederland (EPZ), which has received its plant operating license, on the basis of the Nuclear Energy Law from the Ministry of VROM and other Ministries in The Hague.

The plant was designed and built by Kraftwerk Union (KWU) and is owned by NV EPZ.

The plant has been in operation since October 1973. Its main nuclear components were assumed to have a 40 year operating life in the original design. In 1997 a comprehensive modernization project was performed at the plant in which also some design modifications were implemented. Components impacted by this project were shown to have safety margins warranting operation until at least the end of 2013 (that is, consistent with the original design life of the rest of the plant).

In 2003, the plant finalized its second 10-year periodic safety review (PSR). The evaluation process was started by the licensee and regulator defining and agreeing to the scope of the evaluation. The first phase of that evaluation resulted in a list of specific items to be addressed in the evaluation, and since that time almost all of these items have been completed.

In October 2013, the plant will reach the original design lifetime of 40 years. The current license of the plant is unlimited in time. Every ten years NV EPZ has to perform a PSR. An agreement between the stakeholders of the power plant and the Dutch government was signed which allows the plant to extend its operation until 2034 subject to a number of conditions.

The plant is required to perform an LTO assessment to demonstrate the safety of the plant for 60 years of operation. This SALTO mission is in support of and has reviewed details related to this LTO assessment. The scope of the SALTO mission was agreed to and defined in Terms of Reference issued in July 2009. Preparatory meetings were held in July 2011 and March 2012. Further details were specified in Preparatory Meeting Minutes. According to these the review team was organized, and is constituted of four IAEA staff members and four external experts covering all disciplines involved in the ToR and Preparatory Meeting Minutes.

The mission reviewed the planned, started and performed plant activities related to LTO and ageing management of systems, structures and components (SSCs) important to safety within the framework of a full-scope SALTO Peer Review. Upon request of the Dutch regulator, the scope was extended with the Management, Organization and Administration (MOA) OSART module. Moreover, the progress in the areas in the issue sheets of the limited-scope IAEA Mission of 2009 was reviewed.

The IAEA team found that plans are being prepared and extensive engineering work has been done to review ageing degradation mechanisms, and to review/implement ageing management programmes with the goal of justifying safe continued operation beyond October 2013 with an operational life time horizon of 60 years. In addition, the team noticed good practices and good performance in areas as follows:

Good Practice

- Use of risk matrix

Good performance

- Evaluation of training effectiveness;
- Use of colour coding in the Periodic Safety Review - 10EVA13;
- TLAAs revalidation;
- Chemistry programme;
- Component chain;
- Civil structure integration into equipment database.

Taking into account the above mentioned points, the team recognized that the plant approach and preparatory work for safe long term operation generally follows international practices.

The team identified areas which are to be improved upon or have room for further improvement. Fifteen issues were raised including:

- Human performance improvement;
- Corrective actions for issues identified in evaluation of Safety Factors 10 and 12;
- Lack of guidance document, in respect of the regulator licensing conditions rules (NVR-rules), related to ageing management and to some degree also for LTO;
- Lack of organizational structures, staffing dispositions and management system documents properly suited for managing LTO including ageing management;
- Practices surrounding parts substitutions and modifications require improvement;
- Practices surrounding acceptance of vendor engineering documentation;
- Assessment of active components for LTO;
- Scoping and screening for LTO;
- Implementation issues in applying the attributes of an effective ageing management programme;
- Ageing management catalogue of ageing mechanisms for mechanical components should include cavitation;
- Plant programmes for ageing management are not documented in a systematic way;
- Establish final documentation of revalidation analyses;
- Ageing analyses not always proved to be conservative;
- Discrepancies within civil ageing management review and degradation mechanism project catalogue;
- Lack of centralized oversight of system/component programmes.

The status of issues from the limited scope SALTO Mission in 2009 was also assessed by the team with the following resolution degree:

- 1 issue - no progress in the resolution of the issue, or unsatisfactory resolution;
- 2 issues – the issue was identified by the Counterpart and work has started to resolve it;
- 3 issues – the implemented actions meet partially the intent of recommendations of previous IAEA review;
- 4 issues - the intent of recommendations of previous IAEA review is fully met. Issue closed.

A summary of the review was presented to the plant management and the Ministry of EL&I representatives during an exit meeting held on 11 May 2012.

This report includes in Appendix III the Team's detailed recommendations arising from this mission. Also included in Appendix IV are Team comments and conclusions related to issues raised during the previous 2009 SALTO Mission.

FOLLOW-UP MISSION

A follow-up mission was organized during 4–7 February 2014 and the team consisted of one IAEA staff member, three external experts and two observers. Participating experts from the Czech Republic, Sweden and Spain were members of the original SALTO team in 2012. Observers from Sweden and the Czech Republic were also members of the follow-up team. The SALTO follow-up report is the original report from the main SALTO mission supplemented with the "counterpart actions" and "follow-up assessment by the IAEA review team". The "counterpart actions" provided in issue sheets` section 4 are reviewed by the follow-up IAEA review team prior to the follow-up mission and confirmed in the field during the visit. "Follow-up Assessment by the IAEA Review Team" is then added in light of the follow-up mission into issue sheets` section 5. The IAEA conclusion is produced in issue sheets` section "Resolution Degree". "Status at follow-up SALTO mission" is prepared by the IAEA team for each review area. This resulting document is therefore an overall report of both the original mission and the follow-up mission.

During the original full-scope SALTO peer review mission in 2012, fifteen issues were defined in six reviewed areas. The follow-up team reviewed the progress in issues solving separately for each of those issues and also separately for each recommendation and suggestion contained in issue sheets (except of issues from area "Management, Organization and Administration OSART Module" which will be reviewed by the planned OSART mission in September 2014). Progress in solving of A3 and C1 issues of "A Limited-scope SALTO Peer Review Mission (2009)" was also evaluated.

The team has concluded that the plant performed a significant work to solve those issues but a resolution of majority of issues must be still finalized. The resolution degree was determined by the team for each issue sheet separately with results as follows:

- 1 issue - insufficient progress to date;
- 10 issues - satisfactory progress to date;
- 4 issues - issue resolved.

The detailed evaluation of plant actions is provided in Appendix IV of this report in a section 5 of each individual issue sheet of issues from 2012 (resp. in Appendix III, section 7 of issues A3 and C1 from 2009). Additional evaluation is provided for each review area in a "Status at follow-up SALTO mission" subsection of each review area (resp. in a "Status at follow-up SALTO mission" subsection of general conclusion section for issues A3 and C1 from 2009).

1. INTRODUCTION

1.1.SUMMARY OF IAEA SALTO PEER REVIEW SERVICE

IAEA Member States give high priority to the safe, continuing operation of NPPs beyond their original anticipated time frame (e.g. 30 or 40 years) as an alternative to decommissioning. In this respect Long Term Operation (LTO) is defined as nuclear power plant operation beyond an established time frame originally set forth by the licensing term, design limits, standards or regulations. LTO is justified by a safety assessment that considers life limiting processes and features for structures, systems and components.

The peer review approach has been proven to be a very effective mechanism to perform safety reviews of complex issues, and to evaluate the safety performance of an entire plant organization. This is confirmed by on-going good experiences with OSART (Operational Safety Review Team) Reviews.

The Agency has conducted various types of safety review services, including those for design, engineering, operation and external hazards. Several Member States have requested AMAT (Ageing Management Assessment Team) missions. Through these activities, it was recognized that a comprehensive engineering safety review service related to LTO would be very useful for Member States.

The Safe Long Term Operation (SALTO) peer review is a comprehensive engineering safety review service addressing the strategy and the key elements for safe LTO of NPPs. This includes the original AMAT objectives and complements OSART reviews.

1.2.SUMMARY INFORMATION ON BORSSELE NUCLEAR POWER PLANT

The plant is located near the village of Borssele in the Borssele municipality. The cities Vlissingen, Middelburg, Goes and Terneuzen are at a distance of respectively 10, 10, 14 and 13 km from the power plant.

The plant is owned and operated by N.V. Elektriciteits–Produktiemaatschappij Zuid-Nederland (EPZ). Construction started in 1969, with first electricity production in 1973. The plant is a single unit two-loop PWR of KWU design, with a net capacity of 487 Megawatts. The plant organization consists of 450 persons, with approximateky 120 of these dedicated to operating the 427 MWe capacity fossil fired plant on an adjacent site.

The plant has the following characteristics:

- Net electrical output 487 MW;
- Gross electrical output 515 MW;
- Rated thermal power 1365.6 MW;
- Number of primary loops: 2 Loops.

The operation license for the plant was issued in 1973 and does not contain a predetermined expiration date. This means that as long as the requirements (as stated in the regulations and the license) are fulfilled, the plant is allowed to operate. The regulatory body is charged with the monitoring and control of these requirements and will intervene if necessary.

Following political pressure to shut down the plant (first by the end of 2003, later by the end of 2013) and in consideration of the new tasks and responsibilities of the Government in the now liberalized energy production market, the desirability of a clearly predefined expiration date for the license was recognized by the Government. It has also been recognized that it is technically possible to continue to operate the plant safely after 2013, and that continued operation can help reduce greenhouse gas emissions.

An agreement with the owners of the plant and its shareholders (EPZ, Essent and Delta) was therefore pursued, by which several issues could be settled and from which both the Government and plant owners could benefit. This resulted in the 'Borssele Nuclear Power Plant Covenant', which was signed in June 2006 by the Dutch government and the owners of the plant. In the covenant they agreed upon extending the operating life of the plant to no later than December 31st 2033 and the conditions which should be met during the remaining operating life. The agreements in the covenant are in addition to the requirements of the operation license, which remains in full force.

The main agreements, besides the closing date, include the following: 1) an extra incentive for more sustainable energy management in relation to the closing date of the plant; 2) funding of decommissioning costs; and 3) a so-called 'safety-benchmark'.

In 1997 the utility operating the plant (which was 20 years old at the time) embarked on a € 200 million modification programme. The new safety concept was largely based on a comparison of the plant's design basis at that time with national and international deterministic nuclear safety rules, deterministic studies of the plant, insights gained from similar designs, operating experience and, last but not least, insights derived from the German Risk Study (DRS-B). A plant-specific PSA was performed in parallel with the activities for the conceptual design. This PSA played a major role in the later stages of the modification programme. Once the safety concept had been finalized, it was translated into a 'safety plan'. This plan consisted of a package of modification proposals for plant systems, structures and components.

Modifications due to the second 10-yearly periodic safety review

In 2003, the plant finalized its second 10-year periodic safety review. The evaluation process was started with the definition and agreement by licensee and regulator of the scope of the evaluation. The first phase of the evaluation resulted in a list of concrete items to be addressed in the evaluation. In the meantime almost all of these have been completely implemented.

Evaluation items were then grouped into improvement issues. Safety interests related to the improvement issues have been estimated from nuclear safety and radiation protection points of view. The safety interests were characterized according to a method whereby both deterministic and probabilistic considerations were used. Additionally, expert judgment was used as part of this method.

In 2004 the licensee presented a preliminary version of its improvement plan as the final result of the evaluation process, which was to be implemented in the following years.

1.3. OBJECTIVES

The objective of this service is to review the current status of activities for the safe long term operation programmes performed at the plant based on related IAEA Safety Standards and guidance documents, and internationally accepted practices. It was decided during a preparatory meeting held on 14-15 July 2011 in Vienna [12], in contrast to the original Terms of Reference for the Peer Review mission for Borssele Nuclear Power Plant in the Netherlands, IAEA, Vienna, Austria, 26–27 March 2009 [11], that this peer review will be a full scope SALTO mission entitled "Safe Long Term Operation (SALTO) for Borssele Nuclear Power Plant in the Netherlands".

1.4. SCOPE

As agreed during a preparatory meeting held on 21 March 2012 in the plant [13] the full scope SALTO peer review service for Borssele plant focuses on the following areas:

1) scope of the standard SALTO peer review service, which should include areas according to chapter 3 of IAEA SALTO Guidelines [10] divided as the follows:

    - Organization and Functions, Configuration/Modification management;
    - Safety analysis reports and existing plant programmes relevant for LTO;
    - Review of ageing management programmes and related TLAAs divide to:
        - Mechanical SCs
        - Electrical, I&C SCs
        - Civil SCs

2) The standard scope of Management, Organization and Administration (MOA) OSART module

3) Review of progress done by the plant in areas described in the issue sheets of the IAEA report “Peer Review Mission for Borssele Nuclear Power Plant in the Netherlands” (IAEA, November 2009)

1.5.CONDUCT OF THE MISSION

1.5.1. IAEA Review Team and preparatory work before the mission

Taking into account the objectives and the scope of the mission, as indicated above in Sections 1.3 and 1.4, it was agreed with the counterpart that the IAEA Review Team be constituted by four (4) IAEA staff members and four (4) external experts covering all disciplines involved in the studies. In this regard, the review scopes of the reviewers were as follows:

Reviewer A (Mr. Gabor Vamos)

Management, Organization and Administration OSART Module

Reviewer B (Mr. Tage Eriksson) + Observer 2 (Mr. Un Sik Seo)

Organization and Functions, Configuration/ Modification Management:

- Related regulatory requirements and guidelines;
- Organizational structure for LTO;
- Plant policy (LTO, scope of SSCs for LTO);
- Plant implementation programme for LTO;
- Configuration/ modification management.

Reviewer C (Mr. Radim Havel)

Safety analysis reports and existing plant programmes relevant for LTO:

- Current safety analysis report and other licensing basis documents;
- Existing plant programmes relevant for LTO: Maintenance, EQ, ISI, Surveillance and monitoring, Chemical regimes as preconditions for LTO;
- ISI programme;
- Methodology and criteria for scoping and screening of SSCs for LTO;
- Completeness of SSCs scoping for LTO;
- Status of 2009 SALTO Mission issues – A-1, A-2, A-3, C-1, C-3.

Reviewers D (Mr. Jack Cole)

Review of ageing management programmes and related TLAAs for mechanical SCs:

- Scoping and screening of SScs for LTO;
- Review of Ageing management programmes;
- Original TLAAs;
- Design Basis information;
- Revalidation of TLAAs;
- Chemistry and Surveillance programmes;
- Data collection and record keeping;
- Status of 2009 SALTO Mission issues – C-2, D-1, D-2, D-3.

Reviewers E (Mr. Miguel Calatayud) + Observer 1 (Mr. Bo Svensson)

Review of ageing management programmes and related TLAAs for electrical and I&C components:

- Scoping and screening of SScs for LTO;
- Review of Ageing management programmes;
- Original TLAAs;
- Design Basis information;
- Revalidation of TLAAs;
- Cable AMP, Equipment Qualification /as one of TLAAs;
- Data collection and record keeping;
- Status of 2009 SALTO Mission issues – B-1.

Reviewers F (Mr. John Moore)

Review of ageing management programmes and related TLAAs for civil structures and components:

- Scoping and screening of SSCs for LTO;
- Review of Ageing management programmes;
- Original TLAAs;
- Design Basis information;
- Revalidation of TLAAs;
- Maintenance programme;
- Concrete ageing;
- Data collection and record keeping.

Team Leader – Robert Krivanek

Deputy Team Leader – Alex Polyakov

In preparation for the peer review, an electronic advance information package (AIP) was provided by the counterpart approximately one month prior to the mission.

1.5.2. Basis for the review and review methodology

The IAEA Safety Guide and Safety Report on the procedure to be followed for ageing management programmes and LTO [1-3, 10] were used as support materials for the peer review. In addition, a large number of IAEA existing documents related to basic safety concepts that could be relevant to life extension programmes were utilized. A Safety Guide on "Periodic Safety Review" [4] addresses some aspects of the preconditions to LTO. A draft Safety Guide on "Periodic Safety Review" [14] was also used as a reference document for this Mission, since it was used by the counterpart as a basic document for performing of the current periodic safety review. Other technical documents present technical aspects of ageing management [5] and equipment qualification [6].

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

- IAEA Safety Guides and relevant application documents;
- IAEA Safety Reports and Review Guidelines;
- Advance Information Package [17];
- State-of-the-art practices in other Member States (MS).

Final programme report of the IAEA Extra Budgetary Programme on Safety Aspects of Long Term Operation of Water Moderated Reactors (EBP) [3] was used as a generic, useful reference to the practice in some countries.

1.5.3. Conduct of the mission

The list of participants in the mission and their functions and contact information is given in Appendix I, while the programme of the mission is presented in Appendix II of this report.

The mission was conducted through meetings and discussions of the IAEA Review Team with counterpart specialists from the plant and technical support organizations. The meetings were held at the plant. Short plant walk-downs were also arranged as a part of the mission.

Plenary sessions and parallel discussions were organized as needed. The discussions were conducted in parallel for all the areas assigned to the experts. Each expert had an assigned counterpart from the plant responsible for the area of the peer review. Other specialists were invited from plant technical support organization suppliers such as AREVA and NRG.

1.5.4. Conduct of the follow-up mission

The follow-up mission was organized in accordance with conclusions of the main SALTO mission. The plant provided Advance Information Package, describing counterpart actions to address recommendations and suggestions made previously, one month before the mission to the IAEA review team. Four days follow-up mission included introductory presentation of the plant, discussions and interviews of responsible counterparts. These were the basis for assessment of status of issues as presented in the report of the main SALTO mission in 2012. This resulting document is an overall report of both the original mission and the follow-up mission.

2. MAIN CONCLUSIONS AND RECOMMENDATIONS

2.1. GENERAL CONCLUSION

The plant plans to extend its operating life with 20 years until 2034. The plant has started the project LTO "bewijsvoering" (LTO Justification - ENT2034.1) in order to meet the requirements of the Dutch regulator. The outline of the project is based on IAEA safety guide 57 "Safe Long Term Operation of Nuclear Power Plants". The contents and coherence of the different parts of the project and how these respond to the IAEA guidelines on LTO are described in a conceptual document [15]. The goal of the project LTO "bewijsvoering" is to ensure that safety and safety relevant systems, structures and components continue to perform their intended functions during long term operation. The outcome of the project LTO "bewijsvoering" will be used for a license change application. This will be submitted to the Dutch regulator KFD for approval of prolonged operation of the plant after 2013.

Four other related projects were also started prior to 2013. These include:

- Feasibility study on the modernization of I&C of the NPP (ENT2034.2);
- Feasibility study on the replacement of all other SSC outside of I&C (ENT20034.3);
- Programmeto improve human performance and safety culture (ENT2034.4);
- Project to obtain a license to make use of a modified fuel type (ENT2034.5).

For LTO the following conditions have to be met:

- Safe operation has to be demonstrated;
- A license change will have to be issued to allow operation after 2013.

In order to meet these requirements, the plant has started assessment project LTO "bewijsvoering" (LTO "Justification"). The basis for the project LTO "bewijsvoering" is formed by the IAEA guidelines on LTO. To evaluate the project, the Dutch regulator (KFD) makes use of external specialists from GRS in Germany and IAEA SALTO peer reviews. As a result of comments in the first IAEA SALTO peer review in 2009, the scope of the project was extended to the assessment of active components. Additional requests have also been made by the Dutch regulator with respect to non-technical requirements (PSR project 10EVA13 - organization & administration and human factors). The license change application will be done via a separate project and is based on the outcome of LTO "bewijsvoering" and specific parts of 10EVA13 which fill in the additional requests of the regulator.

The project is structured in accordance with IAEA safety guide 57 "Safe Long Term Operation of Nuclear Power Plants" [2]. Some activities are in a very advanced stage, as assessment of preconditions for LTO, scoping and screening methodology, AMR of passive components, assessment of TLAAs.
Some activities, such as assessment of active components, implementation of state-of-the-art software for database, transfer of supplier LTO project documents into plant documentation, are still in an initial phase. During this full scope SALTO Peer Review, for these initial-phase activities only draft methodologies and the planned activities were presented.

Based on counterpart requirements, the standard scope of Management, Organization and Administration (MOA) OSART module was also carried out by the team with a special focus on PSR Safety Factors No. 10 and 12.

Assessment of those specific areas is reflected in issue sheets developed by the team. Good practices/performances are described in chapter 2.3 of this report.

Through the review of available documents, which included the AIP and presentations delivered by contractors in charge of the above tasks, and discussions with counterparts as well as with other staff of the plant, the IAEA team confirmed that plant has done extensive work in the field of LTO and ageing management. The plant's plan to complete activities related to LTO, in conjunction with the implementation of IAEA recommendations and suggestions, will, if implemented in a rigorous manner, place the plant in a good position to enter the LTO period in compliance with the IAEA safety standards and international good practices.

During the review the team identified the following good practices/performances:

- Use of risk matrix;
- Evaluation of training effectiveness;
- Use of colour coding in the Periodic Safety Review - 10EVA13;
- TLAAs revalidation;
- Chemistry programme;
- Component chain;
- Civil structure integration into equipment database.

Taking into account of the above mentioned points, the team recognized that plant activities and planned actions for safe long term operation are principally following and are in line with international practices as implemented by various countries in accordance with their respective regulatory regimes.

Nevertheless, the team also noticed that actual plant activities for LTO are not finalized. The team would suggest that plant management facilitate early implementation of all related activities. The LTO project documents should be integrated into the plant management system documentation as soon as possible. Implementation of actual activities on the planned schedule is important. In addition, there are some areas which should be improved or have room for further improvement beyond the international good practice level. Fifteen issues have been raised in the following areas:

- Human performance improvement;
- Corrective actions for issues identified in evaluation of Safety Factors 10 and 12;
- Lack of guidance document, in respect of the Regulator licensing conditions rules (NVR-rules), related to Ageing Management and to some degree, Long Term Operation;
- Lack of Organizational structures, Staffing dispositions and Management system documents properly suited for managing Long Term Operation including Ageing Management;
- Practices Surrounding Parts Substitutions and Modifications Require Improvement;
- Practices Surrounding Acceptance of Vendor Engineering Documentation;
- Assessment of active components for LTO;
- Scoping and Screening for LTO;
- Implementation issues in applying the attributes of an effective ageing management programme;
- Ageing Management Catalogue of Ageing Mechanisms for Mechanical components should include cavitation.
- Plant programmes for ageing management are not documented in a systematic way;
- Establish final Documentation of revalidation analyses;
- Ageing analyses not always proved to be conservative;
- Discrepancies within Civil Ageing Management Review and Degradation Mechanism Project Catalogue;
- Lack of Centralized Oversight of System / Component Programmes.

Issue details and corresponding recommendations and suggestions are shown in the subsequent subsections. Individual issue sheets are presented in Appendix III. Additional comments of the team related to the areas observed are contained within the relevant subsections of the report below.

The progress done by the plant in areas described in the issue sheets of the IAEA SALTO Mission in 2009 [16] was reviewed by the team. Current status of issues was also assessed by the team with the following resolution degree:

- **No action** (No progress in the resolution of the issue, or unsatisfactory resolution) - 1 issue
- **Action under way** (The issue was identified by the Counterpart and work has started to resolve it) - 2 issues
- **Issue partially resolved** (The implemented actions meet partially the intent of recommendations of previous IAEA review) - 3 issues
- **Issue resolved** (The intent of recommendations of previous IAEA review is fully met. Issue closed) - 4 issues.

The solution of **one recommendation** was carried over to a new issue sheet. **One** new **suggestion** was carried over to a new issue sheet:

- SSCs and applicable safety class boundaries identification should be incorporated into the plant's documentation and maintained as living document (updated as required).

This report includes in Appendix IV Team comments and conclusions related to the status of issue from the IAEA 2009 SALTO Mission.

Status at SALTO follow-up mission

New SALTO Peer Review Guidelines [19] were used for this SALTO follow-up mission. The main differences which are reflected in this report are as follows:

- Different template for issue sheets was used for assessed issue sheets;
- Original section 3 "Counterpart views and measures" was eliminated from assessed issue sheets;
- Urgency degree was eliminated from assessed issue sheets;
- New levels of resolution degree were used.

As agreed during a preparatory meeting held on 22 August 2013, a progress in solving of issues A3 and C1 of a Limited-scope SALTO mission in 2009 was also reviewed by SALTO follow-up mission team in 2014 with the results as follows:

Issue A3 "Consolidation of data stored in different databases to avoid the incompleteness and inconsistency of data was recognized" identified by the review team in 2009 remained unresolved also during the SALTO mission in 2012.

One suggestion was identified within A3 issue. The team suggested to the plant that all necessary information for LTO should be stored in one place and be accessible for all associated parties.

In 2009, nine databases were related to LTO activities. Actions initiated by the plant shows that three main sources of information will be used by the plant in the future. These information sources have a scope clearly identified:

- Asset Suite for Component Database (BRS–AS400), Maintenance Database (ISO), ISI Database and ISH Database;
- COMSY for ageing management related activities, including FAC and other mechanical ageing mechanisms, and possibly integration with Aurest, FAMOS, NDT results and AM Database (VOB);
- Lotus Notes DMS for configuration document control.

Pending tasks are to implement several modules of COMSY, update the IT system's middleware and an interaction format between this three main information sources.

Conclusion: Satisfactory progress to date.

Issue C1 "Evaluation of effectiveness of AMPs and justification to use AMPs shown in the US GALL report" identified in the area C remained unresolved also during the SALTO mission in 2012.

One suggestion was identified within the issue C1.

Since the SALTO mission in 2012, the plant developed, in addition to documents presented in 2012, the following controlled documents:

- AM Handbook that provide the overall concept;
- AM Procedure;
- The development of the following documents is underway (some are already completed);
- AM Strategy documents (components or commodities based);
- AM Plans (AMP that are structured along the 9 attributes).

The NS-G-2.12 has been adopted in full by the Regulatory Body (NVR NS-G-2.12) and is referred in the AM Handbook.

Summary Report Ageing Management Review, NRG-22503/11.109273, was published in 2012.

Active components are dealt with through surveillance and maintenance. During the LTO assessment, opportunities for improvement were identified and are being implemented. Further details regarding the treatment of active components are also provided in the issue C1 from 2012.

Conclusion: Satisfactory progress to date.

2.1.1. Management, Organization and Administration OSART Module

During the preparatory meeting for the SALTO mission the IAEA was requested to perform a peer review of the self-evaluation by the plant of safety factor 10 "Organization, management system and safety culture" and safety factor 12 "The human factor" as outlined in DS426. The self-evaluation was performed following the new draft specific safety guide DS426 "Periodic Safety Review of Nuclear Power Plants" which is being prepared as the revision of IAEA Safety Standards Series No. NS-G-2.10.

The next section is produced to summarize the findings in the review scope, according to chapter 3.1 on Management, Organization an Administration of the OSART Guidelines 2005 edition (IAEA Services Series No. 12). The text reflects only those areas where the team considers that a Recommendation, a Suggestion, an Encouragement, a Good Practice or a Good Performance is appropriate. In all other areas of the review scope, where the review did not reveal further safety conclusions at the time of the review, no text is included. This is reflected in the report by the omission of some paragraph numbers and subtitles where no text is required.

Organization and Administration

Functions and responsibilities

The concept of integrated management system is not fully implemented yet at the plant. The financial activities are only planned to be incorporated into the integrated management system. The concept of continuous improvement could be better integrated into plant processes. The plant is encouraged to continue work in this direction.

Staffing Policy

Back in the past in 2003 a staff reduction programme was initiated and a target staffing level for the Nuclear Operations (NO) part of the plant was set at 227 in the assumption that plant decommissioning will take place in 2013. This is a low staffing level in an international comparison

for a single unit nuclear utility and created shortage of human resources for some tasks. Since then the opportunity for long term operation was opened and it was also realised that human resources have to be expanded in order to cover needs of day-to-day operation and the projects aiming at extended operation. After several studies at the end of 2010 a decision was made to increase the staff of NO by 50 full time equivalent (FTE) staff members.

The process of hiring new staff has been completed in the beginning of 2012. The authorised and actual staffing of NO at present is about 330 FTE. This includes capacity to cope with projects, classroom and on-the-job training of the extra amount of new recruitment and with reduced working time of staff above age of 60. However some of the new staff are still in training. Hiring and 'adoption' into the organization took more time than envisaged at the time of decision to implement the capacity expansion plan. Therefore the 2011 Annual Report on Operating Experience noted that the effect of staff reinforcement has not been evident in every area. On the other hand new staff coming from other industries brought fresh views and new ways of thinking to the plant what is a positive result. The plant was able to achieve in practice a better ratio of new staff with academic degree of education than the 30% goal set when the capacity expansion plan was approved.

Staffing after adding 50 FTE is considered by department heads and plant management as sufficient for normal daily tasks and projects known today. If there will be a need to initiate new projects in the frame of the long term operation project or due to other reasons, there will be a possibility to employ the additional staff from the budget of those projects. It is expected that the new projects in the coming ten years will result in about twice as much value and scope of investment than the 'normal' investment in the past. The organization will have to be able to 'absorb' and provide the required conditions for installing the new equipment at the plant.

Management of organizational changes

The process of organizational change is clearly set out in a procedure under the main process of management. However some lessons could be drawn from the recently implemented organizational changes based on the opinion of department heads:

- 'Adopting' new staff into the organization is a cultural change for the new staff but also for the existing workforce;
- Better timing of advertising newly established job positions could decrease the pressure on organizational units from where applicants were to leave;
- Better coordination of organizational changes and process changes (adoption of INPO AP928, introduction of Asset Suite and eSOMS) could reduce the overload of the organization and staff.

Management activities

Communication

Management expectations are set out in a booklet with department specific part. The booklets are easy to use and well-illustrated by visual information. This enables each staff member to easily understand what are the management expectations relating to his job position and working environment. However for the Technical Support (KT) department the development of management expectations specific to them is still in progress.

The plant has identified in the 2010 Annual Report on Operating Experience that work related discussions between employees of different departments does not yet occur naturally. Managers and supervisors need to continue stressing the importance of communication and cooperation.

Human factors management

Concerning safety culture self-assessment, methodologies proposed by VGB and Veritas were considered by the plant but were found to be inappropriate for local conditions. The project "ON-LIME" on cultural improvement process 4-5 years ago brought improvement, however it is not recalled by most of management staff when asked about the subject. The regulatory body was planning to organize external evaluation of safety culture, but due to different reasons it was not implemented. In PSR (10EVA13) the safety culture will be explicitly evaluated. This evaluation will be based on the coming WANO Peer Review scheduled for September 2012, as agreed with the regulatory body. Further considerations on this subject are included in the issue about the improvement in human performance.

Risk informed management

Risk Matrix developed at the plant is used for identifying corporate risks for strategic goals of the plant (safety, availability, finance, motivation of staff and compliance). The Risk Matrix is also used for prioritizing safety issues and other purposes. The team identified the use of the Risk Matrix as a Good Practice.

Management of safety

Monitoring and assessment of safety performance

The team concluded that the plant's efforts in the recent years to improve human performance have not resulted in tangible improvement. The team recommended the plant to apply a more effective approach to improve human performance. This subject also includes the initiative to improve safety culture which influences human performance.

In response to the request of EL&I the plant prepared evaluations of safety factors 10 (Organization, the management system and safety culture) and 12 (Human factors) as outlined in DS426. These evaluations will be handled in the frame of the license renewal process. The team suggested that the plant should consider proposing corrective actions including deadline for their implementation for the "points requiring attention" identified in the evaluation of safety factors 10 and 12.

Learning organization

The team considered the evaluation of the effectiveness of training sessions as a good performance.

The plant has recognized the importance of knowledge management as outflow of people due to retirement and recruitment of new staff to cover the resource requirements of multiple new projects became more intense. Internal movement of staff within the organization due to organizational changes and establishment of projects is also a significant factor in this respect. For example in the Maintenance department there are about 30 new staff and about 20 staff is working in a new position.

It is generally known that knowledge management should be used to capture knowledge (both tacit and explicit) from individuals before they leave the organization, so that it can be retained and transferred to others who need the knowledge for the performance of their jobs or tasks. The plant has made it a practice that there is an overlap in time when the new and the outgoing staff filing in a supervisory position are working in parallel. It allows transfer of knowledge and experience. However there is no system in place to ensure that outgoing staff captures their knowledge not reflected in plant documentation before they leave the organization.

Quality Assurance Programme

The once existing certification of the plant's management system according to ISO 14000 expired but renewal was not asked by the plant because of insufficient progress on outstanding non-conformities. The reason for this was the workload in 2011 associated with organizational changes and with the Fukushima accident. It was also connected to the proposal of the independent auditor to obtain a joint certificate for the nuclear and the coal fired plant. The nuclear plant has identified this situation as highly significant and the certification is expected to be renewed by the end of 2012 or in 2013. Although a corrective action programme at the plant is known to exist. It was not apparent to reviewers that it was integrated into daily activities.

Document and Records Management

Some documents reviewed by the team were found to be not updated. The Organizational chart included old name for the organizational units KTE and KQ. It was explained that the organizational chart is frequently updated and probably the relevant supervisor or manager has not initiated the update. Maintenance procedure HP-N12 is 2 years late with the updating and maintenance sub-procedure PU-N12-19 has passed the due date by 2 months. It was told that maintenance staff is occupied with the document review which is being performed to introduce INPO AP928 on work management process.

2.1.2. Organization and Functions, Configuration/ Modification Management

The review area covered:

- Related regulatory requirements and guidelines;
- Organizational structure for LTO;
- Plant policy (LTO, scope of SSCs for LTO);
- Plant implementation programme for LTO;
- Configuration/ modification management.

The following topics were presented and discussed:

Regulatory framework regarding LTO and associated areas like Equipment Qualification and Ageing Management as well as PSR, FSAR-update and QA/CM

The plant operation is governed by a licence from the regulator. The current licence conditions are based on the original licence conditions and a series of amendments which the regulator has issued from time to time. Included in the licence conditions are a number of "NVR-rules" many of which are based on IAEA guides. The latest amendments were issued by the regulator at the end of year

2011 and incorporates nearly sixty (60) new "NVR-rules" which are identical to and named after corresponding IAEA standards and guides, incorporating several important for LTO and associated areas (among them NS-R-1, NS-R-2, GS-R-3, NS-G-2.10 and NS-G-2.12).

The plant document KEW-vergrunning BS-30 version 9 dated 2 April 2012, which relates a compilation of the current licence conditions including a list of the "NVR-rules", was presented and discussed. The previous version (8) of this document, dated 1 Feb 2006, which refers to several older IAEA guides (e.g. guides named 50-SG-xx), was also presented.

No documented transition rule is currently given by or agreed with the regulator when and how the new NVR-rules should be applied.

The Organizational flowchart and Management system documents for areas like policies, authority duties and required staff numbers and qualification, in view of the suitability to handle LTO

The plant Management system includes organizational flowcharts, with the overall name "Organogram EPZ", which are detailed down to a level where names of individuals. The sheets appear to correctly reflect the current situation (including number of personnel). However, the formal due date of the document has been over-run by more than 2 years.

Several of the sheets starting from the plant director organizational level down to the levels relevant for nuclear operation was presented and discussed. The Nuclear Operation section NO is directly under the director and has five departments; KM (Reactor physics), KT (Technical support), KP (Operation), KO (Maintenance) and KQ (Projects).

The overall tasks and numeral of the "Technical" department KT and the sub-departments KTC (Construction) KTE (Engineering) and KTO (Design) was presented and discussed in more detail.

A Management system steering document pointing out the responsibility of LTO-activities does not exist. But 5 persons in the department KTE, assisted by from time to time up to 25 consultants, has been working with the LTO and AMP issues. The work has been headed by the KTE manager. KTE also has the lead of In Service Inspections and responsibilities including Quality Control and the Ageing Management Programme.
In reviewing some of the Management system steering documents related to maintenance and AMP, two documents was discovered to have passed the due-date for revision. One document with 2 month and one document with 2 years.

KTO has amongst others responsibility for the FSAR (part of the SAR available for the public), Technical Specifications and the Technical Information Package (part of the SAR not available for the public).
KTC main responsibility is the initiation of modifications involving creating documents like Modification Plans and Investment Proposals.

The project department KQ has project managers and project support which takes over the responsibility for executing the agreed modifications defined by KTC.

Exploring the Management system steering document a formal responsibility for Ageing Management feedback was found as a sub-document (ref doc. PU-N12-19) to the tasks description for the Maintenance department KO (ref doc. HP-N12). However, responsibility for the doc. PU-N12-19 is department KTE (approved by head of dept. KT). Also a few other maintenance steering

documents, related to AM feedback and LTO-assessment, are within the responsibility of dept. KTE. Both experiences from actual occurrences in the plant and other plants (e.g. through VGB) is taken care of and assessed. It appears though that the time available for the few personnel of KTE to deal with Proactive AM, on top of the current LTO related activities, is not enough. As an example (and as a possible consequence of the limitation) no personnel from the plant is participating in, and thus learning from, the IGALL work.

Plant policies regarding LTO, Ageing Management and Scoping and Screening

The review has found no documents within the plant management system describing the strategy for neither implementing nor maintaining an AMP. However, such strategy documents exist for Surveillance, ISI and Maintenance, but not explicitly for AM. Further, no documents within the Management system, describing the integration of the AMP within the LTO programme, were found.

What regards scoping and screening of SSCs the plant has the intention to adopt part of the US NRC "maintenance rule" (US NRC 10CFR50 §50.65 (a)(4) and/or US NRC RG 1.160 and RG 1.182) for the assessment of active components. However, no document describing the result of this work is available.

The Scoping and Screening reports, AREVA Work Report NEPS-G/2008/en/0056 and AREVA Work Report NTCM-G/2009/en/0144 was reviewed. It became clear that the methodology of scoping relies heavily on that the classification methodology (not part of the AREVA…0056 report) is correct. No evidence was found for that the classification methodology takes into account all the acceptance criteria and subsequent rules presented in the scoping report e.g. rule "h)" relevant for SC3 SSCs (which says that SCs beneficial for accident control, but not necessary, shall be scoped in). Also rule "i)" (which says that SCs whose failure may significantly increase the frequency of challenging safety systems shall be scoped in).

Also, a methodology for scoping of civil structures is missing (the AREVA…0056 report section 4 Column C-G does not reference the civil structure classification handbook).

It was also found that the content of the reviewed Scoping and Screening reports has not yet been transferred to the plant management system. This is also supported by findings of reviewer F.
Further the AREVA Work Report PESS-G/2011/en/0147, regarding detailed screening of mechanical components, is not yet finished (and not included in the plant management system).

Reviewing the screening report tables an error was spotted in relation to the system for "personnel airlock" plant id code XC. The table showed no electrical penetration (to containment) coupled with this system. The counterpart confirmed that there actually are electrical containment penetrations within the XC system.

No process for accepting contractor's documents, like the scoping and screening reports, was found.

The LTO programme and procedures for its updating as well as corrective measures as a result of PSR and implementation programmes

The review of this area confirmed that no real complete programme (including internal procedures) for implementation of actions / measures identified on the basis of review of AMPs and relevant safety analysis exists.

The review also found that:

- That the programme NT 2034 contains feasibility studies for various improvements but actions like a revalidation of SAR (to be done within the PSR up to 2013), that involves time limited ageing assumptions, is not done yet;
- Subsequently no programme for reconstruction is launched yet;
- Neither internal (Management system) steering documents exists that holds together LTO, including AMP, nor procedures for the implementation of such documents;
- A "Conceptual Document LTO "Bevwijsvoering" KCB" exists but this is only a project document;
- Result of a PSR is scheduled for end of 2013, so the need for possible corrective measures has not been identified yet.

Plant FSAR requirements, procedures, criteria and experience, related to plant Modifications

The plant main document HP-N13, relevant for configuration management and change management, was explained by the counterpart. Also some sub-documents e.g. PU-N13-05 and PU-N13-30 were looked at. The review found that the main processes seem to be in place.

Some deficiencies were however encountered in the interview:

- The procedure for reviewing detailed design, done by the engineering department KTC, lacks the requirement of having a formalized release and authorization of a detailed design (or part of a design, e.g. a detailed design package);
- The procedure for reviewing commissioning programmes was lacking the review of the engineering department KTC which is responsible for basic engineering (i.e. responsible for the design requirements).
- Also, the use of creating performance indicators for various processes, like the CM procedure, and which is called for in the Management system is not in reality in use.

It was also found, as a more or less direct result of that several procedures linked to LTO is not formalized within the Management system, that these procedures also lacks formal ways of taking care of modifications to plant equipment or the procedures them self.

Reviewed procedures with this deficiency are:

- Procedure for handling EQDBA, as lined out in AIP document "NRG-22701/10.103460" Figure 8;
- Scoping report AREVA Work Report NEPS-G/2008/en/0056, including methodology and resulting tables;
- Screening report AREVA Work Report NTCM-G/2009/en/0144, including methodology and resulting tables.

The ground for configuration management and change management in the regulatory framework and within the plant QA manual was also explored.

The current version of the QA manual (handbook) consists of several parts (e.g. documents) KHB-2, KHB-4 and KHB-5, which were looked at and partly explained. The KHB-2 document points at the H-N13 document regarding configuration. The KHB-5 document links a set of specific regulator

NVR-rules to the H-N13 document. Thus the regulator requirements were found to be formally coupled as drivers for the H-N13 document requirements (and its sub-documents).

However, it must be noted that the NVR-rules referred to is not updated in the QA manual as per the latest license condition. This work will be one of the outcomes of the PSR review scheduled for end of year 2012 (as discussed above in this section).

Presentation and interviews about following projects and activities connected with LTO were carried out:

- Review of regulatory requirement in respect of LTO;
- Review of organizational aspects focusing on the capability to handle LTO;
- Review of Management systems documentation aspects focusing on their suitability in respect of LTO;
- The LTO demonstration and compliance project;
- Integrating Ageing Management in LTO;
- Completeness of Scoping and Screening;
- Maintenance planning and surveillance (done under review area “F”);
- Conduct of Plant modifications.

Beside the scope the team has the following observations and comments: n/a

After the review the team found that the following areas need enhancements:

- Regarding the recommended documentation (issue B-1, recommendation R1), on the plant position, in respect to the NVR-rules, the plant is encouraged to place such documents in the plant FSAR;
- The plant is also encouraged to carefully observe CM/DM procedures relating to documents which are based on the application of NVR-rules. As many of the NVR-rules have not yet been assessed, any documents based on a non-approved application of the rules will need to be re-verified, once the formal plant position is formally established;
- A number of documents reviewed had passed the due-date, one being more than 2 years over-due;
- No personnel from the plant have participated in the IGALL work. The knowledge exchange from participation in IGALL (both ways) is regarded highly relevant and the plant is therefor encouraged to create this opportunity for at least one staff member;
- Regarding review of Scoping and Screening the plant is encouraged to include plant operational personnel in the review team, in order to, in the best way, reflect Scoping and Screening concerns which are based on the way that the plant is currently operated. This point is also relavant for future reviews in light of possible equipment modifications or modification in operation procedures;
- Processes and practises surrounding the implementation of plant modifications appear to be applied inconsistently. Examples of parts substitution being performed as part of routine maintenance wthout following the small modification process were noted, and a counterpart described certain issues related to software version control. There appear to be different standards regarding the threshold for invoking the modification process, with “gray areas“ implicitly tolerated. The plant is encouraged to look in to these areas and improve the working practice;

- The modification process when applied does not ensure that key station programmes such as ageing management are updated to ensure safe, long term operation of the power plant.
  The plant is encouraged to look in to these areas and improve the working practice;
- Processes reviewed do not provide linkage back to ensure that these programmes are updated.
  The plant is encouraged to review and correct the relevant processes from this point of view;
- There is no process to formally document acceptance or concurrence of engineering or technical documents completed on behalf of the plant by an external company. Status of such documents within the plant design basis is unclear. During several discussions, the plant indicated that they had commented extensively on contractor documents, however this review process and the status of contractor-signed documents is not apparent. The plant is encouraged to review and correct the relevant processes from the above points of view;
- There appear to be different working practices regarding the creation and use of performance indicators for various processes, although this is mandatory according to the Management system documents. The plant is encouraged to look in to these areas and improve the working practice.

During the review the team identified the following good practices: n/a

As good performance Area B reviewers supports the recognition of the Area C good performance "PSR result visualisation".

Documents and information used during the review were:

- Mod Checklist PO-N13-30;
- Small Mod Procedure PO-N13-26 Rev. 11 "Klein wijzigingen";
- Typical Modification Plan WP # WP-30-1737;
- Modification Implementation Procedure PU-N13-05 Rev. 11 "Initiatie, beoordeling en realisatie van wijzigingen";
- Work package for PI replacement (supplied by Mtce Mgr);
- Draft Monthly Mtce Report March 2012 "Maandrapport KO maart 2012": KO/SCHOO/LKL/R122067;
- PU-N07-02 Plant Walkdowns;
- Organization Chart "Organogram EPZ" (intranet based document);
- KEW-vergunning BS30 version 9, dated 2 April 2012;
- Conceptual Document LTO "Bewijsvoering"KCB, NRG-22701/10.103460, dated 9 September 2012;
- AREVA Work Report NEPS-G/2008/en/0056, dated 27 February 2011;
- AREVA Work, Report NTCM-G/2009/en/0144, dated 6 November 2011;
- Maintenance, main procedure HP-N12;
- Maintenance, sub-procedures, PU-N12-19, PU-N12-76, PU-N12-78 and PU-N12-80;
- Configuration Management, main procedures HP-N13;
- Configuration Management, main sub-procedures PU-N13-01, PU-N13-02; and PU-N13-05;
- Quality manual, sections KHB-2, KHB-4 and KHB-5.

Status at SALTO follow-up mission

Under the area B, four issues were identified by the review team in 2012 - B1 "Lack of guidance document, in respect of the Regulator licensing conditions rules (NVR-rules), related to Ageing Management and to some degree also for Long Term Operation", B2 "Lack of Organizational structures, Staffing dispositions and Management system documents properly suited for managing Long Term Operation including Ageing Management", B3 "Practices Surrounding Parts Substitutions and Modifications Require Improvement" and B4 "Practices Surrounding Acceptance of Vendor Engineering Documentation".

One recommendation and one suggestion were identified within the **B1 issue**.

The plant has rightly focused on creating guidance documents to NVR NS-G-2.6 and NVR NS-G-2.12. Regarding NVR NS-G-2.6, three guidance documents exists (STRAT-SURV, STRAT-ISI and STRAT-OHD, dealing with surveillance, in-service inspection and maintenance respectively. The surveillance document has been issued for review and is expected to be approved before March 2014. The in-service inspection document has not been revised yet but the old version of the guide for the ISI-strategy is claimed by the plant to be consistent with NS-G-2.6. The revision of the maintenance related document has not been executed yet. This document gives an overall guidance to maintenance, pointing out to several other well established documents detailing with maintenance.

In respect to NVR NS-G-2.12, the document KTE/AdJ/AdJ/R126169 gives detailed guidance of NVR NS-G-2.12 implementation, specifically regarding integrated AMP. However, guidance on obsolescence is still pending, which also has been noted in the latest PSR (scheduled to be resolved within three years).

The plant general response to new NVR regulations is agreed with the regulator to be handled in the recently performed PSR report. This issue focuses on organization and functions which are also part of the PSR Safety Factor 10 (and Safety Factor 12). The PSR report is already available for these areas. Actions in response to PSR findings in the Safety Factor 10 area shall be resolved within 3 years. However, no major relevant findings were defined.

The IAEA team concludes that the reviewed documents have not resolved all the aspects of the recommendation. However, the safety relevance of the delay of the schedule is deemed moderate and thus the overall conlusion is that the progress of the recommendation solution is satisfactory to date.

The IAEA team further concludes that the reviewed documents fully deal with all the aspects of the suggestion. The suggestion can therefore be regarded as resolved.

Conclusion: Satisfactory progress to date.

Two recommendations and two suggestions were identified within the **B2 issue**.

The recently issued Proposed Management Directive for a new organization amongst others redefines the work processes relevant to AM and LTO. The directive also points out process owners as well as changes the organizational position of the group responsible for experience feed-back. The directive is scheduled to be implemented in June 2014. Inspite of a small increase of personnel

and the strengthening of the competence in the AM and LTO area, the commitment and endorsement from the top management to enhance the ability for the plant to deal with LTO is of utmost importance. In order to further enhance the ability to deal with AM and LTO, the plant has been creating several new documents and reviewing older documents. There is now a new overall handbook on AM in place and a detailed procedure PU-N12-50 for handling AM and LTO activities.

The strategy and process for AM is described in a handbook which is a part of the plant Integrated management system. The process has the necessary of "plan-do-check-act" for continuous improvement.

The implementation of the AM process into the plant quality management system ensures that the AM process contributes to the company strategic goals.

The IAEA team concludes that the reviewed documents deal with all the aspects of the first recommendation. However, as not all modifications are formally in place yet, the conclusion is that the progress of the first recommendation can only be concluded to be satisfactory to date.

Regarding to the second recommendation, the IAEA team considers this resolved.

The IAEA team also concludes that the documents reviewed under the first suggestion fully deals with all the aspects of the suggestion. However, for the second suggestion to be fully met, the Integrated Management System needs to be to be formally in place. The first suggestion can therefore be regarded as being resolved, whilst the second can be regarded as satisfactory to date.

Conclusion: Satisfactory progress to date.

One recommendation was identified within the **B3 issue**.

Draft procedure giving criteria for determining what shall be treated as a part`s substitution, a minor modification, a large modification and a temporary modification was prepared.

The plant processes for modifications, apart for the temporary modification process, are supported by a checklist to provide oversight that design requirements, codes, standards, and programme requirements are met.

The IAEA team notes that the procedure for temporary modifications, PO-N07-53, does not prescribe that the checklist shall be used. A consistency in the procedures for all types of modification for using the check list, in this respect, would be desired.

Software modifications (including set-point changes) are not explicitely considered to be modifications. This point is particularly relevant to the minor modification procedure. This was acknowledged by the plant.

It was also explained by the plant that the apparent lag in getting the above documents developed and approved was to a considerable degree due to that they have been tried out in practice. This was acknowledged by the IAEA team. The IAEA team thus concludes that the reviewed draft documents to a large extant deal with all the aspects of the recommendation in a satisfactory way and in an acceptable timely manner.

Conclusion: Satisfactory progress to date.

One recommendation was identified within the **B4 issue**.

A procedure is in place now to stipulate that external documents shall be handled in the same way as internal documents (i.e. reviewed and approved by the plant). The IAEA team verified the application of the procedure by making some spot-checks in the plant documentation database.

The IAEA team notes that although all external documents now pass a review procedure and after that are approved by the plant, this plant approval cannot be seen on the document. For user`s verification, if an external document is approved by the plant, it is necessary to look up this information in the documentation database.

Conclusion: Issue resolved.

2.1.3. Safety analysis reports and existing plant programmes relevant for LTO

The review area covered:

- Current safety analysis report and other licensing basis documents;
- Existing plant programmes relevant for LTO: Maintenance, EQ, ISI, Surveillance and monitoring, Chemical regimes as preconditions for LTO;
- ISI programme;
- Methodology and criteria for scoping and screening of SSCs for LTO;
- Completeness of SSCs scoping for LTO;
- Status of 2009 SALTO Mission issues – A-1, A-2, A-3, C-1, C-3.

The following topics were presented and discussed:

FSAR

The plant operation is based on a License according to the Dutch Nuclear Act (KEW).

It was clarified that the FSAR equivalent is termed "Technical Information Package" (TIP). The TIP format and contents is based on the US NRC RG 1.70. The TIP is complemented by a document titled Technical System Description, which deals with operational aspects.

TIP and Technical System Description will be combined into one document by the end of 2013 (in connection with the current PSR).

Changes and updates to the TIP and Technical System Description are provided for information to the regulatory body but not for approval.

The document "Technical Specification" (TS) follows the US format and is approved by the regulatory body. In addition to the TS, there is a document providing additional information, "Operational Technical Specification" (Bedrijfstechnische Specificaties, BTS), that is approved internally at the plant only, and deals with fire protection systems, communication, accident management, etc.

The Safety Report (SR) is a "summary" document that is structured similarly like the TIP according to the US NRC RG 1.70. It is an integrated part of the plant license and is public. It does not contain detailed information.

Changes to SR are approved by the regulatory body.

It is planned to issue a new license for the plant, since the existing one contains a large number of amendments; in this connection the SR will be also revised completely.

PSR

The current PSR "10EVA13" is performed on the basis of the IAEA Safety Guide NS-G-2.10, resp. its revision draft DS426 (under development, draft 3 dated 27.11.2009). The 10EVA13 is guided by the "Basic Document" (BD), developed by the plant and agreed with the regulatory body. The BD describes PSR methodology, acceptance criteria (that are based on Dutch regulatory documents NVR that are in turn based on IAEA Safety Standards modified by replacing "should" in Safety Guides by "shall"), activities for each SF, and includes also discussion of LTO interfaces (such as the Scoping and Screening results, etc.).

At present the review in the areas of individual SFs is under way. The review includes mechanism to consider and address the outcomes of other projects performed at the plant.

The review includes benchmarking against current safety requirements, modern plant designs (such as EPR), practices, etc. The results identify the differences between the plant and the state of the art information. This difference is used as a basis for the design of various safety improvement activities, dealt with in the Global Assessment.

10EVA13 aims at obtaining all significant documentation relating to the original design basis as well as modifications implemented. Intensive cooperation with the original plant designer is on-going, see also the report of the SALTO PR, 2009.

SFs 1-4, 10, and 12 are primarily related to LTO and directly consider the LTO scope. Colour coding used facilitates easy identification of relationships with other projects and activities.

PSR also serves the purpose of gap/overlap analysis and provides inputs to the TIP.

The 10EVA13 will be completed end 2013. It was stated that subsequently the plant license will be revised in 2015 following the LTO and the Safety Report are completely revised.

Existing plant programmes relevant for LTO

The plant LTO project is described in the report Conceptual document LTO "bewijsvoering" KCB, NRG-22701/10.103460. The report also describes the existing plant programmes on maintenance, surveillance, in-service inspection, equipment qualification, and water chemistry. Combination of these plant programmes' elements constitutes in principle AMPs. Therefore in this part of the review the programmes are addressed from the point of view of preconditions. It was noted that the plant programmes discussed are not yet based on the IAEA Safety Guide NS-G-2.6 that is included in the current license, but on earlier version of IAEA Safety Standards.

Maintenance programme requirements are provided in the Dutch regulation NVR 2.2.7. Based on the regulation, Maintenance Strategy and Maintenance Programme were developed. The Maintenance Strategy is based on supplier recommendations and operating experience. The scope of maintenance is based on safety classification and on the results of PSA.

Different types of maintenance are in place (condition-, time-, failure-based). Preventive maintenance is mandatory for safety related components.

The maintenance information is contained in several databases (ISH, ISO, DMS, AM database "VOB", etc.). Maintenance programme include trend analysis and evaluate degradation mechanisms. Maintenance programme is being verified for meeting the intent of the "Maintenance Rule" for the in-scope items in the LTO project 'Assessment of active components'.

Plan for improving maintenance programmes is based on plant self-assessment and in line with good international practices exists.

Maintenance programme was evaluated for compliance with 9 attributes of an effective AMP as recommended in SRS No.57 and the evaluation is summarized in the respective plant report KTE/AdJ/RBn/R106151.

Equipment qualification was evaluated for compliance with the 9 attributes of an effective AMP as recommended in SRS No.57 and the evaluation is summarized in the respective plant report IAEA Safety Report 57-Verification of preconditions-Equipment Qualification. KTE/AdJ/Rnh/R106190, 2011.

In-service inspection follows the requirements provided in the Dutch regulation NVR 2.2.7, the Dutch Steam Law, ASME Code Section XI, and considers the equipment manufacturer specification.

The ISI programme was reviewed for compliance with the 9 attributes of the effective AMP (SRS No.57). The review is summarized in a plant report IAEA Safety Report 57-Verification of preconditions-ISI. KTE/AdJ/RBn/R106153, 2011.

The surveillance and monitoring programme is based on Dutch regulation NVR 2.2.8, ASME XI 1986 edition and KTA rules. Based on these requirements, the plant Surveillance Strategy document was developed and serves as a basis for In-service Testing Programme and Data that feed into several database systems (that are not interconnected: ISH, ISO, ISO4).

Surveillance programme was evaluated for compliance with 9 attributes of an effective AMP (KTE/AdJ/Rnh/R106188).

Chemical regimes (Chemistry Programme) at the plant are based primarily on the VGB Guidelines VGB R 401 J, that are used to develop the Chemistry Strategy (Chemistry Handbook). The Chemistry Programme consists of 3 level of documents (hierarchy).

The assessment of plant chemistry including trending is carried out and reported regularly. The chemistry surveillance includes also various diagnostic parameters. Impact of water chemistry on plant SSCs is carefully considered.

The Chemistry Programme has been reviewed for consistency with the 9 attributes of an effective AMP given in Ref. [SRS No.57]. The review is summarized in the plant report IAEA Safety Report 57-Verification of preconditions-Water chemistry, KTE/AdJ/RBn/R106155, 2011.

In-service Inspection

The In-service Inspection (ISI) is based on results compiled from the very beginning and includes manufacturer inspection results as per applicable German rules at that time. Manufacturer documents are available at the plant for replacement components.

The plant performed pre-service inspection for primary circuit components (not mandatory at that time). Initially the ISI was based on Dutch “Steam Law”. The plant license from 1975 refers to ASME XI. As of 2010 the ISI is performed based on ASME XI (2007 edition, for nuclear part) and on PED (European code, for conventional part).

The plant has taken various measures to establish a “fingerprint”.

ALARA principle is considered in planning the ISI; e.g. for RPV and PRZ the ISI is carried out in 2 intervals instead of 3.

SG heat exchange tubing is inspected every 3 years, 60% is required, almost 100% performed. Approx. 80 of 4500 SG tubes were plugged.

The surge line NDE was discussed in detail as an example. The NDE includes volumetric examination of the connecting welds (to PRZ and MCL), 2 longitudinal welds and 1 circumferential weld of the surge line elbow next to MCL. In 1997 all surge line welds were inspected in connection with the LBB application. Examples of the procedures used and the results obtained were presented (including e.g. TJ for respective NDE qualification, etc.). The information was also presented in the related plant databases (ISI database, ISO4 database).

It was noted that the NDE results stored in the plant database were not readable since they were black and white scans of colour pictures (NDE results).

The ISI is a part of the maintenance programme.

The NDE for primary components is qualified according to ENIQ. The plant has established a co-operation in this area with Goessgen plant (sharing test blocks, etc.).

Risk-informed ISI is not used at the plant.

ISI database, and ISO4 databases were developed for 40 years of operation. The databases are not interconnected and information needs to be entered in both manually. New database system will be implemented next year. The new database system should integrate the information provided in different isolated databases at present.

The ISI plant staff has been reviewing the LTO project documents thus ensuring the ISI covers the LTO scope. However, a dedicated verification of the LTO scope against the current scope of ISI programmes was not performed.

Scoping and Screening

The scoping methodology and results are described in the AREVA NP report "Definition of the scope of the plant systems, structures, and components to be taken into consideration for the LTO process", NEPS-G/2008/en/0056, Rev.B. The report revision takes into account, among other aspects, the recommendations of the SALTO PR carried out in 2009.

The scoping was carried out based on a list of all plant systems and their safety classification. The starting point for the safety classification was the existing plant classification system that implements the IAEA Safety Guide 50-SG-D1. This starting point was replaced by a new approach based on the IAEA Draft Safety Guide DS367, complemented by the plant and AREVA experts' engineering judgement and including specific design aspects of the plant and other KWU plants.

The scoping process resulted in a list of plant subsystems safety classification according to the methodology described in the report. The results are divided in 3 tables for mechanical, electrical and I&C, and civil. For each subsystem considered it is indicated if it is within the LTO scope (or not).

The screening methodology and results are described in the AREVA NP report "Screening of relevant structures, and components in the frame of the KCB LTO process", NTCM-G/2009/en/0144, Rev.B. The report revision takes into account, among other aspects, the recommendations of the SALTO PR carried out in 2009.

The report deals with passive and active structures and components at the level of commodity groups. For each subsystem identified to be within the scope of LTO assessment, applicable

commodity groups are identified.

The information provided in the report is complemented by information given in several other AMR reports, which are outlined in Fig.5 of the NRG report Conceptual document LTO "bewijsvoering" KCB, NRG-22701/10.103460. In particular the safety class boundaries are identified for mechanical part in each of the 14 AMR reports (prepared by AREVA NP, for example PESS-G/2010/en/0044) by colour coding on respective P&IDs (supplemented by the information provided in the AREVA NP report AMR Methodology Report, PESS-G/2010/en/0041).

It was noted that the report deals, in the sense of the IAEA SRS No.57, with scoping rather than with screening.

The actual screening (as per the IAEA terminology) is described in the AREVA NP draft report on "Detailed screening of relevant mechanical structures and components in the frame of the KCB LTO process", PESS-G/2011/en/0147 Rev.A. The report deals with both passive and active mechanical components.

The results of the screening are provided in the Appendices of the report.

It was noted that the draft report on "Detailed screening of relevant mechanical structures and components in the frame of the KCB LTO process" is not considered or referred to in the Conceptual document LTO "bewijswoering" KCB, NRG-22701/10.103460, see e.g. Fig.5; the conceptual document should be revised.

It was stated that the plant intends, after finalizing all LTO project documents (that are mainly contractors documents) will develop LTO plant documentation, and maintain it as a "living document".

LTO assessment

The LTO assessment is performed separately for passive and active components.

For passive components the approach outlined e.g. in Fig. 5 of the NRG report Conceptual document LTO "bewijsvoering" KCB, NRG-22701/10.103460 is used.

For the assessment of active components the approach described in Section 4 and outlined in Fig.9 of the NRG report Conceptual document LTO "bewijswoering" KCB, NRG-22701/10.103460 is used. The approach is based on a methodology described in a draft plant report "Assessment of active components with regards to LTO", without number yet.

The scope of the assessment is based on the report "Screening ...", NTCM-G/2009/en/0144, Rev.B, and on the draft report "Detailed Screening ...", PESS-G/2011/en/0147 Rev.A output (based on "safety categories"). The plant approach, in order to enable comparison with the "Maintenance Rule", follows ASME OM Code and should also ensure that it includes components relied upon in EOPs and SAMGs.

The objective of the assessment is to demonstrate that the plant maintenance and testing of components (in scope of the LTO assessment) are adequate to ensure accomplishment of required safety functions. The acceptance criteria, in general terms, are meeting the intent of the US NRC Maintenance Rule. Meeting the acceptance criteria will ensure operability and reliability of active components and structures.

To verify the approach to scoping and screening, and to the assessment in general, an example the surge line was discussed in detail, starting from scoping, and proceeding through screening,

detailed screening to ageing management review. The pilot example led to the recommended actions, in this case fatigue assessment and NDE for ISI. The fatigue assessment was reviewed in detail in the respective TLAA, the ISI in the frame of the discussion on ISI.

After the review the team found that the following areas need enhancements:

- ISI database-black and white scans of colour pictures result in unreadable records of NDE results;
- Documentation of scoping and screening processes and of the whole LTO concept;
- Methodology for the assessment of active components and its implementation.

Documents and information used during the review were:

- Conceptual Document LTO "Bewijsvoering" KCB, NRG-22701/10.103460, 2011;
- IAEA Safety Report 57-Verification of preconditions-Maintenance, KTE/AdJ/RBn/R106151, 2011;
- IAEA Safety Report 57-Verification of preconditions-Surveillance and Monitoring, KTE/AdJ/Rnh/R106188, 2011;
- IAEA Safety Report 57-Verification of preconditions-Water chemistry. KTE/AdJ/RBn/R106155, 2011;
- IAEA Safety Report 57-Verification of preconditions-ISI. KTE/AdJ/RBn/R106153, 2011;
- IAEA Safety Report 57-Verification of preconditions-Equipment Qualification. KTE/AdJ/Rnh/R106190, 2011;
- Definition of the scope of KCB systems, structures, and components to be taken into consideration for the LTO process, NEPS-G/2008/en/0056, Rev.B, 2011;
- Screening of relevant structures, and components in the frame of the KCB LTO process, NTCM-G/2009/en/0144, Rev.B, 2011;
- Draft Detailed screening of relevant mechanical structures and components in the frame of the KCB LTO process, PESS-G/2011/en/0147 Rev.A, 2012;
- AMR PESS-G/2010/en/0044;
- AMR Methodology report, PESS-G/2010/en/0041;
- Draft report Assessment of active components with regards to LTO. No number yet.

Status at SALTO follow-up mission

There were two issues identified by the review team in 2012 – C1 "Assessment of active components for LTO", and C2 "Scoping and Screening for LTO".

Two recommendations and one suggestion were made for the **issue C1**.

The plant has developed 4 documents to address the recommendations given:

- Methodology Report and Checklist;
- Scope Verification and Categorization;
- Response Document;
- Evaluation and Conclusions.

The "Methodology Report and Checklist" describes the approach to assessing the maintenance rule, ageing, maintenance and testing of active components. Additionally, checklists for maintenance and ageing of components are included. The report "Scope Verification and Categorization" identifies all active components from the "Detailed Screening" report, verifies this scope against requirements that could be applicable in an assessment against the maintenance rule and categorizes the components in categories that can be evaluated in accordance with US requirements. The "Response Document" presents the evidence, which is used to assess the maintenance and IST programmes. Acceptability is determined by comparing the evidence with the criteria that ensure component reliability and that comply with relevant test codes, requirements, and/or good engineering practices. The "Evaluation and Conclusions" report evaluates ageing management in the form of preventive maintenance and performance monitoring in the form of in-service testing (surveillance), and identifies a number of specific and general opportunities for improvement (SOFI, GOFI). The plant established a schedule for implementing the SOFIs and GOFIs identified.

The 4 documents were reviewed by GRS, resulting in a number of comments and recommendations, and providing favorable conclusions. The regulatory body also reviewed these documents.

The implementation of SOFIs and GOFIs identified and of the GRS comments and recommendations is scheduled for completion in October 2014. The schedule for implementation of SOFIs and GOFIs was discussed with the regulatory body.

The "Surveillance Strategy" document was revised to include the efficiency improvements resulting from the assessment performed in the surveillance programme.

The team concludes that the recommendations to the issues C1 (R1 and R2) are resolved.

The implementation of the reliability engineering process is underway. It was included in the "House of Quality" as an object and its owner assigned (already in 2012). In 2013, a multi-disciplinary work team was established to implement the reliability engineering process in line with the project document "Plan of Action for the Implementation of a Reliability Engineering Process". The INPO AP-913 ER process description is used as a guideline.

The team concludes that the solution of suggestion S1 is in satisfactory progress to date.

Conclusion: Satisfactory progress to date.

Two recommendations were made for the **issue C2**.

The overview of the identification of SSCs in a scope of the LTO assessment is provided in the "Summary Report Ageing Management Review" developed by NRG that refers to original scoping procedure and screening procedure, but not to the detailed screening procedure, which contained the essential information on the screening and was published shortly before publication of the "Summary Report".

The scoping table, which outlines both the methods used as well as the results obtained, was revised and contains mechanical, electrical and I&C systems. The table includes now also those systems that are out of the scope of the LTO assessment and indicates the scoping criteria (methods used).

The report "Scoping Procedure, Criteria and Results", which is one of the implementation reports of the "AM General Procedure", and which provides detailed description of the scoping methodology used. That will also include, as a main input, the scoping table. Its text part remains to be developed and should also include a description of the methodology used for scoping of civil structures and the results of its application.

Marked-up P&IDs for the whole plant were developed and form a substantial technical basis of the plant report "Scoping document – coloured P&IDs", which is also one of the implementation reports of the "AM General Procedure". The text part of the report still remains to be developed.

Information that was provided in the detailed screening procedure should be either referred in the "Summary Report Ageing Management Review" or described in a dedicated plant document (e.g. a implementation reports of the "AM General Procedure").

The team concludes that the solution of both recommendations of the issue C2 is in satisfactory progress to date.

Conclusion: Satisfactory progress to date.

2.1.4. Review of ageing management programmes and related TLAAs for mechanical SCs

The review area covered:

- Review of Ageing management programmes;
- Original TLAAs;
- Design Basis information;
- Revalidation of TLAAs;
- Chemical regimes and Surveillance programmes;
- Data collection and record keeping;
- Status of 2009 SALTO Mission issues – C-2, D-1, D-2, D-3.

The following topics were presented and discussed:

- Ageing management review for steam generator, KCB primary component supports, ageing, TLAA summary assessment, chemistry, and surveillance programmes.

Due to the volume of materials provided the review approach utilized spot verification of various programmes. For ageing management each of the nine Generic Attributes of an effective ageing management programme were verified. All attributes were confirmed in the Chemistry programme. The Surveillance programme attributes were spot checked, but time was insufficient to thoroughly review its implementation.

The TLAA programme fatigue analyses were reviewed for status of revalidation. In the area of updating plant transient cycle counts and implementation of on-line fatigue/transient monitoring the plant has made substantial progress. The use of FAMOS for re-verification and updating of thermal transients is recognized as moving in the right direction. Data from FAMOS was provided for the first year of monitoring. Five years of data were established as necessary to provide a basis to update operating transients. This is under way and will be completed after entry into LTO. All

TLAA fatigue analyses have been revalidated with update cycles as reported in LTO Demonstration of Fatigue TLAAs. The summary table identifies those analyses that are not demonstrated at this time to have a usage less than 1.0 for the full period of the LTO. The plant has in place, with the use of FAMOS, a method to refine the analyses to determine if further actions are necessary during the period of LTO for specific components. This plan is recognized below as a good performance in this area.

The ageing management review included checking that ageing mechanisms were identified and assessed within the plant programmes. The Ageing management reviews for the Steam Generator and the Primary Component supports and the Mechanical Ageing Management Catalog were selected for more detailed review.

The Mechanical Ageing Mechanism catalog is an excellent document that is very thorough. The reviewer identified the addition of a known mechanism to the catalog based upon his experiences in use of risk informed ISI programmes and plant operational experience. This was agreed upon by the counterparts.

For the implementation aspects of ageing management two items were selected for further review. The plant approach to ageing management of damage mechanism is to utilize existing plant processes and not create separate programmes such as the chemistry and surveillance programmes. The Steam Generator Ageing Management Review and the draft Summary Ageing Report had identified FAC as a mechanism for the main steam and feedwater nozzles and piping. A request was made for documents that demonstrated the implementation attributes of the programme, for example past data, baseline inspections, and trending from the plant FAC programme. These documents were not made available to the reviewer. It was determined at the end of the mission, these mechanisms were identified, but a commitment or resolution of the method for dealing with the mechanism was not yet determined and the plant had no tracking system to identify this open item. The late revelation of this lack of implementation data prevented selecting an alternative mechanism for implementation assessment.

As part of this mission, the SALTO peer review team was requested to review the follow-up activities of the previous 2009 mission. Item C-2 of that mission had noted an issue with the main RPV support inspection. This item was evaluated in the main component support ageing management review. Two mechanisms were identified as applicable in the review. The review for support clearances that was completed in 1993 was credited as a basis for not doing a follow-up inspection. In addition, the draft summary report did not capture the requirement to inspect for boric acid corrosion.

Since it is 20 years since the last inspection and new techniques for examination are available today it is the reviewer opinion that this inspection removal should be re-evaluated in light of the time period anticipated for extended operation, 20 years. An alternative inspection may be possible and thus the elimination today may not be justified given the critical nature of the support. At a minimum the plant implementation programme should inspect for Boric Acid corrosion as identified in the Ageing review documents.

Based upon these reviews Issue D-1 was documented to note that a review of damage mechanisms identified in the applicable ageing management documents, should be conducted to assure that applicable inspections are implemented. This is identified as a potential programme weakness.

Presentation and interviews about following projects and activities connected with LTO were carried out:

- Chemistry Programme;
- Surveillance Programme;
- Reactor Vessel Safety Assessment Programme;
- TLAA Revalidation Programme;
- Ageing Management Reviews.

Beside the scope the team has the following observations and comments: n/a

After the review the team found that the following areas need enhancements:

In the area of ageing management two issues were identified for enhancement. The first issue identified covers a potential weakness in taking an identified ageing management identified degradation mechanism and implementing inspection and tracking in the plant. It is noted that the summary report ageing management review is still in draft stage. During final discussions with the plant staff it was determined that some identified items are to be addressed in the future, but no master tracking list of open items was provided for review. Significant review time during this SALTO was spent determining status of inspection activities. The summary of this issue is documented in issue D-1.

As part of the review of the mechanical ageing management catalog, the reviewer identified a potential damage mechanism that should be included in the assessment of internal piping systems. The plant staff noted this mechanism was not identified in the GALL report, but agreed it would be a potential mechanism to be evaluated. This suggestion is documented in issue D-2.

During the review the team identified the following good practices: n/a

As good performances team recognized TLAAs revalidation and handling of chemistry programme.

Documents and information used during the review were:

- PESS-G/2010/en/0041, Ageing management review- methodology, Rev A, dated 2011-08-11;
- PTCM-G/2010/en/0043, Catalog of ageing mechanisms for mechanical components (CAM-MC), Rev A, 04.05.2011;
- PESS-G/2010/en/0044, Ageing management review to support LTO for KCB steam generators, Rev A, 07.10.2011;
- PESS-G/2010/en/0049, revision A, 22.12.2011, Ageing management review to support LTO of KCB nuclear safety systems;
- PEER-G/2011/en/0071, Ageing management review to support LTO for KCB primary component supports;
- GEN-07-001 revision 0, “Flow-accelerated corrosion” (FAC), ook wel erosie corrosie (EC) genoemd;
- KTE/AdJ/RBn/R106155, IAEA Safety Report 57- Verification of preconditions-water chemistry;
- NRG-22503/11.109273, Draft Summary report ageing management review, April 2012;
- N04-22-001, Specificatielijst Systeemparameters KMC Conventioneel + KMC Nucleair, verie 29, 1-6-2102;

- NRC-224888/11.106369, LTO Demonstration of Fatigue TLAAs, LTO of NPP Borssele, 01 May 2012;
- NRG-22503/11.109273, Summary Report Ageing Management Review: Draft B1;
- NRC-224888/11.106369, LTO Demonstration of Fatigue TLAAs, LTO of NPP Borssele, 01 May 2012;
- NRG-22488-11.106371, Revision 1, Assessment of Fatigue TLAAs, 01 May 2012;
- NRG-22981/12.113224, Fatigue Assessment of Spray Nozzles of Main Spray Lines of NPP Borssele, 28 March 2012;
- KTE/ADJ/Rnh/R106188, IAEA Safety Report 57- Verifications of preconditions-Surveillance and Monitoring, 21 January 2011.

Status at SALTO follow-up mission

There were two issues identified by the review team in 2012 – D1 "Implementation issues in applying the attributes of an effective ageing management programme" and D2 "Ageing Management Catalogue of Ageing Mechanisms for Mechanical components should include cavitation".

Two recommendations and one suggestion were identified within **issue D1**.

A formal procedure was developed and implemented to control ageing management programme. It contains a top level document for ageing management (HB-N12-2, Handbook of Ageing Management) and a new Ageing Management Procedure PU-N12-50. A complete review of the ageing management process, as defined in PU-N12-50, will be periodically repeated once per three years at least. Ageing Management Strategy documents for components and commodity groups in the scope of LTO are in development and will be implemented as they become finalized. Each Ageing Management Strategy document will contain a matrix defining relevant programmes addressing each degradation mechanism or ageing effect. Ageing management programmes will be developed based on that. FAC AMP, as a pilot, is already prepared and implemented. AMPs will be degradation mechanism- or ageing effect-oriented but some will be also component-oriented. AMPs will be described in a format of IAEA nine attributes of effective AMP and will use IGALL AMPs as a basis whenever applicable.

During the compilation of the Ageing Management Strategy documents for the main components in the scope of the AMR, AMR documents were reviewed again to ensure that no omissions were made in the identification of ageing mechanisms and the appropriate activities to manage them. A matrix defining relevant programmes addressing each degradation mechanism or ageing effect in each Ageing Management Strategy document will assure that all degradation mechanisms and ageing effects will be addressed by relevant programme. AMP on FAC was developed as a pilot AMP. It is described in IAEA nine attributes of effective AMP. All attributes are satisfactorily described but implementation of some of them is still in progress (e.g. trending of wall thickness measurements, acceptance criteria and corrective measures will be in COMSY, quality management is not addressing indicators for evaluation and improvement of AMP and confirmation process that AMP is addressing degradation mechanism and appropriate actions are taken).

Ageing management related activities will be flagged in the enterprise asset and work management system "Asset Suite" as an ageing management related activity. PMID and PMRQ numbers and corresponding work orders will be identified in the "Asset Suite" as well as in the relevant AMP to

assure traceability. It is currently implemented only for a pilot AMP on FAC. This approach will be implemented for all AMPs while they are prepared and implemented.

Both recommendations and suggestion defined within issue D1 by SALTO review team are in a satisfactory progress to date.

Conclusion: Satisfactory progress to date.

One suggestion was identified within **issue D2**.

Cavitation was supplemented into a "Catalogue of Ageing Mechanisms for Mechanical Components" as a new degradation mechanism within a group of flow-induced corrosion mechanisms. Screening of susceptible components was performed with identification of high pressure reducer in the reactor auxiliary system as a susceptible component. A modification of this component has already been implemented. In a current phase of AM implementation, cavitation is controlled through a current ageing management team activities and AM database.

As a part of the new AM approach, a new AMP devoted to cavitation will be implemented in accordance with IAEA nine attributes of an effective AMP to manage cavitation. The "Catalogue of Ageing Mechanisms for Mechanical Components" will be translated as the whole document into Dutch.

Conclusion: Issue resolved.

2.1.5. Review of ageing management programmes and related TLAAs for electrical and I&C components

The review area covered:

- Scoping and screening of SSCs for LTO;
- Review of Ageing management programmes;
- Original TLAAs;
- Design Basis information;
- Revalidation of TLAAs;
- Cable AMP, Equipment Qualification /as one of TLAAs;
- Data collection and record keeping;
- Status of 2009 SALTO Mission issues – B-1.

The following topics were presented and discussed:

- Historic review of environmental qualification activities performed at the plant;
- Scoping and screening of SSCs to be environmental qualified for harsh environment;
- Environmental conditions in the plant during normal operation;
- Environmental qualification database Calculation qualified lifetime;
- Results of the revalidation analyses for TLAA;
- Consistency between the EQDB and Components Systems Database;
- Updating of the EQDB;
- Ageing related experience feedback (VOB database);
- Ageing management review;

- Scope of the current Equipment Qualification Programme;
- EQ Spare Parts Policy.

The result of the reviewing of these topics is summarized in the following points:

Scoping and screening process

The report NEPS-G/2008/en/0056 defines the process to select the systems in the scope of LTO. This procedure takes into account the rules recommended in Safety Report Series, it includes the safety categories (S1, S2, S3) and also the rules applicable to each one. These categories and rules are in accordance with the IAEA Draft Safety Guide DS367, and define the functions to take into account during the scope process. Despite this, in some of the presentations referenced below, was indicated that this process rely in the previous Safety Classification, this fact could have as a result that not take into account all the rules mentioned previously.

The results of the analysis are included in the report and shows if the systems are in/out of the scope of LTO and also the safety category in which any of the systems belong. The Scope of LTO described in NEPS-G/2008/en/0056, take into account passive and active components. The criteria for selecting passive and active components follow the NEI-95-10.

The whole screening process is described in the report NTCM-G/2009/en/0144 and it is based on 10CFR50.54. The screening process has been performed for passive and active Structures and Components (SCs) on the level of the commodity groups. The passive (SCs) identified will be assessed through the Ageing Management Review (AMR) and as a result of the screening process, have been identified seven (7) passive commodity groups.

The active SCs will be addressed as indicated in the Conceptual document NRG-22701/10.103460. The objective of the assessment is to demonstrate that the plant maintenance and testing of components are adequate to ensure accomplishment of required safety functions. The acceptance criteria, in general terms, are meeting the intent of the US NRC Maintenance Rule. This activity is not finalized yet, due this, has not been possible the review during this mission.

Ageing management review

The Report PLTQ-G/2010/en/0038 “Ageing management review to support LTO of the plant electrical and I&C SSCs” describes for all the commodity groups, the service conditions, materials and design values directly related with the stressors identified. The report defines the stressors that could degrade any of the materials and combined with the Report PTLQ-G/2010/en/0031 demonstrates why some of the materials and stressors have to be considered in the AMR and justify the stressors that are considered negligible for any of the materials. It is an important document that will help to the plant to manage the ageing of the components if it is correctly implemented. In the current status of the LTO project, the plant has not developed specific AMPs for the different commodity groups mentioned above, this fact has been identified as an issue E-1. Nevertheless the plant has developed the report KTE/AdJ/RBn/R106151 to demonstrate that the existing plan programmes are consistent with the nine attributes, but it is a general document that doesn’t cover the requirements of the Safety Standards to do an effective Ageing Management Review.

The cables are one of the most important commodity groups in the scope of the AMR, and the state of the art shows that temperature and radiation are important stressors to take into account during the LTO period in order to manage adequately the ageing of this components. The temperature that should be considered for a correct AMR, depends on the rooms for which the cables have been routed but, this information is not available for the plant. Some of the assumptions in the report

PLTQ-G/2010/en/0038 require a revision in order to be more conservative to compensate that the cable routing are out of the control of the plant. This is considered as an issue E-3.

Revalidation of TLAA

The list of the specific safety analyses that uses time limited assumption are all the safety related components that are installed in harsh environment. The detailed list of these components is in the EQDBA, the methodology to create this database is described in the report "KTE/AdJ/SAL/R106299 "Qualification of Design Base Accident Resistant Electrical Equipment", in paragraph 2.2 is indicated that the qualification requirements are according to the KTA and IEEE rules and reported in WV/Bge/R4284.

The report "KTE/Adj/Rnh/R106190 - Verification of preconditions - Equipment Qualification" concludes that "Monitoring of the environmental conditions to which the SSCs are exposed is an important input for ageing management", although the revalidation of the analysis is based on a comprehensive programme to ensure temperature and radiation during normal operation in the plant, is recommended an environmental monitoring programme to detect change in environmental conditions that could affect to the TLAA revalidation analysis. This is considered as an issue E-3.

The LTOB-EQDBA contains the results of the revalidation of TLAA. The analysis has been projected to the end of the intended period of LTO (2034 as indicated in KTE/AdJ/SAL/R106299). For the components for which the residual lifetime is lesser than the intended period of LTO, should be correctly managed trough the Report PTLQ/2011/en/0018 in which is described the components that has a residual lifetime lesser than five years. Prior to this time, the plant should decide the corrective or compensatory measures to take. The Report KTC/MC/FN/R116317 establishes the list of components that the plant has decided to replace in the next five years. The rest of the components described in the Report PTLQ/2011/en/0018, are under the reanalysis process.

The EQDBA not only consider the end components also consider the complete component chain which has been identified as a good practice and is described below.

The result of the revalidation includes Technical Terms of Reference (EQDBA), justification of the computational model used (NGLE/2004/de/0032, NLTQ-G/2009/de/0068, NTLQ-G/2009/de/0065), calculation of the residual lifetime (Aurest DataBase) and conclusions for the components that required additional actions in the next five years (KTC/MC/FN/R116317, PRQ/2001/en/0018).

Although the revalidation analyses have been finalized the whole of the results is not in a final report as required by the IAEA Safety Standards, related to this topic has been identified a suggestion which is described as an issue E-2.

The plant has implemented the VOB Database which contains the ageing related experience feedback, this database is currently working and as example, is considered the special programme to replace the capacitors (RPT-99-001) in the circuit boards in panels installed in the plant and as spare part. This programme is under the maintenance department.

Finally, the follow-up issue from previous mission, issue B1, is partially resolved.

The qualified life for 1E component installed in harsh environment has been revalidated and the recommendation R1 is closed. The EQDBA contains the results of this revalidation.

Regarding to the recommendation R2, the plant is working on it and has initiated a special programme to replace capacitors on circuit boards, as described in RPT-99-001. The preventive

maintenance programme for active components is not finalized yet, and is not possible to know the whole replacement programmes required to close this recommendation.

Presentation and interviews about following projects and activities connected with LTO were carried out:

- LTOB-EQDBA, Long Term Operation Bewijsvoering Equipment Qualification Design Basis Accidents [EPZ];
- KCB Ageing management review, Catalog of ageing mechanism for electrical components (CAM-EC), AREVA, (PTLQ-G/2010/en/0031);
- KCB Ageing management review, Ageing management review to support LTO of KCB electrical and I&C systems, structures and components. [AREVA]. (PLTQ-G/2010/en/0038);
- Identification of components to be environmental qualified for harsh environment;
- Survey of environmental conditions in the plant during normal operation;
- Environmental qualification database including information about functional chains;
- Method used to calculate qualified lifetime, AUREST- database;
- Retrieval of data for material in installed components;
- Identification of ageing mechanisms;
- The Experience feedback system. VOB Database;
- LTOB-AMR. Long Term Operation Bewijsvoering. Ageing Managemet Review electrical, EPZ;
- Description of the AMR Process for passive electrical components, PESS-G/2010/en/0041;
- Identification of the stressors to be considered during the AMR;
- Development of LTO-AMR component Database;
- Description of the Scope and Screening process, NPES-G/2008/en/0056, NTCM-G/2009/en/0144;
- Identification of the passive commodity groups in the scope of the AMR;
- Identification of the components included in the LTO-AMR Database;
- Equipment Qualification, EPZ.

Beside the scope the team has the following observations and comments:

Although in general terms the LTOB-projecs and AMR-electrical have been addressing with high performance, some activities should be highlighted:

- Some AMPs, although planned, have not been developed yet;
- A secure routine in the control of the environmental conditions in some specifics rooms have been required in order to ensure that the TLAA analyses remain valid during the entire period of the LTO;
- The plant has finished the Revalidation of TLAA analyses appropiately; the results of this work should be included in a verifiable and traceable report.

After the review the team found that the following areas need enhancements:

- Improve QA-process of the EQ Database.

As good performance the team recognized the methodology for Environmental Qualification based in Component Chain that actually is implemented in EQ-DB.

Documents and information used during the review were:

- PLTQ-G/2010/en/0038 “Ageing management review to support LTO of KCB electrical and I&C SSCs”;
- PTLQ-G/2010/en/0031 “Catalog of ageing mechanisms for electrical components (CAM-EC)”;
- PESS-G/2010/en/0041 “Ageing management review, methodology report”;
- KTE/AdJ/RBn/R106151 “Verification of preconditions, maintenance”;
- KTE/Adj/Rnh/R106190 “Verification of preconditions, equipment qualification”;
- KTE/AdJ/SAL/R106299 “Qualification of design base accident resistant electrical equipment”;
- WV/Bge/R4284 “Vergellijking van de Kwalificatie-Beproevingsmethode van IEEE en KTA MET de Condities Van BS30”;
- NGLE/2004/de/0032 “Beschrebung der im Funktionsketten-Tool der Aurest DatenBank verwendeten Berechnungsalgorithmen”;
- PTLQ-G/2011/en/0018 “Berechungsergebnisse der Aurest-DatenBank”;
- NLTQ-G/2009/de/0068 (not available);
- NTLQ-G/2009/de/0065 (not available);
- KTC/MCR/FN/FR116317 “Wijzigingsvoorstel. Verganging ongelvalsbestendige E&I componenten”;
- NTCM-G/2009/en/0144 “Screening of relevant structures and components in the frame of the KCB LTO”;
- PESS-G/2010/en/0051 “Ageing management review to support LTO for KCB safety-related auxiliary systems”;
- NEPS-G/2008/en/0056 “Definition of the scope of KCB systems, structures and components to be taken into consideration for the LTO”;
- RPT-99-001 “Verdampen elektrolytische condensatoren”;
- STRAT-KWAL “Strategie voor kwalificatie van veiligheidsrelevante componenten”;
- N13-51-001 “E&I Veiligheidsklassering Kernenergiecentrale Borssele”;
- EQ Database, VOB Database, LTOB-AMR Component, Aurest Database, BRS Database;
- Procedures and instructions (PU-A05-04, PO–A05.32, A05-32.001, PO-N12-81, PU-N01-07, PU-N12-19, PO-N12-77);
- Counterpart presentation and interview;
- Plant walk down.

Status at SALTO follow-up mission

There were three issues identified by the review team in 2012 – E1 “Plant programmes for ageing management is not documented in a systematic way”, E2 “Establish final Documentation of revalidation analyses” and E3 “Ageing analyses not always proved to be conservative”.

One recommendation was identified within **issue E1**. The team recommended to the plant to prepare AMPs for passive commodity groups in line with the nine attributes.

To improve of the auditability of the AM at the plant, the AM process is described in a procedure PU-N12-50 “Verouderingsbeheer”. Within this process, the description of the ageing management of the 7 passive electrical commodity groups is to be prepared in 3 documents PU-N12-50-500/501/502.

Through the procedure PU-N12-50, the plant has initiated activities to assist in the development of these specific AMPs, the guidance provided deals with the recommendation purpose. The plant has the necessary information as a component level scope, ageing mechanisms for all commodity groups, international references for all AMPs and also has developed some additional information (work instructions) that will help in the future to implement these AMPs.

The specific AMPs for the commodity groups are not developed at the time of the follow-up mission even in a draft version.

Conclusion: Insufficient progress to date.

One suggestion was identified within **issue E2**. The team suggested to the plant to prepare a report with the results of the revalidation analyses of the LTOB-EQDBA project.

All results of the revalidation analysis of the LTOB-EQDBA project are reported in document PTCQ-G/2012/de/0133 "Darstellung der mit der AUREST-Datenbank erzielten Ergebnisse bis einschlieβlich Zyklus Nr.38, Identifikation von Handlungsbedarf und Festlegung der weiteren Vorgehensweise". The complete set of information included in the results of the revalidation analyses, added to the procedure PU-N12-81, that describes the process to follow during this revalidation analyses, will help in the future to preserve this revalidation analyses updated. As was suggested by the team, the revalidation analyses have been reported properly.

Conclusion: Issue resolved.

Two recommendations were identified within **issue E3**. The team recommended to the plant to implement a programme for monitoring of environmental conditions that secure that the temperatures used in the ageing analyses over time stay conservative and take additional measures to prevent that ageing analyses of cables are performed with a conservative temperature.

To fulfil the first recommendation, a monitoring programme is under development, which consists of a continuous measurement of the temperature inside the containment. The possibility to extend the monitoring programme with trending of existing radiation measurements will be investigated in consultation with the radiation control department. The selected measurement points are representative of the conditions inside the containment that will be reported, trended and analysed periodically. Additional temperature measurements will be collected in 2022 during one cycle to confirm the environmental conditions inside the containment.

To fulfil the second recommendation, additional measurements will be performed on cable trays. In the end of November 2013, potential hotspots were located during a plant walk down and temperature data loggers to confirm the recommendation proposed were installed. The end of the recorded established period is June 2014 and the results obtained will be analysed.

Conclusion: Satisfactory progress to date.

2.1.6. Review of ageing management programmes and related TLAAs for civil structures and components

The review area covered:

- Scoping and screening of SSCs for LTO;
- Review of Ageing management programmes;
- Original TLAAs;
- Design Basis information;
- Revalidation of TLAAs;
- Maintenance programme;
- Concrete ageing;
- Data collection and record keeping.

The following topics were presented and discussed:

- The process by which the current Ageing Management review for LTO is taking place;
- This is described in more detail above in section 2.1.3;
- Status of the LTO Ageing Management Review project;
- This is described in more detail above in section 2.1.3;
- Content of various plant and contractor technical documents related to the LTO Ageing Management Review project.

General programme documents are described in more detail above in section 2.1.3. For the civil area the documents specific to civil structure were reviewed in some detail. These were primarily AREVA Technical report PESS-G/2010/en/0048 Rev. A: Ageing management review to support LTO for KCB steel containment structure, AREVA Technical report PEEC-G/2010/en/0083 Rev. A: Ageing management review to support LTO for KCB structural scope, AREVA Technical report PEEC-G/2010/en/0084 Rev. A: Catalog of ageing mechansims for structural components (CAM-SC), and EPZ Civil frequency substantiation report N12-77-ONDC Rev. 8 “Onderbouwingsrapport van het civiele onderhoud“. These documents were found to be substantial in nature and contained much pertinent information regarding ageing degradation mechanisms at the plant and how they are addressed. In some cases discrepancies or omissions between documents were encountered, which the counterpart was in general agreement with and indicated would be fixed in the next revision. The complete process for the LTO review had not been fully completed at the time of the mission, which may have accounted for some of the discrepancies.

Inspections related to civil structure ageing are primarily visual, as is the practice in most utilities.There does not appear a specific training programme in place for inspectors or engineering staff re result interpretation.

- Recent technical issues related to civil/structural components

These were discussed in some detail with the Counterpart(s) and also the subject of the plant walkdown. Some major issues the plant had been dealing with (and are now completed) are:

- Need to refurbish the reactor concrete exterior wall and ventilation stacks (redoing of a repair done previously that did not last; the Counterpart indicated that there is better technology available today to effect such repaires);

- Repair to anchors in powerhouse basement;
- Repairs to a oil pipe chase that had chronic leaks.

Counterparts appear quite knowledge regarding the subject repairs and could produce inspection reports covering the history of the subject problem areas. There did not appear to be an integrated summary of all current issues and their status for the civil / structural area, nor an indication whether system health was getting better or worse.

- Conduct of maintenance programme

A review of some recent maintenance practises and work packages was performed with the counterpart. The counterpart explained how surveillance is performed at the station, and how maintenance feedback is delivered to technical staff (mainly via morning meeting process). Monthly maintenance trend reports were jointly reviewed and discussed. It was noted that these trend reports primarily focussed on maintenance backlogs and not individual system health. The Counterparts indicated that the plant was cosidering moving to an INPO AP-913 maintenance process but this was not yet confirmed by station management (was planned to be discussed in June). When reviewing a maintenance package, a non-safety related part substitution was described as being completed in the field. When question as to what engineering approvals had been obtained, the Counterpart indicated that since it was a simple change no engineering approval was needed. A separate Counterpart indicated later that upon review the minor change process should have been followed for that change.

- Population of equipment database for civil/structural components

A Counterpart demonstrated in some detail how civil structures had been incorporated into the plant equipment database. Each civil structure component (wall, floor, etc.) has been input into the database using a unique equipment identification number. This allows for individual tracking of maintenance items and repairs.
It was apparent that this database is use to initiate regular inspections of key structures. Time did not permit analysis of the extent to which this has been used as a surveillance tool (trending and tracking of programme details), however as a mimimum the plant has been set up to be able to perform such tasks.

- Issues and processes related to plant modifications (this subject is discussed in review area “B”, with the maintenance substitution issue being incorporated)

Presentation and interviews about following projects and activities connected with LTO were carried out:

- Ageing Management Overview (May 2, 2012);
- LTO Assessment : Scoping and Screening (May 3, 2012);
- Maintenance programme (with Electrical Manager) (May 4, 2012). Typical work packages were reviewed, a description of the assessment and surveillance programme was given, and a typical monthly maintenance package was reviewed. An issue with a parts substitution was uncovered that is described more fully under review area “B”;
- Plant walkdown – recent civil structural issues areas plus general familiarization (May 4, 2012). Notable areas reviewed were:

  - Reactor building containment and ventilation stack rehabilitation repairs performed in 2007 to 2009 timeframe (followed earlier repair work done in 1998 that was not as long lasting/successful as anticipated);
  - Turbine building anchor failures brittle fracture;
  - Turbine building oil pipe duct leak repairs;
  - Lifting beam rating identification.
- Population and content of Equipment Database for civil/structural components;
- Use of database for location of related procedures, frequencies, and technical data related to civil/structural inspections.

Beside the scope the team has the following observations and comments:

Plant personnel interviewed in the civil / structural area appeared to have good working knowledge of civil structural technical issues and plant history.

After the review the team found that the following areas need enhancements:

1) Certain discrepancies were noted within the plant degradation mechanism project catalogue PEEC-G/2010/en/0084 and Ageing Management Reviews PEEC-G/2010/en/0083 and PESS-G/2010/en/0048 related to the civil/structural area.

   Certain degradation mechanisms appeared missing, degradation mechanisms for the spent fuel pool could be better described, implementation of a groundwater monitoring programme was not yet in place, how hot spots were managed in the civil area was not clear, and OPEX reviews in some areas could have provided clearer conclusions.

2) There is a lack of centralized oversight for a system or component group (i.e. no System Engineer and/or Component Engineer role). This hinders the ability to ensure completeness of programmes within a given area. This observation was not specific to the civil/structural area.

   Station procedures do not require engineering walkdowns by systems or component groups to be performed regularly. There is no central engineering oversight function in place on a system or component group basis that reviews performance trends, maintenance trends, ageing programme implementation etc. of a given system or component grouping. Maintenance trending focuses on work management process metrics and not broad system health issues. Previous audits have identified a need for more detailed lower level reporting for issues that would be enhanced by system or component level oversight.

As good performance the team recognized that the plant has made recent efforts to input its civil structures into the plant equipment database in a meaningful way.

Documents and information used during the review were:

- NRG Summary Report Ageing Management Review, NRG-22503/11.109273 Draft B1;
- AREVA Technical Report PESS-G/2010/en/0041 Rev. A: Ageing Management Review Methodology Report;
- AREVA Technical Report PESS-G/2010/en/0048 Rev. A: Ageing Management Review to Support Long-Term Operation for KCB Steel Containment Structure;
- AREVA Technical Report PEEC-G/2010/en/0083 Rev. A: Ageing Management Review to Support Long-Term Operation for KCB Structural Scope;

- AREVA Technical Report PEEC-G/2010/en/0084 Rev. A: Catalog of Ageing Mechansims for Structural Components (CAM-SC);
- AREVA Technical Report PESS-G/2010/en/0110 Rev. A: Ageing Management Review to Support Long-Term Operation for Remaining In-Scope Supports and Hangers;
- EPZ Civil Frequency Substantiation Report N12-77-ONDC Rev. 8 "Onderbouwingsrapport van het civiele onderhoud";
- NRG Conceptual Document LTO "Bewijsvoering" KCB;
- Mod Checklist PO-N13-30;
- Small Mod Procedure PO-N13-26 Rev. 11 "Klein wijzigingen";
- Typical Modification Plan WP # WP-30-1737;
- Modification Implementation Procedure PU-N13-05 Rev. 11 "Initiatie, beoordeing en realisatie van wijzigingen";
- Work package for PI replacement (supplied by Mtce Mgr);
- Various maintenance procedures related to pump lubrication, oil sampling, rebuild, logic testing (PB-TJ-004 Rev 19, WNW-TJ-011 Rev 3, PB-TJ-204 Rev 2, PB-PC-616 Rev 3);
- Draft Monthly Mtce Report March 2012 "Maandrapport KO maart 2012": KO/SCHOO/LKL/R122067;
- Preventative Maintenance Strategy Document STRAT-OHD Rev. 7 "Strategierapport preventief onderhoud Kernenergiecentrale Borsele";
- PU-N07-02 Plant Walkdowns;
- KEMA Report 50662488-TOS/DTI 06-5639, 2007-05-01, "Statusrapport 2006" (Inspection Report of Reactor Containment Building / Recommendations);
- Organization Chart "Organogram EPZ".

Status at SALTO follow-up mission

There were two issues identified by the review team in 2012 – F1 "Discrepancies within Civil Ageing Management Review and Degradation Mechanism Project Catalogue", and F2 "Lack of Centralized Oversight of System/ Component Programmes".

One recommendation and one suggestion were made for the **issue F1**.

The plant developed a "Catalogue of Ageing Mechanisms for Structural Components" and a "Catalogue of Ageing Mechanisms for Mechanical Components", based on the initial documents. The documents are plant controlled documents, available as drafts at present.

The "Catalogue of Ageing Mechanisms for Structural Components" now includes additional information regarding the irradiation of concrete relevant for the RPV support structure. The information provided demonstrates that the fluence levels are below the threshold values beyond which mechanical properties change/deterioration starts to occur. The information is rather detailed, similar to a TLAA.

Regarding the irradiation behaviour of the spent fuel pool liner made of austenitic stainless steel 1.4550, reference is made to the "Catalogue of Ageing Mechanisms for Mechanical Components", which deals with this degradation for RPV internals (which are subject to substantially higher

fluence). A justification similar to the case of the RPV support concrete (EOL fluence level, material properties vs. fluence, etc.) is, however, not provided with the same level of detail.

Catalogues developed are specific for the plant and include only relevant degradation mechanisms/ageing effects. Catalogues were reviewed for completeness by GRS.

One-time measurement of the groundwater quality in the direct vicinity of the relevant building foundations was performed in January 2014. Based on the results of this measurement, periodic groundwater monitoring activities scheduled in the Asset Suite work management system and properly documented in the ageing management plan for civil structures, will be implemented before September 2014.

The plant performed the measurement of temperatures and doses over 2 fuel cycles to support EQ for electrical and I&C component. Measurement locations were identified by engineering judgement. There were no hot spots identified for civil and mechanical structures and components. Hot spots, which were identified for qualified electrical and I&C components are addressed in Aurest Database.

The plant prepared an "Ageing Management Strategy Document for the Steel Containment" that incorporates the operating experience as per the related plant procedure.

The team concludes that the recommendation and suggestion of the issues F1 are resolved.

Conclusion: Issue resolved.

Two suggestions were made for the **issue F2**.

The implementation of the reliability engineering process was considered by the plant and based on the plant management decision its implementation is underway. It was included in the "House of Quality" as its object and its owner assigned (already in 2012). In 2013, a multi-disciplinary work team was established to implement the reliability engineering process in line with the project plan: "Implement a Reliability Engineering process at maturity level 4 before 2014 outage". The INPO AP-913 ER process description is used as a guideline.

The process of categorization of SCs according to INPO AP 913 principles was performed, and critical SCs were identified.

In close relationship to the reliability engineering process implementation, the maintenance department is initiating a preventive maintenance optimization project.

The plant is in the process of acquiring the services of an external organization that will support the plant in this preventive maintenance optimization project and first proposals were delivered.

The possible organization structure changes that could create a position of system engineers group are to be evaluated but the plant reliability engineering process is not mature enough to be able to decide on this organizational issue yet.

"Indicator Display Tool" is used for periodic performance indicators evaluation. All key areas are evaluated by a set of performance indicators (PIs). In the areas Nuclear Safety, Covenant (25%) and Operational Focus, PIs related to maintenance and reliability are defined. Some of these PIs are reported to WANO. They could also be used for benchmarking other utilities.

On a more detailed level, Maintenance Trend System, related to the Asset Suite (work order management) database, has been implemented. During a practical demonstration for a selected "bad

actor", the 8 failures shown to occur within last 12 months were asset database records on in-service inspection activities (such as wall thickness measurements, installation of scaffolding for inspection, etc.) The system needs to be further improved to facilitate its practical use.

The team concludes that both suggestions of the issues F2 are satisfactory progress to date.

Conclusion: Satisfactory progress to date.

2.2. SPECIFIC RECOMMENDATIONS / SUGGESTIONS

2.2.1. Recommendations

- The plant should apply a more effective approach to improve human performance in a tangible manner.
- The team recommends to the plant that a documentation of the plant positions, in respect of the NVR rules applicable to LTO and ageing management, are created. These documented positions shall be approved by the plant.
- The team recommends to the plant that the organizational structure and staffing disposition, including numerals and knowledge, is reviewed and enhanced in order to be well adapted and developed for the proper handling of the work associated with Long Term Operation and ageing management.
- The team recommends to the plant that the management system documents, including all documents required to perform the scoping and screening work, are reviewed and amended in order to be well adapted and developed to handle all the issues involved in manageing LTO and ageing.
- Define a managed process within the plant management system to address processing of technical documents prepared by external companies.
- The plant should finalize the methodology for the assessment of active components for the LTO in line with the LTO B project schedule. SSR-2/2 (4.53-4.54), SSR No.57 (4).
- The plant should implement the methodology for the assessment of active components for the LTO before entering the LTO. SSR-2/2 (4.53-4.54), SSR No.57 (4).
- The scoping report should be revised to address comments C1 through C4 (as described in the C-2 issue sheet).
- The conceptual document NRG-22701/10.103460 should be revised and include actual information on the LTO process, such as the report "Detailed screening...". In this connection the plant may also consider clarifying the scoping and screening reports titles in line with the IAEA recommendations, (SRS No.57, Section 4).
- A formal procedure should be followed to assess and modify ageing management programme changes from the evaluation to the impact on the plant components.
- A review should be conducted to determine if other identified ageing mechanisms from the ageing management review have been removed from evaluation or been missed in implementation.
- Implement a programme for monitoring environmental conditions that secure that the temperatures used in the ageing analyses over time stay conservative.
- Additional measures should be taken to prevent that ageing analyses of cables is performed with conservative temperature.

- Perform revision of PEEC-G/2010/en/0084 or otherwise document a complete list of civil structural degradation mechanisms for use in plant LTO assessments. Perform specific spent fuel pool and security related degradation mechanisms ageing management review in PEEC-G/2010/en/0083 or other suitable document. Review methodology and report to disposition hot spot issue.
- Perform review, revision, and roll out of the plant modification processes ensuring the following:
    - Clear instructions exist for clarifying boundaries between parts substitutions, small modifications, temporary modifications, and large modification;
    - Appropriate design oversight is applied to parts subsitutions and modifications (including temporary modifications) to ensure station design requirements, codes, standards, and programme requirements are met;
    - Modification processes ensure that required revisions to the plant ageing management and other key site programmes are assessed and implemented.

2.2.2. Suggestions

- The plant should consider proposing corrective actions including deadline for their implementation for the "points requiring attention" identified in the evaluation of safety factors 10 and 12.
- Suggestion is given to the plant to establish a common documented understanding with the regulator which NVR-rules should be selected and in what time perspective these different documented plant positions should be ready.
- The team suggests to the plant to implement a document within the Management system which describes the Ageing Management strategy.
- Suggestion is given to the plant to develop a document within the management system that describes the integration of the ageing management within the LTO.
- INPO AP 913 represents a good international practice; the plant should consider its implementation in close coordination with LTO, in particular considering that the maintenance programme constitutes an essential part of ageing management at the plant.
- The plant equipment database should have ageing management programmes/mechanisms.
- Add cavitation to the "Ageing Management Catalogue of Ageing Mechanisms for Mechanical Components" and screen to determine if there are any susceptible components.
- Prepare AMPs for the passive commodity groups in line with the nine attributes.
- Prepare a report with the results of the revalidation analyses of the LTOB-EQDBA project.
- Consider implementing regular groundwater monitoring programme or otherwise address implicit assumption that it is being done to detect potential degradation mechanism as per PEEC-G/2010/en/0084 section 4.3.1.4.
- Consider expediting implementation of INPO AP-913 or similar process at the plant for equipment, component, and programme surveillance.
- Further develop current metrics for maintenance oversight to allow for benchmarking other utilities/plants.

2.3. GOOD PRACTICES AND PERFORMANCE

2.3.1. Good practice

2.3.1.1.Use of risk matrix

A risk matrix developed at the plant is used for identifying corporate risks related to the plant strategic goals (safety, availability, finance, motivation of staff and compliance). Every quarter a report is prepared related to main corporate risks.

The risk matrix is also used for prioritizing safety issues. This enables the plant to optimally allocate resources and use available resources efficiently in resolving safety issues. Examples of other applications of the Risk Matrix or the risk assessment concept are:

- Initial screening of events to determine the type of analysis;
- Analysis mixed oxide fuel project;
- Assessment of the modification of the service water system;
- Assessment of the project on modifications related to three large plant cranes;
- Assessment of an administration IT project;
- Analysis of an event related to a high pressure injection pump (not formalised in matrix).

2.3.2 Good performance

2.3.1.2.Evaluation of training effectiveness

Training on human performance tools and safety culture uses a broad scope of case studies (other industry, external NNP experience, plant experience) to allow focus on actual tasks relating to work practices. Effectiveness of training sessions is evaluated in a comprehensive manner; the results of the evaluation are used to improve training.

2.3.1.3.Use of colour coding in the Periodic Safety Review - 10EVA13

Plant utilized comprehensive colour coding to visualize PSR results, illustrating and summarizing principal points of the project. Similar colour codes are used in documents to highlight safety importance of equipment, activities or focus areas, e.g. use of a risk monitor to quantify nuclear safety relevance and a colour scheme for license related codes & guides. The same colour code is used to show the functional relationships with other projects like LTO and IPSART, showing overlaps or deltas. This adds to the focus and coordination with respect to an important project such as the PSR.

2.3.1.4.TLAAs revalidation

The plant has made a substantial investment in revalidation of safety analyses that used time limited assumptions. Plant staff has a complete listing of applicable safety analyses and the updated results for the current and projected plant cycles. They have identified areas where they cannot demonstrate that the analyses meet the acceptance criteria for operation to 2034, but have a plan in place to address needed actions. Implementation of the FAMOS system will provide them with data to assist in demonstrating TLAA acceptability and will provide them with a tool to study plant operation and make improvements in ageing of components.

2.3.1.5.Chemistry programme

The chemistry programme review was handled very well. Plant staff was capable of demonstrating the recommended attributes of an effective ageing management programme. The interviewer determined that he would spot check acceptance criteria, operating experience, and trending. Plant staff was able to retrieve applicable documentation and had a good understanding of programme implementation.

2.3.1.6.Component chain

In the EQ Database, not only the end component is registered with its environmental requirement, environmental data and qualification documentation information, but also all subcomponents such as connectors, connection cables, connection boxes, cable bushings, connection terminals, etc. are registered. The practice to register the complete component chain together with the end component is a comprehensive way to visualise all items needed to fulfil the required function during a DBA.

2.3.1.7.Civil structure integration into equipment database

The plant has made recent efforts to input its civil structures into the plant equipment database in a meaningful way that supports maintenance, monitoring, and records. Each structure such as a floor, wall or door is input with unique equipment tag identification. Moreover equipment parameters such as seismic status (Yes/No), thickness, load bearing capacity, and others are loaded into the database, providing easy access to such data by station personnel. Such a level of detail is not found at all NPPs, with such information typically needing to be derived from other sources (design drawings, etc.)

3. ASSESSMENT OF THE SAFETY ISSUES

3.1.PRESENTATION AND TREATMENT OF THE SAFETY ISSUES

3.1.1. General

In this section of the report, the technical safety issues of the peer review performed by the IAEA review team are presented in detail, following a standard format for all Engineering Safety Review Services.

The safety issues are presented in sequence and numbered, with an "*issue sheet*" specific for each safety issue. Basically, each *"issue sheet*" consists of the following sections:

For the first review mission on the subject:

(1) Issue Identification
(2) Issue Clarification
(3) Counterpart views and measures (self assessment by the counterpart)
(4) Assessment by the Review Team.

For the follow-up missions on the same subject (clarification: for each follow-up mission, new sections as 5 and 6 below are added, with sequential numbering):

(5) Counterpart actions
(6) Follow-up assessment by the IAEA Review Team.

In the Issue Clarification section of each "*issue sheet*", a clear reference to the relevant corresponding paragraph in the IAEA Safety Standards used in the review is indicated, as it was used for the review.

If, as an outcome of a follow-up mission, a new safety issue appears with respect to the previous ones, a new "*issue sheet*" will be generated.

3.1.2. Comments on Sections 3and 5 of "Issue Sheet"

The purpose of Sections 3 and 5 of the Issue Sheets is to reflect the views of and the measures taken by the Counterpart for the issue resolution, including the self-assessment.

3.1.3. Comments on Sections 4 and 6 of "Issue Sheet"

The purpose of Sections 4 and 6 of the Issue Sheets is to reflect the discussions with the Counterpart experts, to record the conclusions, to issue possible recommendations and to synthesize the expert's judgment on the resolution of the safety issue under discussion. In the present mission, the issues and recommendations from previous missions are considered as basic reference for the review.

Therefore, in these sections, included are the comments, recommendations/suggestions and documents reviewed by the IAEA Review Team, resulting from the assessment performed during the mission. As a result of such assessment, "comments", "recommendations" and "suggestions" are provided on the basis of the following criteria;

Comments: They are a summary of the findings of the review performed and of the discussions during the mission, including at the end the conclusions on the status of the issue under consideration.

Recommendation: This gives advice of the external experts of the IAEA Review Team, provided in order to resolve a deviation from the IAEA Safety Standards and/or from the international recognized practice in the subject.

Suggestion: A suggestion either is an additional proposal in conjunction with a recommendation or may stand on its own following a discussion of the pertinent background. It may indirectly contribute to improvements in the reviewed subject but is primarily intended to make useful expansions to existing programmes and to point out possible superior alternatives to ongoing work.

Comments, recommendations and suggestions are numbered in a sequential order for further reference. The reviewed documents, corresponding specifically to the safety issue under consideration, are also listed.
Each recommendation and suggestion, whenever possible, is referenced to the relevant requirement/recommendation of respective IAEA safety standard, and other reference documents.

3.1.4. Resolution degree of the safety issues

The status of the safety issue under consideration is assessed and the respective "*resolution degree*" (RD) is assigned to reflects the judgment of the IAEA review team. The degree is scaled from 1 to 4, as indicated in the issue sheet form.
The urgency degree (UD) of the issue resolution should also be evaluated and indicated in the corresponding part of the issue sheet. Promptness in the resolution of the issue may be assessed through a scale of the UD, from I to II in relation to a specific deadline or critical event.
The first date in the RD and UD tables is the date when the issue is developed. The second date in the tables is the date when the status of the issue is checked during the follow-up mission.

3.1.5. Main structure for the reviewed issues

The following six (6) main "*Reviewed Areas*" are considered to group the issues identified during the IAEA Safety Review Missions, as follows:

Reviewed Area: **A** Management, Organization and Administration OSART Module

Reviewed Area: **B** Organization and Functions, Configuration/ Modification Management

Reviewed Area: **C** Safety analysis reports and existing plant programmes relevant for LTO

Reviewed Area: **D** Review of ageing management programmes and related TLAAs for mechanical SCs

Reviewed Area: **E** Review of ageing management programmes and related TLAAs for electrical and I&C components

Reviewed Area: **F** Review of ageing management programmes and related TLAAs for civil structures and components

The following table summarizes the situation of the issues:

Issue No.	Issue Title	Rec.	Sug.
Reviewed Area A: Management, Organization and Administration OSART Module			
A-1	Human performance improvement	**1**	**-**
A-2	Corrective actions for issues identified in evaluation of Safety Factors 10 and 12	**-**	**1**
Reviewed Area B: Organization and Functions, Configuration/ Modification Management			
B-1	Lack of guidance document, in respect of the regulator licensing conditions rules (NVR-rules), related to ageing management and to some degree also for LTO	**1**	**1**
B-2	Lack of organizational structures, staffing dispositions and management system documents properly suited for managing LTO including ageing management	**2**	**2**
B-3	Practices surrounding parts substitutions and modifications require improvement	**1**	**-**
B-4	Practices surrounding acceptance of vendor engineering documentation	**1**	**-**
Reviewed Area C: Safety analysis reports and existing plant programmes relevant for LTO			
C-1	Assessment of active components for LTO	**2**	**1**
C-2	Scoping and screening for LTO	**2**	**-**
Reviewed Area D: Review of ageing management programmes and related TLAAs for mechanical SCs			
D-1	Implementation issues in applying the attributes of an effective ageing management programme	**2**	**1**
D-2	Ageing management catalogue of ageing mechanisms for mechanical components should include cavitation	**-**	**1**
Reviewed Area E: Review of ageing management programmes and related TLAAs for electrical and I&C components			
E-1	Plant programmes for ageing management are not documented in a systematic way	**1**	**-**
E-2	Establish final documentation of revalidation analyses	**-**	**1**
E-3	Ageing analyses not always proved to be conservative	**2**	**-**

Reviewed Area F: Review of ageing management programmes and related TLAAs for civil structures and components			
F-1	Discrepancies within civil ageing management review and degradation mechanism project catalogue	**1**	**1**
F-2	Lack of centralized oversight of system/component programmes	**-**	**2**

All the issue sheets from the 2009 SALTO mission are collected in Appendix III. They contain also "Counterpart actions" in section 5 and "Follow-up assessment by the IAEA Review Team" in section 6. "Status of the Issue" was not assessed during the SALTO Mission in 2009. That is why the "Resolution degree" is assessed only for a date of 2012 Mission.

All the issue sheets from the 2012 SALTO mission are collected in Appendix IV. Different template was used for this SALTO mission issue sheet in accordance with changes in the IAEA SALTO methodology.

4. REFERENCES

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[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Final Report of the Programme on Safety Aspects of Long Term Operation of Water Moderated Reactors, IAEA, Vienna (2007).

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[11] Preparatory Meeting Report, Terms of Reference for Peer Review mission for Borssele Nuclear Power Plant in the Netherlands, IAEA, Vienna, Austria, 26–27 March 2009.

[12] The Meeting Minutes of The preparatory meeting between IAEA and Dutch counterparts for IAEA Peer Review activities on "Safe Long Term Operation (SALTO) for Borssele Nuclear Power Plant in The Netherlands (Second part)", IAEA, Vienna, Austria, 14–15 July 2011.

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[14] INTERNATIONAL ATOMIC ENERGY AGENCY, Periodic Safety Review of Nuclear Power Plants, Draft Safety Standards Series Safety Guide DS426 Draft3, IAEA, Vienna, 27/11/2009.

[15] NRG-22701/10.103460 Conceptual Documents LTO “Bewijsvoering” KCB, NRG, 2011.

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[18] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Commissioning and Operation, Specific Safety Requirements No. SSR-2/2, IAEA, Vienna (2011).

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5. ABBREVIATIONS AND GLOSSARY FOR THE MISSION

AMAT	Ageing Management Review Team
AMP	Ageing management programme
AMR	Ageing management review
AREVA	Global nuclear power industry supplier which covers the fuel cycle, reactor design and construction, and related services
CFR	US Code of Federal Regulations
EBP	Extra budgetary fund of the IAEA (joined on voluntary basis)
EQ	Equipment Qualification
GALL	Generic Ageing Lessons Learned
IAEA	International Atomic Energy Agency
ISI	In-Service Inspection
I&C	Instrumentation & Control
KTA	Kerntechnisher Ausschuss – the German Nuclear Standard Commission
KWU	Kraftwek Union (former Siemens subsidiary)
LBB	Leak Before Break concept
LR	License Renewal
LTO	Long Term Operation
MOV	Motor Operated Valve
MS&I	Maintenance, Surveillance and Inspection
NEI	Nuclear Energy Institute
NPP	Nuclear Power Plant
NRC	Nuclear Regulatory Commission
P&ID	Piping and instrumentation diagram
PV&P	Pressure vessel and piping
PSR	Periodic Safety Review
RCM	Reliability Centred Maintenance
RPV	Reactor Pressure Vessel
RTD	Resistance Temperature Detector
SALTO	Safety aspects of LTO
SSC	Systems, structures and components
SC	Structures and components
SOV	Solenoid Operated Valve
TLAA	Analysis using time limiting assumptions (Time limited ageing analysis)

Ageing

General process in which characteristics of a structure, system or component gradually change with time or use.

Ageing Management

Engineering, operations and maintenance actions to control within acceptable limits ageing degradation and wear out of structures, systems or components.

- Examples of engineering actions include design, qualification, and failure analysis. Examples of operations actions include surveillance, carrying out operational procedures within specified limits, and performing environmental measurements.
- life management (or life cycle management) is the integration of ageing management with economic planning to: (1) optimize the operation, maintenance and service life of structures, systems and components; (2) maintain an acceptable level of performance and safety; and (3) maximize return on investment over the service life of the facility.

Design Basis

The range of conditions and events taken explicitly into account in the design of a facility, according to established criteria, such that the facility can withstand them without exceeding authorized limits by the planned operation of safety systems.

Design life

Period during which a System, Structure or Component is expected to function within criteria

Licensing Basis

A set of regulatory requirements, applicable to a nuclear facility.

Periodic Safety Review

A systematic reassessment of the safety of a nuclear power plant carried out at regular intervals to deal with the cumulative effects of ageing, modifications, operating experience, technical developments and site aspects that are aimed at ensuring a high level of safety throughout plant service life.

Analysis using time limited assumptions (TLAA)

Plant specific calculations and safety analysis (Time Limited Ageing Analysis or Residual Life Assessment) using time limited assumptions that are based on an explicitly assumed time of plant operation or design life. The licensee calculations and analyses:

- Involve systems, structures, and components within the scope of license renewal or life extension;
- Consider the effects of ageing;
- Involve time-limited assumptions defined by the current operating term, for example, 40 years;
- Were determined to be relevant by the licensee in making a safety determination;
- Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions; and
- Are contained or incorporated by reference in the Current Licensing Basis.

APPENDIX I LIST OF PARTICIPANTS

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FOLLOW-UP MISSION

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APPENDIX II MISSION PROGRAMME

Day 1, Tuesday **01 May**	**PM**	Arrival of team members to airport. Transportation to the hotel from airport. Accommodation IAEA team briefing, preparatory activities Pre-meeting with counterparts (main counterparts)
Day 2, Wednesday **02 May**	**AM**	8:00 Departure from the hotel 8:30 – 9:30 Entrance procedure 09:30 – 12:30 IAEA team training
	PM	13:30 Entry meeting Opening of the mission – representative counterpart Regulatory body expectations NPP manager - NPP expectations Objective and schedule – Team Leader Introduction of participants – both sides Methodology of review – Team Leader NPP – operational results, LTO activities – representative counterpart Initial Working Group meeting. Counterpart presentations 18:00 Departure to the hotel
Day 3, Thursday **03May**	**AM**	8:00 Departure from the hotel 8:30 – 12:30 Parallel sessions- Groups A - F (review)
	PM	13:30 – 16:00 Parallel sessions - Groups A - F – interview and discussion 16:00 – 16:30 Preparation for Team meeting 16:30 – 17:30 Team Meeting with main counterpart (NPP+ELI) 18:00 Departure to the hotel
Day 4, Friday **04 May**	**AM**	8:00 Departure from the hotel 8:30 – 12:30 Parallel sessions - Groups A - F – interview and discussion
	PM	13:30 – 14:00 Preparation for Team meeting 14:00 – 14:30 Team Meeting with main counterpart (NPP+ELI) 14:30 – 18:00 All the groups - Plant Walk-down (in 3 groups) 18:00 Departure to the hotel
Day 5, Saturday **05 May**	**AM**	Work day – Team meeting - discussion of interim review results Start draft Technical Notes,
	PM	Plant Organizes Social Activities
Day 6, Sunday **06 May**		Drafting of Technical Notes, bilateral discussions of team members, Team Meeting
Day 7, Monday **07 May**	**AM**	8:00 Departure from the hotel 8:30 – 12:30 Parallel sessions - Groups A - F – interview and discussion
		13:30 – 16:00 Parallel sessions - Groups A - F – interview and discussion 16:00 – 16:30 Preparation for Team meeting

		16:30 – 17:30 Team Meeting with main counterpart (NPP+ELI) 18:00 Departure to the hotel
Day 8, Tuesday **08 May**	**AM**	8:00 Departure from the hotel 8:30 – 12:30 Parallel sessions - Groups A - F – interview and discussion
	PM	13:30 – 16:00 Parallel sessions - Groups A - F – interview and discussion 16:00 – 16:30 Preparation for Team meeting 16:30 – 17:30 Team Meeting with main counterpart (NPP+ELI) - discussion of the overall findings 18:00 Departure to the hotel
Day 9, Wednesday **09 May**	**AM**	8:00 Departure from the hotel 8:30 – 12:30 Team Meeting - Discussion of the draft report within the team
	PM	13:30 – 16:30 Preparation of the mission report 16:30 – 17:30 Team Meeting with main counterpart (NPP+ELI) 18:00 Departure to the hotel
Day10, Thursday **10 May**	**AM**	8:00 Departure from the hotel 8:30 – 12:30 Preparation of the mission report, counterparts review the draft simultaneously
	PM	13:30 – 15:00 Discussion of the draft report with counterparts 15:00 – 16:30 Revision of the draft based on counterpart's comments 16:30 – 17:30 Agree the issues and recommendations/suggestions between the team and the counterparts 18:00 Departure to the hotel
Day 11, Friday **11 May**	**AM**	8:00 Departure from the hotel 8:30 – 10:30 Concluding session (all Counterparts/ IAEA team members) 10:30 – 11:30 Exit meeting - (including plant management, regulatory body and TSO) Opening by the host organization Overall conclusion of the review (Team Leader+DTL): 10 minutes Major findings (each reviewer): 6 * 5 (30) minutes Counterpart's remark (comparison against initial expectation - the representative counterpart): 10 minutes Speech by a plant management level: 5 minutes Speech by a regulatory body: 5 minutes Closing by the host organization Total about 60 minutes
	PM	13:00 Transportation to the airport

Reference timetable:
AM: 8:30-12:00
PM: 13:00-16:00
Preparation for team meeting including arrangement for the next day with counterpart: 16:00-16:30
Daily IAEA team meeting with representative counterpart (max. 2 persons): 16:30-17:30

"A Follow-up SALTO Peer Review Mission for Borssele Nuclear Power Plant in the Netherlands"

Mission Programme (4 – 7 February 2014)

Day 1, Monday	**PM**	Arrival of team members to Schiphol Airport in Amsterdam before 3 p.m. 15:00 Transportation from Schiphol Airport (meeting point) to the hotel organized by KFD 18:00 – 19:00 IAEA team briefing in the hotel, preparatory activities
Day 2, Tuesday	**AM**	07:30 Departure from the hotel 08:00 – 09:30 Entrance procedure in the plant 09:30 – 10:30 IAEA team training 10:30 – 11:30 Entrance meeting Opening of the mission – Host plant peer Plant manager - Plant expectations Regulatory authority speech Objective and schedule – Team Leader Introduction of participants – both sides LTO activities – Host plant peer 11:30 – 12:30 Presentation of implemented corrective measures, details planning of review activities - in groups
	PM	13:30 – 17:00 Parallel sessions – reviewers and counterparts 17:00 – 17:15 Preparation for Team meeting 17:15 – 18:00 Team Meeting with host plant peer 18:00 Departure to the hotel
Day 3, Wednesday	**AM**	07:30 Departure from the hotel 08:00 – 12:30 Parallel sessions – reviewers and counterparts 11:00 – 11:30 Information meeting of PM and TL
	PM	13:30 – 17:00 Parallel sessions – reviewers and counterparts 17:00 – 17:15 Preparation for Team meeting 17:15 – 18:00 Team Meeting with host plant peer 18:00 Departure to the hotel
Day 4, Thursday	**AM**	07:30 Departure from the hotel 08:00 – 12:30 Parallel sessions – reviewers and counterparts 11:00 – 11:30 Information meeting of PM and TL
	PM	13:30 – 14:30 Updating of issue sheets 14:30 – 15:30 Agree the updated issues with counterparts 15:30 – 18:00 Finalization of draft report 18:00 Departure to the hotel
Day 5, Friday	**AM**	07:30 Departure from the hotel 08:00 – 09:00 Preparation of exit meeting speeches 08:30 Deadline for any changes in draft report 09:00 – 09:30 Rehearsal of exit meeting speeches, "cleaning" of offices 09:30 – 10:15 Exit meeting - (including plant management) Opening by the host plant peer Description of Mission scope and detail findings - team leader – 5 minutes

		Detail findings (each reviewer): 3 * 5 (15) minutes Main finding and conclusions - team leader – 5 minutes Host plant peer's remark (comparison against initial expectation): 10 minutes Regulatory authority speech: 5 minutes Speech by a plant manager: 5 minutes Closing by the plant manager 10:30 Departure of team members to Schiphol Airport in Amsterdam
	PM	15:00 or later – Return flights

APPENDIX III - ISSUE SHEETS FROM SALTO PEER REVIEW MISSION IN 2009

ISSUE SHEET		
1. ISSUE IDENTIFICATION	Issue Number:	**A - 1**
NPP:	Borssele	
Unit:	1	
Reviewed Area:	Identification of SSCs and assessment methodology	
Issue Title:	Scoping and screening process	
2. ISSUE CLARIFICATION		
2.1 - ISSUE DESCRIPTION		
Current scoping and screening process does not give a clear picture how to evaluate all SSCs related to safety from LTO point of view. The intention was presented to perform ageing management review of active and short-lived passive components within the frame of PSR, which is not a generally applied practice.		
2.2 - REFERENCE TO IAEA SAFETY STANDARDS		
- IAEA Safety Report No. 57 – Safe LTO on NPPs (Section 2.1(d)); - IAEA NS-G-2-12 – Ageing management for NPPs (Section 6.2).		
3. COUNTERPART VIEWS AND MEASURES (self assessment by the Counterpart)		
We understand the need to have a conceptual document which describes the complete scope of SRS 57 and we have started the work on this. In the project we will incorporate the part 'prior to LTO assessment' with the important topic 'Verification of Preconditions'. In this Verification of Preconditions we are planning to incorporate the active (and short-lived passive) safety relevant SCs. If the ageing management of active (and short-lived passive) components should be part of the AMR for LTO, the current version of SRS 57 seems not the right reference for the SALTO Peer Review. SRS 57 is in principle based on the US LR process in which the AMR is performed for long-lived passive components. In SRS 57 the aspect of Maintenance Rule is according to our interpretation addressed by the Verification of the Preconditions.		

4. ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	13/11/2009

4.1 – COMMENTS:

C1) The plant is required by the regulatory authority to follow the IAEA guidance. Scoping process is done very thoroughly in accordance with AREVA document covering IAEA SR-57 procedure. However, the process of screening out the active and short-lived passive components should be clarified and justified as discussed in par. 2.1.1 of the report. Reference to US regulation 10 CFR 54 and NEI 95-10 screening out active components and short-lived passive components seems to be not relevant as maintenance rule (10 CFR 50.65) is not applied to the plant.

C2) Ageing of active and short-lived passive components is planned to be reviewed by PSR. However, the way to evaluate these SSCs has not been clarified yet.

C3) As a result of proposed procedure, only passive long-lived SCs stay in scope of AMR. Active and short-lived passive components do not enter to AMR.

C4) All reviewed documents were AREVA documents, two listed in 4.3 in final version, other covering AMR in very initial version. The plant should have written conceptual document describing scoping and screening process and AMR and revalidation of TLAAs as part of a preparation for LTO.

4.2 – RECOMMENDATIONS/SUGGESTIONS:

R1) Plant should develop a conceptual document describing the ageing management review for all the safety and safety related SCs. The document should cover all the safety and safety related components in accordance with the document "NEPS-G/2008/en/0056".

S1) Consideration should be given by the plant that in a case that the ageing of active and short-lived passive components will be reviewed by PSR, it is suggested be clearly stated in a conceptual document on the plant level that it will be done above the regular scope of PSR and describe the procedure.

4.3 – DOCUMENTS REVIEWED:

- "Definition of the scope…", NEPS-G/2008/en/0056;
- "Screening of relevant Structures and Components…", NTCM-G/2009/en/0144.

5. COUNTERPART ACTIONS	Date:	31/03/2012

R1) Based on this recommendation, EPZ did extend the scope of 'LTO Bewijsvoering' so that it comprises all the safety and safety related SSC. This means that also active and short-lived passive components are now part of the scope. All this is addressed in a conceptual document [Blom F.J., Conceptual Document LTO "Bewijsvoering" KCB, NRG-22701/10.103460, 2011] which is part of the AIP for the SALTO PR May 2012.

S1) See answer of R-1.

6. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	**11/05/2012**

6.1 – COMMENTS:

C1) The Conceptual Document LTO "Bewijsvoering" KCB was developed by NRG. The document describes the whole LTO project and the role of its individual activities/documents.

C2) Assessment of active components for LTO is addressed in the Conceptual Document and will be performed using a specially developed methodology. The activities in this direction were initiated but need to be completed.

C3) In several places a need to revise the conceptual document was identified. This is, however, addressed in the Issue C-2 of the SALTO PR May 2012.

6.2 – RECOMMENDATIONS/SUGGESTIONS:

6.3 – DOCUMENTS REVIEWED:

- Conceptual Document LTO "Bewijsvoering" KCB, NRG-22701/10.103460, 2011;
- Draft Methodology Assessment of Active Components with regard to Long Term Operation, without number.

STATUS OF THE ISSUE			**Date: 13/11/2009**	**Date: 11/05/2012**
1 – Resolution Degree:				
1.	**No action**	*The issue was not identified by the Counterpart, or having been identified, no action was taken to resolve it.*	n.a.	
		No progress in the resolution of the issue, or unsatisfactory resolution.	n.a.	
2.	**Action under way**	*The issue was identified by the Counterpart, but the actions did not comply with IAEA SSS.*	n.a.	
		The issue was identified by the Counterpart and work has started to resolve it.	n.a.	
3.	**Issue partially resolved**	*The issue was identified by the Counterpart and actions are underway but no results are available yet.*	n.a.	
		The implemented actions meet partially the intent of recommendations of previous IAEA review.	n.a.	
4.	**Issue resolved**	*The issue was identified by the Counterpart and the solution provided is fully satisfactory. Issue closed.*	n.a.	
		The intent of recommendations of previous IAEA review is fully met. Issue closed.	n.a.	X
2 – Urgency degree:				

I	*The issue should be addressed urgently, before continuing the PSHA and seismic PSA project.*	n.a.	
II	*The issue should be addressed before . . .*	n.a.	

n.a.: not applicable for the present mission.

ISSUE SHEET		
1. ISSUE IDENTIFICATION	Issue Number:	**A – 2**
NPP:	Borssele	
Unit:	1	
Reviewed Area:	Identification of SSCs and assessment methodology	
Issue Title:	Overview of activities for LTO	
2. ISSUE CLARIFICATION		
2.1 – ISSUE DESCRIPTION		
Feasibility study for LTO has been carried out in 2005. LTO assessment started in 2007, however, verification of preconditions is planned to be done as a part of PSR that is to be performed from 2010 to 2013.		
2.2 – REFERENCE TO IAEA SAFETY STANDARDS		
- IAEA Safety Report No. 57 – Safe LTO on NPPs – figure 1, page 4.		
3. COUNTERPART VIEWS AND MEASURES (self assessment by the Counterpart)		
We agree on the suggestion, see our comment on A-1.		
4. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:**	**13/11/2009**
4.1 – COMMENTS: **C1)** In accordance with Figure 1 in the IAEA SR-57, verification of preconditions for LTO should be done prior to LTO assessment. LTO assessment should be done following the verification of preconditions. **C2)** Verification of preconditions under the PSR could be possible, but the PSR's original purpose is different.		

4.2 – RECOMMENDATIONS/SUGGESTIONS:

S1) Consideration should be given by the plant to start with the verification of preconditions as soon as possible because it is an important step for an effective ageing management review. In case that the intention is to use the PSR activities for the verification of preconditions for LTO, such plans are suggested to be described in a conceptual document.

4.3 – DOCUMENTS REVIEWED:

- "Definition of the scope…", NEPS-G/2008/en/0056;
- "Screening of relevant Structures and Components", NTCM-G/2009/en/0144.

5. COUNTERPART ACTIONS	Date:	**31/03/2012**

S1) Based on this suggestion, verification of preconditions has been incorporated in the scope of 'LTO Bewijsvoering'. That means that the Phase Prior to LTO assessment has been incorporated. This is reported in the conceptual document [Blom F.J., Conceptual Document LTO "Bewijsvoering" KCB, NRG-22701/10.103460, 2011].

6. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	**11/05/2012**

6.1 – COMMENTS:

C1) The verification of preconditions is described in the Conceptual Document LTO "Bewijsvoering" KCB, NRG-22701/10.103460, 2011. For each plant programme, the evaluation of its compliance with the 9 elements of IAEA SRS No.57 was performed and is described in plant reports.

6.2 – RECOMMENDATIONS/SUGGESTIONS

6.3 – DOCUMENTS REVIEWED:

- Conceptual Document LTO "Bewijsvoering" KCB, NRG-22701/10.103460, 2011;
- IAEA Safety Report 57-Verification of preconditions-Maintenance. KTE/AdJ/RBn/R106151, 2011;
- IAEA Safety Report 57-Verification of preconditions-Surveillance and Monitoring. KTE/AdJ/Rnh/R106188, 2011;
- IAEA Safety Report 57-Verification of preconditions-Water chemistry. KTE/AdJ/RBn/R106155, 2011;
- IAEA Safety Report 57-Verification of preconditions-ISI. KTE/AdJ/RBn/R106153, 2011;
- IAEA Safety Report 57-Verification of preconditions-Equipment Qualification. KTE/AdJ/Rnh/R106190, 2011.

STATUS OF THE ISSUE	**Date:** **13/11/2009**	**Date:** **11/05/2012**

1 – Resolution Degree:

1.	**No action**	*The issue was not identified by the Counterpart, or having been identified, no action was taken toresolve it.*	n.a.	
		No progress in the resolution of the issue, or unsatisfactory resolution.	n.a.	
2.	**Action under way**	*The issue was identified by the Counterpart, but the actions did not comply with IAEA SSS.*	n.a.	
		The issue was identified by the Counterpart and work has started to resolve it.	n.a.	
3.	**Issue partially resolved**	*The issue was identified by the Counterpart and actions are underway but no results are available yet.*	n.a.	
		The implemented actions meet partially the intent of recommendations of previous IAEA review.	n.a.	
4.	**Issue resolved**	*The issue was identified by the Counterpart and the solution provided is fully satisfactory. Issue closed.*	n.a.	
		The intent of recommendations of previous IAEA review is fully met. Issue closed.	n.a.	X
2 – Urgency degree:				
I	*The issue should be addressed urgently, before continuing the PSHA and seismic PSA project.*		n.a.	
II	*The issue should be addressed before . . .*		n.a.	

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	**Issue Number: A – 3**
NPP: Borssele	**Unit:** 1
Reviewed Area: Identification of SSCs and assessment methodology	
Issue Title: Identification of SSCs for LTO – data collection and record keeping	
2. ISSUE CLARIFICATION	
2.1 – FUNDAMENTAL OVERALL PROBLEM: Consolidation of data stored in different databases to avoid the incompleteness and inconsistency of data was recognized.	
2.2 – IAEA BASIS: - IAEA NS-G-2-12 – Ageing management for NPPs – article 4.10 to 4.13.	

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 13/11/2009

3.1 – FACTS:

F1) There are many standalone databases, such as AM database (operational feedback and external event feedback related to ageing issues) called VOB-DB, RCM database, AUREST database (EQ), maintenance database. It is also not clear whether they cover all safety equipment in scope for LTO or not.

F2) Some data in different databases are redundant as an example in component database BRS (AS-400), EQ-database and AUREST database (MS Access).

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

S1) Consideration should be given by the plant to store all necessary information for LTO assessment in a database. The data should be stored in one place and be accessible for all associated parties.

3.4 – DOCUMENTS REVIEWED:

- ENT 2034.1 (passive long-lived SCs);
- ENT 2034.2 (I&C exchange of printed boards);
- ENT 2034.3 (exchange of other M, E and C components);
- Current maintenance programme;
- AUREST database for equipment qualification programme.

4. COUNTERPART ACTIONS	**Date:** 31/03/2012

S1) To store all the necessary information for the LTO assessment plant has decided to implement a specific software tool from AREVA NP: COMSY. A contract has been signed with AREVA NP to help the plant on implementing all LTO SSC data in the COMSY database. The plant wants to use this database as an important tool for ageing management.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date**: 11/05/2012

5.1 – FACTS:

F1) Surveillance tests results are recorded on paper and later, by another person, are manually transmitted to computer DB, which may cause to errors or lose of information.

F2) Paper reports of surveillance tests have several corrections, missing signatures, not all chapters are filled in, which may impact quality of data transmission to the computer database.

F3) Paper reports are collected on weekly basis in 60 mm. folders. The folders do not have list of content, to facilitate search of necessary programme and to review whether all the programmes are in place.

F4) Work orders database (ISO) developed in 1996, very old, which may impact its integration with more modern DBs.

F5) ISO and ISH data bases are isolated, to check all data related to a specific surveillance test it is necessary to perform manual entry in one DB and then into another.

F6) In the interview Plant personnel explained, that Plant is planning purchasing a new computer database allowing integration of Plant databases according to recommendations of 2009 SALTO mission.

5.2 – DOCUMENTS REVIEWED:

- Weekly surveillance tests folder (week 29, 2011);
- Overview of Plant surveillance programme;
- NVR NS-G-2.6; surveillance: In-service inspection, Testing, monitoring and calibration;
- Plant databases ISO and ISH.

5.3 – RESOLUTION DEGREE:

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

6. COUNTERPART ACTIONS	**Date:** 20/12/2013

S1) All the necessary data for the LTO assessment is now stored in the COMSY database. This data is retrievable for use in the ageing management procedure, as described in PU-N12-50.

With regard to facts F1 to F3, it should be said that COMSY is not intended to be used as a tool for the Surveillance programme. The plant is working on a project to record surveillance test results as obtained during the operator rounds straight into a handheld computer.

With regard to facts F4 to F6, the old work order system (ISO) was replaced by the new “Asset Suite” asset management database system. Integration between the work order system and ISH (“Instandhouding”) is thus enabled. This data is also used by the COMSY ageing management tool. The ISH database is currently updated with the latest data from Asset Suite on a 24-hour basis. This is considered to be sufficient. Nevertheless, further developments are currently underway to make this integration in-time with a so-called “distribution database”. COMSY will be connected with this same “distribution database” to ensure its synchronization with the centralized Asset Suite database.

On the short term the following implementation stages for COMSY are planned:

- Stage-1: working with prototype / example data until December 2013;
- Stage-2: working with the database filled and supplied by AREVA starting December 2013; (this data concerns plant component data (scope AKS-codes), SSC documents,

catalogue data and ISI related data);
- Stage-3: starting 2014, working with:
    - Connections to related systems for transfer of related data (equipment, work orders, documents); i.e., Asset Suite (the successor of ISO) and the plant Document Management System;
    - Connections to / import of concrete measuring data related to AKS codes from the ISI systems (Wall thickness measurements, etc).

Data which is maintained in other applications can be interfaced by controlled connections to avoid data redundancy and to establish ownership of the data and accompanying applications/ services (Ventyx - Asset Suite work management & equipment/component module, ISI (In Service Inspections), ISH (Instandhoudingenbestand), Lotus-Notes – Document Management System).

7. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

7.1 – FACTS:

F1) Some of the old databases existing in 2009 are currently integrated in Ventyx' Asset Suite: Component Database (BRS–AS400), Maintenance Database (ISO), ISI Database and ISH Database.

F2) AM Database (VOB) and Aurest Database is not integrated in Asset Suite to date, and is planned that these two databases will possibly be integrated in COMSY in future.

F3) Lotus Notes is the configuration document control database for the plant and is planned to keep as it is. Asset Suite and COMSY (in the future) contain the appropriate links to access the plant documentation.

F4) AM Database (VOB) as a part of the operational feedback procedure (PU-N12-19) is not connected to date with some other source of information. COMSY provide the feature to manage external/internal feedback experience but the plant has not decided if this will be used in the future.

F5) COMSY contains to date all the LTO scope components information and plant documentation, which has been implemented manually. In the future, COMSY could access directly to Asset Suite (for components information) and Lotus Notes (plant documentation). It is planned that this connection between them will be finished in 2015.

F6) Areva is working in Aurest Database to be integrated in COMSY with its associated database (OBA environmental accident conditions). It is scheduled for 2015.

F7) AMR component database contains the entire passive electrical and I&C components in the scope of LTO. All this information is available in COMSY but it has not been possible to verify it.

F8) The old database for surveillance, called Test Results DB, has been replaced by a new one called eSOMS Database (also from Ventyx). For the surveillance tests, it is necessary to use a handheld computer that provides guidance for acceptance criteria, automatically does the calculations and requires the necessary approval signatures. This handheld computer

automatically records the data into the eSOMS database avoiding human errors.

F9) The plant has scheduled the following phases for the implementation of COMSY:

- Connect Asset Suite and Lotus Notes DMS module to COMSY. (Q4 2014 – 2015);
- Optionally include in COMSY Aurest Database, FAMOS and RTD "metingen" (from 2015);
- Include AM (VOB Database) in COMSY is not decided to date.

When the actions proposed will be finished, the plant will have Asset Suite, COMSY (several modules integrated) and AM (VOB Database) as databases important for LTO. Some isolated databases could exist in the plant as eSOMS but those are not directly related with the LTO.

7.2 – DOCUMENTS REVIEWED:

- Asset Suite software demonstration;
- COMSY software demonstration;
- OBA database;
- AMR Components Database.

7.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

ISSUE SHEET			
1. ISSUE IDENTIFICATION		Issue Number:	**B – 1**
NPP:	Borssele		
Unit:	1		
Reviewed Area:	Environmental qualification for electrical and I&C components		
Issue Title:	**Replacement of electrical equipment with a short qualified life**		
2. ISSUE CLARIFICATION			
2.1 – ISSUE DESCRIPTION			

Shorter-than-the-original qualified lifetime of equipment in a hot spot area.

Some equipment or parts susceptible to ageing have a qualified lifetime much shorter than 40 years.

2.2 – REFERENCE TO IAEA SAFETY STANDARDS

- IAEA-SR-3, Section 2.4.

3. COUNTERPART VIEWS AND MEASURES (self assessment by the Counterpart)

To our opinion recommendation 1 is the project we are doing at the moment within LTO Bewijsvoering. In this project the aim is to revalidate the qualified life for all components with a harsh environment requirement. The mentioned hot spots, actually area's with a relatively high environmental temperature, are found as a result of the environmental monitoring programme for the components with a harsh environment requirement.

Recommendation 2 is outside the scope of the current LTO-project, but we will discuss this issue with the maintenance department and if necessary measures will be taken.

4. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:**	**13/11/2009**

4.1 – COMMENTS:

C1) Results of presentation of analysis done by AREVA show the presence/existence of hot spots. If a temperature is higher than in the qualified life calculation, the life time is reduced.

C2) Ageing susceptible equipment, such as capacitors and energised coils from magnetic valves, relay and contactor, have a qualified life much shorter than 40 years. Maintenance programme does not address timely replacement of such type of equipment.. It might be possible that some class 1E components in harsh environment could be in service for longer period than their qualified life.

4.2 – RECOMMENDATIONS/SUGGESTIONS:

R1) For class 1E components in harsh environment (Stoerfall matrix) and hot spot, it is recommended to revalidate their qualified life.

R2) For class 1E components with short qualified life, it is recommended to screen their service life against their qualified life. When the qualified life is shorter than service life, a replacement programme should be considered.

4.3 – DOCUMENTS REVIEWED:

- Maintenance procedure magnetic valves, MOV and I&C

5. COUNTERPART ACTIONS	Date:	**31/03/2012**

R1) The revalidation of class 1E components in harsh environment is addressed in the EQBDA subproject in 'LTO Bewijsvoering'. More information can be found in paragraph 3.4.4 of the conceptual document [Blom F.J., Conceptual Document LTO "Bewijsvoering" KCB, NRG-22701/10.103460, 2011] and in a specific report on this topic which has been send to the regulator [Lievense S.A., Methodology and approach of the "Long Term Operation Bewijsvoering subproject: Qualification of Design Base Accident resistant electrical Equipment", EPZ report KTE/AdJ/SAL/R106299].

R2) For class 1E components the ageing management actions are improved. Where possible and relevant, qualified life is taken into account.

6. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	**11/05/2012**

6.1 – COMMENTS:

C1) The issue have been addressed in the LTO-EQDBA project. A revalidation is performed with help of the AUREST tool developed by AREVA.

The AUREST DataBase contains the results of the analyses. The analysis has been projected to the end of the intended period of LTO (2034) as indicated in KTE/AdJ/SAL/R106299.

The Report PTLQ-G/2011/en/0018 describes the components that has a residual lifetime < 5 years and have to be managed during this period. New calculations will be performed yearly to identify components to be handled during the next 5 years.

The computational model used in the AUREST DataBase and described in report NGLE/2004/de/0032, NLTQ-G/2009/de/0068 and NTLQ-G/2009/de/0065 fulfil the requirements.

C2) It has not been possible to in a systematic way check the completeness of this recommendation since the check of preventive maintenance programmes of active components is not completed. Examples of components that have been screened and preventive actions initiated exists, e.g. exchange of capacitors on circuit boards (both in the plant and in the warehouse) and exchange of medium voltage cables. The check of preventive maintenance programmes on active components is to be finalised and identified replacement programmes implemented.

6.2 – RECOMMENDATIONS/SUGGESTIONS

6.3 – DOCUMENTS REVIEWED:

- KTE/AdJ/SAL/R106299;
- PTLQ-G/2011/en/0018;
- NGLE/2004/de/0032;
- NLTQ-G/2009/de/0068;
- NTLQ-G/2009/de/0065;
- RPT-99-001;
- AUREST database.

STATUS OF THE ISSUE			Date: 13/11/2009	Date: 11/05/2012
1 – Resolution Degree:				
1.	**No action**	*The issue was not identified by the Counterpart, or having been identified, no action was taken toresolve it.*	n.a.	
		No progress in the resolution of the issue, or unsatisfactory resolution.	n.a.	
2.	**Action under way**	*The issue was identified by the Counterpart, but the actions did not comply with IAEA SSS.*	n.a.	
		The issue was identified by the Counterpart and work has started to resolve it.	n.a.	
3.	**Issue partially resolved**	*The issue was identified by the Counterpart and actions are underway but no results are available yet.*	n.a.	
		The implemented actions meet partially the intent of recommendations of previous IAEA review.	n.a.	X
4.	**Issue resolved**	*The issue was identified by the Counterpart and the solution provided is fully satisfactory. Issue closed.*	n.a.	
		The intent of recommendations of previous IAEA review is fully met. Issue closed.	n.a.	
2 – Urgency degree:				
I	*The issue should be addressed urgently, before continuing the PSHA and seismic PSA project.*		n.a.	
II	*The issue should be addressed before . . .*		n.a.	

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	Issue Number: C – 1
NPP: Borssele	**Unit:** 1
Reviewed Area: Assessment and management of SCs for ageing degradation for LTO	
Issue Title: Evaluation of effectiveness of AMPs and justification to use AMPs shown in the US GALL report	
2. ISSUE CLARIFICATION	
2.1 – FUNDAMENTAL OVERALL PROBLEM:	

Policy and methodology to demonstrate effectiveness of AMPs, which include the current programmes to manage ageing effects and those newly introduced from other national/international practices such as US-GALL report, have not been established by the plant.

2.2 – IAEA BASIS:

- NS-G-2.12; 4.32, 6.2 and Tab.2;
- Safety Report Series No. 57, 5.3.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 13/11/2009

3.1 – FACTS:

F1) The AMR activity is in an initial phase and content of the AMR reports have not been completed.

F2) The proposed table of contents of the AMR report for Mechanical Category A SCs does not show the details on "Identification of relevant Ageing Mechanisms" and "Evaluation of long term operation – Ageing Mitigation".

F3) The current draft AMR report for commodity groups, which have not been reviewed by the plant staff, does not show effectiveness of AMPs. It was explained that the AMP shown in the report were simply copied from the US-GALL report so far. If the plant uses AMPs shown in the US-GALL report, evaluation of their effectiveness is required.

F4) In some countries, it is requested by the regulatory body that the AMR reports explain effectiveness of the current programmes to manage ageing effects. Otherwise an additional programme is required.

F5) It can be useful for this issue if reports on effective prevention/mitigation measures against relevant ageing mechanisms are prepared.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

S1) Consideration should be given by the plant to clarify and document how to perform AMR and demonstrate effectiveness of AMPs, which include current programmes to manage ageing effects and newly introduced programmes, based on the AMP attributes shown in the IAEA Safety Guide on Ageing Management.

3.4 – DOCUMENTS REVIEWED:

- Presentation provided by AREVA;
- Draft report on AMR for commodity groups presented by AREVA.

4. COUNTERPART ACTIONS	**Date:** 31/03/2012

S1) For the clarification of the performance of the AMR, and the way in which the plant ageing management activities are assessed, the Methodology Report has been written [Leilich J.,

Ageing Management Review – Methodology Report, PESS-G/2010/en/0041, 2011]. This report explains the whole framework and the methodology of the AMR including for instance the use of catalogues of relevant ageing mechanisms for the assessment of the plant ageing management activities. Documents with descriptions of current plant programmes and activities for specific activities to manage ageing effects, based on the AMP attributes in IAEA NS-G-2.12, were prepared and used in the AMR.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date**: 11/05/2012

5.1 – FACTS:

F1) The Plant personnel stated that AMR reports prepared by AREVA identify relevant ageing mechanisms by making use of a catalogue of ageing mechanisms and assess the applicability to the plant. They then identify existing ageing management activities and consequently assess the effectiveness of these activities. A conclusion for each relevant ageing mechanism is drawn, concluding if the ageing mechanism is adequately managed or if additional measures need to be taken for the activities to be effective during LTO. The plant does not take credit on AMPs of the US-GALL report for the management of ageing mechanisms, but implements appropriate measures using existing programmes and procedures. Ageing related issues are identified using internal and external experience, and then evaluated by the Ageing Management Team (AMT) who propose relevant ageing management activities to be implemented in the existing plant programmes including ISI, operational, chemistry and repair and replacement activities (procedure PU-N12-19). But review did not find evidence that the plant included the results of this effort in plant documents, describing what indicators were used to assess effectiveness of the AMPs for specific SSCs and evidence that assessment of effectiveness of the AMPs is incorporated in permanent Plant activities.

F2) All the reviewed reports: (AMR Methodology report PESS-C/2010/en/0041 and the others listed in p. 6.3) were prepared by AREVA, the documents are not converted into the plant documentation; no traces that they are subject of Plant documentation control system are present in the documents.

F3) Summary Ageing Management Review report (Ref. NRG-22503/11.109273) is only under preparation by a subcontracting Company NRG now.

F4) Reviewed, the latest revision of the Summary Ageing Management Review report, contains chapters 3, 4 and 5 describing results of AMR for Mechanical, I&C components and Civil Structures, and Chapter 6 related to implementation of AMR recommendation, but at a summary level only. Consequently, this document cannot serve for assessment of effectiveness of specific AMPs.

5.2 – DOCUMENTS REVIEWED:

- Presentation provided by AREVA;
- AMR Methodology report PESS-G/2010/en/0041;
- Ageing Management Review to support Long Term Operation for KCB Steam Generators, PESS-G/2010/en/0044;
- Ageing Management Review to support Long Term Operation for KCB Main Coolant Pumps, PESS-G/2010/en/0045;

- Catalogue of Ageing Mechanisms for Mechanical Components (CAM-MC), PESS-G/2010/en/0043;
- Summary report Ageing Management Review, NRG (Draft B1, dated 04.04.2012).

5.3 – RESOLUTION DEGREE:

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

6. COUNTERPART ACTIONS **Date:** 20/12/2013

S1) The Ageing Management Review as part of the LTO-B project was a once-off AMR where the scope, performance and effectiveness of ageing management activities as a part of the plant's existing programmes (e.g. preventive maintenance, ISI, surveillance, etc.) was evaluated by the plant's OEM, AREVA-NP. The results of this comprehensive AMR were appraised by the regulator in the process of the LTO-license change application. The resulting documentation was archived.

Fact F1 explains that no evidence could be found that assessment of effectiveness of the AMPs is incorporated in permanent plant activities. This is the problem that the plant experienced in performing the AMR in preparation of LTO. It took a lot of effort to demonstrate adequate handling of the issues that were identified in the AMR as relevant and to demonstrate that relevant (mitigating) activities are indeed effectively incorporated in the maintenance, inspection, testing and other programmes. Therefore, based on the AMR results as a part of the LTO-B project, the plant developed the ageing management procedure PU-N12-50. This procedure incorporates the Plan-Do-Check-Act circle as presented in IAEA (NVR) NS-G-2.12, the safety guide for ageing management for NPPs.

Documents that are produced as a part of this ageing management procedure include ageing management strategy documents for the major components, based on the AMR results of the LTO-B project, and Ageing Management Plans (AMPs), using the AMP attributes shown in the IAEA Safety Guide NS-G-2.12 on Ageing Management. The AMPs provide the link between the ageing management activities and the plant work management system. Together, the ageing management documents provide a comprehensive role in coordinating ageing management activities at the plant and improving traceability.

All relevant documents are in Dutch and under full plant document configuration control.

7. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM **Date:** 07/02/2014

7.1 – FACTS:

F1) The plant developed, in addition to documents presented in 2012, the following documents (controlled):

- AM Handbook that provide the overall concept;

- AM Procedure.

F2) The development of the following documents is underway (some are already completed):

- AM Strategy documents (components or commodities based);
- AMPs (that are structured along the 9 attributes).

F3) The documents mentioned above are/will be plant's controlled documents.

F4) The NS-G-2.12 has been adopted in full by the Regulatory Body (NVR NS-G-2.12) and is referenced in the AM Handbook.

F5) Summary Report Ageing Management Review, NRG-22503/11.109273, was published in 2012.

F6) Active components are dealt with through surveillance and maintenance. During the LTO assessment opportunities for improvement were identified and are being implemented. Further details regarding the treatment of active components are also provided in the facts for issue C1 (2012).

7.2 – DOCUMENTS REVIEWED:

- HB-N12-2, Handboek verouderingsbeheersing, version 1, 7/1/2014;
- PU-N12-50, Verouderingsbeheer, version 1, 5/6/2013;
- NVR NS-G-2.12, Verouderingsbeheer voor kernenergiecentrales, januari 2011 (amended version of NS-G-2.12);
- NRG-22503/11.109273. Summary Report Ageing Management Review.

7.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

ISSUE SHEET		
1. ISSUE IDENTIFICATION	Issue Number:	**C - 2**
NPP:	Borssele	
Unit:	1	
Reviewed Area:	Assessment and management of SCs for ageing degradation for LTO	
Issue Title:	Significance of possible ageing degradations for the RPV support	
2. ISSUE CLARIFICATION		

2.1 - ISSUE DESCRIPTION

Due to limited accessibility of RPV support, it is required to determine significance of possible ageing degradation.

2.2 - REFERENCE TO IAEA SAFETY STANDARDS

- NS-G-2.12; 4.32, 6.2 and Tab.2;
- Safety Report Series No. 57, 5.3.

3. COUNTERPART VIEWS AND MEASURES (self assessment by the Counterpart)

The assessment of ageing degradation of the RPV support will be performed in the AMR. Taking into account this suggestion, we will thoroughly consider all possible ageing degradation of the RPV support.

4. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:**	**13/11/2009**

4.1 – COMMENTS:

C1) In some countries, neutron embrittlement, damage due to gamma radiation and wearing of the pad are identified as possible mechanisms for the RPV support and their significance is quantitatively evaluated in the AMR report.

C2) Since a direct inspection or maintenance is difficult for the RPV support, thorough consideration about significance of possible ageing degradations is requested before excluding them from detailed evaluation

4.2 – RECOMMENDATIONS AND/OR SUGGESTIONS:

S1) Consideration should be given by the plant to thoroughly determine significance of possible ageing degradation for the RPV support. Justification of the determination should be described in the AMR report. This suggestion should be applied to SCs which can not be directly inspected.

4.3 – DOCUMENTS REVIEWED:

- TOR;
- AIP;
- Discussion with the counterparts and engineers from AREVA.

5. COUNTERPART ACTIONS	Date:	**31/03/2012**

S1) The RPV supports are dealt in the AMR. The parts welded to the RPV are dealt in the Mechanical A RPV AMR report. The other parts of the support are dealt in the AMR report for Primary Supports. Considerations for the inaccessibility of the RPV supports were included.

6. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	**11/05/2012**

6.1 – COMMENTS:

C1) The inspection of the RPV support is eliminated due to a one time inspection in 1993. There is not sufficient technical basis provided for the elimination of a one-time inspection for LTO.(page 89, 7.2.2 of reference below.) This item was discussed with the plant staff. The basis for elimination of the inspection for the two identified mechanisms should be re-evaluated in light of current inspection methodologies and given that twenty years have passed since the last inspection.

6.2 – RECOMMENDATIONS/SUGGESTIONS:

R1) Note resolution of this item is carried over to this SALTO review in issue D-1.

6.3 – DOCUMENTS REVIEWED:

- PEER-G/2011/en/0071, Ageing Management Review to Support Long-Term Operation for KCB Primary Component Supports, Rev A, 22.12.2011.

STATUS OF THE ISSUE			**Date: 13/11/2009**	**Date: 11/05/2012**
1 – Resolution Degree:				
1.	**No action**	*The issue was not identified by the Counterpart, or having been identified, no action was taken toresolve it.*	n.a.	
		No progress in the resolution of the issue, or unsatisfactory resolution.	n.a.	X
2.	**Action under way**	*The issue was identified by the Counterpart, but the actions did not comply with IAEA SSS.*	n.a.	
		The issue was identified by the Counterpart and work has started to resolve it.	n.a.	
3.	**Issue partially resolved**	*The issue was identified by the Counterpart and actions are underway but no results are available yet.*	n.a.	
		The implemented actions meet partially the intent of recommendations of previous IAEA review.	n.a.	
4.	**Issue resolved**	*The issue was identified by the Counterpart and the solution provided is fully satisfactory. Issue closed.*	n.a.	
		The intent of recommendations of previous IAEA review is fully met. Issue closed.	n.a.	

2 – Urgency degree:			
I	*The issue should be addressed urgently, before continuing the PSHA and seismic PSA project.*	n.a.	
II	*The issue should be addressed before . . .*	n.a.	

n.a.: not applicable for the present mission.

ISSUE SHEET		
1. ISSUE IDENTIFICATION	Issue Number:	**C - 3**
NPP:	Borssele	
Unit:	-	
Reviewed Area:	Assessment and management of SCs for ageing degradation for LTO	
Issue Title:	Identification of SCs on the boundary for the scope of the LTO assessment	

2. ISSUE CLARIFICATION

2.1 - ISSUE DESCRIPTION

Currently there is no project document which describes procedure on how to identify SSCs and their LTO boundary drawing (P&ID).

2.2 - REFERENCE TO IAEA SAFETY STANDARDS

- NS-G-2.12; 4.15
- Safety Report Series No. 57, 4.1

3. COUNTERPART VIEWS AND MEASURES (self assessment by the Counterpart)

A project document will be written which incorporates the procedure on how to identify SSCs and their LTO boundary.

4. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:**	**13/11/2009**

4.1 – COMMENTS:

C1) The plant has not yet prepared its own document on setting scope and screening of SCs subjected to the LTO assessment.

C2) A clear instruction for inclusion of parts of valves on the boundary of the LTO scope has not been established.

- Although valves on the scope boundary are included in the scope, it has not been clarified if the valve disk and seat are within the scope or not, in the case the valve is required a sealing function.
- Since this depends on how to define the function of these parts, i.e. passive or active, and differs from country to country, the plant should simply establish a instruction and share it with the plant and manufacturer staff members.

4.2 – RECOMMENDATIONS AND/OR SUGGESTIOS:

R1) The plant should prepare a project document, which describes procedure on how to identify SSCs and their LTO boundary drawing (P&ID).

4.3 – DOCUMENTS REVIEWED:

- No documents (only discussion with the counterparts and engineers from AREVA).

5. COUNTERPART ACTIONS	Date:	**31/03/2012**

R1) For 'LTO Bewijsvoering', a scoping and a screening report have been written. These documents have been revised in 2011. A very important revision was the incorporation of active components. Also a detailed screening report was written for mechanical components to address screening on component level including screening criteria. The final version of this report is now under internal review. A color scheme is used on the P&IDs to clearly identify the in-scope SSCs. In the AMR methodology report [Leilich J., Ageing Management Review – Methodology Report, PESS-G/2010/en/0041, 2011] the color scheme used to mark the scope on the P&IDs is explained. The colored P&IDs were used to identify the boundaries of the AMR scope. It is described in the methodology and the screening reports that only the valve bodies are regarded to form part of the AMR evaluation of passive SCs. Valve disks and seats are always regarded as the active subcomponents of valves, even if the valves have a passive function. The assessment of active components is addressed in a separate part of the project (see A-1 R1).

6. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	**11/05/2012**

6.1 – COMMENTS:

C1) It is clearly described in the AMR methodology report how the SSCs and their boundaries are identified. AMR reports for particular components contain P&IDs, which precisely define the scope of the SSCs and their boundaries – e.g. PESS-G/2010/en/0049. The colour scheme key is provided in the AMR methodology report.

C2) SSCs and applicable safety class boundaries identification in P&IDs exist only in LTO project documentation developed by AREVA NP.

6.2 – RECOMMENDATIONS/SUGGESTIONS:

S1) SSCs and applicable safety class boundaries identification should be incorporated into the plant's documentation and maintained as living document (updated as required). This is addressed in issue B-2 of the 2012 SALTO PR.

6.3 – DOCUMENTS REVIEWED:

- Leilich J., Ageing Management Review – Methodology Report, PESS-G/2010/en/0041, 2011;
- AMR reports for particular components – e.g. PESS-G/2010/en/0049.

STATUS OF THE ISSUE			Date: 13/11/2009	Date: 11/05/2012
1 – Resolution Degree:				
1.	**No action**	*The issue was not identified by the Counterpart, or having been identified, no action was taken toresolve it.*	n.a.	
		No progress in the resolution of the issue, or unsatisfactory resolution.	n.a.	
2.	**Action under way**	*The issue was identified by the Counterpart, but the actions did not comply with IAEA SSS.*	n.a.	
		The issue was identified by the Counterpart and work has started to resolve it.	n.a.	
3.	**Issue partially resolved**	*The issue was identified by the Counterpart and actions are underway but no results are available yet.*	n.a.	
		The implemented actions meet partially the intent of recommendations of previous IAEA review.	n.a.	
4.	**Issue resolved**	*The issue was identified by the Counterpart and the solution provided is fully satisfactory. Issue closed.*	n.a.	
		The intent of recommendations of previous IAEA review is fully met. Issue closed.	n.a.	X
2 – Urgency degree:				
I	*The issue should be addressed urgently, before continuing the PSHA and seismic PSA project.*		n.a.	
II	*The issue should be addressed before . . .*		n.a.	

n.a.: not applicable for the present mission.

ISSUE SHEET		
1. ISSUE IDENTIFICATION	Issue Number:	**D - 1**
NPP:	Borssele	
Unit:	1	
Reviewed Area:	Revalidation of safety analyses that used time limited ageing assumptions	
Issue Title:	Mixing different pressure vessel & piping codes and standards in the stress analysis.	

2. ISSUE CLARIFICATION

2.1 - ISSUE DESCRIPTION

The plant piping Design Code of Record is based on the German pressure vessel & piping (PV&P) codes and standards KTA. During the review of the fatigue analysis, it was discovered that the utility is also using ASME Code Section III in the same calculation without any Code Reconciliations.

2.2 - REFERENCE TO IAEA SAFETY STANDARDS

- IAEA SALTO Guideline Services Series 17, December 17
- IAEA Safety Report Series No. 57 (2008), Section 6.1.3, 6.1.4

3. COUNTERPART VIEWS AND MEASURES (self assessment by the Counterpart)

We understand that mixing of codes can lead to non-conservative results. In the mentioned case in C1 however, different codes are used but this was both from technical point of view as from regulatory point of view valid and documented.

For the revalidation of the fatigue analyses we will use an assessment methodology including the use of codes. This methodology will be reviewed by the regulator. Complete code reconciliation might not be possible and is to our opinion also not necessary.

We will consider to provide trainings on PV&P Codes and Standards for Engineering staff. .

4. ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	**13/11/2009**

4.1 – COMMENTS:

C1) In the calculation performed by Stork Engineers & Contractors (61908-RP-001: 3-D Stress analysis of the 30RL feedwater nozzle of steam generator 30YB, W. de Koning, 15-10-1997), on page 28 of 31, the ASME Code allowable for Criterion DC.3 (Pl+Pb load cases) was exceeded. The stress analyst utilized the Dutch Code for non-nuclear vessel Code to re-qualify the nozzle.

C2) To maintain nuclear pressure vessel and piping systems, components and structures design fidelity and pressure boundary integrity, mixing of pressure vessel Codes may lead into non-conservative results. The design, material specification, inspections, fabrications, and installation requirements for each code and standard are different from each others.

4.2 – RECOMMENDATIONS/SUGGESTIONS:

S1) Consideration should be given to code reconciliation between the original design and the codes which will be used for revalidation of fatigue analyses, or other calculations to be performed in order to revalidate TLAAs.

S2) Consideration should be given to provide trainings on the use of applicable nuclear PV&P Codes and Standards for Engineering staff involved with the plant design, modifications, and analysis related activities.

4.3 – DOCUMENTS REVIEWED:

- 61908-RP-001: 3-D Stress analysis of the 30RL feedwater nozzle of steam generator 30YB, W. de Koning, 15-10-1997;
- S611/92/027 KWU: Bewertung der Hauptkühlmittelleitung einschließlich;
- Volumenausgleichsleitung im Hinblick auf Bruchausschluß, Zusammenfassende Bewertung, 30.10.92, revisie a;
- S514/92/e016 KWU: Siemens-Work-Report, Topical Report on Break Preclusion Concept including the Leak-Before-Break-Approach for New Plants, 09.03.92;
- NDM2/94/075 KWU: Bewertung von HKL und VAL im Hinblick auf Bruchausschluß, Ergänzende Nachweise und zusammenfassende Bewertung, 24.05.94;
- E121/91/097 KWU: Bruchmechanische Bewertung der Hauptkühlmittel- und Volumenausgleichsleitung hinsichtlich Leck-vor-Bruch, 26.10.92, revision a;
- KWU NT13/94/128 a: Leck-vor-Bruch-Bewertung der Volumenausgleichsleitung
- (einschlieslich Schichtung), 10.11.1994;
- Stork Engineers & Contractors 61908-RP-001: 3-D Stress analysis of the 30RL feedwater nozzle of steamgenerator 30YB, W. de Koning, 15-10-1997;
- NT13/96/022 KWU: KCB. Leck-vor-Bruch Nachweis der auszutauscheden RA und RLLeitung, 29 april 1997, revisie a.

5. COUNTERPART ACTIONS	Date:	**31/03/2012**

S1) Complete code reconciliation for the fatigue analyses or other calculations seems, to our opinion, not necessary and might also be very difficult or impossible. In the TLAA fatigue project, the original design codes (mostly ASME III and KTA, which are familiar on this issue) are used as a basis for revalidation. In addition, for the issue of environmental fatigue a specific part of KTA (3201.2) is used which prescribes threshold values for the calculated cumulative usage factors (CUF). In case of CUFs exceeding these thresholds specific actions are required. This doesn't mean that the we deviate from the original design code. More information on this topic can be found in the report 'LTO Demonstration of Fatigue TLAAs' [Blom F.J., LTO Demonstration of Fatigue TLAAs, NRG report NRG-22488/11.106369, 2011].

S2) Also based on this suggestion, we intend to organize trainings for old and new plant engineers for the use of applicable nuclear PV&P Codes and Standards. Last year we already made a start and organized a short internal overview course for engineers on this subject.

6. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	**11/05/2012**

6.1 – COMMENTS:

C1) The plant response regarding requirement to reconcile the two design codes is acceptable. International work has been done in this area with no conclusion that either Code is unacceptable. In addition, the Codes provide similar results when utilized. The plant has stated that for the current TLAA the Code utilized in the original design fatigue analysis was used and therefore updated fatigue analysis remained consistent with the original design basis code.

The plant response regarding requirement to reconcile the two design codes is acceptable. International work has been done in this area with no conclusion that either Code is

unacceptable. The plant uses the Code utilized in the original design fatigue analysis and therefore has remained consistent with the original design basis.

The plant staff provided a training record to demonstrate that training on classifications and specifications was provided.

Based upon the above observations the issue is closed.

6.2 – RECOMMENDATIONS/SUGGESTIONS:

6.3 – DOCUMENTS REVIEWED:

STATUS OF THE ISSUE			**Date: 13/11/2009**	**Date: 11/05/2012**
1 – Resolution Degree:				
1.	**No action**	*The issue was not identified by the Counterpart, or having been identified, no action was taken toresolve it.*	n.a.	
		No progress in the resolution of the issue, or unsatisfactory resolution.	n.a.	
2.	**Action under way**	*The issue was identified by the Counterpart, but the actions did not comply with IAEA SSS.*	n.a.	
		The issue was identified by the Counterpart and work has started to resolve it.	n.a.	
3.	**Issue partially resolved**	*The issue was identified by the Counterpart and actions are underway but no results are available yet.*	n.a.	
		The implemented actions meet partially the intent of recommendations of previous IAEA review.	n.a.	
4.	**Issue resolved**	*The issue was identified by the Counterpart and the solution provided is fully satisfactory. Issue closed.*	n.a.	
		The intent of recommendations of previous IAEA review is fully met. Issue closed.	n.a.	X
2 – Urgency degree:				
I	*The issue should be addressed urgently, before continuing the PSHA and seismic PSA project.*		n.a.	
II	*The issue should be addressed before . . .*		n.a.	

n.a.: not applicable for the present mission.

ISSUE SHEET			
1. ISSUE IDENTIFICATION		Issue Number:	**D - 2**
NPP:	Borssele		
Unit:	1		
Reviewed Area:	Revalidation of safety analyses that used time limited ageing assumptions		
Issue Title:	Start up and shut down transients in the primary system design specification and calculations		
2. ISSUE CLARIFICATION			
2.1 - ISSUE DESCRIPTION			
Primary system design specification start up and shut down transients occurrences (number of cycles) are not consistent within design calculations and design specification.			
2.2 - REFERENCE TO IAEA SAFETY STANDARDS			
- IAEA SALTO Guideline Services Series 17, December 17 - IAEA Safety Report Series No. 57 (2008), Section 6.1.3., 6.1.4			
3. COUNTERPART VIEWS AND MEASURES (self assessment by the Counterpart)			
In the project to revalidate fatigue analyses also the delivery of a new load catalogue (valid until 2034) is incorporated in which we will revalidate plant transients and their occurrences. If necessary we will reconcile and update affected documents on this. In the revalidation of fatigue analyses we will take this recommendation also in account.			
4. ASSESSMENT BY THE IAEA REVIEW TEAM		Date:	**13/11/2009**
4.1 – COMMENTS: **C1)** During the review of numerous primary system nozzle and piping system stress reports and the reactor pressure vessel design specification, the start up and shut down transient occurrences are documented as 150 cycles while the annual transient report and load catalogue list the number of cycles as 155. **C2)** Design Load Specification RE-L-319, Calculation Z0903968-001-01 (30682-B-008), and RPV Design Specification list the number of start up and shut down transients occurrences (number of cycles) as 150. **C3)** The annual transient report (KTE/Adj/PHu/R086039 (Feb 8, 2008) and the load catalogue (KWU E411/93/2005 b, dated April 24, 1995) list the number of cycles as 155.			

4.2 – RECOMMENDATIONS/SUGGESTIONS:

R1) The plant should revalidate the plant transients and their occurrences (number of cycles).

R2) The plant should reconcile and update the affected documents that contained plant transients occurrences (i.e. design specifications and calculations, etc.)

4.3 – DOCUMENTS REVIEWED:

- Design Load Specification RE-L-319, Calculation Z0903968-001-01 (30682-B-008);
- RPV Design Specification;
- The Annual Transient Report (KTE/Adj/PHu/R086039 (Feb 8, 2008);
- - The Load Catalog (KWU E411/93/2005 b, dated April 24, 1995).

5. COUNTERPART ACTIONS	Date:	**31/03/2012**

R1) Revalidation of plant transients and occurrences is integrated in the TLAA fatigue project. For the purpose of revalidation regarding the LTO license change application, a load catalogue based on a projected number of cycles is used to show that crack initiation by fatigue is very unlikely during the whole operation until 2034. In the TLAA fatigue project a new fatigue basis will be delivered in which also data retrieved from the in 2010 installed fatigue monitoring system FAMOS is used. This new basis will comprise a revalidation of plant transients and their occurrences. More detailed information on this topic can be found in the report 'LTO Demonstration of Fatigue TLAAs' [12].

R2) See also the answer on R1. While setting up a new fatigue bases, underlying documents will be studied and if necessary reconciled or updated too (i.e. updated load specifications are set-up for new analyses where FAMOS measurement results are used).

6. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	**11/05/2012**

6.1 – COMMENTS:

C1) The plant LTO demonstration of fatigue TLAAs has caused the actual and projected cycles to be updated and the implementation of the FAMOS software has allowed for monitoring of actual transients. The required monitoring has provided partial implementation of the five years of cycle tracking recommended by AREVA for utilizing FAMOS data for revalidation of actual transients. The efforts as noted above address the recommendations of the previous SALTO mission. It will take additional time to fully implement the activity.

In conclusion the counterpart measures are going in the right direction and this item may be closed.

6.2 – RECOMMENDATIONS/SUGGESTIONS:

6.3 – DOCUMENTS REVIEWED:

- FAMOS Cycle Record for 2010/2011, NRG-22981/12.113571;
- LTO Demonstration of Fatigue TLAAs, LTO of NPP Borssele, NRG-22488/11.106369, Revision 1.

STATUS OF THE ISSUE			Date: 13/11/2009	Date: 11/05/2012
1 – Resolution Degree:				
1.	**No action**	*The issue was not identified by the Counterpart, or having been identified, no action was taken toresolve it.*	n.a.	
		No progress in the resolution of the issue, or unsatisfactory resolution.	n.a.	
2.	**Action under way**	*The issue was identified by the Counterpart, but the actions did not comply with IAEA SSS.*	n.a.	
		The issue was identified by the Counterpart and work has started to resolve it.	n.a.	
3.	**Issue partially resolved**	*The issue was identified by the Counterpart and actions are underway but no results are available yet.*	n.a.	
		The implemented actions meet partially the intent of recommendations of previous IAEA review.	n.a.	X
4.	**Issue resolved**	*The issue was identified by the Counterpart and the solution provided is fully satisfactory. Issue closed.*	n.a.	
		The intent of recommendations of previous IAEA review is fully met. Issue closed.	n.a.	
2 – Urgency degree:				
I	*The issue should be addressed urgently, before continuing the PSHA and seismic PSA project.*		n.a.	
II	*The issue should be addressed before . . .*		n.a.	

n.a.: not applicable for the present mission.

ISSUE SHEET		
1. ISSUE IDENTIFICATION	Issue Number:	**D - 3**
NPP:	Borssele	
Unit:	1	
Reviewed Area:	Revalidation of safety analyses that used time limited ageing assumptions	
Issue Title:	Differences between the design and the accumulated number of occurrences in the plant annual transient report.	
2. ISSUE CLARIFICATION		

2.1 - ISSUE DESCRIPTION

Differences between the total number of occurrences of transients for the power increase and power decrease. There are also differences between the design and the actual accumulated cycles.

2.2 - REFERENCE TO IAEA SAFETY STANDARDS

- IAEA SALTO Guideline Services Series 17, December 17
- IAEA Safety Report Series No. 57 (2008), Section 6.1.3, 6.1.4

3. COUNTERPART VIEWS AND MEASURES (self assessment by the Counterpart)

To our opinion the appropriate transients are compared to the plant design transients on a conservative way, but we were not able to show this clearly in the SALTO Peer Review. Translating actual transients to the (very rough) design transients in the load catalogue is a task which requires engineering judgement.

The large differences between design and the actual accumulated cycles are caused by the conservative design assumption of a load following the plant instead of the actual base load as the plant is.

The margins/differences will be considered in the new load catalogue (see D-2).

Based on the new load catalogue we will consider the updating of the annual transient report.

4. ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	**13/11/2009**

4.1 – COMMENTS:

C1) This is a concern for fatigue monitoring programme effectiveness if the plant is not comparing the appropriate transients to the plant design transients (Annual transient report: KTE/Adj/PHu/R086039, Feb 8, 2008).

C2) Plant power history was reviewed and it could not be concluded which actual transient to be compared to the design transients.

4.2 – RECOMMENDATIONS/SUGGESTIONS:

R1) The plant should review, and if necessary, revalidate the plant transients and determine the appropriate plant power transient from the plant computer data base.

S1) Consideration should be given to update the Annual transient report after determining and reconciling the differences between the design and actual cycles.

4.3 – DOCUMENTS REVIEWED:

- The Annual Transient Report (KTE/Adj/PHu/R086039 (Feb 8, 2008).

5. COUNTERPART ACTIONS	Date:	**31/03/2012**
R1) See answer on D-2 R1 S1) See answer on D-2 R1. The annual transient report will be updated based on the new fatigue basis forthcoming from the TLAA fatigue project.		
6. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	Date:	**11/05/2012**
6.1 – COMMENTS: **C1)** The plant LTO demonstration of fatigue TLAAs has caused the actual and projected cycles to be updated and the implementation of the FAMOS software has allowed for monitoring of actual transients. The required monitoring has provided partial implementation of the five years of cycle tracking recommended by AREVA for utilizing FAMOS data for revalidation of actual transients. The efforts as noted above address the recommendations of the previous SALTO mission. It will take additional time to fully implement the activity.		
6.2 – RECOMMENDATIONS/SUGGESTIONS:		
6.3 – DOCUMENTS REVIEWED: - Assessment of Fatigue TLAAs, LTO of NPP Borssele, NRG-22488-11.106371 Revision 1; - FAMOS Cycle Record for 2010/2011, NRG-22981/12.113571.		

STATUS OF THE ISSUE			**Date: 13/11/2009**	**Date: 11/05/2012**
1 – Resolution Degree:				
1.	**No action**	*The issue was not identified by the Counterpart, or having been identified, no action was taken to resolve it.*	n.a.	
		No progress in the resolution of the issue, or unsatisfactory resolution.	n.a.	
2.	**Action under way**	*The issue was identified by the Counterpart, but the actions did not comply with IAEA SSS.*	n.a.	
		The issue was identified by the Counterpart and work has started to resolve it.	n.a.	
3.	**Issue partially resolved**	*The issue was identified by the Counterpart and actions are underway but no results are available yet.*	n.a.	
		The implemented actions meet partially the intent of recommendations of previous IAEA review.	n.a.	X
4.	**Issue**	*The issue was identified by the Counterpart and the solution provided is fully satisfactory. Issue closed.*	n.a.	

	resolved	*The intent of recommendations of previous IAEA review is fully met. Issue closed.*	n.a.	
2 – Urgency degree:				
I	*The issue should be addressed urgently, before continuing the PSHA and seismic PSA project.*		n.a.	
II	*The issue should be addressed before . . .*		n.a.	

n.a.: not applicable for the present mission.

APPENDIX IV - ISSUE SHEETS FROM SALTO PEER REVIEW MISSION IN 2012

1. ISSUE IDENTIFICATION	Issue Number: A – 1
NPP: Borssele	**Unit:** 1
Reviewed Area: Management, organization and administration	
Issue Title: Human performance improvement	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

The plant's efforts in the recent years to improve human performance have not resulted in tangible improvement.

2.2 – IAEA BASIS:

NS-G-2.11

II.10. Human performance is greatly affected by the management systems that are put in place to help workers perform well (e.g. in the planning and scheduling of work, training, supervision, work practices, written instructions and the work environment). When there are latent weaknesses in any of these systems, conditions may exist that are likely to lead to errors.
III.15.The analysis of events relating to human characteristics should include the causes and circumstances of any problems with human performance that contributed to the event. …There may have been errors and human performance related issues in the areas of procedures, training, communication, engineering for human factors and the human–machine interface, management and supervision. The analysis should be sufficient to categorize the human performance issues.
I–19. The purpose of an analysis of the human factor aspects of an event is … to understand the contributory and influencing factors that have led to an error.

GS-G-3.5

2.22. In developing a process for continually improving the safety culture in an organization, the following steps should be considered:

(c) Describing the desired safety culture;

(d) Assessing the existing culture;

(e) Communicating the results of the assessment to all personnel in the organization;

2.24. Once the desired future state is well understood, the present state of the safety culture should be assessed. The assessment should yield information on how the existing safety culture may help in achieving the desired new way of working and thinking. It should also identify any safety culture issues that could hinder the achievement of goals or the fulfilment of strategies,

plans and objectives. A specific programme of change for the safety culture should then be designed to deal with these issues.

NS-G-2.8

5.24. Maintenance personnel should have access to mock-ups and models for training in those maintenance activities that have to be carried out quickly and cannot be practised with actual equipment.

4.5. The training needs for duties important to safety should be considered a priority … For these critical duties, the training environment should be as realistic as possible, to promote positive carry-over from the training environment to the actual job environment.

4.15 (d) Training mock-ups and models should be provided for activities that have to be carried out quickly and skilfully and which cannot be practised with actual equipment. Training mock-ups should be full scale if practicable.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 11/05/2012

3.1 – FACTS:

F1) Human error was the cause for 65% of plant events in 2011. The operating experience indicates that 27% of analysed events and even higher ratio of low level events and near misses have "personal work practices" as dominant contributor in 2011. Addressing this contributor could lead to efficient reduction of events with human performance related cause. Nevertheless the evaluation of human performance in Safety Factor 12 does not identify this situation as a point requiring attention. (The evaluation of training in safety culture in Safety Factor 10 concluded that "Continuous attention is to be paid to safety culture and instilled among employees in order to reduce the number of plant events with 'human performance' as the cause" however no analysis has identified that the major contributor to human errors would be safety culture.)

The 2011 Annual Report on Operating Experience concluded: "Since 2004 it is realized that improvements are necessary in the area of work practice. It can be concluded that the work practice did not visibly improve in 2011. The events that occurred in 2011 did not present (structural) improvements in the general way of working."

F2) The WANO peer Review in 2008 concluded that plant management does not ensure that site events, low level events and adverse trends are rigorously identified, analysed and corrected. The stream analysis performed in the same year concluded that this area for improvement is almost a "driver", meaning that focusing on resolving this area the plant will also resolve several other areas for improvement which are symptomatic. The WANO Peer Review Follow-up in 2010 concluded that in this problem has not received the appropriate level of priority. Lack of resources was told to be the cause of this situation. Human resources for event analysis were increased and backlog of event analysis has been reduced since then.

F3) The Annual Report on Operating Experience in 2009 and 2010 indicated that the most significant contributors to inappropriate personal work practices are: inattention to detail, lack

of questioning attitude, task not adequately researched prior start and inadvertent bumping, stepping on or damage to equipment. The 2010 report first time included the full breakdown of contributors to inappropriate personal work practices along 18 causal categories. However this information on causal contributors to inappropriate personal work practices is not well known within the plant.

F4) The department heads of the plant expressed the following opinion how human performance could be improved:

- Better work preparation (implementation of the new work management process following INPO 928 will improve the situation);
- Reduced time pressure in work scheduling;
- Increased of supervisory monitoring at worksite;
- Implementation of work simulator.

F5) The training programme on improving work practices and safety culture includes modules on general safety awareness, situation awareness, communication, teamwork, monitoring/providing feedback and leadership. This is a comprehensive approach to manage improvement. However if analysis results concerning cause contributors (or root causes) of inappropriate personal work practices were better known within the plant, training on human performance tools and safety culture could be more focused and targeted on the most important contributors of inappropriate performance. The present practice is that line managers determine based on their experience which training modules have to be covered by which staff member.

F6) Implementing and/or improving practical training on actual tasks relating to working practices was identified by the plant self-assessment as a point requiring attention having medium safety significance. A potential improvement could be the establishment of a work practice simulator "loop flow simulator" with real equipment simulating realistic work conditions. This could complement theoretical training with practice of work in realistic environment.

Audit point T-11/6 in the 2009-2011 biannual self-evaluation identifies lack of practical training facilities. The associated action is "purchase loop flow simulator". The action is considered to be closed, since maintenance and training departments have evaluated the subject and "investment plan was drafted and the investment is included into the investment list of 2012". However this initiative is only in the first phase of development, namely modification proposal.

F7) Safety culture self-assessment, independent assessment or survey has not been done at the plant, although continuous attention to be paid to safety culture is an issue identified in SF 10 as having high safety significance. Safety culture has not been identified as a cause for low level events and near misses and in negligible occasions for analysed events in 2011.

Audit point T-11-S5 in the 2009-2011 biannual self-evaluation concluded that "the plant will consider the possibility to implement performance indicators to measure safety culture". This point was decided to be addressed jointly with point T-11/7 (referring to performance indicators at management level) by Technical Support (KD) Department by 31 December 2012. Limiting the assessment of safety culture to aspects of measuring and applying performance indicators

would reduce the potential gain from this effort.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) The plant should apply a more effective approach to improve human performance in a tangible manner.

3.4 – DOCUMENTS REVIEWED:

- Application to amend nuclear energy permit, Draft 20 March 2012;
- Borssele SALTO Information Package, section 14 Operational Experience;
- IAEA OSART Follow-up mission report, 2007;
- WANO Stream Analysis REPORT, 2008;
- WANO Peer Review Follow-up report, 2010;
- Training programme on improving work practices and safety culture, A11-23-N007, 20 February 2012;
- Operating Experience Annual Report 2009, 2010 and 2011;
- Self-evaluation for the 2009-2011 period.

4. COUNTERPART ACTIONS	**Date:** n.a.

n.a.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** n.a.

5.1 – FACTS:

n.a.

5.2 – DOCUMENTS REVIEWED:

n.a.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	Issue Number: A – 2
NPP: Borssele	**Unit:** 1
Reviewed Area: Management, organization and administration	
Issue Title: Corrective actions for issues identified in evaluation of Safety Factors 10 and 12	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

Corrective actions including deadline for their implementation for "points requiring attention" (issues) identified in evaluation of Safety Factors 10 (Organization, the management system and safety culture) and 12 (Human factors) are currently not available.

2.2 – IAEA BASIS:

GS-G-3.5

6.19. Managers should verify that issues for resolution that are identified in the self-assessment process are promptly entered into the corrective action programme or other tracking systems, to ensure that the resolution of issues is timely and is prioritized on the basis of their potential consequences for safety and reliability.

6.46. All forms of assessment, such as independent assessments, external assessments, assessments by the regulatory body and self-assessments, together with feedback from operating experience, are methods for the identification of issues, and they provide input to the corrective action process. The process can also be used to track issues that have been identified by any other means.

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4.21. Findings from the reviews of safety factors should be evaluated and the timing of any proposed safety improvements should be determined. The proposed plan should recognize the need to implement safety improvements as soon as reasonable and practicable in accordance with the global assessment of safety at the plant (Section 6). 6.7. … The safety improvements proposed in the global assessment should be included in the integrated implementation plan.

6.10. As part of the global assessment, the following matters should be examined:

- The time necessary for implementing corrective actions and/or safety improvements.

3. ASSESSMENT BY THE IAEA REVIEW TEAM — Date: 11/05/2012

3.1 – FACTS:

F1) KFD requested the evaluations of Safety Factors 10 (Organization, the management system and safety culture) and 12 (Human factors) to be handled in the frame of the license renewal process. The evaluation report on SF 10 was already submitted to KFD, two points requiring attention are categorized as having high and four points as having medium safety significance.

The evaluation report on SF 12 will be submitted to KFD in May 2012. The application for licence renewal is planned to be submitted in September 2012. Based on common sense such application in principle has to demonstrate, from the human and organizational point of view, the organization's readiness to operate the plant for an extended period. This assumes identification of issues and indication of how they will be resolved. However corrective actions including deadline for their implementation for "points requiring attention" identified in evaluation of Safety Factors 10 (Organization, the management system and safety culture) and 12 (Human factors) are currently not available.

F2) For some points requiring attention (e.g. re-establishment of certification according to ISO 14000, improving quality of audits) plan for corrective action is being prepared in the plant and identifying the responsible organization is quite obvious. However other points requiring attention, which are cross-cutting in the organization (e.g. improving the effectiveness of management, management of change process, prioritising safety issues and improving safety culture), require more complex improvement effort and allocating responsibility and defining the reasonable timeframe for implementing the improvement is not a simple task.

F3) If the plant does not proceed with proposing corrective actions the resolution of the issues might be delayed and the plant may lose the initiative in selecting optimal corrective actions.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

S1) The plant should consider proposing corrective actions including deadline for their implementation for the "points requiring attention" identified in the evaluation of safety factors 10 and 12.

3.4 – DOCUMENTS REVIEWED:

- Application to amend nuclear energy permit, Draft 20 March 2012;
- Self-evaluation for the 2009-2011 period.

4. COUNTERPART ACTIONS	**Date:** n.a.
n.a.	

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** n.a.

5.1 – FACTS:

n.a.

5.2 – DOCUMENTS REVIEWED:

n.a.

5.3 – RESOLUTION DEGREE:		
1.	**Insufficient progress to date**	n.a.
2.	**Satisfactory progress to date**	n.a.
3.	**Issue resolved**	n.a.

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	**Issue Number: B – 1**
NPP: Borssele	**Unit:** 1
Reviewed Area: Organization and Functions, Configuration/Modification Management	
Issue Title: Lack of guidance document, in respect of the Regulator licensing conditions rules (NVR-rules), related to Ageing Management and to some degree also for Long Term Operation	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

There is a lack of guidance document how the plant intend to apply the Regulator licensing conditions rules (NVR-rules) in general and in particular for rules related to Ageing Management and to some degree also for Long Term Operation.

2.2 – IAEA BASIS:

- IAEA-GS-R-3: 2.3, 2.18;
- IAEA-GS-G-3.1: 3.9, 3.13, 5.3;
- IAEA-GS-G-3.5: 2.1;
- IAEA-NS-G-2.12: 3.2.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 11/05/2012

3.1 – FACTS:

F1) An essential part of the interface with the Regulator is to establish application guides in respect of the Regulator license conditions, including rules and documents which are pointed out by the Regulator. However there is a lack of THE PLANT guidance document which applies in general to the Regulator licensing conditions rules (NVR-rules) and in particular, within the interest of the team, to the rules related to Ageing Management and to some degree also for Long Term Operation. A large number of such rules were added in the latest license conditions (end of 2011) and most of these rules are more or less blue-prints of IAEA standards and guides. There is currently the plan to assess and clarify the plant's position in relation to the

rules, within the on-going PSR work (to be finished at the end of 2013).
However, as only a conceptual guidance or position clarification document [2] exists today for Long Term Operation and none for Ageing Management, there is no solid base for the proper handling of these issues.

The current license conditions situation is compiled in the plant document [1] where many IAEA standards and guides are shown to be incorporated as NVR-rules, several of them relevant to Long Term Operation and Ageing Management.

F2) The current license conditions are, based on a review of [1] thus deemed by the SALTO peer review team, to contain a sufficient regulatory base for a proper implementation of Long Term Operation and Ageing Management. However, it is deemed necessary to establish a common documented understanding of the plant's position, in respect of the relevant NVR-rules, in order to be able to create a base for the development of Management system documents and Technical documents for the proper handling of Long Term Operation and Ageing Management. Such documents are currently not in place for Ageing Management. Regarding Long Term Operation only a conceptual document [2] is in place.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) The team recommends to the plant that a documentation of the plant positions, in respect of the NVR-rules applicable to LTO and ageing management, are created. These documented positions shall be approved by the plant.

S1) Suggestion is given to the plant to establish a common documented understanding with the regulator which NVR-rules should be selected and in what time perspective these different documented the plant positions should be ready.

3.4 – DOCUMENTS REVIEWED:

- KEW-vergunning BS30 version 9, dated 2 April 2012;
- Conceptual Document LTO "Bewijsvoering"KCB, NRG-22701/10.103460, dated 9 September 2012.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

R1) From the applicable NVRs which were added in 2011 in the license, two NVRs are directly related to Long Term Operation and Ageing Management: NVR NS-G-2.6 and NVR NS-G-2.12.
NVR NS-G-2.12 gives specific guidance on Ageing Management and LTO assessment. Within the earlier set of NVRs, no such guidance was available. NVR NS-G-2.6 gives guidance on Maintenance, Surveillance and In-Service Inspection. Within the earlier set of NVRs, specific NVRs for these three topics were available. NVR NS-G-2.6 can be seen as an integrated approach of these plant programmes. In the following, it is described how the plant positions on these two NVRs have been or partly will be created. For the other added NVRs, we refer to the

action for S1.

Position on NVR NS-G-2.6

The plant has a system of plant programmes in which every programme is based on regulation and in which all the specific activities come together in one database which is coupled to the work order system (an overview is given in procedure PO-N12-77). Maintenance, surveillance and in-service inspection form part of this system. For these programmes the management system comprises so-called strategy reports in which is described how the (old) regulation (NVR 2.2.7 for Maintenance, NVR 2.2.8 for Surveillance and NVR 2.2.2 for ISI) is worked into specific activities. These strategy reports can be seen as the plant positions for these NVRs. With NVR NS-G-2.6, the three specific NVRs are expired, so an update is needed in which three strategy reports and the overall scheme (PO-N12-77) have to be revised.

The plant has already revised the Surveillance Strategy report (AVS STRAT-SURV). The other two Strategy Reports and PO-N12-77 are scheduled to be revised in the first quarter of 2014.

Position on NVR NS-G-2.12

As mentioned above, this NVR is a new guidance document compared to the existing set of NVRs (before 2011). Based on the assessments which are carried out under the LTO assessment project, it is demonstrated (KTE/AdJ/AdJ/R126169) that the plant ageing management activities are currently largely consistent with NVR NS-G-2.12 and up-to-date since the LTO project has just been carried out. However, it was also concluded that there is a need for improvement in terms of coordination and traceability of ageing management. In order to improve the ageing management activities, it was decided to implement an SSC oriented ageing management system technically based on the performed LTO ageing management review. The ageing management system is described in procedure PU-N12-50 and was implemented in June 2013. This procedure refers to a position paper ('Handboek Verouderingsbeheer') in the plant management system. At this moment the 'Handboek Verouderingsbeheer' is drafted but it will be finalized in January 2014.

S1) The regulator can impose new NVRs on the plant by changing its license. In general, this is part of a license change process with common understanding. As possible escalation level, normal national legal procedures are in place.

The plant's internal compliance procedure PU-A01-16 deals with the response to new regulation.

From the 2011 change of all NVRs, it was concluded that a Periodic Safety Review is a proper compliance process for evaluating the impact of new NVRs and the definition of measures. It has to be realized that such a major change in NVRs should be treated as a project and takes several years to implement.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) In respect to NVR NS-G-2.6 (blue-print of IAEA NS-G-2.6), three guidance documents

will be revised STRAT-SURV, STRAT-ISI and STRAT-OHD. Those documents deal with surveillance, in-service inspection and maintenance respectively.

The plant has revised STRAT-SURV not only due to that a new NVR is in place now but also based on the outcome of the active components assessment. As a consequence the ASME OM-code will be a new basis for the surveillance programme instead of ASME XI (in-service testing is no longer part of the current version of ASME XI). The revised document has been issued for review by the last review level (Nuclear Safety Review, dept. RBVC) which is expected to pass before March 2014 and thereby being released.

The STRAT-ISI document has not been revised yet. The plant claims that the present version of the ISI guide document is adequate for the time being because the new NVR NS-G-2.6 will not change the ISI-strategy in comparison to the former applicable NVR (2.2.2). For this reason there is no big urgency for doing the revision. Another reason for the delay of the revision is due to the fact that the plant is in discussion with the regulator about the License Condition on ISI which includes 29 ISI-relevant points (under condition 2). These points have not been settled yet with the regulator and the idea is first to settle these issues before revising and finishing the STRAT-ISI document.

The revised STRAT-OHD document is not in place yet. The document sets out an overall guidance to maintenance, pointing out to several other documents already well in place. The plant claims, based on this, that the fact that STRAT-OHD is not revised yet, will not impact the maintenance strategy. The delay in revision is due to prioritisation of resources.

F2) In respect to NVR NS-G-2.12 (blue-print of IAEA NS-G-2.12), a handbook, HB-N12-2, exists in the management system. However, the document KTE/AdJ/AdJ/R126169 goes in much more detail of how to apply NVR NS-G-2.12. Specifically regarding integrated AMP (important for LTO). Lacking is guidance on the obsolescence issue of IAEA NS-G-2.12. This issue is deferred to other areas where guidance documents have not been drafted yet. This deficiency has also been noted in the latest PSR and is scheduled to be resolved within three years.

F3) The plant response to NVR regulations regarding organization and management functions (review area B) is presented and reviewed through the PSR area reporting on organization, management and safety culture, Safety Factor 10 (KT/HtL/WM/R116305).

In general all parts of the PSR report systematic review matrix shows how the NVR rules and regulations are prioritised and handled, including ageing management and LTO. This also includes the Safety Factor 10 area.

NVR document DGETM-PDNIV/ 12312954 covering LTO clearly states the detailed regulatory requirement of actions expected to be done by the plant.

Actions in response to PSR findings in the Safety Factor 10 area shall be resolved within 3 years.

F4) The IAEA team noted that the IAEA Safety Fundamentals SF-1 was marked by the plant as not required for compliance with law or licence in the PSR Safety Factor 10 tractability matrix. This seems to be the consequence of that SF-1 is not pointed out by the regulator in the licence conditions.

F5) The IAEA team has also noted that the IAEA Safety Series Report No. 57, which is basic IAEA document for LTO, does not appear to be clearly pointed out by the regulator.

5.2 – DOCUMENTS REVIEWED:

- STRAT-SURV, rev 11, Stategie voor surveillance voor KCB volgens NVR NS-G-2.6;
- STRAT-ISI, rev 10, Strategie In-service Inspection van de Kernenergiecentrale Borssele;
- STRAT-OHD, rev 8, Strategierapport preventif onderhoud Kernenergiecentrale Borsssele;
- HB-N12-2, rev 1, Handboek Verouderingsbeheersing;
- KT/HtL/WM/R116305 – Evaluatierapport van de Safety Factor "Organisate, management system en veiligheidschultuur";
- KTE/AdJ/AdJ/R126169, 'Going towards coordinated Ageing Management'DGETM-PDNIV/ 12312954,- Wijziging van de kernenergiewet-vergunning verleend aan de NV EPZ ten behoeve van bedrijfsduurverlenging Kerncentrale Borssele.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	**Issue Number: B – 2**
NPP: Borssele	**Unit:** 1
Reviewed Area: Organization and Functions, Configuration/Modification Management	
Issue Title: Lack of Organizational structures, Staffing dispositions and Management system documents properly suited for managing Long Term Operation including Ageing Management.	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

There is in general a lack of Organizational structures, Staffing dispositions and Management system documents which are well adapted and developed for the proper handling of all the issues involved in managing Long Term Operation Ageing Management. The issue of not having all documents in place applies also specifically to the handling Ageing Management and Scoping and Screening.

2.2 – IAEA BASIS:

- IAEA-GS-G-3.1: 2.42;
- IAEA-GS-G-3.5: 3.1;
- IAEA-NS-G-2.12: 4.2, 4.4, 4.6;
- IAEA-NS-G-2.12: 2.6, 2.8;
- IAEA-SSR-2/2: 3.2, 4.50, 4.53.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 11/05/2012

3.1 – FACTS:

F1) Essential parts necessary for the proper management of Long Term Operation, including the Ageing Management, are that responsibilities and duties are clearly described in the Management system documents and that the Organization is well adopted in terms of structure and staffed with enough personnel having the appropriate qualifications.

F2) The present Organizational structure [1] and Staffing disposition results in that the work associated with Long Term Operation and Ageing Management is too spread out and inadequate in order to enable a good focus on these issues. The concern is acknowledged by the plant management but so far no actions have been initiated to correct these shortcomings.
Examples are:

- The capability of the "Engineering" department to deal with all Long Term Operation issues, including Ageing Management, is handled only by five (5) people. Additional outside contractors and other personnel with specific knowledge from other departments, has to be utilized to a large degree.
- Specification for plant modifications, including change management, are performed both by "Construction" department (for larger changes) and by the "Maintenance" department (for smaller changes).
- Review of detail design (made internally or externally) is similarly spread out. The limited capability of the "Construction" department to perform design reviews results in the need to use also other departments.

F3) The Management system documents are not well adapted and developed to handle all the issues involved in managing Long Term Operation Ageing Management.
Examples are:

- The formal responsibility for Ageing Management feedback was found in a sub-document (ref doc. PU-N12-19) to the tasks description for the Maintenance department KO (ref doc. HP-N12). However, responsibility for the doc. PU-N12-19 is department KTE (approved by head of dept. KT). Also a few other maintenance Management system documents, related to Ageing Management feedback and LTO-assessment, are within the responsibility of dept. KTE.
- The procedure for reviewing detailed design, done by the engineering department KTC, lacks the requirement of having a formalized release and authorization of a detailed design (or part of a design, e.g. a detailed design package).
- The procedure for reviewing commissioning programmes was lacking the review of the engineering department KTC which is responsible for basic engineering (i.e. responsible

for the design requirements).

F4) In order to properly handle specifically the Ageing Management issues (being part of handling Long Term Operation issues) a documented strategy for Ageing Management should be in place. However, no documents exist within the Management system describing the strategy for neither implementing nor maintaining an Ageing Management strategy.
Such strategy documents exist for Surveillance, In Service Inspection and Maintenance, but not explicitly for Ageing Management.

F5) An integrated view and management attention has to be put on the integration of Ageing Management within Long Term Operation. However, no documents, within the Management system, describing the integration of the Ageing Management within the Long Term Operation exists.

F6) In order to be able to properly handle specifically Scoping and Screening, all documents required to perform the Scoping and Screening work have to be in place, as part of the plant Management system documents. However, the existing important Scoping and Screening documents [2] and [3] are only project documents and not even all the project documents intended to be issued are in place. Examples of such documents are the document for detailed screening of mechanical components [4], and a document [5] relating the intended conformity check with US NRC "maintenance rule" (US NRC 10CFR50 §50.65 (a)(4) and/or US NRC RG 1.160 and RG 1.182), for the assessment of active components.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) The team recommends to the plant that the Organizational structure and Staffing disposition, including numerals and knowledge, is reviewed and enhanced in order to be well adapted and developed for the proper handling of the work associated with Long Term Operation and Ageing Management.

R2) The team recommends to the plant that the Management system documents, including all documents required to perform the Scoping and Screening work, are reviewed and amended in order to be well adapted and developed to handle all the issues involved in managing Long Term Operation and Ageing.

S1) The team suggests to the plant to implement a document within the Management system which describes the Ageing Management strategy.

S2) Suggestion is given to the plant to develop a document within the Management system that describes the integration of the Ageing Management within the Long Term Operation.

3.4 – DOCUMENTS REVIEWED:

- Organogram EPZ (intranet based document);
- AREVA Work Report NEPS-G/2008/en/0056, dated 27 February 2011;
- AREVA Work Report NTCM-G/2009/en/0144, dated 6 November 2011;

- AREVA Work Report PESS-G/2011/en/0147 rev A, not yet released;
- Assessment of Active Components with regard to Long Term Operation preliminary draft not yet released.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

R1) The organizational structure and staffing requirements for the ageing management process during Long Term Operation was reviewed during the preparation of the new ageing management procedure (described in recommendation R2). The activities in this procedure strictly differentiate between the activities and responsibilities related to managing ageing management and the activities and responsibilities of conducting the resulting maintenance, inspection, testing, monitoring and other related activities. This method of thinking enables the company to work with a relatively small department that is responsible for Ageing Management, who can make use of an external source of specialists with whom a working relationship was established over the years (e.g., the plant's OEM AREVA-NP and the Dutch consultancy group NRG) for relevant assistance in the work associated with Long Term Operation and Ageing Management.

The responsibilities for practically implementing the work associated with Long Term Operation and Ageing Management is within the operational departments, such as the Maintenance, Chemistry and Production departments. For this aspect, reference is made to recommendation R2, where the plant ageing management procedure is described in detail, and to issue sheet F2, where the oversight for a system or component group and the solutions for a centralized system health view are addressed.

The staffing and organizational requirements for Ageing Management are documented in a handbook on a strategic level: the Handbook Ageing Management (HB-N12-001A). During this process, it was well established what the particular roles and responsibilities for an Ageing Management team are, as compared to roles and responsibilities in other aspects of Long Term Operation (e.g. maintenance, surveillance and ISI). This way, a clear definition of the work associated with Ageing Management could be developed.

R2) The ageing management procedure is currently documented in the management system (PU-N12-50). As part of the management system, all relevant documents required to perform the activities related to the ageing management procedure also form part of this system. Not only scoping and screening, but also the catalogues of ageing mechanisms, ageing management strategy documents for the main systems/components, and ageing management plan to address specific SSC related ageing mechanisms and their required management activities, as well as to provide the link with the plant's Enterprise Resource Planning software (Asset Suite). Regular configuration control apply to these documents.

Scoping and screening in this procedure is done in the same manner as what was done in the Ageing Management Review that was performed in cooperation with AREVA and NRG in preparation of the license change application for LTO. The results from the AMR could be used in this procedure straightaway.

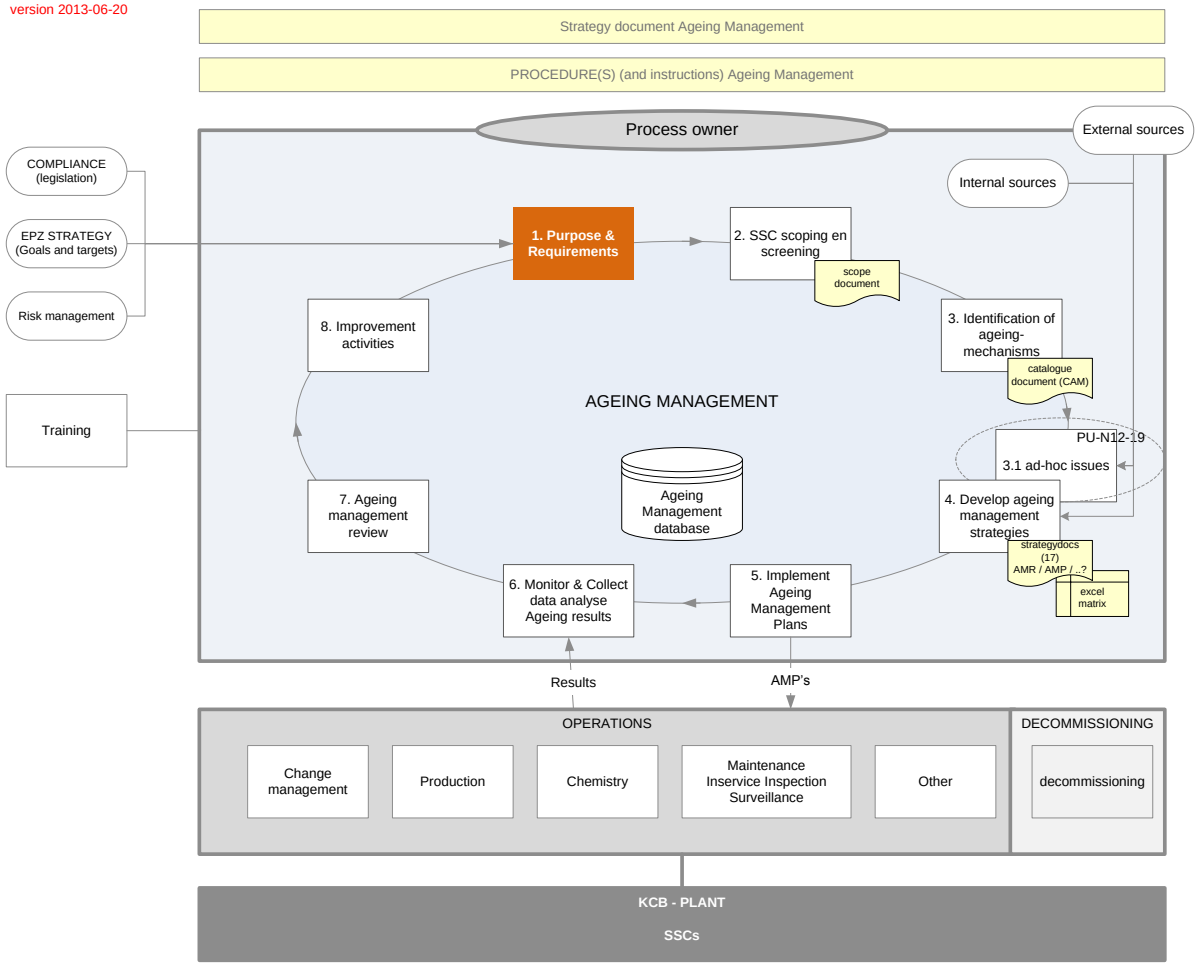
The next step is to identify ageing mechanisms that are specifically applicable for the plant design and conditions. The catalogues of ageing mechanisms that AREVA prepared as part of the AMR project were prepared by AREVA specialists in cooperation with the plant specialist, based on a very detailed knowledge of the plant, wide experience with similar plants and

operational experience from across the globe. These documents were used in the ageing management procedure with the only addition being the comments received during the reviews in the license change application process, including the SALTO 2012 mission. They are under the plant document configuration control now.

With the scope and possibly applicable ageing mechanisms provided, ageing management strategy documents are being prepared, based on the AMR reports provided by AREVA. The AMR reports are a static evaluation of the ageing management on the in-scope passive, long-lived components of the plant 17 AMR reports were prepared in the course of the LTO project. These 17 AMR reports are being transformed in living documents, with the purpose of providing all information necessary to base a comprehensive ageing management programme on, including design and manufacturing information, operational conditions, internal and international operating experience, etc.

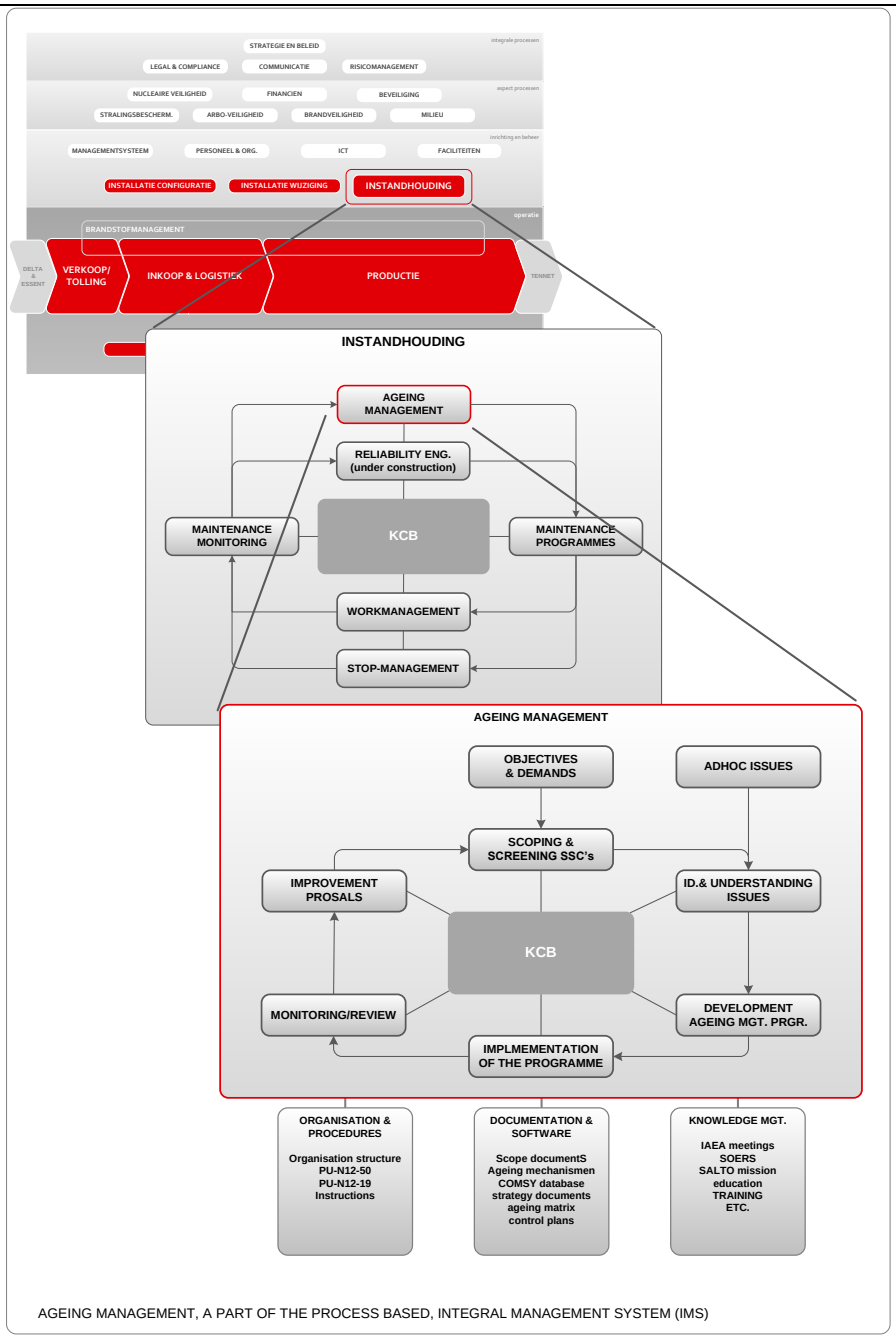
The activities in the ageing management strategies are combined in the ageing management plans. These plans are written to include the nine elements to be able to to detect and mitigate ageing degradation, as provided in safety report 57.

These AMPs are used to effectively communicate with the operational processes to provide traceability. All relevant ageing related activities to be handled in the work order management system of the plant (Asset Suite) are identified in the AMPs. The results from these activities are fed back into the ageing management procedure to be evaluated and to be able to identify any improvement activities in order to comply with the purpose and requirements of the ageing management programme.



S1) The Ageing Management strategy is described in the handbook ageing management (HB-N12-001A) as part of the Integrated plant management system.

S2) The plant management system is described in a handbook "Integrated management system" (HB-A00). The purpose of this handbook is to describe the management system that was developed to enable the plant to obtain their strategic goals and targets, to manage risks, and to comply with legislatory and regulatory requirements, including the objectives for Long Term Operation.



AGEING MANAGEMENT, A PART OF THE PROCESS BASED, INTEGRAL MANAGEMENT SYSTEM (IMS)

It can be seen that a key issue in the management system to support the company goals is a process called "Instandhouding". Instandhouding can be seen as the conglomerate of maintenance management, ageing management, reliability engineering, maintenance engineering, work management, stop management and all related administrative activities.

As part of the Instandhouding process, the Ageing Management process is detailed further into the procedure and related responsibilities as described in the Handbook Ageing Management (HB-N12-001A).

The Handbook for the Integrated Management System (HB-A00) outlines the Integrated management system of the plant and aims to provide insight into the management system to managers, employees and other stakeholders in the company by showing a map of the plant

management systems and procedures. It addresses the following subjects:

- Description of the plant;
- Stakeholders;
- Framework for the management systems;
- Culture;
- Organization;
- Operational processes.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) The plant management has recently issued a Proposed Management directive 2014-01-06-RJo-FOCUS2 for a new organization. In this proposal, two areas are of a major importance in relation to LTO and AM; a redefinition of all the operational processes (incl. ageing management) with specified process owners, and a change of the position of the experience feedback group (under the quality department KZ). However, these directives are not yet in place but scheduled for approval in April 2014 and implementation in June 2014.

F2) Seen from the organizational chart, the technical department KT has had a small but valuable increase in personnel to about 30 persons. The engineering subdepartment KTE, which has the central role of coordinating the AM, has been strengthened and has now about 10 persons. The project department KQ is now a department of its own with about 10 persons.

F3) The knowledge of the KT personnel is deemed to be sufficient by the plant, apart from some minor lack of experience in subdepartment KTC. The competence of personnel is assisted by the plant HR department and the training has in recent time included advanced courses e.g. ASME 3, ASME 11 and material degradation. The KT department also has capability to run computer codes e.g. RELAP.

F4) Governed by the new overall handbook on Ageing management HB-N12-2 and the detailed procedure PU-N12-50 for KTE the ability to deal with AM and LTO is enhanced.

F5) The strategy for AM is described in a "Handbook Ageing Management" process for AM (HB-N12-2), which is a part of the plant integrated management system. The process has a clear ownership within the department KTE, responsible for AM and the process is also designed with the intention of having steps to support a Deming cycle of plan-do-check-act for continuous improvements. The process for AM is closely defined and related to governing subdocuments via a procedure document (PU-N12-50) containing further details on the AM process.

F6) The implementation of the AM process into the plant quality management system "Integrated Management System" (HB-A00), due for implementation in June 2014, indicates how the AM process contributes to the company process goals of "Instandhouding" (i.e. asset management) strategic goals. These strategies also contain goals for LTO in terms of process, people, knowledge, work-flow of information and are open for managers, employees and stakeholders.

5.2 – DOCUMENTS REVIEWED:

- 2014-01-06-RJo-FOCUS2-rev2.1 - Proposed Management directive for new organization, dated 21 January 2014;
- HB-N12-2, Ageing management handbook, rev.1, 7/1/2014;
- Organizational chart of dept. KT;
- Organizational chart of dept. KQ;
- PU-N12-50 - Ageing Management, rev.1, 5/6/2013;
- HB-A00 – Integrated Management System. rev.3, 2/10/2013.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	**Issue Number: B – 3**
NPP: Borssele	**Unit:** 1
Reviewed Area: Organization and Functions, Configuration/Modification Management	
Issue Title: Practices Surrounding Parts Substitutions and Modifications Require Improvement	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

Processes and practises surrounding the implementation of plant modifications appear to be applied inconsistently. The modification process when applied does not ensure that key station programmes such as ageing management are updated to ensure safe, long term operation of the power plant.

2.2 – IAEA BASIS:

IAEA Safety Standard Safety Guide No. NS-G-2.3

4.8. An initial safety assessment should be carried out before starting a modification to determine whether the proposed modification has any consequences for safety and whether it is within the regulatory constraints for the plant design and operation.

IAEA Safety Standard Safety Guide No. NS-G-2.12 Section 3

3.7 Appropriate measure should be taken or design features should be introduced in the design stage to facilitate effective ageing management throughout the lifetime of the plant...

3.8 In the design: All potential ageing mechanisms for passive and active SSCs should be identified, evaluated and taken in account.

IAEA Safety Standard Safety Guide No. NS-G-2.12 Section 6.4

Requirements for modifications of existing plant programmes and development of any new programmes should be identified and implemented.

IAEA Safety Reports Series No. 57 Section 7.

Documentation supporting LTO includes:
(g) Revisions to existing plant programmes and procedures, and any new plant programmes identified as being required to support safe LTO

IAEA Safety Reports Series No. 57 Section 5.4.
A proper LTO assessment demonstrates whether the effects of ageing will be adequately managed...."

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 11/05/2012

3.1 – FACTS:

F1) Inconsistencies were noted with respect to practices and approvals required for parts substitutions during discussions with counterparts. Some examples are noted below. It should be noted that there may be a human performance element at work in some examples, however the existence of procedural ambiguity is a potential contributor and may in fact have been the cause of the HP error(s):

- Substitution of a pressure indicator (PI) by Maintenance with a different make/model on non-safety related system without following small modification process;
- Description by counterpart of case where Maintenance organization replaced a ventilation system fan with a heavier model without following a modification process;
- Indication by counterpart that examples of software version changes and/or setpoint changes have entered the plant without modification process having been followed (especially for non-safety related equipment).

F2) Temporary modification process used by the station is not considered part of the plant configuration management programme (is wholly owned by Operations without formal design oversight).

F3) There is no link between the modification processes and revisions to key station programmes such as ageing management (e.g. Modification Planning Checklist PO-N13-30 does not contain linkages).

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) Perform review, revision, and roll out of the plant modification processes ensuring the following:

- Clear instructions exist for clarifying boundaries between parts substitutions, small modifications, temporary modifications, and large modification;
- Appropriate design oversight is applied to parts substitutions and modifications (including temporary modifications) to ensure station design requirements, codes, standards, and programme requirements are met;
- Modification processes ensure that required revisions to the plant ageing management and other key site programmes are assessed and implemented.

3.4 – DOCUMENTS REVIEWED:

- Mod Checklist PO-N13-30;
- Small Mod Procedure PO-N13-26;
- Typical Modification Plan WP # WP-30-1737;
- Modification Implementation Procedure PU-N13-05 ;
- Work package for PI replacement (supplied by Mtce Mgr).

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

R1) The plant is currently working on the definition and implementation of a new modification process which addresses the recommendation R1 as well as other topics from the 2-yearly safety evaluations. This new modification process clearly distinguishes between identical part substitutions (1), small modifications including non-identical part substitutions (2), and large modifications (3). Temporary modifications will be reviewed at a regular basis, and may result in a small or large modification (2) or (3).

All new work entries will be reviewed by the New Work Review Team. If a work entry is marked as "WZ" (modification; i.e. not related to identical part substitutions), the configuration management department (KTC) will review the work, and decide what modification process should be followed.

The process for handling "identical part substitutions" (1) will not change (HP-N12). The work flow of the "work file" ("werkmap" in Dutch) is managed in Asset Suite.

The process for handling small modifications including non-identical part substitutions (2) will be changed (HP-N13). The work is organized by using again "work files" which are managed in Asset Suite. The "work files" will be completed with an additional form to verify possible implications with respect to design objectives/requirements, configuration management, etc., as to justify the technical reasons for the modification.

The process for handling large modifications (3) will not change (HP-N13). However, a checklist to verify possible implications with respect to design objectives/requirements, configuration management, etc. will be introduced. In this way, the author/reviewer of the modification plan will be adverted to possible implications on or effects from key site programmes, such as ageing management. The work flow is managed in Lotus Notes.

Temporary modifications will be reviewed on a regular basis by KTC. If required, KTC and the department in charge will decide how the temporary modification can be resolved by either using the small or large modification process.

As KTC will be involved in all small, large and temporary modifications, KTC can control that

the appropriate modification process is used from the start.

Note: all nuclear safety relevant modifications, and/or complex modifications that have impact on, or need to be reviewed by, several departments, will always be handled according to the process for large modifications.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) The reviewed draft version of procedure for governing of the modification process, PU-N13-05, describes the criteria for determining what shall be treated as a parts substitution, a minor modification and a major modification. Minor modifications are further governed by the reviewed draft version of procedure PO-N13-26. Major modifications are further governed by the reviewed draft version of procedure PO-N13-30. Temporary modifications are governed by the reviewed draft version of procedure PO-N07-53.

F2) The reviewed draft checklist PU-N13-05-001 includes checkpoints which ensure that the plant issues like design requirements, codes, standards, and programme requirements (including ageing management) are taken care of. The checklist does not reach a detail of applicable codes specification. Both the procedures for minor modifications, PO-N13-26, and for major modifications, PO-N13-30, prescribes that the checklist shall be used. However, the IAEA team notes that the procedure for temporary modifications, PO-N07-53, does not prescribes that the checklist shall be used. A consistency in the procedures for all types of modification for using the check list, in this respect, would be desired. The plant states that this will be implemented in the version to be released before April 2014.

F3) All the above draft documents are part of a documentation package that has been issued for review by the last review level (Nuclear Safety Review, dept. RBVC) which is expected to pass only in April 2014 and thereby being released.

5.2 – DOCUMENTS REVIEWED:

- PU-N13-05, version 13, Initiate, beoordeling en realisatie van wijzigingen;
- PO-N13-30, version 8, Wijzigingsplan;
- PO-N13-26, version 6, Opstellen Klein Wijzigingsplan;
- PO-N07-53, version 22, TMB-registratie en lekregistratie;
- KWP-30-1869, version 1, Klein Wijzigingsplan;
- PU-N13-05-001, version 1, Checklist basis ontwerp.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	Issue Number: B – 4
NPP: Borssele	**Unit:** 1
Reviewed Area: Organization and Functions, Configuration/Modification Management	
Issue Title: Practices Surrounding Acceptance of Vendor Engineering Documentation	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

There is no process to formally document acceptance or concurrence of engineering or technical documents completed on behalf of the plant by an external company. Status of such documents within the plant design basis is thus unclear.

2.2 – IAEA BASIS:

IAEA Safety Reports Series No. 57 Section 7 Documentation

The documents are subject to the approval of senior plant management....

IAEA Safety Standard SSR-2.1 Safety of Nuclear Power Plants : Design

2.16. The prime responsibility for safety rests with the person or organization responsible for facilities and activities that give rise to radiation risks (i.e. the operating organization)
2.18. The management system requirements that are placed on this formally designated entity would also apply to the responsible designers. However, the overall responsibility for maintaining the integrity of design of the plant would rest with the formally designated entity, and hence, ultimately, with the operating organization.

IAEA Safety Report No 65. Application of Configuration Management in Nuclear Power Plants

3.2.1 ……The nuclear plant must bear in mind that they are the design authority for all plant modifications, with final responsibility for plant safety and operation, regardless of utilizing outside vendors or contractors. …..

3. ASSESSMENT BY THE IAEA REVIEW TEAM	Date: 11/05/2012

3.1 – FACTS:

F1) There appears to be no process to formally document acceptance or concurrence of engineering or technical documents completed on behalf of the plant by an external company. External engineering support personnel may not have sufficient plant knowledge or experience to perform such work to the required quality level without the involvement of the plant staff. There is evidence that the plant staff members are involved in document reviews but it is unclear at which stages and by which personnel. In the absence of a formal technical acceptance process, the status of documents approved outside of the plant is unclear (may be a design basis document or not etc.)

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) Define a managed process within the plant management system to address processing of technical documents prepared by external companies.

3.4 – DOCUMENTS REVIEWED:

Note: documents below were reviewed. Counterpart has indicated that the plant review process did occur for these LTO related documents. It is not apparent from the documents themselves however who did the review and how this process was implemented.

- AREVA Technical Report PESS-G/2010/en/0110;
- AREVA Technical Report PESS-G/2010/en/0048;
- NRG Conceptual Document LTO "Bewijsvoering" KCB.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

R1) The plant has started the implementation of a process for reviewing and accepting technical documents prepared by external companies in Lotes Notes.

The process will be similar to the process that was implemented for "projects".

The process encompasses the following steps:

1. At receipt of a technical document prepared by an external company that needs to be reviewed and approved by the plant, a new document approval process will be launched in Lotes Notes (usually by the plant client/owner).
2. The plant owner will select the plant people that need to review the report, and may add instructions for the review. Lotes Notes will send a notification to these people.
3. After having received all review comments, the plant owner will evaluate and discuss these comments with the external company that did prepare the document.
4. If the comments result in a revision of the document, the plant owner may decide to have another review (go back to step 2).
5. If the plant owner is satisfied with the content of the (revised) technical document, and all comments have been addressed correctly[*)], the plant owner will initiate the formal approval of the document. The plant owner will select the person who has to approve the document. Lotes Notes will send a notification to that person.
6. After formal approval of the document, the document can be released for (internal) publication, and the original document or a copy will be send to the technical archive.

[*)] It is recommended to collect all comments, the answers from the external company and the final decision regarding the processing of the comments in a separate document that will be added in Lotes Notes.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) The document describing the process for configuration management N13-23-102 has now been revised to also include external documents. External documents are thus handled in the same way as internal documents stipulating a documented review and a separate safety review by the Nuclear Safety Review department RBVC, for documents of safety relevance. Making some spot-checks in the plant documentation database (i.e. for external documents NRG 23319/13. 123461 and NRG-23462/13 123770), the IAEA reviewer verified that the procedure has been followed.

F2) The IAEA team notes that although all external documents now pass a review procedure and after this are approved by the plant, this plant approval cannot be seen on the document itself. For user`s verification, if an external document is approved by the plant, it is necessary to look up this information in the documentation database.

5.2 – DOCUMENTS REVIEWED:

- N13-23-102 revision 5, Configuratievoorschrift;
- NRG 23319/13. 123461 revision 3, MELCOR analysis for the Ringruimte p and T in Building 02 due to LB-LOCA;
- NRG-23462/13 123770, Update fluence calculations for irradiation influence ageing mechanisms relevant to RPV internals – Borssele reactor.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	**Issue Number: C – 1**
NPP: Borssele	**Unit:** 1
Reviewed Area: SAR and existing plant programmes relevant for LTO	
Issue Title: Assessment of active components for LTO	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

The methodology to assess active components for LTO has not been finalized and implemented by the plant.

2.2 – IAEA BASIS:

- IAEA Safety Standards, Specific Safety Requirements, Safety of Nuclear Power Plants: Commissioning and Operation, SSR-2/2;
- IAEA Safety Report No. 57 – Safe LTO on NPPs;
- IAEA NS-G-2-12 – Ageing management for NPPs.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 11/05/2012

3.1 – FACTS:

F1) The plant is developing a methodology for the assessment of active components for the LTO. At present the methodology is available only as a first draft. The draft methodology, in particularly its objective and approach, appears to address the issue. The plan to finalize the draft methodology is ambitious and the associated schedule with respect to LTO application deadline rather tight.

F2) The plant intends to implement the methodology for assessing the active components for the LTO after its finalization. This appears to be even more demanding task than the methodology finalization (considering that the plant will enter LTO at the end of 2013).

F3) The plant intends to implement the equipment reliability work process. The INPO AP913 is considered as a guideline for this activity.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) The plant should finalize the methodology for the assessment of active components for the LTO in line with the LTO B project schedule. SSR-2/2 (4.53-4.54), SSR No.57 (4).

R2) The plant should implement the methodology for the assessment of active components for the LTO before entering the LTO. SSR-2/2 (4.53-4.54), SSR No.57 (4).

S1) INPO AP 913 represents a good international practice; the plant should consider its implementation in close coordination with LTO, in particular considering that the maintenance programme constitutes an essential part of ageing management at the plant.

3.4 – DOCUMENTS REVIEWED:

- Conceptual document LTO "bewijswoering" KCB, NRG-22701/10.103460, 2011;
- Screening of relevant structures, and components in the frame of the KCB LTO process, NTCM-G/2009/en/0144, Rev.B, 2011;
- Draft Detailed screening of relevant mechanical structures and components in the frame of the KCB LTO process, PESS-G/2011/en/0147 Rev.A, 2012;

- Draft report Assessment of active components with regards to LTO. No number yet.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

R1) The methodology for the assessment of active components for the LTO was finalized in line with the LTO-B project schedule and submitted to the regulatory authorities for review and approval. The methodology for the assessment of active components with regard to Long-Term Operation was described in the following the plant documents:

- KTE/RBn/Iskyan/R126149 – Methodology Report and Checklist;
- KTE/RBn/xJdKo/R126146 – Scope verification and categorization.

The Methodology report and Checklist and the Scope verification and categorization reports as indicated in Fact F1 were finalized in August 2012 and formed the basis for the implementation of the methodology for the assessment of active components as described in Fact F2.

R2) The assessment of active components was conducted in accordance with the above mentioned methodology and checklist and submitted to the regulatory authorities for review and approval in line with the LTO-B project schedule. The results were reported in the following documents:

- KTE/RBn/xJdKo/R126176 – Response Document;
- KTE/RBn/Iskyan/R126224 – Evaluation and Conclusions.

These reports formed the implementation of the assessment of active components as indicated in Fact F2. They were finalized in November 2012 and February 2013 respectively. The main conclusion from the assessment was that the existing surveillance and maintenance programmes are adequate for managing the ageing of the in-scope active components during LTO, and that these programmes would be in compliance with the requirements from the Maintenance Rule. Some of the efficiency improvements that would affect the plant surveillance strategy have already been accepted by the plant's safety committee (RBVC) and implemented in the updated Surveillance strategy document (STRAT-SURV).

S1) A multi-disciplinary work team, consisting of members from the Maintenance organization, Production department and the Engineering department, is assigned to implement a Reliability Engineering (RE) process. So far, this team investigated the AP-913 process and defined an RE process for the plant organization. Gaps are analyzed and an implementation plan is to be prepared at this moment. For more information about the implementation of the Reliability Engineering procedure at the plant and the continuous improvement of its PM programme, reference is made to issue sheet F2.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) The documents [1-4] were developed, meet the intent of the recommendations R1 and R2. The "Methodology Report and Checklist" describe the approach to assessing the maintenance rule, ageing, maintenance and testing of active components. Additionally, checklists for the

maintenance and ageing of components are included. The report S"cope verification and categorization" identifies all active components from the "Detailed Screening" report, verifies this scope against requirements that could be applicable in an assessment against the maintenance rule and categorizes the components in categories that can be evaluated in accordance with US requirements. The "Response Document" presents the evidence, which is used to assess the maintenance and IST programmes. Acceptability is determined by comparing the evidence with the criteria that ensure component reliability and that comply with relevant test codes, requirements, and/or good engineering practices. The "Evaluation and Conclusions" evaluates ageing management in the form of preventive maintenance and performance monitoring in the form of in-service testing (surveillance). The regulatory body reviewed these documents.

F2) The document [4] identifies a number of specific and general opportunities for improvement (SOFI, GOFI). The plant established a schedule for implementing the SOFIs and GOFIs identified.

F3) The documents [1-4] were reviewed by GRS [5], resulting in a number of comments and recommendations, and providing similar conclusion as given in F2 above.

F4) The implementation of SOFIs and GOFIs identified and of the GRS comments and recommendations is scheduled for completion in October 2014. The schedule for implementation of SOFIs and GOFIs was discussed with the regulatory body.

F5) The "Surveillance Strategy" document was revised to include the efficiency improvements resulting from the assessment performed in the surveillance programme.

F6) The implementation of the reliability engineering process is underway. It was included in the "House of Quality" as an object and its owner assigned (already in 2012). In 2013, a multi-disciplinary work team was established to implement the reliability engineering process in line with the project plan KT/WRvC/WRvC/N137179 "Plan of action for the Implementation of a Reliability Engineering process". The INPO AP-913 ER process description is used as a guideline.

5.2 – DOCUMENTS REVIEWED:

- KTE/RBn/Iskyan/R126149 – Methodology Report and Checklist [1];
- KTE/RBn/xJdKo/R126146 – Scope verification and categorization [2];
- KTE/RBn/xJdKo/R126176 – Response Document [3] ;
- KTE/RBn/Iskyan/R126224 – Evaluation and Conclusions [4];
- EZ-WP2-T12, GRS review report: Assessment of active components of KCB with regard to Long-Term Operation [5];
- STRAT-SURV, vers. 11. Surveillance Strategy [6] ;
- KT/WRvC/WRvC/N137179: 'Plan of action for the Implementation of a Reliability Engineering process' [7].

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	Issue Number: C – 2
NPP: Borssele	**Unit:** 1
Reviewed Area: SAR and existing plant programmes relevant for LTO	
Issue Title: Scoping and Screening for LTO	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

The scoping methodology appears incomplete with respect to the criteria provided in the IAEA recommendations, in particular with respect to electrical and I&C, and civil items. The conceptual document NRG-22701/10.103460 developed does not describe the scoping and screening process correctly.

2.2 – IAEA BASIS:

- IAEA Safety Standards, Specific Safety Requirements, Safety of Nuclear Power Plants: Commissioning and Operation, SSR-2/2;
- IAEA Safety Report No. 57 – Safe LTO on NPPs;
- IAEA NS-G-2-12 – Ageing management for NPPs.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	Date: 11/05/2012

3.1 – FACTS:

F1) The scoping procedure does not describe the approach used for scoping of civil components and structures but provides only a table of buildings scoped in without any explanation. It is not indicated in the text describing scoping of SSCs, if e.g. the table includes all plant buildings and no reference is made to Ref [4] of the scoping report NEPS-G/2008/en/0056, Rev.B that deals with the subject.

F2) The results of the scoping for electrical and I&C items provided in the Appendix 2 of the report appear incomplete. Only items in class 1E and 1A appear to be considered. For example, process computers are not considered in the scoping report NEPS-G/2008/en/0056, Rev.B, steam generator level control is not included in the scope in the scoping report NEPS-G/2008/en/0056, Rev.B, even though it should be as per item S3i.

F3) It appears that the scoping and screening is based rather on safety classification methodology than on dedicated scoping criteria developed for LTO assessment for the electrical and I&C SSCs.

F4) The report does not provide conclusions stating that the scoping criteria used provide for equivalent scope as outlined in the IAEA SRS No.57, i.e. the basic safety functions, non-safety related SSCs failure of which may impact on the basic safety function, and SSCs that are

credited in safety analysis to mitigate certain type of events, and, justifying differences if applicable.

F5) The conceptual document NRG-22701/10.103460 does not incorporate the draft report "Detailed screening of relevant mechanical structures and components in the frame of the KCB LTO process", PESS-G/2011/en/0147 Rev.A in the description of the LTO process.

F6) The report "Screening of relevant structures, and components in the frame of the KCB LTO process", NTCM-G/2009/en/0144, Rev.B deals, in the sense of the IAEA SRS No.57, with scoping rather than with screening. The actual screening as per the IAEA SRS No.57 IAEA is described in the draft report on "Detailed Screening ...", PESS-G/2011/en/0147 Rev.A that deals with both passive and active mechanical components.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) The scoping report should be revised to address comments C1 through C4.

R2) The conceptual document NRG-22701/10.103460 should be revised and include actual information on the LTO process, such as the report "Detailed screening...". In this connection the plant may also consider clarifying the scoping and screening reports titles in line with the IAEA recommendations, (SRS No.57, Section 4).

3.4 – DOCUMENTS REVIEWED:

- Conceptual document LTO "bewijsvoering" KCB, NRG-22701/10.103460, 2011;
- Definition of the scope of KCB systems, structures, and components to be taken into consideration for the LTO process, NEPS-G/2008/en/0056, Rev.B, 2011;
- Screening of relevant structures, and components in the frame of the KCB LTO process, NTCM-G/2009/en/0144, Rev.B, 2011;
- Draft Detailed screening of relevant mechanical structures and components in the frame of the KCB LTO process, PESS-G/2011/en/0147 Rev.A, 2012;
- Ageing management review to support LTO for KCB steam generators, PESS-G/2010/en/0044 Rev. A, 2011;
- AMR Methodology report, PESS-G/2010/en/0041 Rev. A, 2011.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

R1) The scoping and screening effort for determining the LTO-B scope for ageing management review, TLAA revalidation and active component assessment was duplicated in the newly developed procedure for ageing management (PU-N12-50). The original scoping report will thus not be revised, but a similar report is being prepared for the ageing management procedure. This new report (PU-N12-50-201) is in the plant controlled documentation system (see issue sheet B2). Facts F1 through F4 were addressed in the following manner:

F1) Scoping of civil structures is explained better in the PU-N12-50-201 scoping document for the ageing management procedure. A link with the safety classification document is also

provided as a means of verification of the followed procedure.

F2) The tables for "mechanical" and "electrical and I&C" were combined in the PU-N12-50-201 scoping document. This prevents miscommunication and double work, and provides a means of verification between different scoping methodologies. 0E systems that were scoped out in the LTO-B project (i.e., not visible) thus became visible again.

F3) Scoping of the electrical and I&C systems became more transparent by combining its scoping table with the mechanical scoping table. The result of the scoping effort may have seemed based more on the safety classification than on the scoping procedure. The scoping procedure was based on IAEA draft safety guide DS367, the plant specific safety functions and AREVA experience. LTO-B scoping document NEPS-G/2008/en/0056, Rev.B therefore states that deviations with the current safety classification may occur, but there shouldn't be too many differences because DS-367 is a draft guide for safety classification.

F4) Scoping report PU-N12-50-102 provides more attention to conclusions stating that the scoping criteria provide, i.e. the basic safety functions, non-safety related SSCs, failure of which may impact the basic safety function, and SSCs that are credited in safety analysis to mitigate certain types of events. This was also necessary for being able to differentiate the ageing management procedure from procedures such as reliability engineering.

R2) The conceptual document was a guidance document, explaining the concept of the LTO-B project and its role in the license change application process. It served its purpose and the actual project may have deviated slightly in its deliverables. That was not in conflict with the concept as described in the high-level conceptual document. The results of the project were then used as the basis for the plant Ageing Management procedure (PU-N12-50) and recommendation R2) was considered in the relevant new scoping and screening documents.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) The overview of the identification of SSCs in scope of the LTO assessment is provided in the "Summary Report Ageing Management Review" NRG-22503/11.109273 that refers to original scoping procedure (NEPS-G/2008/en/0056, Rev.B) and screening procedure (NTCM-G/2009/en/0144, Rev.B), but not to the detailed screening procedure (PESS-G/2011/en/0147 Rev.A, 2012), which was developed shortly before publication of NRG-22503/11.109273.

F2) The scoping table was revised and contains mechanical, electrical and I&C systems. The table includes also those systems that are out of the scope of the LTO assessment and indicates the scoping criteria (method used).

F3) The report PU-N12-50-201 ("sub-document" of the AM procedure PU-N12-50) providing detailed description of the scoping methodology used, which will also include as a main input the scoping table mentioned in F2 above, remains to be developed (the text part) and has to include also a description of the methodology used for scoping of civil structures and the results of its application.

F4) Marked-up P&IDs for the whole plant were developed and form a substantial technical basis of the plant report PU-N12-50-204 (text part to be developed, "sub-document" of the AM procedure PU-N12-50).

F5) Information that was provided in the detailed screening procedure (PESS-G/2011/en/0147 Rev.A, 2012) is neither referenced in the "Summary Report Ageing Management Review" nor described in a dedicated plant document (e.g. a "sub-document" of the AM procedure PU-N12-50) yet.

5.2 – DOCUMENTS REVIEWED:

- NRG-22503/11.109273. Summary Report Ageing Management Review;
- PU-N12-50-201 Scoping Procedure, Criteria and Results;
- PU-N12-50-204 Scoping document – coloured P&IDs;
- PU-N12-50 AM General Procedure.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	**Issue Number: D – 1**
NPP: Borssele	**Unit:** 1
Reviewed Area: Review of ageing management programmes and related TLAAs for mechanical SCs	
Issue Title: Implementation issues in applying the attributes of an effective ageing management programme	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

The plant has only a limited number of ageing management programmes identified. The remaining ageing programmes are implemented within the normal plant operational structure. This implementation method provides opportunities for errors of omission to be introduced through multiple responsible individuals/organizations.

2.2 – IAEA BASIS:

NS-G-2.12- Reference paragraphs noted below.

4.26 The results of ageing management review should be documented in a report. Application of recommendations should be provided in review of operation, maintenance and design.

4.35 The operating organization should be made responsible for implementing ageing management programmes.

4.37 Implementation should include periodic reporting on the performance of structures.

4.38 Appropriate data should be collected and recorded to provide a basis for decisions on the type and timing of ageing management actions.

4.39 The life of equipment should be reassessed during its lifetime with account taken of the progress in knowledge.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 11/05/2012

3.1 – FACTS:

F1) The plant has only a limited number of ageing management programmes identified. The remaining ageing programmes are implemented within the normal plant operational structure. In checking the effectiveness of this structure a sample FAC mechanism and location were identified to evaluate the effectiveness of the process. For the purpose of this review, the feedwater nozzle and pipe were selected. Reference 1 below (Ageing Management Review) indentified FAC as an ageing mechanism for these locations. This mechanism and location were also confirmed within Ref. 2. Thus with the mechanism identified, the plant staff was asked to provide a history of inspections with the corresponding results including baseline inspections, and on-going trending. This item was identified early in the assessment of ageing management implementation. No document was provided until that summarized the assessment status such that another implementation activity could be chosen. The tracking of implementation could not be demonstrated for this mechanism. Late in the review through discussion with plant staff it was determined that this programme is an open item that will be determined later. The staff provided verbal discussion that it had concluded based upon chemistry control FAC inspection was not necessary previously, but would be dealt with in LTO. No open item list was available for review to show the tracking of the open item. This shows a lack of systematic assessment of the implementation of required inspections.

F2) Follow-up on finding C-2 from 2009.

The 2009 SALTO review had identified a similar issue with identification of ageing mechanisms and then the required inspection that was not implemented. In the 2009 instance a basis was provided to justify not requiring the inspection. The elimination of the inspection was continued during the LTO in document 1 for the reactor support. Since this was previously identified in 2009 SALTO some effort to resolve should have been documented.

Quote from the 2009 SALTO Issue follows "Consideration should be given by the plant to thoroughly determine significance of possible ageing degradation for the RPV support. Justification of the determination should be described in the AMR report. This suggestion should be applied to SCs which cannot be directly inspected."

For the current SALTO review a follow-up review of past issues was conducted by review of the programme documents. The ageing management review, ref. 1 (6.7.1.2) identifies Boric Acid Corrosion as a relevant ageing mechanism for surfaces of the primary RPV support. In ref. 1 (6.1) Concrete shrinkage is identified as a relevant mechanism for the primary supports.

Ref. 1, (7.2.2) Notes that an inspection was performed in 1993 showed that no unequal expansion had taken place.

Ref. 1 (8.2.1) States for loss of clearance, It is also recommended to check the clearance of

primary component support guides and whip restraints during cold and operating conditions. Later in the paragraph it notes that the inspection is extremely difficult due to inaccessibility and high dose rate. It states that checking of clearances in not recommended.

Reference 2 reflects the elimination of the RPV support inspection. The summary table for RPV list the support block welds, but does not include the clearance check or does not list Boric acid corrosion inspection.

It light of the twenty year period since the last inspection and the improved inspection tools and methods, this elimination of inspection of the clearance inspection should be re-evaluated. The basis for elimination of the inspection as documented is weak and shows a lack of questioning attitude and a willingness to accept writing off a critical inspection without consideration of alternate means of accomplishing the task. In addition the inspection for boric acid corrosion that was identified in the ageing management review for the component seems to have been lost in the process. This inspection should be listed as an ageing mechanism for the reactor support.

There appears to be a weakness in the plant process from the identification of an applicable degradation mechanism to the implementation of the appropriate ageing management inspections and may be susceptible to missing required inspections, trending, and documentation.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) A formal procedure should be followed to assess and modify ageing management programme changes from the evaluation to the impact on the plant components.

R2) A review should be conducted to determine if other identified ageing mechanisms from the ageing management review have been removed from evaluation or been missed in implementation.

S1) The plant equipment database should have ageing management programmes/mechanisms identified and tracked for required inspections.

3.4 – DOCUMENTS REVIEWED:

- PESS-G/2010/en/0044, Ageing management review to support LTO for KCB steam generators, Rev A, 07.10.2011;
- NRG-22503/11.109273, Draft Summary report ageing management review, April 2012;
- Plant staff written summary of response to request for applicable programme data.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

R1) The plant developed an ageing management procedure (PU-N12-50) that, in cooperation with the existing procedure for the identification and evaluation of possibly relevant developments/occurrences with regard to ageing at the plant or in the world, ensures that any ageing management programme changes are properly traced, coordinated and documented. The procedure is based on a "Plan-Do-Check-Act" approach. The procedure for Ageing

Management is controlled by a strategy document, the handbook HB-N12-001A. Purposes and requirements are documented in this handbook, fed by legislatory and regulatory requirements and plant goals and targets. For a further description of the formal ageing management procedure, reference is made to issue sheet B2.

R2) The ageing management procedure PU-N12-50 was developed to improve traceability and coordination of ageing management activities, based on the outcome of the ageing management review in the LTO-B project. The specific goal of the procedure is to capture the activities as identified during the ageing management review. In effect, this means that during the compilation of the ageing management strategy documents for the main components in the scope of the AMR, the AMR documents were reviewed again to ensure that no omissions were made in the identification of ageing mechanisms and the appropriate activities to manage them.

The facts as presented under F1 and F2 in this issue sheet may be further discussed to illustrate the improvements made with implementing the ageing management procedure PU-N12-50.

F1) The history of inspections for the feedwater pipe and nozzle was requested, but the plant staff was unable to comply with this request. However, in the existing FAC programme 102 locations are identified for the main and emergency feedwater system (RL-system) alone, with inspection intervals ranging between once-off inspections, 4, 5, 8 and 12 yearly inspection intervals. All these inspections are traceable. This issue may be an indication of the difficulty that the plant personnel faced to provide traceable information. This situation was resolved by the implementation of the ageing management procedure. Document nr PU-N12-50-460 provides relevant activities in the FAC AMP.

The identified location of the feedwater nozzle on the steam generator was identified in the AMR report as having a low priority that should be evaluated in the scope of a FAC screening analysis. The low priority of this location was confirmed by operational experience, when the feedwater line connecting to this nozzle was replaced in 1997 as part of the LBB qualification of this system. No evidence of the FAC mechanism occurring was experienced at this location. The evaluation of the feedwater nozzle was selected as an appropriate case study for the implementation of the COMSY FAC analysis software, which is being prepared during 2013. Obviously, no further inspection history for this location is available.

F2) The issues that are identified in F2) may be discussed during the follow-up mission.

BAC related activities are not neglected, as this fact summary seems to indicate. On the contrary, the AMR report that is referred to (ref 1) concludes that although BAC is a relevant ageing mechanism for the RPV outer surfaces, the activities as implemented at the plant are regarded as adequate to manage this mechanism. The AMR on the primary component supports (PESS-G/2010/en/0044) also reflects this conclusion according to the following text: “Therefore, it can be concluded that boric acid corrosion is adequately managed for in-scope components and subcomponents during LTO through implementation of the “Management of Boric Acid Corrosion” at the plant. Therefore, no further actions are necessary to mitigate Boric Acid Corrosion during LTO”. This means that current activities suffice. This position is also reflected in the summary report (ref 2).

Again, to eliminate the illusion that no BAC related ageing management activities would be required, the new ageing management procedure PU-N12-50 provides an ageing management plan for BAC (PU-N12-50-461), where all BAC related activities have been identified for improved traceability and coordination.

S1) Ageing management related activities are currently flagged in the enterprise asset and work

management system "Asset Suite" as ageing management related.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) "Handbook of Ageing Management" HB-N12-2 is a document which is a top level document for ageing management. It addresses conceptual, technological and physical ageing for all safety SCs. AP-913 will be implemented to address ageing of active components.

F2) A new "Ageing Management Procedure" PU-N12-50 was prepared to address passive long-lived SCs important for nuclear safety and their potential degradation mechanisms and ageing effects. Other safety SCs were reviewed for LTO but they will be continuously reviewed by different procedures (e.g. AP 913).

F3) Nine attributes of appropriate AMP are not defined in "Ageing Management Procedure" PU-N12-50 for a proper development of particular AMPs but there is an intention to use those attributes for AMP`s development as was demonstrated on pilot AMP.

F4) A complete review of the ageing management process, as defined in PU-N12-50, will be periodically repeated once per three years. If needed, some portions will be updated more frequently.

F5) "Ageing Management Strategy" documents for mechanical components - group A are developed but some are still in a draft version. "Ageing Management Strategy" documents for mechanical components - group B, electrical and I&C components and commodity groups are planned to be done in 2014 (in total 17 documents).

F6) "Ageing Management Strategy" documents for electrical and I&C commodity groups do not reach the component level.

F7) Each "Ageing Management Strategy" document will contain a matrix defining relevant programmes addressing each degradation mechanism or ageing effect.

F8) Ageing management programmes are planned to be a degradation mechanism- or ageing effect-oriented. FAC AMP as a pilot is already prepared and implemented. Other AMPs are in preparation or planned. There will be also some component-oriented AMPs.

F8) AMPs will be described in an IGALL format.

F9) P&IDs are prepared for all safety SCs with colour coding of parts which are in the scope of the AM procedure (PU-N12-50).

F10) COMSY database is used not only for FAC but for all degradation mechanisms. COMSY is only partially implemented now.

F11) The plant enterprise asset and work management system "Asset Suite" contains PMID and PMRQ numbers and identification that particular activities are part of ageing management. PMID and PMRQ numbers are identified also in the relevant AMPs to assure traceability. This approach will be implemented for all AMPs while they are prepared.

F12) Approved AMP on FAC was discussed. It is described in IAEA nine attributes of effective AMP. Through planned implementation of COMSY, trending of wall thickness measurements will be solved, including residual lifetime as well as planning of future

measurements. Using PMID/PMRQ which is a unique work order number, all necessary actions are identified. Component part numbers are identified only on hard copies of isometric drawings. They will be also supplemented to the results of inspections. Acceptance criteria are currently based on engineering judgement. COMSY will calculate residual life time which will be used as a criterion. Operating feedback contains internal and external events and also connection to continuous processes to assure feedback. Quality management attribute is only addressing documentation control but not indicators for evaluation and improvement of AMP and confirmation process that AMP is addressing degradation mechanism and appropriate actions are taken.

5.2 – DOCUMENTS REVIEWED:

- HB-N12-2, Handbook of Ageing Management, version 1 7/1/2014;
- PU-N12-50, Ageing Management Procedure, version 1, 5/6/2013;
- PU-N12-50-460, Ageing Management Programme for FAC, version 1, 9/1/2014.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	**Issue Number: D – 2**
NPP: Borssele	**Unit:** 1
Reviewed Area: Review of ageing management programmes and related TLAAs for mechanical SCs	
Issue Title: Ageing Management Catalogue of Ageing Mechanisms for Mechanical components should include cavitation	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

Localized wall thinning due to cavitation is not identified as a mechanical ageing mechanism. This mechanism has caused localized thinning and through wall leakage near pumps and flow orifices.

2.2 – IAEA BASIS:

NS-G-2.12

4.20 Ageing of structures and components should address materials, stressors, and the

environment, ageing mechanisms of concern, and sites of degradation available, etc for predicting future degradation.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 11/05/2012

3.1 – FACTS:

F1) Cavitation is a local wall thinning mechanism that may occur near throttle valves or pumps. It has caused through wall leaks in cooling systems with carbon steel piping. It may be considered as one type of FAC mechanism in the mechanical ageing review report, reference 1 below.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

S1) Add cavitation to the Ageing management catalogue of ageing mechanisms for mechanical components and screen to determine if there are any susceptible components.

3.4 – DOCUMENTS REVIEWED:

- PTCM-G/2010/en/0043, Catalogue of ageing mechanisms for mechanical components (CAM-MC), Rev A, 04.05.2011;
- NRG-22503/11.109273, Draft Summary report ageing management review, April 2012.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

S1) The „Catalogue of ageing mechanisms for mechanical components“ is an AREVA-NP document. Its ownership is with the plant. This document was transferred into the plant controlled document as part of the controlled set of documents in the ageing management procedure. Its the plant name and number is „Catalogus van verouderingsmechanismen: Mechanische componenten“, PU-N12-50-101, chapter 3.6.4.2. This document is now under the plant document configuration management and subject to regular review and updating to latest insights.

Cavitation is now included as a mechanism in the group of Flow Induced Corrosion mechanisms. Information from the German VGB working group on ageing management is used to describe the mechanism.

Screening identified typical areas where cavitation may occur, e.g. (feed water) pump impeller and housing, orifices, valves, throttles, sudden pipe expansions. A specific component where cavitation is a current active mechanism at the plant is the high pressure reducer in the reactor auxiliary system. Measures are taken to mitigate cavitation by replacing the current valves with units with more throttle stages.

5. FOLLOW-UP ASSESSMENT BY THE IAEA	**Date:** 07/02/2014

REVIEW TEAM	

5.1 – FACTS:

F1) Cavitation was supplemented into a "Catalogue of Ageing Mechanisms for Mechanical Components" as a new degradation mechanism within a group of flow-induced corrosion mechanisms. The "Catalogue" is already valid document but it is still written partially in English and partially in Dutch. It is planned to translate the whole document into Dutch.

F2) Screening of susceptible components was performed with identification of high pressure reducer in a reactor auxiliary system as a susceptible component. A modification of this component has already been completed and operational restrictions were implemented. A final check of modification impact is planned for next outage.

F3) In a current phase of AM implementation, cavitation is controlled through current ageing management team activities and AM database.

F4) In a future, a new AMP devoted to cavitation will be implemented in a PU-N12-50-400 series of mechanical AMPs in accordance with IAEA nine attributes of an effective AMP. This AMP will describe methods of periodical inspections of potential occurrence of cavitation through the plant.

5.2 – DOCUMENTS REVIEWED:

- PU-N12-50-101, Catalogue of ageing mechanisms for mechanical components, version 1, 2013.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	**Issue Number: E – 1**
NPP: Borssele	**Unit:** 1
Reviewed Area: Review of ageing management programmes and related TLAAs for electrical and I&C components	
Issue Title: Plant programmes for ageing management are not documented in a systematic way	
2. ISSUE CLARIFICATION	

2.1 – FUNDAMENTAL OVERALL PROBLEM:

Currently the ageing management for the different commodity groups is described in different maintenance procedures, in order to get the ageing management more auditable specific AMP should be developed for the passive commodity groups.

2.2 – IAEA BASIS:

IAEA NS-G-2.12 "Ageing Management for NPP" 4.31 Development of AMPs
4.31. A specific programme for the ageing management of each structure, component or group of structures and components selected by the screening process should be developed and documented. The ageing management programme should identify: (a) effective and appropriate actions and practices for managing ageing that provide for timely detection and mitigation of ageing effects in the structure or component; and (b) indicators of the effectiveness of the programme. Thus the effectiveness of current practices should be confirmed in light of applicable ageing evaluations and condition assessments. and/or improvements to current practices should be recommended, as appropriate

IAEA NS-G-2.12 "Ageing Management for NPP" 4.35 Implementation of AMP
4.35. The operating organization should be made responsible for implementing ageing management programmes.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 11/05/2012

3.1 – FACTS:

F1) As a result of the scope and screening process reviewed in the reports NTCM-G/2009/en/0144 and NEPS-G/2008/en/0056 seven (7) passive commodity groups have been identified. The report KTE/AdJ/RBn/R106151 justify that all the nine attributes for an effective ageing management are covered by the actual maintenance practices, but no specific written AMPs for these commodity groups are in place.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) Prepare AMPs for the passive commodity groups in line with the nine attributes.

3.4 – DOCUMENTS REVIEWED:

- Counterpart interview;
- KTE/AdJ/RBn/R106151;
- KTE/ADJ/Rnh/R106190.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

R1) To improve the auditability of the ageing management at the plant the ageing management

process is described in procedure PU-N12-50 "Verouderingsbeheer". Within this process the description of the ageing management of the 7 passive electrical commodity groups is to be prepared in 3 documents:

- PU-N12-50-500: "Verouderingsbeheerplan: Elekrische kabel- en draadisolatie" (electrical insulation of cables and wires);
- PU-N12-50-501: "Verouderingsbeheerplan: Elektrische verbindingen" (electrical connectors);
- PU-N12-50-502: "Verouderingsbeheerplan: Constructies in de elektrische installatie" (structural parts of the electrical SCs).

These documents will be written is such a manner that the 9 attributes are easy auditable.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) The AMPs PU-N12-50-500/501/502 identified to solve this issue are not developed at the time of the mission. The plant has not any draft of those AMPs available for review.

F2) The three AMPs proposed for future development PU-N12-50-500 (cables and wires), PU-N12-50-501(electrical connectors and electrical containment cable penetration) PU-N12-50-502 (cable penetration, cabinets/racks and trays) cover the seven commodity groups identified by the plant in the report NTCM-G/2009/en/0144.

F3) According to the strategic AM document PU-N12-50, AMPs to be developed will be in accordance with nine attributes described in NS-G-2.12.

F4) The plant has sufficient information to identify at the component level the scope of all seven commodity groups. The Cable Database includes the whole amount of cables in the scope of LTO, 23593 cables (1E, 1A, 0E). This cable scope is based on assumption that the worst environmental conditions for cables are at the end component. The plant has started the measurement of temperatures on cable trays. The result of those measurements could modify in the future this scope. This Cable Database includes cable code, safety class, insulation and jacket material, start/end component room, dose in the rooms, etc. that helps to define the component level scope.

F5) The plant has identified the ageing mechanism (NTCM-G/2009/en/0144) and AMR (PTLQ-G/2010/en/0038) for all commodity groups, that should be included in the specific AMPs as indicated in the strategy AM document PU-N12-50.

F6) The plant has initiated the development of some work instructions that could be used as a reference in future AMPs. Examples of these work instructions are described in report KTE/AdJ/SAL/R137257 to perform a visual inspection of cables and connectors, initially performed each 5 years; to improve the programme on wires in I&C-cabinets and the development of an inspection programme for construction parts of electrical and I&C components. Report KO/BeB/XJdKo/R122007 describes a programme for inspections of connectors in junction boxes and dose-rate measurements in junction boxes, WNE-LO-002/006 are existing work procedures for visual inspection of wires in the spreader rooms, WNE-LO-003 for laboratory investigation on ageing degradation of spreader wiring. WNE-LO-005 describes an elongation-at-break test of spreader wiring. Another example of an existing work

instruction is WNE-OO-008 that will be improved to document the result of a visual inspection of cables and connectors, which is carried out on occasion of revision of electrical motors.

F7) The plant has a good idea of the content of the AMPs (PU-N12-50-500/501/502), of which the development is part of the broader implementation of Ageing Management (PU-N12-50). The plant has identified IGALL AMPs as a future reference.

F8) The plant has scheduled that these AMPs should be finished before the end of 2014.

5.2 – DOCUMENTS REVIEWED:

- Cable Database (as part of LTOB-AMR component database);
- NTCM-G/2009/en/0144 "Catalog of Ageing Mechanisms for Electrical Components (CAM -Report)";
- PTLQ-G/2010/en/0038 "Ageing Management Review to support LTO of KCB Electrical and I&C SSCs";
- PU-N12-50 "VEROUDERINGSBEHEER";
- KTE/AdJ/SAL/R137257 "bij afdeling KO belegde implementatie van actiepunten uit de LTOB-EQDBA en –AMR-electrical projecten";
- KO/BeB/XJdko/R122007 "maatregelen ter beheersing van de veroudering van klemmenkasten";
- WNE-LO-002 "Visuele inspectie rangeerverdelers (conventioneel/nucleair)";
- WNE-LO-003 "Onderzoek veroudering rangeerdraden (conv/nucl)";
- WNE-LO-005 "Uitvoering wikkelproef rangeerdraden (conv/nucl)";
- WNE-LO-006 "Visuele inspectie rangeerverdelers voorafgaand aan SW (conventioneel/nucleair)";
- WNE-LO-008 "Reviseren motoren".

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	**Issue Number: E – 2**
NPP: Borssele	**Unit:** 1
Reviewed Area: Review of ageing management programmes and related TLAAs for electrical and I&C components	
Issue Title: Establish final Documentation of revalidation analyses.	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

The plant has finished the Revalidation of TLAA analyses, the results of this work are in Aurest Database, and partially in some reports. It is difficult to have a complete picture of the results.

2.2 – IAEA BASIS:

Safety Report Series No. 57 , (6.1.4 Documentation of revalidation)

6.1.4. Documentation of revalidation

The documentation of analysis covers, as a minimum, the following elements as applicable:

(a) Technical terms of reference;

(b) Justification of the computational model used;

(c) Calculation of the stresses, strains and temperature fields;

(d) Calculation of the residual lifetime throughout the intended period of LTO;

(e) Conclusions and recommendation of measures for LTO.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 11/05/2012

3.1 – FACTS:

F1) The Aurest database contains the results of the analyses. The analysis has been projected to the end of the intended period of LTO (2034) as indicated in KTE/AdJ/SAL/R106299 .The Report PTLQ-G/2011/en/0018 describe the components that has a residual lifetime < 5 years. Prior to this time the plant should address the corrective or compensatory measures to take. The Report KTC/MC/FN/R116317 described the list of components that the plant has decided to replace in the next five years. The rest of the components described in the Report PTLQ-G/2011/en/0018, are under study to decide how to proceed. A detailed list of the components that require additional measurements after the revalidation process could help to manage and follow-up the status of these measurements in the LTO period.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

S1) Prepare a report with the results of the revalidation analyses of the LTOB-EQDBA project.

3.4 – DOCUMENTS REVIEWED:

- EQDB;
- NGLE/2004/de/0032,
- NLTQ-G/2009/de/0068;

- NTLQ-G/2009/de/0065;
- Aurest Database;
- KTC/MC/FN/R116317;
- PTLQ-G/2001/en/0018.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

S1) All the results of the revalidation analysis of the LTOB-EQDBA project are reported in document PTCQ-G/2012/de/0133 "Darstellung der mit der AUREST-Datenbank erzielten Ergebnisse bis einschlieβlich Zyklus Nr.38, Identifikation von Handlungsbedarf und Festlegung der weiteren Vorgehensweise".

A procedure for the EQ-process was written: PU-N12-81 "Environmental Qualification ongevalsbestendige componenten". This guarantees the future management of the qualified life of the components and the yearly reporting of it. Report KTE/AdJ/SAL/R126241 "Kwalificatiestatus ongevalsbestendige E&I-componenten t/m SW1012 + status LTOB-EQDBA-project" can be seen as a pilot report.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) The Report PTCQ-G/2012/de/0133 contains the results of the revalidation analyses of the LTOB-EQDBA project. This report was formally approved and signed in December 2012.

F2) Conclusions included in the report PTLQ-G/2001/en/0018, in which were identified the components whose residual life was less than expected for the LTO period, are now detailed in the "Final Revalidation Analyses Report" PTCQ-G/2012/de/0133.

F3) Results of the revalidation analyses include a complete set of information and references for all components included in the LTO scope. These information are a component identification code, radiological dose rate, qualification type, manufacturer, T^a and test radiation conditions, component type, test results, required accident conditions, component room, environment room conditions, considered activation energy and revalidation results.

F4) Information necessary to determine short-lived components due to temperature and/or radiation is included in results.

F5) The plant has developed the procedure PU-N12-81 which describes clearly the process for the analyses revalidation, different databases (OBA Database, Aurest Database) and how to proceed depending on information available. This procedure also includes the responsibility for all steps in the flowchart.

F6) This procedure identifies the input data necessary to keep updated EQ files.

F7) The Report KTE/AdJ/SAL/R106299 includes components whose residual qualified life is ≤ 5 years due to thermal or radiological ageing or which is insufficiently qualified. The report shows the actions taken over these components.

F8) The Report PTCQ-G/2012/de/0133 will be periodically updated and the regulatory body

will be informed every outage about the status of the EQ file.

5.2 – DOCUMENTS REVIEWED:

- Procedure PU-N12-81; "Environmental Qualification ongevalsbestendige componenten";
- Report PTCQ-G/2012/de/0133, „Darstellung der mit der AUREST-Datenbank erzielten Ergebnisse bis einschlielich Zyklus Nr. 38, Identifikation von Handlungsbedarf und Festlegung der weiteren Vorgehensweise";
- Report KTE/AdJ/SAL/R106299; "Methodology, approach and results of the Long Term Operation Bewijsvoering subproject: Qualification of Design Base Accident resistant electrical Equipment";
- Report PTLQ-G/2011/en/0018, "Berechnungsergebnisse der AUREST-Datenbank".

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	**Issue Number: E – 3**
NPP: Borssele	**Unit:** 1
Reviewed Area: Review of ageing management programmes and related TLAAs for electrical and I&C components	
Issue Title: Ageing analyses not always proved to be conservative.	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

The monitoring of the environmental condition, on a regular basis, for SSCs in the scope of the EQ programme is an important input for ageing management in order to secure that the ageing analyses over time stay conservative.

The ageing analyses of cables may not be conservative since the ageing temperature used may be too low. The routing of the cables is not completely known, this makes it difficult to monitor the environment to be used in the analyses.

2.2 – IAEA BASIS:

Safety Report Series No. 57, (6 Revalidation of Safety Analyses that used TLAA.

Safety Report Series No. 57, (5.2 Identification of ageing degradation effects).

5.2. IDENTIFICATION OF AGEING DEGRADATION EFFECTS
There are various techniques used to identify and assess ageing effects. For some SCs, design margins and/or material properties are known and can be reviewed. In such cases, an analysis may be sufficient to demonstrate whether the effects of ageing are …..
For example, the process used to perform an ageing management review of a component or commodity group for a specific environmental stressor is as follows:
(a) Identification of all component or commodity group construction materials that have potential ageing effects when exposed to the environmental stressor.
(b) Determination of the value of the bounding environmental parameter to which the components in the area to be reviewed are exposed.
(c) Estimation of the ageing characteristics of the identified materials within

3. ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 11/05/2012

3.1 – FACTS:

F1) In report KTE/Adj/Rnh/R106190 IAEA Safety Report 57 - Verification of preconditions - Equipment Qualification, it is concluded "Monitoring of the environmental conditions to which the SSCs are exposed is an important input for ageing management." A comprehensive programme to measure temperature and radiation during normal operation have been performed Radiation levels are regularly measured and reported but no routine secure that changed radiation conditions are taken into account in the equipment qualification programme. Temperatures in the plant are also monitored but also in this case no routine secure that changed conditions are taken into account in the equipment qualification programme.

F2) In report PLTQ-G/2010/en/0038 "Ageing management review to support LTO of KCB electrical and I&C systems, structures and components" the methods to evaluate ageing of cables is described, the temperature in the area of the end component is used as ageing temperature also for the cable, although it is not proved that no cables run through areas with higher temperature.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) Implement a programme for monitoring environmental conditions that secure that the temperatures used in the ageing analyses over time stay conservative.

R2) Additional measures should be taken to prevent that ageing analyses of cables are performed with conservative temperature.

3.4 – DOCUMENTS REVIEWED:

- Interview with Counterpart/Areva;
- KTE/Adj/Rnh/R106190;

- PLTQ-G/2010/en/0038.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

R1) To fulfil recommendation R1 a monitoring programme is under development which consist of the following parts:

- The detailed monitoring programme of environmental conditions as it was performed in the period 2007 - 2009 will be repeated in 2022 – 2023. This is halfway the period of LTO. It is suspected that around 25% of the temperature and radiation measurements will be enough to make an effectual analyse of the trend of the environmental conditions.
- The use of the existing room temperature and radiation measurements for trending will be investigated.
- The use of the existing radiation measurements performed by the radiation control department for trending will be investigated.

This monitoring programme is introduced in the ageing management registration process as "Melding REG-13-22" and described in "Informatieformulier VBT-13-001". This is in conformity with procedure PU-N12-19. In future the programme will be further developed in conformity with the ageing management process PU-N12-50.

R2) To fulfil recommendation R2 additional measurements will be performed on cable trays. In the end of November 2013 potential hotspots were located during a plant walk down. At the potential hotspot locations temperature loggers will be installed until the next outage. When the results of the measurements are known it will be investigated if there are cables with the hotspot temperature on the cable tray, instead of at the begin - or end component.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) The drawing 30-W-TL-00377 contains the location of temperature instruments that the plant has decided to use for the environmental monitoring programme. The temperature elements TL004T003, TL036T001, TL036T002, TL036T004, TL036T005, TL036T006, TL036T007, TL036T008, TL036T009 and TL036T010 have been selected as a representative of containment environment conditions. These temperature elements are connected to the computer process.

F2) The plant intends to include in the monitoring programme radiation measurements provided by the radiation control department. The measurement points have not been identified at the time of the mission; the selection of the most usable measurements will be deliberated with specialists of the radiation control department.

F3) The VOB Database contains the registration form Reg-13-022. This register shows actions to be taken to resolve the issue E3 (R1). The database also indicates that actions and the documentation of results of the actions should be reported using the format VBT-13-001

(information form).

F4) The purpose of the information form VBT-13-001 is to develop a work procedure (PU-N12-50-5) to collect and analyse temperature and radiological measurements. The periodicity initially established, bases on counterpart interview, is three months.

F5) The procedure PU-N12-19 establishes the ageing actions important for the plant, and is connected with the procedure PU-N12-50. This connection between the procedures guaranty that the conclusion of the trend analyses should be reflected into the strategy AM document and will be proposed the corrective actions.

F6) The plant also has scheduled to do an additional detailed environment monitoring programme in 2022 -2023, in line with initial monitoring in 2007-2009, to confirm the results obtained in VBT-13-001. A detail of the number of measurements is not defined yet but 25% of the temperature and radiation measurements that were recorded in 2007-2009, will be enough to make effective analyses.

F7) The plant has installed 28 temperature loggers on cable trays inside the containment. The position of these instruments is indicated in a draft drawing provided by counterpart. The location of these loggers is based on a walk down to identify hotspots.

F8) The temperature loggers will be installed since November 2013 till June 2014. The counterpart has shown pictures of the temperature loggers installed.

F9) The recorded temperatures will be analysed and reported by Areva, once that the recorded period finishes (June 2014).

F10) The procedure PU-N12-81 includes VGB/Areva to updated Aurest Generic Data. This procedure ensures that the revalidation analyses for cables will be updated if results of the additional measurements show that the considered begin/end component temperature in the revalidation analyses are not conservative enough.

5.2 – DOCUMENTS REVIEWED:

- 30-W-TL-00377 “PID Nuclear ventilation system”;
- VOB Database;
- PU-N12-19 “Het analyseren en evalueren van verouderingsmeldingen”;
- PU-N12_50 “VEROUDERINGSBEHEER”;
- PU-N12-81 “Environmental Qualification ongevalsbestendige componenten”;
- Installation temperature logger (draft). Work copy without identification.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	Issue Number: F – 1
NPP: Borssele	**Unit:** 1
Reviewed Area: Review of ageing management programmes and related TLAAs for civil structures and components	
Issue Title: Discrepancies Within Civil Ageing Management Review and Degradation Mechanism Project Catalogue	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

Certain discrepancies were noted within the plant degradation mechanism project catalogue PEEC-G/2010/en/0084 and Ageing Management Reviews PEEC-G/2010/en/0083 and PESS-G/2010/en/0048.

2.2 – IAEA BASIS:

IAEA Safety Reports Series No. 57 Section 5.2.

As appropriate, the assessment includes the following activities:

...(b) Identification of the ageing effects potentially affecting the ability of SCs to perform their intended functions.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	Date: 11/05/2012

3.1 – FACTS:

F1) Potential civil structural degradation mechanisms as described in IAEA-EBP-SALTO document (July 2007) are not all included in the plant degradation mechanism project catalogue PEEC-G/2010/en/0084. For example in PEEC-G/2010/en/0084 irradiation is only identified as impacting reinforcing steel but not necessary steel liners. Counterpart acknowledged during site interview that this was a known condition that requires correction.

F2) Spent fuel pool degradations mechanisms for liner appear have not been specifically considered/dispositioned as part of PEEC-G/2010/en/0083. SFP has some particular differences in normal state and usage that other concrete structures at the plant (e.g. is water filled). Counterpart has indicated that this particular structure is not an issue for degradation at the plant, however this should be specifically documented as part of the LTO review.

F3) Report PEEC-G/2010/en/0084 4.3.1.4 indicates that groundwater monitoring is being done that would detect the presence of any future degradation mechanisms (e.g. chloride/sulphate/acid attack) originating from groundwater. It was found however that this was a one-time activity that is not repeated routinely.

F4) Catalogue of civil ageing mechanisms PEEC-G/2010/en/0084 section 4.2 indicates that hot spots may exist within indoor air environments and will be addressed in the Ageing

Management Review PEEC-G/2010/en/0083. The AMR document does not appear to address hot spots. There appears to be no specific room conditions manual, monitoring programme, or records for hotspots outside of general indoor or outdoor temperature ranges.

F5) AMR Document for Steel Containment PESS-G/2010/en/0048 section 5.6.1 documents generic external OPEX with respect to steel containment ageing, however makes no conclusion as to whether this OPEX is applicable to the plant. Section 5.6.2 of the same document indicates that the contractor could not perform a review of worldwide industry OPEX within the frame of the AMR report, but used US GALL report information (NUREG-1801) as applicable. The plant is noted to have access to worldwide OPEX information, and has indicated verbally that they have provided such information to the contractor for inclusion in this report; however the report is not clear on this.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

R1) Perform revision of PEEC-G/2010/en/0084 or otherwise document a complete list of civil structural degradation mechanisms for use in the plant LTO assessments. Perform specific spent fuel pool and security related degradation mechanisms ageing management review in PEEC-G/2010/en/0083 or other suitable document. Review methodology and report to disposition hot spot issue.

S1) Consider implementing regular groundwater monitoring programme or otherwise address implicit assumption that it is being done to detect potential degradation mechanism as per PEEC-G/2010/en/0084 section 4.3.1.4.

3.4 – DOCUMENTS REVIEWED:

- PESS-G/2010/en/0048 AMR for Steel Containment;
- PEEC-G/2010/en/0083 AMR for Structural Scope;
- PEEC-G/2010/en/0084 Catalogue of Ageing Mechanisms for Structural Components (CAM-SC);
- Draft Ageing Management Summary Report NRG-22503/11.109273.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

R1) The issue of irradiation influence on Compressive Strength, Modus of Elasticity and Tensile Strength of concrete has been evaluated for the plant situation based on the fluence calculations for 60 years of operation. This is incorporated in the plant catalogue of ageing mechanisms for structural components (PU-N12-50-103). The irradiation influence on steel liners is addressed in the plant catalogue of ageing mechanisms for mechanical components (PU-N12-50-101) for the material 1.4550 (the plant liner material).

PEEC-G/2010/en/0084 was used as the first revision of the catalogue of ageing mechanisms for structural components (PU-N12-50-103) as part of the Ageing Management procedure.

This catalogue was prepared by specialist engineers from AREVA, as the OEM of the plant. The ageing mechanisms in this catalogue are specific for the plant and not a generic collection

of ageing mechanisms such as intended in the IAEA-EBP-SALTO document. The mechanisms as included in PEEC-G/2010/en/0084 can be regarded as exhaustive for the plant application. Review of this document was conducted by the plant specialists, as well as by specialists (GRS in Germany) that were contracted by our regulator as part of the license change application. No missing mechanisms were identified during either review.

Nevertheless, during the transformation to the plant controlled document, the ageing mechanisms as identified in the PEEC-G/2010/en/0084 document were reviewed against the IAEA-EBP-SALTO. This did not result in additional findings. The evaluation of irradiation influence is added to the plant catalogue of ageing mechanisms for structural components as was discussed during the SALTO mission.

The ageing management strategy document for civil structures that will replace the review as described in ageing management review PEEC-G/2010/en/0083 will specifically list the above issues for tracking purposes. No further activities to address any of these issues are necessary.

Counterpart action for **F2)** The remark under F2 is incorporated in the plant catalogue of ageing mechanisms for structural components (PU-N12-50-103 Chapter 4.4 and 5.4.3.). The irradiation influence on steel liners is addressed in the plant catalogue of ageing mechanisms for mechanical components (PU-N12-50-101) for the material 1.4550 (the plant liner material)

S1) Periodic groundwater monitoring as part of the ageing management activities for the plant civil structures was indeed not part of a regular monitoring programme, although this impression is created in the section of the CAM-SC as indicated above. A once-off measurement of the groundwater quality in the direct vicinity of the relevant building foundations will be performed in January 2014. Based on the results from this measurement, periodic groundwater monitoring activities, scheduled in the Asset Suite work management system and properly documented in the ageing management plan for civil structures will be implemented per September 2014.

Counterpart action for F4): for environmental qualification hot spots for doses and temperatures are addressed in the operation period 2007/2008 and 2008/2009 to establish conservative long term values (NLEC-G/2008/de/0009 Rev. B).

Counterpart action for F5): the plant prepared an ageing management strategy document for the steel containment (PU-N12-50-307). The worldwide OPEX in possession of the plant as part of the existing ageing management OPEX procedure (PU-N12-19) is now included in the Containment ageing management strategy report. However, it should also be taken into account that the design of a S/KWU steel containment is unique and can be inspected from both sides. For the base of the sphere, the general OPEX is valid and taken into account.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) The plant developed a "Catalogue of ageing mechanisms for structural components" PU-N12-50-103, and a "Catalogue of ageing mechanisms for mechanical components" PU-N12-50-101 based on the initial documents. The documents are plant controlled documents, available as drafts at present.

F2) The "Catalogue of ageing mechanisms for structural components" PU-N12-50-103 now

includes additional information regarding the irradiation of concrete relevant for the RPV support structure. The information provided demonstrates that the fluence levels are below the threshold values beyond which mechanical properties changes/deterioration starts to occur.

F3) Regarding the irradiation behaviour of the spent fuel pool liner made of austenitic stainless steel 1.4550, the "Catalogue of ageing mechanisms for structural components" PU-N12-50-103 now refers to the "Catalogue of ageing mechanisms for mechanical components" PU-N12-50-101 which deals with this degradation for RPV internals (which are subject to substantially higher fluence). A justification similar to the case of the RPV support concrete (EOL fluence level, material properties vs. fluence, etc.) is, however, not provided with the same level of detail.

F4) The catalogue referred to above is specific for the plant and include only relevant degradation mechanisms/ageing effects. The catalogues were reviewed for completeness also by GRS.

F5) One-time measurement of the groundwater quality in the direct vicinity of the relevant building foundations was performed in January 2014. Based on the results of this measurement, periodic groundwater monitoring activities scheduled in the Asset Suite work management system and properly documented in the ageing management plan for civil structures, will be implemented before September 2014.

F6) The plant performed the measurement of temperatures and doses over 2 fuel cycles to support EQ for electrical and I&C component. Measurement locations were identified by engineering judgement. Results of those measurements are described in the document NLEC-G/2008/de/0009 Rev. B. There were no hot spots identified for civil and mechanical structures and components. Hot spots which were identified for qualified electrical and I&C components are addressed in Aurest Database.

F7) The plant prepared an "Ageing management strategy document for the steel containment" (PU-N12-50-307) that incorporates the operating experience as per the related plant procedure.

5.2 – DOCUMENTS REVIEWED:

- PU-N12-50-101, Catalogue of ageing mechanisms for mechanical components;
- PU-N12-50-103, Catalogue of ageing mechanisms for structural components;
- NLEC-G/2008/de/0009 Rev. B, Dose and Temperature measurement in KCB for E and I&C. 2009;
- PU-N12-50-307, Ageing management strategy document for the steel containment.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.

1. ISSUE IDENTIFICATION	Issue Number: F – 2
NPP: Borssele	**Unit:** 1
Reviewed Area: Review of ageing management programmes and related TLAAs for civil structures and components	
Issue Title: Lack of Centralized Oversight of System / Component Programmes	

2. ISSUE CLARIFICATION

2.1 – FUNDAMENTAL OVERALL PROBLEM:

There is a lack of centralized oversight for a system or component group (i.e. System Engineer and/or Component Engineer). This hinders the ability to ensure completeness of programmes within a given area.

2.2 – IAEA BASIS:

- IAEA SALTO Guidelines , 3.1.2 Organizational Structure;
- The organization structure in the plant should be set up in respect of LTO programme of NPP;
- IAEA SALTO Guidelines , 3.1.4 Plant Implementation Programme for LTO;
- The programme should integrate all similar long-term issues arising from different types of reviews.

3. ASSESSMENT BY THE IAEA REVIEW TEAM	Date: 11/05/2012

3.1 – FACTS:

F1) Station documents rely on Operations and Management to perform station walkdowns to detect adverse conditions. There is no requirement for engineering walkdowns per system or component groups. Dependence on Operations and plant management for surveillance without a formal engineering walkdown programme is not per best international practises. An operator walkdown will tend to focus on a specific plant region, while engineering walkdowns will tend to review individual systems or components groups throughout the entire plant.

F2) Site organization charts and discussions with counterparts indicate that there is no central engineering oversight function in place on a system or component group basis that is reviewing performance trends, maintenance trends, ageing programme implementation etc. of a given system or component grouping. Although many of the aspects of good programmes were in place at a detailed level, the lack of a single point of contact or focal point can lead to omissions or gaps in programmes, and a lack of awareness of trends.

F3) Maintenance trending was observed to be evident for some issues relevant to the ageing programme, especially with respect to work order backlogs and the work management process. The trend report reviewed was not granular to a system or component group specific level, and the Maintenance Counterpart indicated that is has not yet been developed to the point where it

can be benchmarked against other utilities.
The Counterpart has indicated that the plant is considering implementing the INPO AP-913 process for equipment reliability. Discussions have been held at a management level in March 2012 with further discussions to follow in June. That process requires among other things dedicated system and component performance monitoring.

F4) From area "A" (Management, Organization, and Administration), the WANO peer Review in 2008 concluded that plant management does not ensure that site events, low level events and adverse trends are rigorously identified, analysed and corrected. The stream analysis performed in the same year concluded that this area for improvement is almost a "driver", meaning that focusing on resolving this area the plant will also resolve several other areas for improvement which are symptomatic. The WANO Peer Review Follow-up in 2008 concluded that in this problem has not received the appropriate level of priority. Having System and Component Engineers would enhance capability for trending and analysis.

3.2 – SAFETY CONSEQUENCE:

n.a.

3.3 – RECOMMENDATION/SUGGESTION:

S1) Consider expediting implementation of AP-913 or similar process at the plant for equipment, component, and programme surveillance.

S2) Further develop current metrics for maintenance oversight to allow for benchmarking other utilities/plants.

3.4 – DOCUMENTS REVIEWED:

- Organization chart "Organogram EPZ";
- Draft Maintenance Trend Report, March 2012 KO/SCHOO/LKL/R122067;
- Draft Ageing Management Summary Report NRG-22503/11.109273;
- PU-N07-02 Plant Walkdowns.

4. COUNTERPART ACTIONS	**Date:** 20/12/2013

S1) Based on the mission, vision, and performance areas of the organization, key focus areas are defined in the "House of Quality" for the station's coming years. In these areas, performance improvement will be realized by improving processes, projects, organizational units etc.

In this respect, the implementation of a Reliability Engineering (RE) process is considered. It is identified as an important object to improve the key areas Nuclear Safety, Focus on the Daily Operation, Production (Availability), Covenant, Technical life (system health) and Continuous Improvement.

A multi-disciplinary work team is assigned to implement a Reliability Engineering (RE) process. The project goal is defined in the project plan KT/WRvC/WRvC/N137179: 'Implement a Reliability Engineering process at maturity level 4 before 2014 outage'.

The INPO AP-913 ER process description is used as a guideline. The 'spirit' of the AP-913 process is understood to develop a Reliability Engineering process for the plant organization. Key aspects in this process to focus on are: Identification of critical components, the centralized role of system engineering, the relation with the Ageing Management process, documentation of PM basis, application of software tooling, and the format of health reporting. Specific recommendations on these aspects to plant management are in preparation.

In close relation to the RE process implementation, a Preventive Maintenance (PM) optimisation project is initiated by the maintenance department. The main goal for this project is to take –besides nuclear safety- all relevant business goals into account in the determination of the PM programme, see project plan KO/BEB/BEB/R132224.

The scoping of the project, the strategic approach towards the definition of the PM programme and the software application to be used in the project are relevant for the RE process to be implemented as well.

The PM project is to be started in the first quarter of 2014.

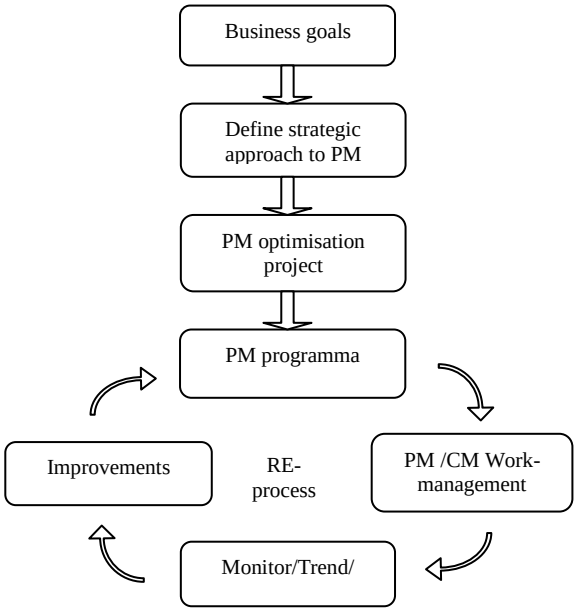


Figure: The relation between PM optimisation project and RE process

S2) At the plant an indicator display tool is used for periodic indicator evaluation. All key areas are evaluated by a set of performance indicators (PI's). In the areas nuclear safety, covenant (25%) and operational focus, PI's related to maintenance and reliability are defined.

Indicators such as #failures with impact on TCDF, #failures of Tech spec components, #failures on critical components, unavailability of safety systems and backlog numbers are calculated on monthly basis.

Part of these PI's are reported to WANO. They could also be used for benchmarking other utilities.

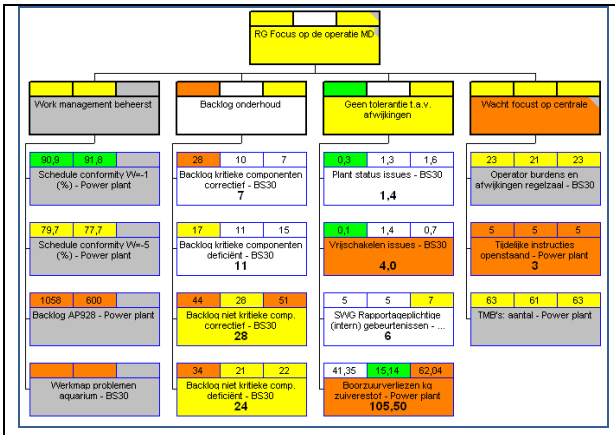


Figure: Example of Indicator Display

On a more detailed level, Maintenance trend reports are improved for trending and evaluation purposes. MTS reports are related to the Asset Suite (Workorder management) database.

The Maintenance trend system consists of three types of reports: Bad actors, trends and distributions. Bad actors are e.g. systems or components with the most failures or the longest repair times. Trend reports show the development of the #failures on critical components over a given period. Distributions are made on workordertype (PM, CM), failure cause and detection method.

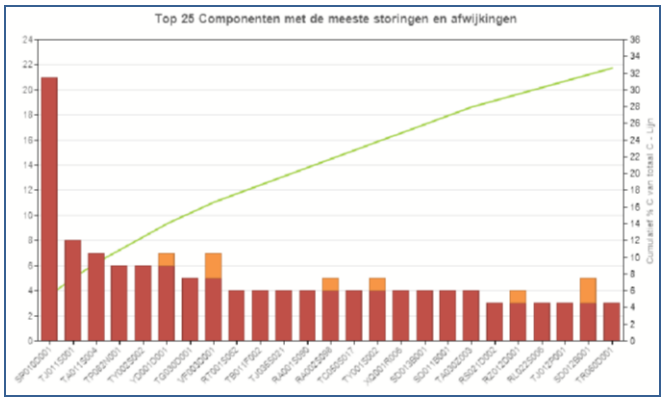


Figure: Example of MTS report

The MTS reports provide the possibility for dedicated system- and component performance monitoring. The goal is to improve reliability by eliminating the bad actors.

5. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM	**Date:** 07/02/2014

5.1 – FACTS:

F1) The implementation of the reliability engineering process was considered by the plant and based on the plant management decision its implementation is underway. It was included in the "House of Quality" as its object and its owner assigned (already in 2012). In 2013 a multi-disciplinary work team was established to implement the reliability engineering process in line with the project plan KT/WRvC/WRvC/N137179 "Implement a Reliability Engineering process at maturity level 4 before 2014 outage". The INPO AP-913 ER process description is used as a

guideline.

F2) The process of categorization of SCs according to INPO AP 913 principles was performed, critical SCs were determined.

F3) In close relation to the reliability engineering process implementation, the maintenance department is initiating a preventive maintenance optimization project.

F4) The plant made an inquiry about possible external organization that could help with INPO AP 913 implementation process and first proposals were delivered.

F5) The possible organization structure changes that could create a position of system engineers group are to be evaluated, but the plant reliability engineering process should still progress sufficiently to be able to decide on this organizational issue.

F6) Indicator Display tool is used for periodic indicator evaluation. All key areas are evaluated by a set of performance indicators (PIs). In the areas Nuclear Safety, Covenant (25%) and Operational Focus, PIs related to maintenance and reliability are defined. Part of these PIs is reported to WANO. They could also be used for benchmarking other utilities.

F7) On a more detailed level, Maintenance Trend System, related to the Asset Suite (work order management) database, has been implemented.

F8) During a practical demonstration for a selected "bad actor", the 8 failures shown to occur within last 12 months were Asset Suite database records on in-service inspection activities (such as wall thickness measurements, installation of scaffolding for inspection, etc.). The system needs to be further improved to facilitate its practical use.

5.2 – DOCUMENTS REVIEWED:

- MTS –Maintenance Training System.

5.3 – RESOLUTION DEGREE:

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

n.a.: not applicable for the present mission.