IAEA Safety Aspects of Long Term Operation SALTO

REPORT

OF THE

SAFETY ASPECTS OF LONG TERM OPERATION (SALTO)

MISSION

TO THE

MIHAMA NUCLEAR POWER PLANT UNIT 3

Mihama, Japan

16 – 25 April 2024

DIVISION OF NUCLEAR INSTALLATION SAFETY
SAFETY ASPECTS OF LONG TERM OPERATION MISSION
IAEA-NSNI/SALTO/57/2024

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PREAMBLE

This report presents the results of the IAEA Safety Aspects of Long Term Operation (SALTO) team review of Mihama Nuclear Power Plant Unit 3, Japan. It includes recommendations and suggestions for improvements affecting ageing management and safe long term operation for consideration by Kansai Electric Power Co. (KEPCO) in Japan and identifies good practices for consideration by other nuclear power plants. Each recommendation, suggestion, and good practice is identified by a unique number to facilitate communication and tracking.

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

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FOREWORD by the

Director General

IAEA Member States give high priority to safe, continuing operation of nuclear power plants (NPPs) beyond their original design life (typically 30 or 40 years) as an alternative to decommissioning. In this respect, long term operation (LTO) is defined as NPP operation beyond an established time frame originally set out in the operating licence, design limits, standards or regulations. LTO is justified by a safety assessment which considers life-limiting processes and features for SSCs.

International peer review is a useful tool for Member States to exchange experiences, learn from each other and apply good practices in different activities carried out throughout the lifetime of NPPs and research reactors, including LTO. The International Atomic Energy Agency (IAEA) supports Member States in enhancing the safety of NPPs and research reactors by providing a peer review service in many areas that affect safety. The Safety Aspects of Long Term Operation (SALTO) peer review service was launched in 2005. It was designed to assist operating organizations in adopting a proper approach to ageing management and preparation for safe LTO of NPPs.

The evaluation of programmes and performance is made based on IAEA Safety Standards and uses combined expertise of the international review team. The review is neither a regulatory inspection nor an audit against national codes and standards. Rather, it is a technical exchange of experience and practices at the working level aimed at strengthening the programmes, procedures and practices implemented at the nuclear installation.

A SALTO peer review for ageing management and preparedness for safe LTO can be carried out at any time during the lifetime of an NPP or research reactor. The SALTO peer review service is beneficial for NPPs and research reactors:

- In the early phase of operation – to support development and implementation of ageing management and other related activities in compliance with latest IAEA Safety Standards;
- During preparation for safe LTO – to review ageing management and preparedness for safe LTO in compliance with latest IAEA Safety Standards;
- During operation in the LTO period – to review ageing management and LTO related activities in compliance with latest IAEA Safety Standards.

The report that follows presents the conclusions of the SALTO team, including good practices and proposals for enhanced operational safety, for consideration by the Member State and its competent authorities.

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EXECUTIVE SUMMARY

At the invitation of Kansai Electric Power Co. (KEPCO) in Japan, the IAEA conducted a SALTO (Safety Aspects of Long Term Operation) mission at Unit 3 of the Mihama Nuclear Power Plant (NPP) from 16 to 25 April 2024.

Mihama NPP Unit 3 (further referred to as 'the plant') has been in operation since 1976. The Japanese Nuclear Regulation Authority (NRA) approved the extension of the operational period of Unit 3 until 2036. KEPCO permanently shut down Unit 1 and Unit 2 of the plant in 2015.

The SALTO mission reviewed the status of activities related to long term operation (LTO) assessment of the plant against IAEA Safety Standards and international best practices. The review team consisted of two IAEA staff members (team leader and deputy team leader), six international experts and three observers from the Czech Republic, Finland, France, Korea, Sweden, the United Kingdom and the USA. The review covered the standard scope of a SALTO mission. The team reviewed the completed, in-progress and planned activities related to LTO, including ageing management of the structures, systems, and components (SSCs) important to safety and revalidation of time limited ageing analyses (TLAAs). Through the review of available documents, presentations, and discussions with counterparts and other members of the plant staff, the IAEA team observed in the field of ageing management and preparedness for safe LTO that most topics are managed as recommended by the IAEA Safety Standards and other topics are planned to be addressed in upcoming years, while some activities are still in progress.

The team found the plant staff to be professional, open and receptive to proposals for improvement. The mission team observed that plant management is committed to improving plant preparedness for LTO. Walkdowns showed the plant is in good condition. In addition, the team noted several good performances. The following are the most important:

- Development of a systematic methodology for identification and management of design obsolescence and plant modifications.
- Use of benchmarking to enhance ageing management of the containment.
- Implementation of an effective mentoring programme using retired staff.

The team recognized that the plant's intention is to consider the IAEA Safety Standards in preparation for safe LTO. The team identified 11 areas for further improvement, the most significant ones are:

- The plant has not developed and implemented a comprehensive LTO programme.
- The plant has not developed and implemented an adequate ageing management review.
- The plant has not developed a complete Equipment Qualification (EQ) Programme for electric, I&C, active mechanical and civil structure components.

A summary of the review was presented to the plant management and the regulatory body representative during the exit meeting held on 25 April 2024. The plant management expressed a determination to address the areas identified for improvement and will consider inviting a SALTO Follow-up Mission to Mihama Nuclear Power Plant Unit 3 in 2026.

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1. INTRODUCTION

1.1. OBJECTIVES

As agreed during the preparatory meeting held on 10 January 2024, this peer review was a 'SALTO Peer Review Mission for Mihama Nuclear Power Plant Unit 3' [19, 20]. The objective was to review the status and future plans for safe LTO programmes and activities performed at the plant against the relevant IAEA Safety Standards, guidance documents and internationally accepted practices and to provide recommendations and suggestions for improvement of the preparations for safe LTO.

1.2. SCOPE

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

A. Organization of ageing management and LTO activities;

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

C. Ageing management of mechanical SSCs;

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

E. Ageing management of civil SSCs;

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

1.3. CONDUCT OF THE MISSION

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

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

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

The list of participants in the mission, including their functions during the SALTO mission and contact information, is given in Section 7.

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

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

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

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

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

A formal exit meeting was held on the last day of the mission. At the exit meeting, all the team members provided short conclusive statements summarizing recommendations, suggestions, encouragements, good practices, and good performances in their reviewed areas.

1.4. SUMMARY INFORMATION ON THE PLANT

1.4.1. General information

The 3-unit plant is owned by KEPCO. Unit 1 and 2 started operation in 1970 and 1972, respectively, and ended their commercial operation in April 2015, which are in decommissioning.

Unit 3 started its commercial operation on 1 December 1976. It underwent a long term outage due to a secondary pipe break event in 2004. The plant resume operation in 2006 and went into shutdown after Fukushima event. In 2015, KEPCO submitted an application to extend operational period of Mihama NPP Unit 3 from 40 to 60 (until November 2036) years. In 2016, the Nuclear Regulation Authority (NRA) of Japan approved the extension. In 2021, Mihama NPP Unit 3 was restarted and commenced its long term operation.

Unit 3 has the following characteristics:

- Status: Operating
- Reactor type: PWR
- Thermal power: 2,440 MWth
- Electric power output (net value): 780 MW(e)
- Number of primary circuit loops: 3
- Pressure in the primary circuit: 15.43 MPa
- Primary circuit inlet temperature: 289 °C
- Primary circuit outlet temperature: 323 °C
- Feed water inlet temperature: 291 °C (max operating temperature)
- Steam temperature from steam generator: 274.2 °C
- Inner diameter of the reactor vessel: 3,950 mm (upper part) 3,988 mm (lower part)
- Enrichment of the fuel: 2.8% ~ 4.6%
- Number of turbines per unit: High Pressure: 1, Low Pressure: 3
- Turbine speed: 1800 rpm

1.4.2. Regulatory framework for LTO

In Japan the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors limits the operation license of nuclear power plants in 40 years. The operation period may be extended up to 20 years only once, based on obtaining the approval of the Nuclear Regulation Authority (NRA). The detailed requirements (Rules on the Installation and Operation of Commercial Power Reactors) require the nuclear operators to periodically evaluate ageing management and to perform the Ageing Management Technical Evaluation of SSCs at the 30th year of operation and then to repeat it every 10 years.

It is also required to submit an application to the Nuclear Regulation Authority for *Approval of Extension of Operating Period*, for which the following should be conducted to ensure SSCs integrity (in compliance with the criteria specified in the technical standards provisions): (1) Special inspections after 35th year of operation, (2) Ageing management technical evaluation and (3) Development of maintenance management policies (as part of the Technical Specifications).

1.4.3. Plant's LTO policy

KEPCO's intention is to operate the plant (Unit 3) until 2036 in compliance with its long term operation license.

2. MAIN CONCLUSIONS

Through the review of available documents, presentations and discussions with counterparts and other members of the plant staff, the IAEA team observed in the field of ageing management and preparedness for safe LTO that most topics are managed as recommended by the IAEA Safety Standards and other topics are planned to be addressed in upcoming years, while some activities are still in progress.

The team found the plant staff to be professional, open and receptive to proposals for improvement. The mission team observed that plant management is committed to improving plant preparedness for LTO. Walk-downs showed the plant is in good condition. In addition, the team noted several good performances. The following are the most important:

- Development of a systematic methodology for identification and management of design obsolescence and plant modifications.
- Use of benchmarking to enhance ageing management of the containment.
- Implementation of an effective mentoring programme using retired staff.

The team recognized that the plant's intention is to consider the IAEA Safety Standards in preparation for safe LTO. There are some areas which should be improved to reach the level of IAEA Safety Standards and international best practices. The team identified 11 issues resulting in either a recommendation or suggestion for improvement:

- Safety Analysis Report (SAR), including the chapter credited for PSR, is not comprehensive. (A-1)
- The plant has not developed and implemented a comprehensive LTO programme. (A-2)
- Oversight and coordination of ageing management activities are not adequate. (A-3)
- The plant has not adequately documented scoping for LTO. (B-1)
- The plant has not completed an evaluation of plant programmes credited for ageing management against the nine attributes of an effective ageing management programme. (B-2)
- The plant has not developed and implemented an adequate ageing management review. (C-1)
- The plant does not adequately analyze and manage relevant data for ageing management. (C-2)
- The plant has not developed a complete Equipment Qualification (EQ) Programme for electric, I&C, active mechanical and civil structure components. (D-1)
- Ageing management activities on civil structures do not address all attributes of an effective AMP. (E-1)
- The plant does not have a comprehensive knowledge management programme. (F-1)
- Analysis of operating experience (OE) and lessons learned from external organisations is not comprehensive. (F-2)

An evaluation of each review area is included in the relevant subsections of Section 3 together with the recommendations and suggestions, while the detailed issue sheets can be found in the Appendix.

The plant management expressed a determination to address the areas identified for improvement and will consider inviting a SALTO Follow-up Mission to Mihama Nuclear Power Plant Unit 3 in 2026.

3. DETAILED CONCLUSIONS FOR REVIEW AREAS

3.1. ORGANIZATION OF AGEING MANAGEMENT AND LTO ACTIVITIES

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

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

Principles and approach to AM and LTO

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

Organizational arrangements for AM and LTO

There is no single design authority of the plant. Design responsibilities are usually assigned to the technical area manager. However, division of responsibilities varies depending on economic and licensing impact, from group manager to Chief Nuclear Officer (CNO). A plant modification in the main control room led to a change in electrical control from analogue to digital signals, which led to an over-speed trip of an emergency diesel generator (EDG). The only performance indicator (PI) available for measuring effectiveness of ageing management activities in the Plant Life Management report (PLM) is based solely on rework (MA2 – 'rework'). Without adequate plant oversight and coordination of ageing management all required aspects may not be developed nor implemented in a timely manner. The team made a **suggestion** in this area (issue A-3).

Periodic Safety Review

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

Programme for LTO

There is no document describing the overall LTO programme. The plant has no firm timeframe for ageing management, that accounts for possible extensions beyond 60 years. Currently the end-of-operation is set to 30th November 2036 (40+20 years), but the recently accepted law allows some qualified extensions to the operation considering the shutdown period occurred post-Fukushima. No special arrangements are made to identify critical resources, because the fleet has not identified new tasks associated with LTO. Without a comprehensive LTO programme, the plant cannot ensure that all necessary activities will be properly implemented to ensure a safe LTO period. The team made a **recommendation** in this area (issue A-2).

Configuration/modification management and design basis documentation

The plant is implementing a systematic methodology for identification and management of design obsolescence and plant modifications, in accordance with new industry guidance. The routine is based on probabilistic risk analysis (PRA) and deterministic analysis, and takes into account human factors evaluation, to identify safety design improvements. Executing the methodology has been found effective to find design obsolescence and has given the plant justification to implement plant modifications, including upgrades to the ECCS automatic switch and the RCP shutdown seals. By using this methodology, the plant has a powerful tool to proactively address obsolescence issues and find safety improvements. The team recognized this as a **good performance**.

Safety Analysis Report

There is a requirement by law that the SAR is submitted to the Nuclear Regulatory Authority (NRA). However, the detailed contents of the SAR, as well as the improvement actions identified in the SAR is based on a voluntary analysis under the responsibility of the operator. Chapter 3.2 of the SAR constitutes the PSR report. The plant did not develop nor submit the SAR chapter 3.2 in the latest submission to the NRA. Not all Current Licensing Basis (CLB) documents are

displayed in SAR chapter 1. The CLB is missing some important safety areas from IAEA standards, such as human factors engineering and decommissioning. Without comprehensive safety analysis report, the plant may not be able to demonstrate safe LTO and miss the opportunities to identify safety improvements for LTO. The team made a **suggestion** in this area (issue A-1).

3.2. SCOPE SETTING, PLANT PROGRAMMES AND CORRECTIVE ACTION PROGRAMME

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

The procedures for scoping are spread over several documents. A list of the SSCs that are in-scope for LTO because they are important to safety and are necessary to fulfil the fundamental safety functions (according to 5.16(a) of SSG-48) is not readily available from the M35 database. A list of the SSCs that are in-scope for LTO because they are SSCs credited in the safety analyses and regulated events (according to 5.16(c) of SSG-48) is not readily available from the M35 database. Without adequate documentation of scoping for LTO, effective ageing management to preserve the safety function of all SSCs important to safety cannot be demonstrated. The team made a **suggestion** in this area (issue B-1).

The plant's identification of SSCs whose failure may prevent SSCs important to safety from performing their intended functions (according to 5.16(b) of SSG-48), so called 'ripple effects', was accomplished using document reviews and plant walkdowns. The procedure for the walkdowns is summarized in a document submitted to the regulator, and the results from the evaluations are provided in that document as well, including sketches of the component arrangement. All of the SSCs whose failure may prevent SSCs important to safety from performing their intended functions were identified as high importance for the Maintenance Programme. The team identified this as a **good performance**.

Maintenance programme

The plant has not documented an evaluation of the maintenance, in-service inspections (ISI), surveillance, and corrective action programmes against the nine attributes of an effective AMP for the intended period of operation. Inspection of fire water piping is limited to visual inspection, which cannot detect cracking or wall loss on the inside diameter of the pipe. Without a complete evaluation of plant programmes credited for ageing management, some needed attributes of an effective programme may be missed and the safety functions of in-scope SSCs could be compromised. The team made a **recommendation** in this area (issue B-2).

In-service inspection programme

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

Surveillance programme

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

Water Chemistry Programme

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

Corrective action programme

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

3.3. AGEING MANAGEMENT OF MECHANICAL SSCS

AMR of mechanical SSCs

Assignment of degradation mechanisms, preventive measures (e.g., chemistry program) and intended functions to SSCs in the scope of ageing management is not documented by a detailed analysis or, in some cases, not performed at all. The Atomic Energy Society of Japan (AESJ) Code, AESJ-SC-P005:2021, Appendix C is the only source utilized for assignment of degradation mechanisms to SCCs without a documented review of the information by the plant. For a subset of pumps exposed to primary coolant, it was noted that some of the pumps had stainless steel bodies and one had a low alloy steel body, but only the pump with the low alloy steel was identified as the representative equipment for the group in the ageing management technical review. In addition, there is not a systematic and periodic review of the scope of SCCs included within ageing management. Without an adequate AMR, the plant may not identify and properly manage all the relevant degradation mechanisms and ageing effects. The team made a **recommendation** in this area (issue C-1).

AMPs of mechanical SSCs

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

TLAAs of mechanical SSCs

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

Scope setting results verification for mechanical SSCs

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

Data collection and record keeping for mechanical SSCs

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

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

The documents relevant for ageing management are stored and archived within different systems and departments and some data (e.g. photographs) are not collected or acquired. The status of ongoing revisions is not available in system M90. Traceable approval is not available in a scanned version of an irradiation embrittlement evaluation of RPV nozzle supports. Trending of data necessary for predicting development of degradation mechanisms or ageing effects is not performed in some cases. The effects of the long term outage on the evaluation of the flow accelerated corrosion (FAC) rate was not analyzed. Without adequate analysis and management of relevant ageing management data, the plant cannot ensure that ageing management activities are effective to preserve the intended safety functions. The team made a **recommendation** in this area (issue C-2).

3.4. AGEING MANAGEMENT OF ELECTRICAL AND I&C SSCS

AMR of electrical and I&C SSCs

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

AMPs of electrical and I&C SSCs

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

Equipment qualification programme for all SSCs

For all electrical and I&C qualified components, the plant does not perform ageing prior to seismic testing, nor does it consider all ageing effects and degradation mechanisms for civil SSCs, such as paint. The plant does not perform all ageing tests on qualified cables to assess their current condition. The plant is unable to provide a general procedure for active mechanical components' qualification, and has not performed for these SSCs, typical accident assessments such as high energy line break (HELB) tests. The plant did not monitor the environment in the containment vessel during the 11-year shutdown after the Fukushima event and considers that during this period, ageing was moderate without further justification. Without implementing the complete measures to qualify and preserve the status of qualified electric and I&C, active mechanical, and civil structure components, the plant is unable to demonstrate that those SSCs are able to fulfil their intended safety function during the intended period of long term operation. The team made a **recommendation** in this area (issue D-1).

Only the main control room and protection control systems equipment require electromagnetic compatibility (EMC) testing. Because Japanese requirements for EMC concern a more restricted scope than international requirements, a current project (ATENA) has identified a gap between Japanese requirements for EMC with regards to other international standards. An analysis is ongoing by ATENA to define the appropriate standards to cover the identified gap. Based on this work by ATENA, the team **encouraged** the plant to perform a plant specific analysis and conduct where needed, the complementary testing.

Technological obsolescence management for all SSCs

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

Scope setting results verification for electrical and I&C SSCs

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

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

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

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

When assessing SSCs important to safety, environmental qualification considers separately ageing effects and seismic compliance assessment. Whereas equipment qualification considers that ageing is performed on equipment prior to their seismic compliance assessment. At the plant this distinction between environmental qualification and equipment qualification is not clearly identified. The team **encouraged** the plant to clearly distinguish "equipment qualification" from "environmental qualification".

3.5. AGEING MANAGEMENT OF CIVIL SSCS

AMR of civil SSCs

The plant has participated in a benchmarking project with the PWR operators of Japan related to the risk of corrosion of the steel containment. This project focused on the bottom part of the containment, which is the most critical area. The plant also performed (through a Technical Support Organization) a benchmark dedicated to containment pressure testing, considering nine

different codes used around the world. The team considered the use of benchmarking to enhance ageing management of the containment to be a **good performance**.

AMPs of civil SSCs

The evaluation of chloride penetration ageing effects in concrete structures does not consider the impact of cracking including on structures exposed to external humidity and the inspection documents did not consider explicitly the crack width as a threshold for repair. In addition, a large area of concrete in one the safety pipe tunnels have been identified as delaminated and then monitored but not repaired since 2022. More generally, the plant inspects periodically all civil structures taking photos when defects are identified but the quantified value of crack width is not systematically recorded. For steel containment no quantitative acceptance criteria related to visual inspection is given relative to the size of the detected defects (i.e. painting delamination or other painting defects). The team made a **recommendation** in this area (issue E-1).

TLAAs of civil SSCs

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

Scope setting results verification for civil SSCs

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

Data collection and record keeping for civil SSCs

The plant develops a periodic inspection report related to the conditions of the buildings. This report is developed room by room and includes a level of detail that is easily understandable and that quickly shows the defects, if any. The team considered this a **good performance**.

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

The justification of the consistency between the global leak test and the sum of the local tests have been given to the team but material was developed specially for the IAEA team. The team **encouraged** the plant to perform these types of evaluations in a proactive manner.

3.6. HUMAN RESOURCES, COMPETENCE AND KNOWLEDGE MANAGEMENT FOR LTO

Human resources policy and strategy to support LTO

The ‘e-Staff System’ makes use of retiring employees to act as mentors to new incumbents into their roles. This helps to maintain competence in the workforce and enables the experience gained by the retiring workforce to be used in the mentoring activities. The team considered this as a **good performance**.

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

The succession planning process applies a graded approach to staff development and includes a prioritized listing of succession candidates over identified time periods to allow for successor training and mentoring. The overall process includes individual 3-year development plans for staff that are also used as the overall review and assessment or role readiness by the Senior Manager and Line Supervisors. The team considered this as a **good performance.**

Knowledge management and knowledge transfer for LTO

There are a number of activities and processes that support competence development as part of the workforce planning and competency management processes, however there is no formal

knowledge management programme or supporting arrangements in place to ensure the effective management of critical knowledge and positions. Without a comprehensive knowledge management programme, the plant cannot ensure that safety and operational risks associated with critical knowledge loss will be adequately identified and managed. The team made a **recommendation** in this area (issue F1)

Lessons learned from operating experience has been included in the Operations and Maintenance training programmes. However, the current arrangements for screening the international event reports significantly reduces the opportunity to gain valuable LTO lessons from the international fleets of NPPs to support safety and operational performance of the plant. The team made a **suggestion** in this area (issue F2).

4. SUMMARY OF RECOMMENDATIONS AND SUGGESTIONS

The following table summarises the issues identified the IAEA team (R / S) in the six main 'Review Areas' of the expert mission. The complete set of issue sheets is presented in the Appendix of this report.

Issue No.	Fundamental Overall Problem	Rec./Sugg.
Review Area A: Organization of ageing management and LTO activities		
A-1	Safety Analysis Report (SAR), including the chapter credited for PSR, is not comprehensive.	S
A-2	The plant has not developed and implemented a comprehensive LTO programme.	R
A-3	Oversight and coordination of ageing management activities are not adequate.	S
Review Area B: Scope setting, plant programmes and corrective action programme		
B-1	The plant has not adequately documented scoping for LTO.	S
B-2	The plant has not completed an evaluation of plant programmes credited for ageing management against the nine attributes of an effective ageing management programme.	R
Review Area C: Ageing management of mechanical SSCs		
C-1	The plant has not developed and implemented an adequate ageing management review.	R
C-2	The plant does not adequately analyze and manage relevant data for ageing management.	R
Review Area D: Ageing management of electrical and I&C SSCs		
D-1	The plant has not developed a complete Equipment Qualification (EQ) Programme for electric, I&C, active mechanical and civil structure components.	R
Review Area E: Ageing management of civil SSCs		
E-1	Ageing management activities on civil structures do not address all attributes of an effective AMP.	R
Review Area F: Human resources, competence and knowledge management for LTO		
F-1	The plant does not have a comprehensive knowledge management programme.	R

F-2	Analysis of operating experience (OE) and lessons learned from external organisations is not comprehensive.	S

5. DEFINITIONS

Recommendation

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

Suggestion

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

Good Practice

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

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

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

Encouragement

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

Good performance

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

6. REFERENCES

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

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

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

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

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

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

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

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

[17] INTERNATIONAL ATOMIC ENERGY AGENCY, Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL), Safety Report Series No. 82 (Rev. 1), IAEA, Vienna (2020).

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

[19] Virtual Preparatory Meeting Report, Terms of Reference for a Peer Review Mission for Mihama Nuclear Power Plant Unit 3 in Japan, IAEA, January 2024.

[20] Preparatory Meeting Minutes of 'A SALTO Peer Review Mission for Mihama Nuclear Power Plant Unit 3', 10 January 2024, Vienna and Mihama.

[21] SALTO Mission Mihama 3, Advance Information Package, March 2024.

7. TEAM COMPOSITIONS

7.1. IAEA SALTO REVIEW TEAM

IAEA STAFF MEMBER:		
Mr. Martin Marchena	Team Leader	IAEA NSNI
Mr. Bryce Lehman	Deputy Team Leader	IAEA NSNI
IAEA EXTERNAL EXPERTS:		
Mr. Christian Lundqvist	Reviewer A	Consultant, Sweden
Mr. Allen Hiser	Reviewer B	Retired-US NRC, USA
Mr. Martin Krondak	Reviewer C	UJZ Rez, Czech Republic
Mr. Benedict-John Willey	Reviewer D	EDF, France
Mr. Etienne Gallitre	Reviewer E	Retired-EDF, France
Mr. David Drury	Reviewer F	Retired-IAEA, UK
OBSERVERS:		
Mr. Dino Nerweyi	Observer Area A	Olkiluoto NPP, Finland
Mr. Woojae Choi	Observer Area B	KHNP, Korea
Mr. Sung-Min Park	Observer Area D	KHNP, Korea

7.2. PLANT ORGANIZATION

MIHAMA NUCLEAR POWER PLANT COUNTERPARTS:	
Mr. Sho Tanaka	Host plant peer
Mr. Yoshihide Kitamura	Deputy host plant peer
Mr. Takeharu Nishizumi	Area A
Mr. Koji Fujinaga	Area B
Mr. Taishi Fukuoka	Area C
Mr. Atsushi Higashitani	Area D
Mr. Kazuhiro Nakazawa	Area E
Mr. Masaki Kuwahara	Area F

APPENDIX - ISSUE SHEETS

1. ISSUE IDENTIFICATION	**Issue Number: A-1**
NPP: Mihama	**Unit: 3**
Reviewed Area: Organization of ageing management and LTO activities	

1.1 – ISSUE TITLE:

Safety analysis report not comprehensive

1.2 – FUNDAMENTAL OVERALL PROBLEM:

Safety Analysis Report (SAR), including the chapter credited for PSR, is not comprehensive.

2. ASSESSMENT OF THE STATUS	**Date:** 25/04/2024

2.1 – FACTS:

F1) There is a requirement by law that the SAR is submitted to the Nuclear Regulatory Authority (NRA). However, the SAR detailed contents, as well as the improving action by SAR is based on a voluntary analysis under the responsibility of the operator. Chapter 3.2 of SAR constitutes the PSR. The plant did not develop nor submit SAR chapter 3.2 in the latest submittal to the (NRA).

F2) Not all Current Licensing Basis (CLB), is displayed in SAR chapter 1. Content is in accordance with national guidance. CLB is missing some important safety areas from IAEA standards, such as human factors engineering and decommissioning.

F3) Prior to 2013 there was no PSR process for the plant that complied with SSG-25.

F4) The current SAR does not address review of Safety Factor 3 - EQ and review of Safety Factor 4 – Ageing.

F5) The plant's RCP design basis documentation has test protocols with flowrates of the initial tests. This was possible to be retrieved in DMS. This is a test protocol from the vendor, from 28 March 1975, that states the flowrate was only calculated to 89000 GPM (=20.214 m3/h). Technical specification in the Design Basis Document contains 20.100 m3/h.

F6) PSR is not used as a tool for decision making for LTO (LRA). AESJ volume 2015 and 2021 guidance based on SSG-25 exists but has not been used yet for the plant. NRA agrees with plants to operate several fuel cycles to be able to use accumulated operating experience to produce PSR using AESJ volume 2015 and 2021 guidance.

F7) In Japan SAR as per IAEA safety standards corresponds collectively to installation permit, design/work plan permit and technical specifications. Their format has history in Japan since the 1950s and plant staff have sufficient knowledge about them. New submittal required since 2013 about the utilities voluntary safety improvements is also called "SAR." Because the format of this new report is still being developed as per utility-regulator dialogue and not yet fixed, the plant´s knowledge of this process is limited. Future licencing basis information will be consolidated in such licencing documents as the installation permit, design/work plans, technical specifications, etc. and removed from the SAR.

2.2 – SAFETY CONSEQUENCE:

Without comprehensive safety analysis report, the plant may not be able to demonstrate safe LTO and miss the opportunities to identify safety improvements for LTO.

2.3 – RECOMMENDATION/SUGGESTION:

S) The plant should consider developing a comprehensive safety analysis report including the chapter credited for PSR.

2.4 – IAEA BASIS:

SSR-2/2 (Rev.1)

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

(e) Review activities, which include monitoring and assessing the performance of the operating functions and supporting functions on a regular basis. The purpose of monitoring is: to verify compliance with the objectives for safe operation of the plant; to reveal deviations, deficiencies and equipment failures; and to provide information for the purpose of taking timely corrective actions and making improvements. Reviewing functions shall also include review of the overall safety performance of the organization

4.44. Safety reviews such as periodic safety reviews or safety assessments under alternative arrangements shall be carried out throughout the lifetime of the plant, at regular intervals and as frequently as necessary (typically no less frequently than once in ten years). Safety reviews shall address, in an appropriate manner: the consequences of the cumulative effects of plant ageing and plant modification; equipment requalification; operating experience, including national and international operating experience; current national and international standards; technical developments; organizational and management issues; and site related aspects. Safety reviews shall be aimed at ensuring a high level of safety throughout the operating lifetime of the plant.

4.47. On the basis of the results of the systematic safety assessment, the operating organization shall implement any necessary corrective actions and reasonably practicable modifications for compliance with applicable standards with the aim of enhancing the safety of the plant by further reducing the likelihood and the potential consequences of accidents.

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

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

SSG-25

2.4. PSR provides an effective way to obtain an overall view of actual plant safety and the quality of the safety documentation, and to determine reasonable and practical modifications to ensure safety or improve safety to an appropriate high level. To do this, the PSR needs to

identify any lifetime limiting features at the plant in order to plan future modifications and to determine the timing of future reviews.

3.8. Where the PSR is to be used in decision making for long term operation or licence renewal, the review should pay particular attention to the following plant programmes and documentation, as these are of significant importance for continued safe operation:

- Plant programmes to support the safety factors relating to plant design, the actual condition of SSCs important to safety, equipment qualification and ageing;
- A management system that addresses quality management and configuration management;
- Safety analyses involving time limiting assumptions relating to the proposed lifetime;
- Programmes for promoting safety culture focused on the pursuit of excellence in all aspects of safety management and human factors.

4.19. Some safety factors or parts of a safety factor might be assessed more efficiently and effectively in other contexts or through different means than by PSR (for example by continuous review through other programmes). In such cases, the PSR should focus on the assessment methodology applied at the nuclear power plant and should review relevant trends.

5.4. The review of safety factors should determine the status of each safety factor at the time of the PSR and should assess future safety at the nuclear power plant at least until the next PSR and, where appropriate, up to the end of planned operation. This should include a review of the capability of the operating organization to identify potential failures and either prevent them or mitigate their consequences before they could lead to a radiological incident. Ageing related degradation mechanisms that could lead to failures of SSCs important to safety that could potentially limit the plant's operating lifetime should be identified to the extent possible.

SSG-61

2.17. Use of the safety analysis report should not be limited to the licensing process and to providing public assurance about the safety of the plant prior the operation. The safety analysis report should also be continuously used by the operating organization to manage safety. It is essential that the operating organization accomplishes the safety objectives embodied in the safety analysis report by developing appropriate management for safety, including procedures and instructions. The safety analysis report serves to identify the limits and conditions for safe plant operation, which provide the basis for the development of operating procedures and instructions.

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

2.5 – DOCUMENTS REVIEWED:

- Long term ageing management implementation guideline for commercial nuclear reactors, 2020;
- AESJ code 2015 PSR to guide LTO decision;
- Kansai Nuclear, AM implementation guideline;

– NRA, Act on the regulation of nuclear source material, nuclear fuel material and reactors; – AESJ-SC-TR017:2020; – NRA, Implementation guideline for commercial reactor SAR, 1 April, 2020; – Mihama 3, SAR submittal number 2 implementation plan, 2024; – Mihama plant SAR, 2023;

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

3.1 – RESULTS OF THE ISSUE ANALYSIS: n.a.
3.2 – CORRECTIVE ACTIONS: n.a.
3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION: n.a.

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

4.1 – FACTS: F1) n.a.
4.2 – DOCUMENTS REVIEWED: n.a.
4.3 – RESOLUTION DEGREE:

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

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

1. ISSUE IDENTIFICATION	**Issue Number: A-2**
NPP: Mihama	**Unit: 3**
Reviewed Area: Organization of ageing management and LTO activities	
1.1 – ISSUE TITLE: Lack of a comprehensive Long Term Operation (LTO) Programme	
1.2 – FUNDAMENTAL OVERALL PROBLEM:	

The plant has not developed and implemented a comprehensive LTO programme.

2. ASSESSMENT OF THE STATUS	**Date:** 25/04/2024

2.1 – FACTS:

F1) There is no document describing the overall LTO programme,

F2) The plant had no firm timeframe for ageing management, that accounts for possible extensions beyond 60 years. Currently the end-of-operation is set to 30th November 2036 (40+20 years), but the recently accepted law allows some qualified extensions to the operation with the post-Fukushima shutdown period.

F3) No special arrangements are made to identify critical resources, because the fleet has not identified new tasks associated with LTO.

F4) SAR chapter 3.2, equivalent to PSR, is implemented every 10 years thus not covering the entire LTO period.

F5) SAR chapter 4 includes 8 safety improvement measures that will be implemented between 2023-2025, along with description of their safety relevance. The SAR does not contain a complete list of plants safety improvement measures for the full LTO period, because the report is to be produced after each refuelling outage.

F6) Several aspects were not considered when a corporate decision was made to move forward with LTO as the plan was to continue operation all the time. An aspect that was addressed was spent fuel. Aspects that were not considered in the decision were:

- The most recent relevant international recommendations, such as SSG-48, IGALL, EPRI, were not comprehensively discussed.
- Obsolescence was not comprehensively discussed.
- Radioactive waste management for long term operation.
- An assessment of the environmental impact of long-term operation was not comprehensively discussed.

F7) A fleet staff plan exists up to 2030. A staff plan does not exist for the entire LTO period

2.2 – SAFETY CONSEQUENCE:

Without a comprehensive LTO programme, the plant cannot ensure that all necessary activities will be properly implemented to ensure a safe LTO period.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should develop and implement a comprehensive LTO programme

2.4 – IAEA BASIS:

SSR-2/2 (Rev.1)

Requirement 16: Programme for long term operation

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

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

(a) Preconditions (including the current licensing basis, safety upgrading and verification, and operational programmes);

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

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

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

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

(f) The implementation programme for long term operation.

SSG-48

2.31. The plant programme for long term operation is a set of activities, including evaluations, assessments, maintenance, inspections and testing, aimed at justifying and demonstrating plant safety for the planned period of long-term operation. The programme for long term operation should be based on national regulatory requirements, should consider international best practices, operating experience and research findings, and should include an implementation plan, as described in Section 7.

3.31. If long term operation is contemplated, the operating organization should establish policy documents, dedicated organizational structures and action plans to perform evaluations for long term operation well before the plant enters into long term operation. The operating organization should specify subjects for evaluation for long term operation and should assess the current physical status of relevant SSCs during the preparation phase for long term operation (see paras 7.3–7.15).

7.7. A plant policy for long term operation should be established and should cover the principles of and concept (strategy) for long term operation. When a decision on long term operation is connected to a regulatory process, such as licence renewal or periodic safety review, the plant policy should take account of the related regulatory process.

7.8. The long term operation programme should be based on the following principles:

(a) …

(b) …

(c) The current licensing basis should provide an acceptable level of safety and should be carried over to the planned period of long-term operation in the same manner and to the same extent, with the exception of any changes specific to long term operation.

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

7.19. The programme for long term operation should address the safety improvements required for safe long-term operation, the schedule, and the commitments of the operating organization relating to long term operation.

2.5 – DOCUMENTS REVIEWED:

- Ageing management implementation procedure, staffing, 2022, 19.03.2022
- rev 29, Kansai Nuclear Corporation Notice on Staffing + organisation rev 27.06.2023
- Kansai Nuclear Corporate PLM Roles + responsibilities in maintenance planning group 18.07.2023
- Kansai Nuclear, Competence evaluation for quality management system 2020 - 2023

- Kansai Nuclear corporate staffing evaluation plan, years 2023-2030 evaluation,
- Kansai Nuclear Corporate LTO staffing projections form 2023-2025.
- NRA guide to Ageing Management long term
- AESJ code 2015 PSR to guide LTO decision.
- AM implementation guideline, fleet
- Licence renewal law
- AESJ-SC-TR017:2020
- Implementation guideline for commercial reactor SAR, April 1 2020
- Mihama 3, SAR No.2 implementation procedure, 2024
- Feasibility study, Licence renewal application for Mihama 3, 26 November 2015 Joint package for special inspections for Mihama 3 and licence renewal for Takahama 1 and 2, 28.10.2015
- Kansai Nuclear, Planning PLM 40 Implementation for Mihama 3

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

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

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

4.1 – FACTS:

F1) n.a.

4.2 – DOCUMENTS REVIEWED:

n.a.

4.3 – RESOLUTION DEGREE:

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

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

1. ISSUE IDENTIFICATION	**Issue Number: A-3**

NPP: Mihama	**Unit: 3**
Reviewed Area: Organization of ageing management and LTO activities	
1.1 – ISSUE TITLE: Inadequate oversight and coordination of ageing management	
1.2 – FUNDAMENTAL OVERALL PROBLEM: Oversight and coordination of ageing management activities are not adequate.	
2. ASSESSMENT OF THE STATUS	**Date:** 25/04/2024
2.1 – FACTS: F1) There is no single design authority. Design responsibilities are usually assigned to technical area manager. However, division of responsibilities varies depending on economic and licensing impact (affected Current Licensing Basis needs corporate approval of design proposal), from group manager to Chief Nuclear Officer (CNO). F2) A plant modification in the main control room led to a change in electrical control from analogue to digital signals. An over-speed trip of an EDG was attributed to this design modification. This was a deficiency impacting all EDGs and was not identified during testing. F3) The only performance indicator (PI) available for measuring effectiveness of ageing management activities in the Plant Life Management report (PLM) is based solely on rework (MA2 – 'rework') F4) M20 'facility change management database' shows planned, ongoing and completed plant modifications. Database contains changes from when the system was implemented, which was in 2004. The main purpose of the database is to track drawing changes associated with facility changes. No data is found prior to 2004 in the system. Prior to 2004 executed changes are stored as hard copies by corporate at headquarters. F5) An increasing fault trend (non-conformance) 1.1% to 3.1% in the seawater and circulating water systems was observed in the last 3 years, coming from long term shutdown to refuelling outage. The conclusion was that it is due to an increase in maintenance activities. The plant did not plan nor implement any corrective action. F6) An increasing fault trend (non-conformance) 0.7% to 1.0% for the secondary auxiliary (I&C) was observed in the last 3 years, coming from long term shut down to refuelling outage. The conclusion is that it is due to an increase in maintenance activities. The plant did not plan nor implement any corrective actions.	
2.2 – SAFETY CONSEQUENCE: Without adequate plant oversight and coordination of ageing management all required aspects may not be developed nor implemented in a timely manner**.**	
2.3 – RECOMMENDATION/SUGGESTION: **S)** The plant should consider implementing an adequate oversight and coordination of LTO and ageing management activities	
2.4 – IAEA BASIS: GSR Part 2	

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

SSR-2/2 (Rev. 1)

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

(f) Design integrity, which includes maintaining a formally designated entity that has overall responsibility for the continuing integrity of the plant design throughout its lifetime, and managing the interfaces and lines of communication with the responsible designers and equipment suppliers contributing to this continuing integrity.

Requirement 3: Structure and function of the operating organization

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

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

Requirement 4: Staffing of the operating organization

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

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

GS-G-3.1

2.28. There should be a clear understanding of the division of responsibilities and the working relationships between all organizational units participating in or supporting the management system. Such units include centralized corporate and technical departments providing support, and company safety committees. They also include public services such as fire services and medical services.

2.29. Consistent methods of defining relative responsibilities and lines of communication between organizational units should be implemented.

2.5 – DOCUMENTS REVIEWED:

- Revision 614, Kansai Electric, Rules on Organization + responsibilities, 29.11.2023
- Revision 91, Kansai Electric, Rules on responsibilities/Authorizations, 29.09, 2023
- Mihama 3, Performance indicator MA2 "Rework"
- Mihama 3, deficiency data, secondary I&C, SW circulation water 2021-2023
- Root cause analysis, EDG digitalization issues 2022

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

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

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

1. ISSUE IDENTIFICATION	**Issue Number: B-1**
NPP: Mihama	**Unit: 3**
Reviewed Area: Scope setting, plant programmes and corrective action programme	
1.1 – ISSUE TITLE: Inadequate documentation of scoping	
1.2 – FUNDAMENTAL OVERALL PROBLEM: The plant has not adequately documented scoping for LTO.	
2. ASSESSMENT OF THE STATUS	**Date:** 25/04/2024
2.1 – FACTS: F1) The procedures for scoping are spread over several documents.	

F2) A list of the SSCs that are in-scope for LTO because they are important to safety and are necessary to fulfil the fundamental safety functions (according to 5.16(a) of SSG-48) is not readily available from the M35 database.

F3) A list of the SSCs that are in-scope for LTO because they are SSCs credited in the safety analyses and regulated events (according to 5.16(c) of SSG-48) is not readily available from the M35 database.

F4) The plant has no specific programme for scoping for LTO. The regulator considers that all Class 1, 2 and 3 equipment are in scope for LTO.

F5) The scope of inspection of anchors for electrical equipment covers Class A, B and partially Class C equipment.

F6) The PLM 40 report has an equipment list. The reactor coolant pump (RCP) is listed as one component and classified as "A", but the RCP flywheel, which is not a part of the equipment list, is considered as class 3 "B or C" component. With this designation, the RCP flywheel is not included explicitly in the PLM 40 report and requires only a global assessment. The PLM 30 assessment of the RCP flywheel is not clearly linked to PLM 40. No justification for the RCP flywheel being classified as 3 "B or C" was provided.

2.2 – SAFETY CONSEQUENCE:

Without adequate documentation of scoping for LTO, effective ageing management to preserve the safety function of all SSCs important to safety cannot be demonstrated.

2.3 – RECOMMENDATION/SUGGESTION:

S) The plant should consider preparing adequate documentation of scoping for LTO.

2.4 – IAEA BASIS:

SSR-2/2 (Rev. 1)

Requirement 15: Records and reports

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

4.52. The operating organization shall identify the types of record and report, as specified by the regulatory body, that are relevant for the safe operation of the plant. Records of operation, including maintenance and surveillance, shall be kept available from initial testing during the startup of each plant system important to safety, including relevant off-site tests. The records of operation shall be retained in proper archives for the periods required by the regulatory body. All records shall be kept readable, complete, identifiable and easily retrievable [3]. Retention times for records and reports shall be commensurate with their level of importance for the purposes of operation and plant licensing and for future decommissioning.

Requirement 16: Programme for long term operation

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

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

. . .

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

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

SSG-48

5.14. A systematic scope setting (also called 'scoping') process to identify SSCs subject to ageing management should be developed and implemented.

5.20. Since the subsequent process is carried out at the level of a structure or component (or its subcomponent), all structures or components and their subcomponents within the scope for ageing management should be identified. If the components or structures within a group have similar functions and similar materials and are in a similar environment, that group may be defined as a structure or component 'commodity group'.

5.21. After the scope setting process, a clear distinction between SSCs within the scope and those out of the scope should be evident. A typical scope setting process is illustrated in Fig. 3.

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

(a) The method of scope setting, the results obtained (structures or components within the scope and out of the scope of long term operation), and supporting technical justifications as outlined in paras 5.14–5.21.

7.20. Scope setting for long term operation should follow the approach set out in paras 5.14–5.21 and should account for differences in regulatory requirements, codes and standards.

2.5 – DOCUMENTS REVIEWED:

- B EDG Load Test, April 17, 2024.
- [Classification of importance by safety function (e.g., PS-1 to PS-3 and MS-1 to MS-3) and Definitions and Functions of SSCs by safety function. – undated excerpt from a document.]
- Examination of AMTE Report and Long-Term Operation Management Policy, etc., March 31, 2020.
- Information Guide for Ageing Measures in Practical Power Reactor Facilities, last revision March 31, 2019.
- M35_RD1020, System List for Maintenance, April 18, 2024.
- Mihama Nuclear Power Plant Reactor Facility Safety Regulations, Rev. 24, May 17, 2023.
- Mihama Nuclear Power Plant Maintenance Division Electrical Section, Daily Patrol Inspection Guide, February 21, 2023.
- Mihama Nuclear Power Plant Maintenance Division Electrical Section, Daily Patrol Inspection Guide, Equipment Zone Frequency, February 21, 2023.
- Mihama Nuclear Power Station Maintenance Regulation Guidelines, Amendment 64, January 31, 2024.
- Mihama Nuclear Power Station Maintenance Regulation Guidelines, Amendment 64, Regarding Equipment Under the Jurisdiction of Each Section, January 31, 2024.

- Mihama Nuclear Power Station Maintenance Regulation Guidelines, Amendment 64, Formulation of Maintenance Scope (MC-7), January 31, 2024.
- Mihama Nuclear Power Station Maintenance Regulation Guidelines, Amendment 64, Maintenance Effectiveness Evaluation (MC-15), January 31, 2024.
- Mihama Nuclear Power Station Rules on Chemistry Control Operations, Rev. 59, March 29, 2023.
- Mihama Nuclear Power Plant Unit 3, Implementation Guide for 40 Years AMTE About Renewal, December 27, 2012.
- Mihama Nuclear Power Plant Unit 3, Implementation Guide for 40 Years AMTE About Renewal, August 13, 2013.
- Mihama Nuclear Power Plant Unit 3, Notice of Change in PLM Implementation Plan, August 13, 2013.
- Mihama Nuclear Power Plant Unit 3 27th Maintenance Cycle Periodic Inspection Report, Instructions Number M3-27-153-1/2 (undated).
- Mihama Unit 3, Technical Evaluation Report of Pump Assuming Intermittent Operation, updated October 28, 2016.
- Mihama Unit 3, Special Maintenance Plan Due to Long-Term Shutdown of Mihama Unit 3, October 18, 2012.
- Mihama Unit 3, Regarding Improvement of Primary System Water Quality Management Due to Long-Term Shutdown, August 7, 2013.
- Mihama Unit 3, Regarding the Implementation Results of a Special Maintenance Plan Due to Long-Term Shutdown of Mihama Unit 3, December 11, 2013.
- Mihama Unit 3, Concerning implementation of Pre-Restart Inspection in Preparation of restarting Mihama Unit 3 after Long-Term Shutdown, September 13, 2019.
- Mihama Unit 3, Regarding the Implementation Status of Special Pre-Startup Inspections Related to Re-Starting After a Long-Term Shutdown (Before Fuel Loading), May 14, 2021.
- Mihama Unit 3, Design Standard Document General Matters – Flying Object Protection, DBD-M3u-1-07, August 2, 2022.
- Mihama Unit 3, The Formulation of Guidelines for Equipment, etc., that Will Have Ripple Effects, December 2023.
- Mihama Unit 3, The Formulation of Guidelines for Equipment, etc., that Will Have Ripple Effects – Implementation Results, April 2024.
- Mihama Power Plant, Maintenance Work Rules, Rev. 92, November 21, 2023.
- Mihama Nuclear Power Plant Unit 3, Supplementary Manual Related to Seismic Design Regarding Consideration of Ripple Effects of Lower-Class Facilities, October 2016.
- Nuclear Power Plant Maintenance Work Guidelines, Rev. 105, (1989 Maintenance Guidelines No. 1), June 9, 2023.
- Nuclear Power Plant Maintenance Work Guidelines, Rev. 70, (2005 Field Maintenance Guidelines No. 1), January 12, 2023.

– Nuclear Safety Division Decision, Examination Guidelines Regarding the Importance Classification of Safety Functions for Light Water Reactor Facilities for Power Generation, partially revised March 9, 2009. – Operational Guide for Application to Extend the Operation Period of Commercial Power Reactors, Nuclear Regulation Authority, June 19, 2013. – Operational Guide for Application to Extend the Operation Period of Commercial Power Reactors, Nuclear Regulation Authority, Revised March 31, 2020. – Outline of Corrective Action Program, Rev. 7, January 25, 2023. – PLM40 Process Chart (undated). – Specification for Consignment of Storage Goods and Deliveries - April 1, 2024, to March 31, 2025 (undated).

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

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

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

1. ISSUE IDENTIFICATION	**Issue Number: B-2**
NPP: Mihama	**Unit: 3**
Reviewed Area: Scope setting, plant programmes and corrective action programme	

1.1 – ISSUE TITLE:

Incomplete evaluation of plant programmes credited for ageing management

1.2 – FUNDAMENTAL OVERALL PROBLEM:

The plant has not completed an evaluation of plant programmes credited for ageing management against the nine attributes of an effective ageing management programme.

2. ASSESSMENT OF THE STATUS	**Date:** 25/04/2024

2.1 – FACTS:

F1) The plant has not documented an evaluation of the maintenance, in-service inspection (ISI), surveillance, and corrective action programmes against all nine attributes of an effective ageing management programme (AMP) for the intended period of operation.

F2) Some elements of a steam generator (SG) AMP exist but are not integrated in a comprehensive SG AMP (e.g., chemistry programme, and foreign material exclusion (FME) programme).

F3) No formal plant evaluation of ageing management activities on steam generators was carried out.

F4) There is a lack of anticipation of ageing effects (an example is the sea water pump lining failure, where the lining was replaced only after loss of function).

F5) Inspection of fire water piping is limited to visual inspection, which cannot detect cracking or wall loss on the inside diameter.

F6) Only visual checks are used to assess wall thinning by FAC in the vicinity of steam inlets (low pressure feedwater heater), and no wall thickness measurement is performed in those susceptible areas, which is not in agreement with available operation experience (e.g., from EPRI or IGALL).

2.2 – SAFETY CONSEQUENCE:

Without a complete evaluation of plant programmes credited for ageing management, some needed attributes of an effective programme may be missed and the safety functions of in-scope SSCs could be compromised.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should complete an evaluation of plant programmes credited for ageing management to address the nine attributes of an effective ageing management programme.

2.4 – IAEA BASIS:

SSR-2/2 (Rev. 1)

Requirement 16: Programme for long term operation

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

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

. . .

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

Requirement 31: Maintenance, testing, surveillance and inspection programmes

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

8.5. The frequency of maintenance, testing, surveillance and inspection of individual structures, systems and components shall be determined on the basis of:

(a) The importance to safety of the structures, systems and components, with insights from probabilistic safety assessment taken into account;

(b) Their reliability in, and availability for, operation;

(c) Their assessed potential for degradation in operation and their ageing characteristics;

(d) Operating experience;

(e) Recommendations of vendors.

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

2.5 – DOCUMENTS REVIEWED:

- B EDG Load Test, April 17, 2024.
- [Classification of importance by safety function (e.g., PS-1 to PS-3 and MS-1 to MS-3) and Definitions and Functions of SSCs by safety function. – undated excerpt from a document.]
- Examination of AMTE Report and Long-Term Operation Management Policy, etc. (undated).
- Information Guide for Ageing Measures in Practical Power Reactor Facilities, last revision March 31, 2019.
- M35_RD1020, System List for Maintenance, April 18, 2024.
- Mihama Nuclear Power Plant Reactor Facility Safety Regulations, Rev. 24, May 17, 2023.
- Mihama Nuclear Power Plant Maintenance Division Electrical Section, Daily Patrol Inspection Guide, February 21, 2023.
- Mihama Nuclear Power Plant Maintenance Division Electrical Section, Daily Patrol Inspection Guide, Equipment Zone Frequency, February 21, 2023.
- Mihama Nuclear Power Station Maintenance Regulation Guidelines, Amendment 64, January 31, 2024.
- Mihama Nuclear Power Station Maintenance Regulation Guidelines, Amendment 64, Regarding Equipment Under the Jurisdiction of Each Section, January 31, 2024.
- Mihama Nuclear Power Station Maintenance Regulation Guidelines, Amendment 64, Formulation of Maintenance Scope (MC-7), January 31, 2024.
- Mihama Nuclear Power Station Maintenance Regulation Guidelines, Amendment 64, Maintenance Effectiveness Evaluation (MC-15), January 31, 2024.

- Mihama Nuclear Power Station Rules on Chemistry Control Operations, Rev. 59, March 29, 2023.
- Mihama Nuclear Power Plant Unit 3, Implementation Guide for 40 Years AMTE About Renewal, December 27, 2012.
- Mihama Nuclear Power Plant Unit 3, Implementation Guide for 40 Years AMTE About Renewal, August 13, 2013.
- Mihama Nuclear Power Plant Unit 3, Notice of Change in PLM Implementation Plan (undated).
- Mihama Nuclear Power Plant Unit 3 27th Maintenance Cycle Periodic Inspection Report, Instructions Number M3-27-153-1/2 (undated).
- Mihama Unit 3, Technical Evaluation Report of Pump Assuming Intermittent Operation (undated).
- Mihama Unit 3, Special Maintenance Plan Due to Long-Term Shutdown of Mihama Unit 3, October 18, 2012.
- Mihama Unit 3, Regarding Improvement of Primary System Water Quality Management Due to Long-Term Shutdown, August 7, 2013.
- Mihama Unit 3, Regarding the Implementation Results of a Special Maintenance Plan Due to Long-Term Shutdown of Mihama Unit 3, December 11, 2013.
- Mihama Unit 3, Concerning implementation of Pre-Restart Inspection in Preparation of restarting Mihama Unit 3 after Long-Term Shutdown, September 13, 2019.
- Mihama Unit 3, Regarding the Implementation Status of Special Pre-Startup Inspections Related to Re-Starting After a Long-Term Shutdown (Before Fuel Loading), May 14, 2021.
- Mihama Unit 3, Design Standard Document General Matters – Flying Object Protection, DBD-M3u-1-07, August 2, 2022.
- Mihama Unit 3, The Formulation of Guidelines for Equipment, etc., that Will Have Ripple Effects, December 2023.
- Mihama Unit 3, The Formulation of Guidelines for Equipment, etc., that Will Have Ripple Effects – Implementation Results, April 2024.
- Mihama Power Plant, Maintenance Work Rules, Rev. 92, November 21, 2023.
- Mihama Nuclear Power Plant Unit 3, Supplementary Manual Related to Seismic Design Regarding Consideration of Ripple Effects of Lower-Class Facilities, October 2016.
- Nuclear Power Plant Maintenance Work Guidelines, Rev. 105, (1989 Maintenance Guidelines No. 1), June 9, 2023.
- Nuclear Power Plant Maintenance Work Guidelines, Rev. 70, (2005 Field Maintenance Guidelines No. 1), January 12, 2023.
- Nuclear Safety Division Decision, Examination Guidelines Regarding the Importance Classification of Safety Functions for Light Water Reactor Facilities for Power Generation, partially revised March 9, 2009.
- Operational Guide for Application to Extend the Operation Period of Commercial Power Reactors, Nuclear Regulation Authority, June 19, 2013.

– Operational Guide for Application to Extend the Operation Period of Commercial Power Reactors, Nuclear Regulation Authority, Revised March 31, 2020. – Outline of Corrective Action Program, Rev. 7, January 25, 2023. – PLM40 Process Chart (undated). – Specification for Consignment of Storage Goods and Deliveries - April 1, 2024, to March 31, 2025 (undated).
3. HOSTING ORGANIZATION ACTIONS TO RESOLVE ISSUE — **Date:** D2/M2/YYY2
3.1 – RESULTS OF THE ISSUE ANALYSIS: n.a.
3.2 – CORRECTIVE ACTIONS: n.a.
3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION: n.a.
4. FOLLOW-UP ASSESSMENT BY THE IAEA REVIEW TEAM — **Date:** D3/M3/YYY3
4.1 – FACTS: F1) n.a.
4.2 – DOCUMENTS REVIEWED: n.a.
4.3 – RESOLUTION DEGREE:

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

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

1. ISSUE IDENTIFICATION	**Issue Number: C-1**
NPP: Mihama	**Unit: 3**
Reviewed Area: Ageing Management of Mechanical SSCs	
1.1 – ISSUE TITLE: Inadequate Ageing Management Review (AMR)	
1.2 – FUNDAMENTAL OVERALL PROBLEM: The plant has not developed and implemented an adequate ageing management review.	

2. ASSESSMENT OF THE STATUS	Date: 25/04/2024

2.1 – FACTS:

F1) No detailed analysis is documented for the assignment of degradation mechanisms to SSCs in the scope of ageing management.

F2) The maintenance tables are considered by the plant to be AMR tables. The maintenance tables do not include preventive measures (e.g., chemistry programme), even if those are implemented in the plant. Equipment inspections are listed as the only ageing management measure. Therefore, preventive measures are not formally credited for ageing management.

F3) Intended component functions are not listed in the maintenance tables. Intended component functions are included in other documents but no evidence of links between the two processes was provided.

F4) Degradation mechanisms are assigned to (sub)components only on the basis of Atomic Energy Society of Japan (AESJ) code Appendix C. No other sources are utilized by the plant.

F5) The plant has given no evidence of a plant specific review of the Degradation Mechanism Arrangement Table taken from the AESJ-SC-P005E:2021 code.

F6) Commodity groups are used for the PLM (an ageing management evaluation report updated every 10 years), but the representative specimens are not chosen on the basis of degradation mechanism.

F7) There is no procedure clearly describing how commodity groups are created in the PLM report for the Nuclear Regulatory Authority (NRA).

F8) For a subset of pumps exposed to primary coolant, it was noted that some of the pumps had stainless steel bodies and one had a low alloy steel body, but only the pump with the low alloy steel was identified as the representative equipment for the group in the ageing management technical review.

F9) No periodic/systematic review of component scoping for ageing management (AM) is performed.

F10) The PLM report for NRA does not include all components in the ageing management scope (e.g., safety class 3 low-pressure pumps).

F11) No degradation mechanism is assigned to the Reactor Pressure Vessel Nozzle Supports in the maintenance tables in the M35 system.

F12) Fire water components (e.g., water tank, pumps, piping, dry sprinkler piping) have safety class 3 and they are in the plant ageing management scope. No degradation mechanism from the degradation mechanism arrangement tables is assigned to the pipe in the maintenance tables in system M35.

F13) No complete AMR has been performed on the anchors of the pump house.

2.2 – SAFETY CONSEQUENCE:

Without an adequate AMR, the plant may not identify and properly manage all the relevant degradation mechanisms and ageing effects.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should develop and complete an adequate ageing management review.

2.4 – IAEA BASIS:

SSR-2/2 (Rev. 1)

Requirement 14: Ageing management

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

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2.32. If a decision is taken to pursue long term operation, justification of the adequacy of ageing management for the planned period of long term operation should be provided, based on the results of the periodic safety reviews or the results of an adequate evaluation process (that includes scope setting, ageing management review, and revalidation of time limited ageing analyses, as described in this Safety Guide), and this justification should be evaluated for adequacy by the regulatory body.

5.22. An ageing management review for in-scope SSCs should be performed to ensure and demonstrate that ageing will be effectively managed.

5.23. The ageing management review should systematically assess ageing effects and the related degradation mechanisms that have been experienced or are anticipated. The assessment should include an evaluation of the impact of the ageing effect on the in-scope SSCs' capability to perform their intended functions as specified in para. 5.16, including consideration of the current condition of the SSC.

5.24. Relevant applicable lessons relating to ageing provide a good reference basis for the ageing management review but should not be used in place of a plant specific ageing management review.

5.26. An ageing management review should be performed for each in-scope structure or component or commodity group of structures or components….

5.35. The methodology and results of the ageing management review should be documented and should also provide information on the following:

(a) …
(b) …
(c) Understanding ageing, monitoring of ageing and prevention or mitigation of ageing effects;
(d) …
(e) How the programmes and activities will manage the ageing effects and degradation mechanisms, considering the current condition of the structure or component; …

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

5.69. Results of the evaluation of time limited ageing analyses should be used as an input for ageing management review.

2.5 – DOCUMENTS REVIEWED:

- System M35 for Maintenance, maintenance table for SG heat exchange tubes, on-line database;
- System M38 for Wall thinning management, data for elbow 38 at line from SG to MSR, on-line database;

– Policy on Guidelines for Nuclear Power plant Maintenance Work, 12. 01. 2023, ver. 70; – Manual on drafting maintenance plan, 22-(1)-6; – Guidelines for Nuclear Power Plant Maintenance Work, 06. 09. 2023, ver. 105; – PLM technical evaluation sheet: Technical Evaluation Document for Pumps; – Code on Implementation and Review of Nuclear Power Plant Ageing Management Programs 2021, Attachment 3, AESJ-SC-P005E:2021; – Reactor vessel surveillance samples retrieval plan, 29. 06. 2021; – PLM: Technical Evaluation Document for Vessels

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

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

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

1. ISSUE IDENTIFICATION	**Issue Number: C-2**
NPP: Mihama	**Unit: 3**
Reviewed Area: Ageing Management of Mechanical SSCs	
1.1 – ISSUE TITLE:	

Inadequate analysis and management of data for ageing management

1.2 – FUNDAMENTAL OVERALL PROBLEM:

The plant does not adequately analyze and manage relevant data for ageing management.

2. ASSESSMENT OF THE STATUS	**Date:** 25/04/2024

2.1 – FACTS:

F1) Monitoring of ageing effects is in place, and it is done through equipment inspections within the plant maintenance programme, but trending is not carried out for some of the inspections results.

F2) FAC (Flow-accelerated corrosion) rate is trended based on wall thickness measurements. An evaluation of the effect of the long-term dry layup on FAC trending is not in place yet.

F3) Maintenance records for passive components are recorded in scanned handwritten form and the relevant data is not stored in a format that allows trending analysis (e.g., database, spreadsheet).

F4) In M90 "Integrated Management System" it is not possible to see if a document is under revision. One needs to approach the responsible departments to determine if an update is ongoing or review the design package to identify the fact that a certain document is affected/under revision.

F5) The previous/old versions of station internal rules are stored within a responsible plant section and no unified system for such documents is available. Recent versions are available through web interface.

F6) Photographs are not taken or collected (if taken by contractor) by the plant for future use during some steam generator (SG) examinations.

F7) The guidance document on FAC uses a generic Heat Balance Diagram from the code instead of a specific balance diagram for the Plant.

F8) No trending is evaluated for SG heat exchange tubes plugging.

F9) The scanned version of the evaluation for irradiation embrittlement of the RPV nozzle supports presented by the plant does not include any signature page with approvals.

2.2 – SAFETY CONSEQUENCE:

Without adequate analysis and management of relevant ageing management data, the plant cannot ensure that ageing management activities are effective to preserve the intended safety functions.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should improve the analysis and management of relevant ageing management data.

2.4 – IAEA BASIS:

SSR-2/2 (Rev. 1)

Requirement 15: The operating organization shall establish and maintain a system for the control of records and reports.

4.52. The operating organization shall identify the types of record and report, as specified by the regulatory body, that are relevant for the safe operation of the plant. Records of operation,

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

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2.7. Understanding the ageing of SSCs … is the key to effective ageing management. This understanding is derived from knowledge of:

(j) Data and data trends from condition monitoring, inspection and maintenance.

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

(b) Analysis of trends in ageing effects;

5.33. Once the approach for managing ageing effects and degradation mechanisms has been determined, documentation should be prepared that logically demonstrates that the ageing effects will be adequately managed.

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

7.40. The demonstration of safety for long term operation should be provided to the regulatory body for review and approval at a level of detail, and in a manner, defined by national regulatory requirements. The justification should include trends of expected ageing effects during the period of long term operation based on past studies, such as studies undertaken in past periodic safety reviews, and, when appropriate, the plant modifications to be implemented to improve safety.

2.5 – DOCUMENTS REVIEWED:

- System M35 for Maintenance, maintenance table for SG heat exchange tubes, on-line database;
- System M38 for Wall thinning management, data for elbow 38 at line from SG to MSR, on-line database;
- Policy on Guidelines for Nuclear Power plant Maintenance Work, 12. 01. 2023, ver. 70;
- Manual on drafting maintenance plan, 22-(1)-6;
- Guidelines for Nuclear Power Plant Maintenance Work, 06. 09. 2023, ver. 105;
- PLM technical evaluation sheet: Technical Evaluation Document for Pumps;
- Kansai Electric Power Company, Mihama Plant, Unit 3, 27th Outage, Regular Licencee's Inspection Report, M3-27-106;
- Guidance for non-conformity management and corrective actions, 14.6.2023, ver.28;
- Nuclear Power Generation Work Guideline, 14.11.2023, ver. 106;

– Code on Implementation and Review of Nuclear Power Plant Ageing Management Programs 2021, Attachment 3, AESJ-SC-P005E:2021

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

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

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

1. ISSUE IDENTIFICATION	**Issue Number: D-1**
NPP: Mihama	**Unit: 3**
Reviewed Area: Ageing management of electrical and I&C SSCs	
1.1 – ISSUE TITLE: Equipment Qualification (EQ) Programme for Electric I&C, active Mechanical and Civil Structures components not complete	
1.2 – FUNDAMENTAL OVERALL PROBLEM: The plant has not developed a complete Equipment Qualification (EQ) Programme for electric, I&C, active mechanical and civil structure components.	
2. ASSESSMENT OF THE STATUS	**Date:** 25/04/2024

2.1 – FACTS:

F1) Seismic testing of electric and I&C equipment was performed only on new equipment. The plant did not perform ageing testing prior to seismic testing.

F2) The plant is unable to provide a general procedure for qualification of active mechanical components.

F3) The plant does not have a list of qualified active mechanical equipment.

F4) The plant does not perform any sampling of in-service cables nor have deposit cables.

F5) The plant does not perform elongation at break (EAB) testing on cables.

F6) Insulation resistance and electrical resistance tests are the only tests performed on cables inside the containment vessel (for example, no Tan Delta has been performed since 1992).

F7) High Energy Line Break (HELB) tests are not performed on active mechanical equipment.

F8) No tests are performed for radioactive particles on active mechanical components (it is performed on passive components).

F9) The paint of the inner face of the steel containment is qualified on the basis of explicit documents with several accident conditions and effects of radiation in normal operation, but these documents do not consider every paint ageing effect and degradation mechanism for the LTO period (normally represented by high temperature/accelerated tests).

F10) The series N° of the test samples used for performing the environmental qualification tests are not given in the assessment report. Traceability of how the model equipment for EQ testing was manufactured is not possible from the report.

F11) The plant was unable to provide the manufacturers storage requirements for O-rings and gaskets. The plant informed the team that these spare parts are purchased on demand.

F12) The plant did not monitor the environment in the containment vessel during the 11year shutdown after the FKS event. The plant considers that during this period, the environment in the containment vessel was moderate (because the shutdown conditions were the same as those for the yearly outage). Therefore, the plant considers ageing during that period is also moderate without further justification.

F13) Looking at LT475 level transmitter's data in M35, the equipment was replaced in 1999 and then in 2023: 4 years more than the 19.8 years qualified life as defined in M35. Despite exceeding the qualified life, replacement was not performed in 2019 because the qualified life of LT475 was reassessed, in July 2019, to 26.2 years. But the M35 maintenance management system is still not updated.

2.2 – SAFETY CONSEQUENCE:

Without implementing the complete measures to qualify and preserve the qualified conditions of electric and I&C, active mechanical, and civil structure qualified components, the plant is unable to demonstrate that those SSCs are able to fulfil their intended safety function during the intended period of long term operation.

2.3 – RECOMMENDATION:

R) The plant should implement the complete measures to qualify and preserve the qualified condition of electric, I&C, active mechanical, and civil structure qualified components.

2.4 – IAEA BASIS:

SSR-2/1 (Rev.1)

Requirement 30: Qualification of items important to safety.

A qualification programme for items important to safety shall be implemented to verify that items important to safety at a nuclear power plant are capable of performing their intended functions when necessary, and in the prevailing environmental conditions, throughout their design life, with due account taken of plant conditions during maintenance and testing.

5.48. The environmental conditions considered in the qualification programme for items important to safety at a nuclear power plant shall include the variations in ambient environmental conditions that are anticipated in the design basis for the plant.

5.49. The qualification programme for items important to safety shall include the consideration of ageing effects caused by environmental factors (such as conditions of vibration, irradiation, humidity or temperature) over the expected service life of the items important to safety. When the items important to safety are subject to natural external events and are required to perform a safety function during or following such an event, the qualification programme shall replicate as far as is practicable the conditions imposed on the items important to safety by the natural external event, either by test or analysis, or by a combination of both.

SSR-2/2 (Rev.1)

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

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

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

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

4.26 Environmental qualification should establish the qualified life of equipment within which ageing effects would not prevent satisfactory performance of the equipment if a postulated accident were to occur within the established operating period (possibly including long term operation).

4.27 Monitoring of actual environmental conditions should be implemented in order to get additional information necessary for the assessment of ageing effects on the equipment in its actual operating environment.

4.28 The qualified life of equipment should be reassessed during its lifetime, taking into account progress in the knowledge and understanding of degradation mechanisms and the actual operating environment of the equipment. If the qualified life is to be increased, a thorough safety demonstration should be provided by the operating organization.

4.29 The qualification status of equipment should be properly documented and maintained throughout the plant lifetime. The documentation relating to equipment qualification, which is typically part of the equipment qualification programme, should include:

a. A master list of qualified equipment;

b. Results of temperature monitoring and radiation monitoring in the plant;

c. The evaluation report for equipment qualification;

d. Test reports relating to equipment qualification;

e. Reports of time limited ageing analyses relating to equipment qualification (for evaluation for long term operation) or reports of another suitable equivalent analysis.

4.30 The review of equipment qualification should include an assessment of the effectiveness of the plant's equipment qualification programme in accordance with Requirement 13 of SSR-2/2 (Rev. 1) [2]. The review should also consider the effects of ageing on equipment during service and the effects of possible changes in environmental conditions during normal operation and postulated accident conditions since the equipment qualification programme was implemented.

5.25 (6) If the qualified lifetime of equipment important to safety expires, such equipment should be requalified or replaced at the expiration of its present qualification.

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2.26. Equipment qualification documentation of a nuclear installation should include the following, A list of items important to safety that are subject to equipment qualification. This list should include the intended safety functions and the specific location of each item of equipment.

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

5.2. A programme to establish, to confirm and to maintain required equipment qualification shall be launched from the initial phases of design, supply and installation of the equipment. The effectiveness of equipment qualification programmes shall be periodically reviewed.

5.15. When new ageing mechanisms or increases in the effects of previously known ageing mechanisms are identified, the relevant parts of the equipment qualification programme should be reviewed to determine whether changes in the qualified life or maintenance of the equipment are needed.

6.5. The assessment of the effectiveness of the equipment qualification programme should be an active and ongoing process that considers the following: (a) Whether a list of equipment subject to qualification is available and up to date.

2.5 – DOCUMENTS REVIEWED:

- Corporate Maintenance Planning No.14, Procedure for Implementing Plant Life Management, 2021

- Heisei26 Nuclear Safety Security Guideline, Rev. 36, Guidelines for Safety Management Work, 2024
- KanGenHatsu No.324, Power cable ageing test result which is submitted to NRA, 2016
- Heisei18 Policy on the Mihama plant maintenance work rules, Rev. 64, Policy on the Mihama plant maintenance work rules, 2024
- Screen capture of containment spray pump motor maintenance
- JANSI-P14SC-46-5-2, Ageing mechanism report reflecting EDG startup test failure
- NTEC-2019-1002(NRA TR Series), Analysis of Insulation Performance of Cables under Severe Accident Environmental Conditions, 2019
- Evidence document reflects 9 generic attribues of SSG-48
- Heisei17 Policy on the guidelines for nuclear power plants maintenance work, Rev. 71, Policy on the guidelines for nuclear power plants maintenance work, 2024
- Heisei17 Guidelines for non-conformance management and corrective action, Rev. 28, Guidelines for non-conformance management and corrective action, 2023
- Screen capture of reflecting OE(Operating Experience) including troubles(sea water pump)
- GenDenSetsu No.124, Environmental Test Guidelines of HQ
- DenDai No.1 [Rev.1], Environmental Test Guidelines of Mihama#3, 2022
- JANSI-EQG-01, Rev. 2, Environmental Test Guidelines of Nuclear Safety Association, 2022
- JEAG 4623-2018, Environmental Test Guidelines of Japanese Electric Association, 2018
- EQ List
- Corporate Nuclear Power Generation Department No.1610261, Seismic specification of transmitters. Approved by NRA on 2016
- Technical specification issued by KANSAI & other Electric company. Joint Research Report: Environment evaluation report of transmitter (DBA condition), 2005
- Joint Research Report: Aging mechanism evaluation of Electric I&C of PWR in Severe Accident Phase 2 (except cable)(SA condition), 2023
- Approval stamp & qualification summary report, test result for the transmitter, 2023
- Test result for the cable, 2018
- Brochure of wireless sensor installed in containment to check compliance with EQ condition
- Corporate Nuclear Power Generation Department No.1610261, Seismic test report, 2016 (same to ref [17])
- Insulation test results for the MOV & cable
- EPA and Cable test report for LTO
- Screen capture of E, I&C maintenance tool

- Rev. 88, Corporate's obsolescence process, 2024
- Warehouse temperature monitoring report
- Government's criteria for cable life extension, 2020
- Commitment of Kansai Electric Power Co.
- Heisei15 Mihama Plant Rules No.1, Rev. 337, Rules on Power Generation Maintenance at Mihama Nuclear Power Station, 2024
- Ageing management procedure of Mihama #3
- Ageing management result of Mihama #3
- D5-65LY100, Management caution for transmitter offered by the manufacturer

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

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

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

4.1 – FACTS:

F1) n.a.

4.2 – DOCUMENTS REVIEWED:

n.a.

4.3 – RESOLUTION DEGREE:

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

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

1. ISSUE IDENTIFICATION	**Issue Number: E-1**
NPP: Mihama	**Unit: 3**
Reviewed Area: Ageing Management of Civil Structures	

1.1 – ISSUE TITLE:

Incomplete ageing management for civil structures

1.2 – FUNDAMENTAL OVERALL PROBLEM:

Ageing management activities on civil structures do not address all attributes of an effective AMP.

2. ASSESSMENT OF THE STATUS	**Date:** 25/04/2024

2.1 – FACTS:

F1) The document 'Mihama Unit 3: Technical Evaluation Report on Concrete Structures and Steel Frame Structures' shows, based on a quantified analysis, that the effect of corrosion due to chloride is below the acceptance criteria due to the large cover of concrete over the rebars: the conclusion of this document is valid for the areas between the cracks but not for the areas of the cracks themselves.

F2) The different guidance documents for civil structures and buildings related to acceptance criteria take the crack width as an input criterion for assessment in order to lead to repair or not, taking into consideration other factors but without explicit threshold for corrective action. This assessment requires a significant engineering judgment without explicit guidance.

F3) The acceptance criteria related to the containment visual inspection are 'integrity' and 'tightness' without quantified guidance.

F4) A statement of the document 'Mihama Unit 3: Technical Evaluation Report on Concrete Structures and Steel Frame Structures' (corporate level document) is that the 25th inspection (FY 2011) confirms that "there is no significant defects that might impair the strength … and no rapid ageing degradation in strength" while site inspection reports show cracks.

F5) The tunnel containing the safety related piping system providing the water for the Auxiliary Building has a defect whose size is L=1.4m x H= 0.5m, with a potential depth of 7.5 cm, representing a significant mass. A monitoring action is performed since this crack was found and the plant decided to conduct investigations and repair. The plant did not provide an explanation about the root cause of the damage yet. The defect was found in 2022 and the repair is still not completed.

F6) For civil structures the plant applies a corporate level document for quantitative acceptance criteria of identified defects, the application of this document led to continuous monitoring (in a first step) but not to repairing the defect in the safety pipe tunnel.

F7) The plant inspects periodically all civil structures taking photos when defects are identified but the quantified value of crack width is not systematically recorded.

2.2 – SAFETY CONSEQUENCE:

Without addressing all AMP attributes for civil structures, the plant cannot demonstrate effectiveness of ageing management for LTO.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should improve ageing management activities to address all attributes of an effective AMP for civil structures.

2.4 – IAEA BASIS:

SSR-2/2 (Rev.1)

Requirement 14: Ageing management

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

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

Requirement 16: Programme for Long Term Operation

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

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

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

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5.38. Each ageing management programme should be consistent with the generic attributes of an effective ageing management programme listed in Table 2.

Table 2/ Attribute 1 (Scoping and Understanding): Structures (including structural elements) and components subject to ageing management Understanding of ageing phenomena (significant degradation mechanisms, susceptible sites): — Structure or component materials, service conditions, stressors, degradation sites, degradation mechanisms and ageing effects — Structure or component condition indicators and acceptance criteria — Quantitative or qualitative predictive models of relevant ageing phenomena

Table 2/ Attribute 3 (Detection of ageing effects) : Specification of parameters to be monitored or inspected Effective technology (inspection, testing and monitoring methods) for detecting ageing effects before failure of the structure or component

Table 2/ Attribute 6 (Acceptance criteria): Acceptance criteria against which the need for corrective actions is evaluated

Table 2/ Attribute 7 (Corrective Actions): Corrective actions if a structure or component fails to meet the acceptance criteria

Table 2 / Attribute 8 (Operating experience feedback and feedback of research and development results) : Mechanism that ensures timely feedback of operating experience and research and development results (if applicable) and provides objective evidence that they are taken into account in the ageing management programme.

2.5 – DOCUMENTS REVIEWED:

- Mihama Unit 3: Technical Evaluation Report on Concrete Structures and Steel Frame Structures
- Policy on the Guidelines for Nuclear Power Plant Civil Structure Inspection
- Guidance for Survey and Inspection of Civil Structures at Nuclear Power Plants, May 9 2022

- Policy on the Guidelines for Nuclear Power Plant Building Inspection
- Architectural Institute of Japan: Guidelines for Maintenance and Management of Structures in Nuclear Facilities (2015)
- Evaluation Criteria for Cracks (extract from 'Architectural Institute of Japan: Guidelines for Maintenance and Management of Structures in Nuclear Facilities')
- Mihama 3 LTO Evaluation – The PLM report of Containment Vessel for NRA
- Test results of the 26th and 27th Outage Inspection of containment leak test of Mihama 3 (M3-26-143, M3-27-144)
- Cross Section of Mihama 3 Building passing through the reactor axis (P&ID part3 3-1-7)
- General Diagram of Mihama 3 Containment Penetrations (extract from M3-26-143, M3-27-144)
- JEAC 4203-2017 Code for Leakage Rate Testing of Reactor Containment Vessel (Nuclear Standards Committee of JEA)
- JSME S NA1 – 2012 Codes for Nuclear Power Generation Facilities – Rules on Fitness for Maintain For Nuclear Power Plants
- Report about International Comparison of Containment Pressure Tests (Janus, March 2004)
- Table of containment leakage tests results of Mihama 3 (global leakage test, local pressure tests results including concrete absorption)
- Mihama 3 - Diagram of liner leakage detective system of Spent Fuel Pool (P&ID part1 1-1-5)
- Mihama 3 - Daily Patrol Rule Chapter 15 for liner leakage detective system of Spent Fuel Pool
- Nuclear Power Plant Maintenance Division Mechanical Section, Daily Patrol Inspection Guide (2024)
- Mihama Nuclear Power Plant Maintenance Division Electrical Section, Daily Patrol Inspection Guide (2023)
- Mihama 3 - Evaluation of Effectiveness of Maintenance Report before the 27th Outage Inspection

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

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

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

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

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

1. ISSUE IDENTIFICATION	**Issue Number: F-1**
NPP: Mihama	**Unit: 3**
Reviewed Area: Human resources, competence and knowledge management for LTO	
1.1 – ISSUE TITLE: Lack of a comprehensive knowledge management programme	
1.2 – FUNDAMENTAL OVERALL PROBLEM: The plant does not have a comprehensive knowledge management programme.	
2. ASSESSMENT OF THE STATUS	**Date:** 25/04/2024

2.1 – FACTS:

F1) The plant does not have a policy for knowledge management (KM).

F2) The plant does not have a long term strategy for KM and has no formal KM arrangements in place.

F3) The plant has some elements of a KM programme, however there is not a comprehensive set of processes or activities in place.

F4) There is no individual or section responsible for the management and oversight of the KM programme.

F5) The plant does not have a formal Knowledge Loss Risk Assessment (KLRA) process in place, nor any equivalent commonly in use, to identify critical knowledge or critical competencies.

F6) When questioned the senior members of the HR, Training, and Competence Management organisations could not define the concept of KM, nor could they explain an effective KM programme.

F7) The station staff have not been fully informed or trained in KM, or all of the components of an effective KM programme.

2.2 – SAFETY CONSEQUENCE:

Without a comprehensive knowledge management programme, the plant cannot ensure that safety and operational risks associated with critical knowledge loss will be adequately identified and managed.

2.3 – RECOMMENDATION/SUGGESTION:

R) The plant should implement a comprehensive knowledge management programme.

2.4 – IAEA BASIS:

GSR Part 2

Requirement 4: Goals, strategies, plans and objectives.

Senior management shall establish goals, strategies, plans and objectives for the organization that are consistent with the organization's safety policy.

4.3. Goals, strategies, plans and objectives for the organization shall be developed in such a manner that safety is not compromised by other priorities.

4.26. All individuals in the organization shall be trained in the relevant requirements of the management system. Such training shall be conducted to ensure that individuals are knowledgeable of the relevance and the importance of their activities and of how their activities contribute to ensuring safety in the achievement of the organization's goals.

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

Requirement 10: Management of processes and activities.

Processes and activities shall be developed and shall be effectively managed to achieve the organization's goals without compromising safety.

Requirement 11: Management of the supply chain.

The organization shall put in place arrangements with vendors, contractors and suppliers for specifying, monitoring and managing the supply to it of items, products and services that may influence safety.

4.34. The organization shall have a clear understanding and knowledge of the product or service being supplied. The organization shall itself retain the competence to specify the scope and standard of a required product or service, and subsequently to assess whether the product or service supplied meets the applicable safety requirements.

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3.6. … The operating organization shall ensure long term access to knowledge of the plant design and manufacturing and construction throughout the lifetime of the plant.

Requirement 4: Staffing of the operating organization

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

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

2.5 – DOCUMENTS REVIEWED:

- AIP【Appendix-18】Guidelines for Nuclear Technical Personnel Development, 2024
- AIP【Appendix-17】Guidelines for Education and Training
- AIP【Appendix-16】Rules on Responsibility and Authority
- AIP【Appendix-14】Organizational Rules
- AIP【Appendix-13】Instructions for Stuffing and Organizational Planning
- AIP【Appendix-8】Procedure for Implementing Plant Life Management
- AIP【Appendix-6】Policy on the Mihama Nuclear Power Station Maintenance Work Rules
- AIP【Appendix-5】Guidelines for Nonconformance Management and Corrective Actions
- AIP【Appendix-3】Policy on the Guidelines for Nuclear Power Plant
- AIP【Appendix-2】Policy on the Guidelines for Nuclear Power Plant Maintenance Work
- AIP【Appendix-1】 Guidelines for Nuclear Power Plant Maintenance Work
- Quality Assurance Rules for Nuclear Power Safety
- Corporate SAT Training Manuals supporting Operations and Maintenance training
- Staff Personal Development Plans (employee specific)
- Staff OJT Manuals (employee specific)
- Supply Chain Council Organisational Arrangements Procedure
- Engineering Change Procedures (various site-specific documents)

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

3.1 – RESULTS OF THE ISSUE ANALYSIS:

n.a.

3.2 – CORRECTIVE ACTIONS:

n.a.

3.3 – STATUS OF CORRECTIVE ACTIONS IMPLEMENTATION:

n.a.

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

4.1 – FACTS:

F1) n.a.

4.2 – DOCUMENTS REVIEWED:

n.a.

4.3 – RESOLUTION DEGREE:

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

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

1. ISSUE IDENTIFICATION	**Issue Number: F-2**
NPP: Mihama	**Unit: 3**

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

1.1 – ISSUE TITLE:

Missing learning opportunities from operating experiences

1.2 – FUNDAMENTAL OVERALL PROBLEM:

Analysis of operating experience (OE) and lessons learned from external organisations is not comprehensive.

2. ASSESSMENT OF THE STATUS	**Date:** 25/04/2024

2.1 – FACTS:

F1) The international operating experience (OE) reports undergo initial screening by the JANSI Corporate organisation. One of the criteria for screening out international OE reports is removing OE reports that are not specific to LPWRs.

F2) Only 7 operating experiences at Mihama have been addressed in HQ technical evaluation report during a 10 year period (30-40 years in operation)

F3) The plant did not systematically use the best available international practices to identify relevant ageing effects and degradation mechanisms (TLAAs, i.e. IGALL, GALL or others).

F4) The PAC-OE system cards are not formally reviewed by HR or Training as part of the initial on plant screening.

F5) The recommended actions for operational experience on FAC degradations (EPRI and IGALL) and ruptures of low-pressure feed water heater (LP-FWH) vessels is not implemented by inspection program.

F6) The international OE reports undergo initial screening from the JANSI Corporate organisation. The annual average number of initial OE reports reviewed by JANSI is 4000 approximately. The average number of reports sent for formal technical review from this 4000 is 63, which is low compared with international practices.

2.2 – SAFETY CONSEQUENCE:

The lack of adequate methodology for usage of lessons learned from external organizations and operating experience could result in missing opportunities to improve the safety and operational performance of the plant.

2.3 – SUGGESTION:

S) The plant should consider improving the utilization of all available sources of operating experience and lessons learnt from external organisations to support LTO activities.

2.4 – IAEA BASIS:

GSR Part 2

6.7. The management system shall include evaluation and timely use of the following:

(a) Lessons from experience gained and from events that have occurred, both within the organization and outside the organization, and lessons from identifying the causes of events;

(b) …

(c) Lessons from identifying good practices.

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

Requirement 24: Feedback of operating experience

The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide.

5.27. The operating organization shall establish and implement a programme to report, collect, screen, analyse, trend, document and communicate operating experience at the plant in a systematic way. It shall obtain and evaluate available information on relevant operating experience at other nuclear installations to draw and incorporate lessons for its own operations, including its emergency arrangements. It shall also encourage the exchange of experience within national and international systems for the feedback of operating experience ….

5.29. Information on operating experience shall be examined by competent persons for any precursors to, or trends in, adverse conditions for safety, so that any necessary corrective actions can be taken before serious conditions arise.

2.5 – DOCUMENTS REVIEWED:

- AIP Appendix-18, Guidelines for Nuclear Technical Personnel Development, 2024
- AIP Appendix-17, Guidelines for Education and Training
- AIP Appendix-16, Rules on Responsibility and Authority
- AIP Appendix-14 Organizational Rules
- AIP Appendix-13 Instructions for Stuffing and Organizational Planning
- AIP Appendix-8 Procedure for Implementing Plant Life Management

– AIP Appendix-6 Policy on the Mihama Nuclear Power Station Maintenance Work Rules – AIP Appendix-5 Guidelines for Nonconformance Management and Corrective Actions – AIP Appendix-3 Policy on the Guidelines for Nuclear Power Plant – AIP Appendix-2 Policy on the Guidelines for Nuclear Power Plant Maintenance Work – AIP Appendix-1 Guidelines for Nuclear Power Plant Maintenance Work – QA Rules Related to the Safety of Nuclear Generation (5-57), 2022. – Engineering Work Rules Procedure Clause 18, 2021. – Field Maintenance Guideline No.5. 2020. – Guideline for Nuclear Maintenance Work Chapter 8 (B), 2019

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

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

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