

EXECUTIVE SUMMARY

At the invitation of Eletrobras Eletronuclear, the IAEA conducted a Pre-SALTO (Safety Aspects of Long Term Operation) mission at Unit 1 of the Angra Nuclear Power Plant in Brazil from 2 May to 11 May 2018.

Angra Unit 1 is a 640 MWe Pressurised Water Reactor, operated by Eletrobras Eletronuclear SA. It started commercial operation in 1985. In 2010, Comissao National de Energia Nuclear (CNEN) granted to Eletrobras Eletronuclear S.A a new operational permission for a period of 14 years, with conditions directly related to ageing management.

MAIN MISSION CONDUCT AND RESULTS

This Pre-SALTO mission focused on the status of activities for the long term operation (LTO) assessment of the plant. The review team consisted of two IAEA staff members (team leader, deputy team leader), seven external experts and four external observers, covering all areas of 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 systems, structures and components 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 concluded that the plant has made progress in the field of ageing management and initiated many activities for preparation for safe long-term operation. The LTO project of the plant already addresses several topics as recommended by IAEA. Some activities are partially implemented and many others have been initiated.

The team found the plant staff to be professional, open and receptive to suggestions for improvement. The mission team concluded that plant management is committed to improving plant preparedness for LTO. Walk-downs showed the plant to be in good condition.

In addition, the team found several good practices and good performances, including:

- The plant reduced the number of allowable fatigue cycles in the technical specifications to demonstrate acceptable LTO performance in relation to environmentally-assisted fatigue (area C);
- The plant has successfully performed a comprehensive master list reconstitution of equipment subject to environmental qualification (area D);
- The plant actively supports educational activities such as an internship programme for potential employees (area F).

The team identified several areas for further improvement where the plant performance should be improved to reach the level of international good practice. Twenty-one (21) issues were raised:

- Expectations of the regulatory authority for demonstration of preparedness for safe LTO are not clearly defined;
- The organizational structure for implementation of ageing management and preparation for LTO is not fully established;
- The plant currently does not have a formal policy for ageing management and LTO;
- The plant's periodic safety review is not comprehensive;
- Design basis documentation is not adequately managed to ensure its availability to the plant personnel;

- The scoping and screening process is not comprehensive to ensure completeness of the ageing management review (AMR);
- Ageing of the active and short-lived structures and components within the scope of LTO is not properly assessed and managed;
- Existing plant programmes are not adequate for LTO;
- Databases are not linked to ensure a complete and accurate LTO evaluation;
- The AMR for mechanical components is not adequate;
- Ageing management programmes (AMPs) for mechanical components are not fully developed to ensure plant safety during LTO;
- The plant has not considered all relevant sources of information for the identification of TLAAs for mechanical components and civil structures;
- The revalidation of TLAAs for mechanical components and civil structures is not complete;
- The plant has not fully implemented a comprehensive environmental qualification programme;
- AMR for electrical and I&C components is not complete for LTO;
- New AMPs and enhancement of existing AMPs to manage ageing effects for electrical and I&C components are not implemented;
- AMR for civil structures does not incorporate plant specific operating experience;
- Ageing management of concrete civil structures is not adequate for LTO;
- Human resources policy and strategy for LTO does not exist;
- The plant does not have a systematic and effective process to ensure all competences required for safe LTO;
- The knowledge management activities and principles are not embedded in the integrated management system.

A summary of the results was presented to the plant management during the exit meeting held on 11 May 2018. The plant management expressed a determination to address the areas identified for improvement, and indicated their intention to invite a ‘SALTO Peer Review Mission for Angra Nuclear Power Plant Unit 1’ in November 2020.

FOLLOW-UP MISSION CONDUCT AND RESULTS

At the invitation of Eletrobras Eletronuclear, the IAEA conducted a follow-up mission from 7 to 10 June 2022. The IAEA follow-up team consisted of four experts from Argentina, Slovenia and Sweden, and two IAEA staff members covering all areas of the original Pre-SALTO review mission.

The IAEA follow-up team reviewed the progress in resolving each of the issues from the 2018 pre-SALTO mission. Based on the observations of the follow-up mission, the team noted that the plant had progressed in resolving most of the issues. Resolution of some issues requires further work by the plant. The resolution degree was determined by the team for each issue sheet separately, with the following results:

- Eleven issues were assessed as issue resolved;
- Eight issues were assessed as satisfactory progress to date;
- Two issues were assessed as insufficient progress to date.

The SALTO team concluded that actions taken to resolve some recommendations and suggestions are sound and implemented well. The following can be highlighted:

- Issues A-2 and A-3: The plant developed and implemented a formal policy and improved organizational arrangements for LTO.
- Issues C-4 and C-5: The plant completed the identification and revalidation of Time Limited Ageing Analyses.
- Issues C-3, D-3 and E-2: The plant completed the development and started the implementation of a large number of Ageing Management Programmes.

Nevertheless, some issues will still require significant attention and effort of the plant. The most important ones are as follows:

- Issue D-1: The plant should fully implement a comprehensive environmental qualification programme.
- Issues F-1: The plant should develop a human resources policy and strategy for LTO.

A summary of the results was presented to the plant management during the exit meeting held on 10 June 2022. The plant management expressed determination to continue to address the remaining issues and decided to invite a full scope SALTO mission in 2023.