EXECUTIVE SUMMARY

Upon the invitation of the Belgian Government and the Federal Agency for Nuclear Control (FANC), a peer review mission on safe long term operation (SALTO) was provided to review programmes/activities of the Tihange Nuclear Power Plant Unit 1 (further referred as "the plant").

The administrative address of the plant is Avenue de l'Industrie 1, 4500 Tihange. The plant is located in the southern part of Belgium, on the river Meuse. The turn-key contracts were awarded to TRABEL (Tractebel) and ELECTRICITE DE FRANCE for the design, to the temporary association A.C.L.F, headed by FRAMATOME (AREVA), BELGONUCLEAIRE, GROUPEMENT ATOMIQUE ALSACIENNE ATLANTIQUE, CAMPENON BERNARD and C.F.E. for the construction. The initial start-up operation of the plant 1 was awarded to ELECTRABEL. The plant is a pressurised water reactor power plant. Its nuclear steam supply system was provided by the temporary association A.C.L.F and is located in a double containment concrete building. Its reactor output is 2,873MWth and the electrical output of the turbine generator is 960MWe. The turbine sets were supplied by Alsthom.

The plant started its commercial operation in October 1975. The unit will be 40 years old in October 2015, reaching the lifetime foreseen in the 2003 Nuclear Phase-out Act. Given the intention of the Belgian government to grant a 10-year life extension to the plant, LTO evaluation was required by the Federal Agency for Nuclear Control (FANC). At the end of 2011 ELECTRABEL GDF-SUEZ submitted its LTO-file to the FANC which was approved in June 2012.

The plant is required to perform an LTO assessment to demonstrate the safety level of the plant for 50 years of operation. This SALTO mission reviewed details related to this LTO assessment. A preparatory meeting was held in August 2014. The scope of the SALTO mission was agreed on and defined in the Terms of Reference issued in August 2014. The review team was organised accordingly; it comprised two IAEA staff members and five external experts covering all disciplines stated in the Terms of Reference.

The mission reviewed completed, in-progress and planned plant activities related to LTO, including activities involving the ageing management of systems, structures and components (SSCs) important to safety and revalidation of time limited ageing analyses (TLAA).

Through the review of available documents, including the Advance Information Package and other plant documents, presentations and discussions with counterparts as well as with other members of the plant staff, the IAEA team concluded that the plant has worked extensively in the field of long-term operation and ageing management. Based upon the observations of this SALTO review, the team finds good preparation for the long-term operation of the plant. We have found the plant staff very professional, open and mostly receptive to suggestions for improvement. Numerous walk-downs showed that the power plant is in a good condition.

The SALTO team concluded that plant management is committed to improving plant preparedness for LTO. In addition, the team noticed the following good practice:

- Management of critical suppliers.

Taking into account the above mentioned points, the team recognised that the plant approach and preparatory work for safe LTO generally follows the IAEA Safety Standards and international practices.

The team identified areas for further improvement. Ten issues were raised:

- The plant does not have a programme in place for carrying out ageing management activities for the LTO period;
- AMPs are not fully implemented in and addressed by the plant organization and responsibilities are not clearly defined in plant processes;
- The process for evaluating preventive and predictive maintenance programmes for active mechanical components is not comprehensive;
- The demonstration that mechanical equipment qualification will remain valid over the LTO period is not clear;
- The time span of operating experience and the range of references used are not sufficiently comprehensive for AMR;
- There are no planned periodic and documented condition visual inspections and tests during the LTO period aiming at preserving cable system qualification and functionality (cables, cable trays and connections);
- The current approach to the testing of containment structural integrity is not fully consistent with IAEA Safety Standards;
- Loss of concrete durability due to leaching Calcium Hydroxide has not been appropriately addressed in the plant;
- The design intent of cable tray support anchoring is not performed as required by the design;
- Competence and knowledge management processes are not fully integrated into the line organisation for LTO.

The status of issues from the Pre-SALTO Mission in 2012 was also assessed. The team concluded that the plant performed a significant amount of work to solve those issues but resolution of several of issues must be still finalized. The resolution degree was determined separately by the team for each issue sheet, with results as follows:

- 0 issue - insufficient progress to date;
- 7 issues - satisfactory progress to date;
- 6 issues - issue resolved.

A summary of the review was presented to plant management during the exit meeting held on 22 January 2015. Plant management expressed a determination to address the areas identified for improvement, and indicated its intention to invite a “Follow-up SALTO peer review mission” in December 2016 to complete the review of the plant preparation for LTO. The follow-up mission will review progress in solving issues raised during this mission.

Appendix III of this report includes the team’s comments and conclusions related to issues raised during the 2012 Pre-SALTO Mission. Appendix IV of this report includes the team’s detailed recommendations and suggestions arising from this mission.

FOLLOW-UP MISSION

A follow-up mission was organized from 6 to 9 December 2016 and the team consisted of one IAEA staff member, two external experts and two observers. Participating experts from France were members of the Pre-SALTO and SALTO teams in 2012 and 2015. Observers from Sweden and Mexico were also actively contributing members of the follow-up team. The SALTO follow-up report is the original report from the SALTO mission in 2015 supplemented with the "counterpart actions" and "follow-up assessment by the IAEA review team". The "counterpart actions" provided in issue sheets` section 4 are reviewed by the follow-up IAEA review team prior to the follow-up mission and confirmed in the field during the visit. "Follow-up Assessment by the IAEA Review Team" is then added in light of the follow-up mission into issue sheets` section 5. The IAEA conclusion is produced in issue sheets` section "Resolution Degree". "Status at follow-up SALTO mission" is prepared by the IAEA team for each review area. This resulting document is therefore an overall report of both the SALTO mission and the SALTO follow-up mission.

During the SALTO peer review mission in January 2015, ten issues were defined in six reviewed areas. The follow-up team reviewed the progress in issues solving for each of these issues separately.

The team concluded that the plant has made significant progress to resolve most of the issues. The resolution degree was determined by the team for each issue sheet separately, with the following results:

- 2 issues were assessed as satisfactory progress to date;
- 8 issues were assessed as issue resolved.

The detailed evaluation of plant actions is provided in Appendix IV of this report in a section 5 of each individual issue sheet. Additional evaluation is provided for each review area in a "Status at follow-up SALTO mission" subsection of each review area.