

APAL

Advanced PTS Analysis for LTO

OBJECTIVES

One of the most limiting safety assessments for long term operation (LTO) of nuclear power plants (NPP) is the reactor pressure vessel (RPV) integrity assessment for pressurized thermal shock (PTS). The goal is to demonstrate the safety margin against fast fracture initiation or RPV failure.

In the EU, currently used PTS analyses are based on deterministic assessment and conservative boundary conditions. This type of PTS analyses is reaching its limits. However, inherent safety margins exist and several LTO improvements and advanced methods are intended to increase the safety margins of PTS analysis. Additionally, the quantification of safety margins in terms of risk of RPV failure by advanced probabilistic assessments becomes more important.

The main objectives of this project are establishing of state-of-the-art for LTO improvements having an impact on PTS analysis: NPP improvements, development of advanced deterministic and probabilistic PTS assessment method including thermal hydraulic (TH) uncertainty analyses, quantification of safety margins for LTO improvements and development of best-practice guidance.

EXPECTED IMPACTS

- An extensive research to define the state-of-the-art for LTO improvements, identify technology gaps and establish new solutions for tools, systems and practices for a PTS analysis.
- The performance of a well-defined benchmark that will give partners the opportunity to qualify and verify their tools, methods and practices used for safety margin assessment.
- The application of LTO improvements and advanced methods for PTS analysis to qualify and quantify the reduction of vulnerabilities of operating plants under PTS event.
- The development of best-practice guidance on advanced PTS analysis for LTO.

HIGHLIGHTS

After establishing the LTO improvements, TH calculations will be performed including also uncertainty quantification relevant to PTS assessment. Benchmark calculations for both deterministic and probabilistic RPV integrity assessment will be performed with the goal to establish the impact of LTO improvements and TH uncertainties on the overall RPV integrity margins.

International collaboration of 14 APAL project partners and 2 international (non European) partners.

PARTNERS

ÚJV Řež, a. s. / Framatome GmbH / Paul Scherrer Institut / IPP Centre LLC / Kiwa Inspecta Technology AB / Tecnomat S.A. / Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH / Bay Zoltán Nonprofit Ltd. for Applied Research / European Research and Project Office GmbH / Jožef Stefan Institute / Institut de radioprotection et de sûreté nucléaire / Lappeenranta University of Technology / Warsaw University of Technology / State Scientific and Technical Center for Nuclear and Radiation Safety

DURATION & BUDGET

10/2020 – 9/2024 - 4 years
4 Million Euros

CONTACTS

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EVENTS

A state-of-the-art workshop, an advanced workshop and a final seminar are planned for the APAL project.

