DEFI-PROSAFE

DEFInition of reference case studies for harmonized PRObabilistic evaluation of SAFEty margins in integrity assessment for long-term operation of reactor pressure vessel

OBJECTIVES

The goals of the project are to develop the approach for assessing the key parameter that could represent the total safety status (integrity safety margin) of a NPP RPV and to create ”benchmark-ready” reference case studies for which a reliable validation and verification basis is available. The objective is to develop a probabilistic integrity assessment approach as well as to create input deck files for RELAP5/ATHLET/CATHARE. Reference case studies are defined to investigate the propagation of the uncertainties from the boundary conditions through the structural integrity evaluation, in order to get insights in the total safety margin.
The objectives are

- to develop a probabilistic integrity assessment approach
- to create input deck files for RELAP5/ATHLET/CATHARE.
- to define reference case to investigate the propagation of the uncertainties from the thermal-hydraulic boundary conditions through the structural integrity evaluation.

DESCRIPTION OF WORK

To define a common understanding of safety margin within the RPV assessment and propose a method to appreciate the remaining margin inherent to the deterministic evaluation for the integrity of RPV assessment considering uncertainties propagation (thermal hydraulic loading, flaw, material). RPV beltline and nozzle regions are considered.

To prepare and validate procedure for safety margin quantification (based on allowable T_0). Comparison of RELAP/ATHLET/CATHARE with UPTF experiment. Link together a rigorous treatment of TH uncertainties with probabilistic structural calculations. Identify important input variables and phenomena that have the most important impact on the result (PIRT, sensitivity studies). Define a benchmark (with mandatory and non-obligatory tasks) to allow verification and validation of the methodology and tools, based on past experience (PROSIR, ICAS).

MAIN RESULTS / HIGHLIGHTS

Proposition of RPV safety margin definition in terms of material fracture toughness transition temperature (using T_0) following deterministic and probabilistic assessment
PIRT analysis dedicated to the whole RPV (beltline and nozzle)
Uncertainties provided by RELAP5/ATHLET/CATHARE compared to experimental 1:1 scale facilities
Benchmark definition for assessment of the proposed approach

DURATION

1 March 2015 – 31 August 2016
18 months

PARTNERS

AREVA-G / PSI / UJV

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