ABSTRACT

The FPT3 test is the last in the series of 5 in-pile integral experiments of the FP programme. The international Phebus FP programme was initiated in 1988 by IRSN, in cooperation with the European Commission (EC), and includes contributions from other partner countries USA (US-NRC), Canada (COG), Japan (JNES, JAEA), Korea (KAERI) and Switzerland (HSK, PSI). The overall technical objective of the experiments is to contribute to the validation of models and computer codes to be used for the calculation of the source term in case of a severe accident in a Light Water Reactor.

In terms of fission products, the Phebus-FP facility is scaled down by a factor 5000 relative to a 900-MWe PWR: the scale factor uniformly applies to the initial bundle inventory, the circuit concentrations and the containment concentrations, so as to ensure that representative phenomena can be studied under typical concentrations.

In the ambit of the 7th EURATOM Framework Programme, ENEA is partner in the SARNET-2 Project, with involvements in many tasks, amongst which WP8.3 "*Bringing research results into reactor application*", in which ENEA will take part in proposed benchmark using ASTEC and MELCOR codes and performing calculations for PHEBUS FPT3 test.

A strong difference between FPT3 and previous tests is the use of a B_4C control rod instead of a SIC control rod (Silver-Indium-Cadmium).

Main FPT3 objectives are:

- Bundle: (a) Maximize the release of FPs by achieving significant fuel degradation (with about 1kg of relocated fuel material); and (b) learn more about the presence of a B4C control rod and the behaviour of its components during the degradation phase.
- Circuit: (a) Study FP transport and deposition at low pressure (~0.2 MPa) without steam condensation and with laminar flow in the steam generator; (b) Provide data on FP chemistry, including interactions between FPs and pipe walls at high temperature and between FPs and degradation products of the control rod material (mainly CO, CO2, CH4); and (c) Investigate transport and wall deposition processes in the vertical line just above the bundle, where a strong change in the carrier gas temperature is forced.
- Containment: (a) Study the FP chemistry, and the iodine radiochemistry in the atmosphere and the sump water; (b) Take advantage of the actual aerosol source to assess aerosol physics codes, especially the models for diffusion-phoresis onto internal condensing surfaces; (c) Investigate wall and sump deposition processes; and (d) examine the performance of hydrogen recombiners.

The work presented here is just the beginning of the planned activities using MELCOR code in order to validate ASTEC code and training users to became more and more skilled and upgrading on to latest MELCOR version 2.1. More precisely, it will be presented some bundle related activities that are propaedeutic with the goal to model the Circuit and the Containment.