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SAFIR2014 FINAL SEMINAR

The PWR PACTEL experiments in the
OECD/NEA PKL Phase 3 project

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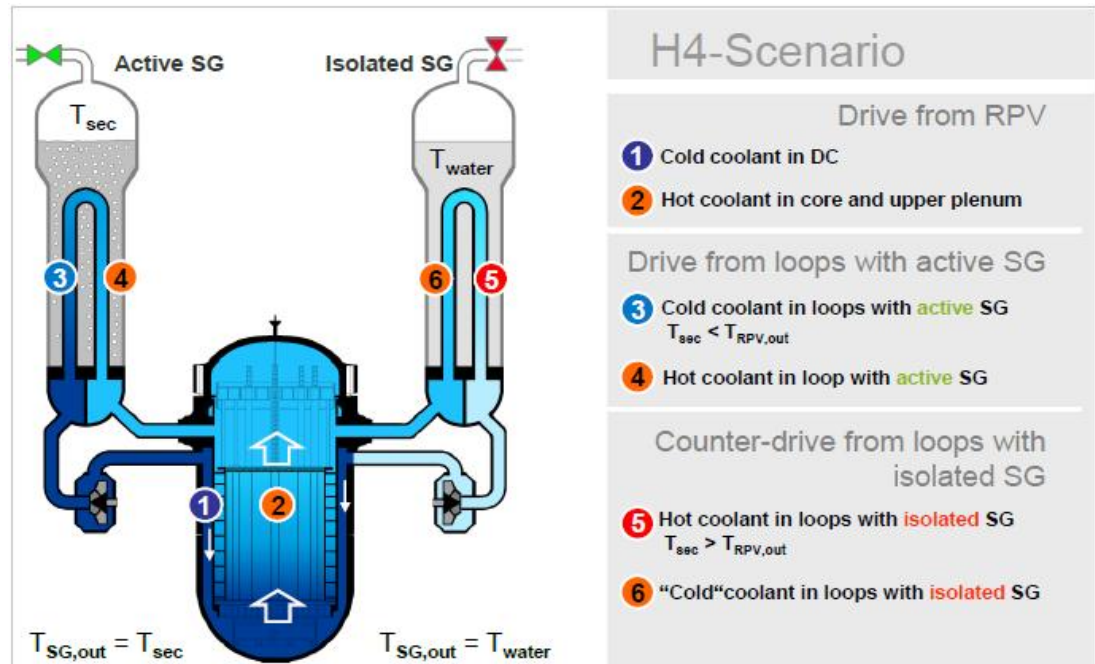


BACKGROUND

- OECD/NEA PKL Phase 3 project
 - ✓ several tests with the PKL facility (integral test facility simulating a 1300 MW PWR) owned by AREVA
 - ✓ investigate safety issues related to beyond design basis accident transients with significant core heat-up
 - ✓ demonstrate efficiency of very late initiated AM-measures and explore the safety margins
 - ✓ the most of the OECD countries using nuclear power are participating
 - ✓ complementary tests in ROCOM (HZDR, Germany), PMK (MTA EK, Hungary) and PWR PACTEL (LUT, Finland)

COOL DOWN UNDER NATURAL CIRCULATION CONDITIONS IN PRESENCE OF SECONDARY SIDE ISOLATED STEAM GENERATORS

- The PWR PACTEL CNC experiments as a supplement to a similar experiment in the PKL facility
- Objective
 - ✓ to find the maximum continuous cool down rate while maintaining the natural circulation in the loops with isolated steam generators and water-filled on the secondary side



CNC EXPERIMENTS (continue)

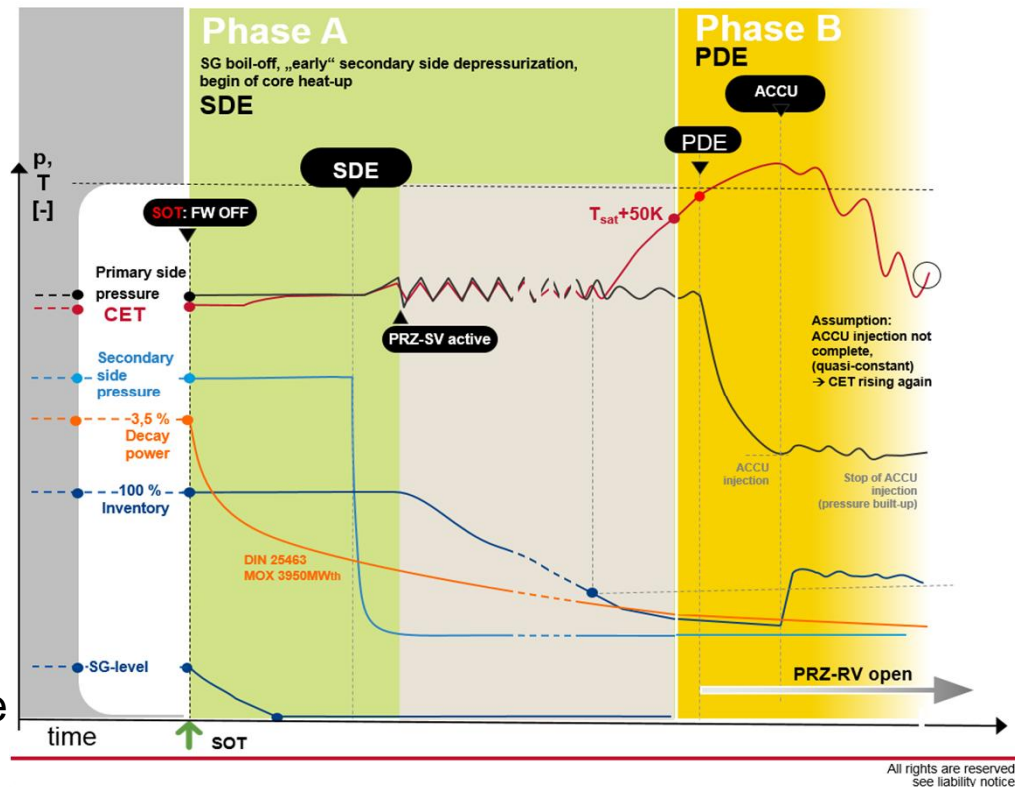
- A preliminary experiment with the cool down rate of 25 K/h
 - ✓ test the systems and experiment procedure
 - ✓ get more information for planning the final experiment
 - ✓ the flow reversing in the loop was not possible
- Several pre-test analyses with the APROS and TRACE codes
 - ✓ different pressure, core power, and cool down rate values to find suitable experiment parameters
 - ✓ none of the pre-test analyses gave results where the natural circulation in the isolated loop reverse or stagnate

CNC EXPERIMENTS (continue)

- After discussions with AREVA the cool down rate of 50 K/h was decided to be used in the final experiment
 - ✓ the results can be compared with the results of the PKL experiment
- In PWR PACTEL the driving force for the reverse direction was not enough to stop the natural circulation
- The flow did not reverse in the isolated loop of PWR PACTEL with any available experiment conditions and procedures (the small height of the steam generators in the PWR PACTEL facility?)

STATION BLACKOUT

- The PWR PACTEL SBO experiments as a supplement to a similar experiment with the PKL facility
- Objectives
 - ✓ to evaluate the effectiveness of accident management measures
 - ✓ to test the performance of the core exit temperature measurement for the detection of core heat up



SBO EXPERIMENTS (continue)

- Secondary side depressurization (SDE)
 - ✓ did not have any significant effect on the primary side behavior
 - ✓ the capacity of the pressurizer relief valve was enough to keep the primary side pressure below the allowed maximum pressure of the facility
 - ✓ the core exit temperatures began to rise later than the core cladding temperatures
 - the core cladding temperatures were then higher than the core exit temperatures

SBO EXPERIMENTS (continue)

- Primary side depressurization (PDE)
 - ✓ proved to be an efficient accident management measure but timing is crucial
 - ✓ the peak cladding temperature during the core heat up depends on the core uncover depth and duration
 - the later the primary side depressurization was executed the higher the peak cladding temperature was during the core heat up
 - ✓ the initial accumulator pressure has also a significant effect
 - in the experiments much lower initial primary and secondary side pressures were used than in the real power plants

Thank you for your attention



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