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SPACE Validation on a Steam Generator Tube Rapture Experiment with SMART-ITL Facility

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Evaluation of Nuclear Power Plants (NPPs) performances during accident conditions has been the main issue of research in nuclear fields during the last 40 years. Therefore, several complex system thermal-hydraulic codes have been developed for simulating the transient behavior of NPPs. Safety and performance analysis codes validation is required and important work that should be performed to obtain reliable results for simulating the NPPs behaviors during the steady state or transients.

SMART100 is System Integrated Modular Advanced Reactor with 100 MWe and fully Passive Safety Systems (PSSs). The design of SMART100 was upgraded from the standard design of SMART and developed by Korean Atomic Energy Institute (KAERI). Unlike loop-type commercial reactors, the SMART100 plan adopts a helically coiled steam generator, an internal pressurizer, inside the Reactor Pressure Vessel (RPV).In addition, SMART-ITL is an integral test loop facility that has been constructed by KAERI and finished its commissioning tests in 2012, to observe and understand the thermal hydraulic phenomena that occur in the systems of SMART100 during normal operation or transients. To simulate the thermal-hydraulic behavior well at SMART100 plant under various conditions including Steam Generator Rapture (SGTR), it is necessary to develop and validate safety and performance system analysis codes that reflect the characteristic of SMART100. In general, developing physical models and validation work for separate effect and integral effect tests are required to enhance the reliability of the simulation results of a system analysis code.

The purpose of this paper is to validate the Safety and Performance Analysis CodE (SPACE) based on the steam generator tube rapture experiment with SMART-ITL in order to predict and identify the capability of SPACE for analyzing thermal hydraulics in integral reactors

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