

International Conference on Fast Reactors and Related Fuel Cycles: Next Generation Nuclear Systems for Sustainable Development (FR17)



Contribution ID: 172

Type: ORAL

An assessment of transient over-power accident in the PGSFR

Monday, June 26, 2017 4:50 PM (20 minutes)

KAERI (Korea Atomic Energy Research Institute) has been developing a preliminary specific design of the PGSFR (Prototype Gen-IV Sodium-cooled Fast Reactor), which is a pool-type sodium cooled fast reactor with a thermal power of 392.2 MW. The PGSFR has an inherent safety characteristic owing to the design to have a negative power reactivity coefficient during all operation modes and it has a passive safety characteristic due to the design of a passive decay heat removal circuit.

For an evaluation of the safety features of the PGSFR, a sensitivity analysis has been performed for TOP (Transient Over-Power) which is one of most important DBEs in the PGSFR using MARS-LMR code. MARS-LMR contains the sodium property table including dynamic properties, heat transfer correlations for the liquid metal, and the models describing the flow resistance by wire-wrap spacer in the core, which shows a good agreement with the experimental data conducted in the EBR-II plant and the appropriateness of the models related to liquid metal reactor.

For a sensitivity analysis, some design variables are applied to be conservative. An effect of uncertainties is evaluated on a Doppler reactivity and a sodium density. Conservative assumptions are applied to the analysis of the plant responses during the postulated DBAs, which are 102 % of power condition with ANS-79 decay power model, 5.0 seconds delay in opening of AHX and FHX dampers, and loss of off-site power (LOOP) is taken into account. Additionally, one PDHRS and one ADHRS are available in accordance with a single failure criterion and maintenance.

As a result, the preliminary specific design PGSFR meets safety acceptance criteria with a sufficient margin during the TOP event and keep accidents from deteriorating into more severe accidents.

Country/Int. Organization

Republic of Korea/Korea Atomic Energy Research Institute

Primary author: Dr LEE, KWI LIM (KAERI)

Presenter: Dr LEE, KWI LIM (KAERI)

Session Classification: 3.2 Core Disruptive Accident

Track Classification: Track 3. Fast Reactor Safety