Contribution ID: **23037** Type: **Paper**

Bubble transport during SGTR accident in lead-cooled fast reactor: A machine learning

Wednesday, 15 November 2023 14:10 (20 minutes)

Steam generator tube rupture (SGTR) is one of the safety issues for pool type lead-cooled fast reactors (LFR). After high-pressure water is injected into the lead pool, the subsequently generated steam bubble would transport to the core and affect the heat transfer performance. This paper addresses tracking the bubble motion using an Eulerian-Lagrangian method in CFD based on the 1/8 centrosymmetric scale geometric model of ELSY primary system. The steady and transient bubble distributions under different leakage heights are obtained. Furthermore, the simulation results are predicted by machine learning, where Gaussian Process Regression (GPR) is employed for steady conditions and backpropagation neural network (BPNN) for transient conditions. For steady conditions, the prediction results by the kernel function of ardrationalquadratic show the best accuracy in predicting the percentages of bubbles reaching the core, top of the steam generator, and staying in the system. Four typical transient cases of bubble accumulation in the core are selected for BPNN prediction. All the cases are well predicted with R2>0.99. In conclusion, machine learning algorithms have great potential to predict bubble transport in the primary system after SGTR.

Speaker Bio

Primary authors: Mr DONG, Kejian (City University of Hong Kong (CityU)); ZHAO, jiyun (City University of Hong Kong)

Presenter: Mr DONG, Kejian (City University of Hong Kong (CityU))

Session Classification: Day 3- Parallel Session - I : Thermal-Hydraulics

Track Classification: Nuclear Thermal-hydraulics