A Study on Improvement of Power Distribution and Safety in Soluble Boron Free Core Through Alteration of Fuel Composition

Soon Young Kim, Jong Kyung Kim, Gyoo Dong Jeun, and Shane Park
Hanyang University

Abstract

A new concept of Pu-238 added fuel is introduced to control the reactivity and power distribution in soluble boron free (SBF) pressurized water reactor (PWR) core. Though excessive use of burnable poison and control rods is inevitable for reactivity suppression in SBF core, it causes the core power distribution control to be so difficult that a practical SBF operation is far distant. In this work, it is confirmed that the excess reactivity can be greatly suppressed by introducing the Pu-238 added fuel. As the result of the conceptual core design of the 600MWe SBF PWR using the Pu-238 added fuel, the core power distribution is well controlled in comparison with the results obtained from the previous 600MWe SBF core design works. Safety analysis of the SBF core is tested about two limiting accidents, steam line break accident and rod cluster control assembly ejection accident, and it is verified that the SBF core is safer than the previous SBF core against the two limiting accidents. Hence, one of the difficult control problems arising in SBF core design can be greatly mitigated by introducing the new fuel concept. It is further expected that the Pu-238 added fuel introduced in this study is directly applicable to practical SBF core design.

Full MOX Core Design for KNGR

Yu Seon Choi, Yong Hee Kim and Kwang Ho Lee
Korea Electric Power Research Institute

Abstract

Nuclear design of KNGR(Korean Next Generation Reactor) is performed to evaluate the feasibility of full MOX(Mixed Oxide, PuO_2-UO_2) fuel loading in KNGR core. The reactor core is designed to produce 3983 MW_{th} fission power, 3-batch, 18-month cycle length and Low Leakage Loading Pattern scheme with minimal change in NSSS designs optimized for UO_2 fuel. A hybrid CEA configuration, 50% enriched boron in chemical shim, 5% enriched UO_2 fuel in burnable poison rod have been adopted to guarantee the required shutdown margin and satisfy MSLB accident requirement.