A Study on the Conceptual Design of a 1,500 MWe Passive PWR with Annular Fuel

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Abstract

In this study, the preliminary conceptual design of a 1500 MWe pressurized water reactor (PWR) with annular fuel has been performed. This design is derived from the AP1000 which is a 1000 MWe PWR with two-loop. However, the present design is a 1500 MWe PWR with three-loop, passive safety features and extensive plant simplifications to enhance the construction, operation, and maintenance. The preliminary design parameters of this reactor have been determined through simple relation to those of AP1000 for reactor, reactor coolant system, and passive safety injection system. Using the MATRA code, we analyze the core designs for two alternatives on fuel assembly types: solid fuel and annular fuel. The performance of reactor cooling systems is evaluated through the accident of the cold leg break in the core makeup tank loop by using MARS2.1 code. This study presents the developmental strategy, preliminary design parameters and safety analysis results.