

## Performance analysis of AP1000 passive systems during direct vessel injection (DVI) line break / A.S. Ekariansyah, S. Widodo

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### Abstrak

Generation II Nuclear Power Plants (NPPs) have a design weakness as shown by the Fukushima accident. Therefore, Generation III+ NPPs are developed with focus on improvements of fuel technology and thermal efficiency, standardized design, and the use of passive safety system. One type of Generation III+ NPP is the AP1000 that is a pressurized water reactor (PWR) type that has received the final design acceptance from US-NRC and is already under construction at several sites in China as of 2015. The aim of this study is to investigate the behavior and performance of the passive safety system in the AP1000 and to verify the safety margin during the direct vessel injection (DVI) line break as selected event. This event was simulated using RELAP5/SCDAP/Mod3.4 as a best-estimate code developed for transient simulation of light water reactors during postulated accidents. This event is also described in the AP1000 design control document as one of several postulated accidents simulated using the NOTRUMP code. The results obtained from RELAP5 calculation was then compared with the results of simulations using the NOTRUMP code. The results show relatively good agreements in terms of time sequences and characteristics of some injected flow from the passive safety system. The simulation results show that the break of one of the two available DVI lines can be mitigated by the injected coolant flowing, which is operated effectively by gravity and density difference in the cooling system and does not lead to core uncover. Despite the substantial effort to obtain an appropriate AP1000 model due to lack of detailed geometrical data, the present model can be used as a platform model for other initiating event considered in the AP1000 accident analysis.