

A backward method to estimate the dai-ichi reactor core damage using radiation exposure in the environment / P.M Udiyani, S. Kuntjoro, S. Widodo

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Abstrak

The Fukushima accident resulted in the melting of the reactor core due to loss of supply of coolant when the reactor stopped from operating conditions. The earthquake and tsunami caused loss of electricity due to the flooding that occurred in the reactor. The absence of the coolant supply after reactor shutdown resulted in heat accumulation, causing the temperature of the fuel to rise beyond its melting point. In the early stages of the accident, operator could not determine the severity of the accident and the percentage of the reactor core damaged. The available data was based on the radiation exposure in the environment that was reported by the authorities. The aim of this paper is to determine the severity of the conditions in the reactor core based on the radiation doses measured in the environment. The method is performed by backward counting based on the measuring radiation exposure and radionuclides releases source term. The calculation was performed by using the PC-COSYMA code. The results showed that the core damage fraction at Dai-ichi Unit 1 was 70%, and the resulting individual effective dose in the exclusion area is 401 mSv, while the core damage fraction at Unit 2 was 30%, and the resulting individual effective dose was 99.1 mSv, while for Unit 3, the core damage fraction was 25% for an individual effective dose of 92.2 mSv. The differences between the results of the calculation for estimation of core damage proposed in this paper with the previously reported results is probably caused by the applied model for assessment, differences in postulations and assumptions, and the incompleteness of the input data. This difference could be reduced by performing calculations and simulations for more varied assumptions and postulations.