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Core Modeling and Source Term Calculations Using MCNPX Code for Fukushima Daiichi Unit-1 Nuclear Power Plant Accident

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Management of severely damaged spent fuel and corium plays an important role in the nuclear safety issues for the nuclear power plants. The calculation of burned fuel inventory is required for determining the composition, activity of core melt and in the estimation of the radiological source term in the environment. Isotopic inventory of the burned fuel at the time of the accident of Fukushima Daiichi Unit 1 (FD-U1) was calculated using Monte Carlo analysis MCNPX 2.7 code linked to depletion calculation code CINDER'90 and ENDF/B-VII.0 cross section data library. The reactor core model results were validated with experimental measurements which was carried out by Japan Nuclear Energy Safety Organization (JNES) and verified with published results using ORIGEN-Code by Japan Atomic Energy Agency (JAEA). The verification comparison was in good agreement for all the radionuclides, and more radionuclides were obtained using MCNPX-Code. The total activity of the burned fuel at the time of the accident was 9.86E+19 Bq and after 50 Yrs. was 1.89E+17 Bq and the higher inventory concentration in the fuel was dominated by the trans-uranic elements. Also, the specific activity was calculated for the inventory at the time of the accident and after 50 Yrs. And found to be 1.84E+15 Bq/gm and 5.86E+12 respectively.

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