

Atmospheric Dispersion Benchmark Problem of the ASEAN Network on Nuclear Power Safety Research

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Abstract

ASEAN Network on Nuclear Power Safety Research (ASEAN NPSR) has been working since 2017 on the atmospheric dispersion benchmark problem to support capacity building in emergency preparedness and response (EPR) in ASEAN. Its project named Enhancing ASEAN Research Competency in Nuclear Emergency Preparedness and Response is being funded under the ASEAN Science, Technology and Innovation Funds (ASTIF). Atmospheric dispersion characteristics of a hypothetical release from nuclear power plants (NPP) are assessed with different meteorological conditions, calculation codes and assessors, and the results are compared and discussed. The project started with the assessment of the proposed Ninh Thuan 1 Nuclear Power Plant, and later shifted to Fangchenggang Nuclear Power Plant. Source term data is adopted from the station blackout scenario in the SOARCA report. Three different sets of meteorological data are used for the calculation to cover dry and wet conditions. The benchmark problem is assessed by three member states: Singapore, Vietnam and Thailand, using four calculation codes: ARGOS, Flexpart, JRODOS and NACAC. The dispersion patterns of ARGOS and JRODOS are almost identical, while those of Flexpart and NACAC are quite different. It was found that air concentration and ground concentration calculated by ARGOS and JRODOS are within the same ranges (differences are less than an order of magnitude), though ARGOS delivers much smaller total effective dose equivalents (TEDEs) for dry deposition, and much larger TEDEs for wet deposition. The results are being investigated to find the root causes to these differences, and to summarize recommendations to the users of these calculation codes when the codes are applied to transboundary atmospheric dispersion calculation.

Keywords

atmospheric dispersion, benchmark problem, ASEAN NPSR, transboundary