Atmospheric Dispersion Modelling and Radiological Environmental Impact Assessment for the Potential Reopening of the Bataan Nuclear Power Plant, Philippines

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To address the growing demand in energy, the Philippine government set out a target to integrate nuclear energy in the country's energy mix and reduce its dependence on fossil fuels by 2032. One consideration is the revival of the inactive Bataan Nuclear Power Plant (BNPP), a Westinghouse Pressurized Reactor that can generate 621 MWe of electricity. As the unit was constructed in the 1980s, this work presents an updated radiological and environmental impact assessment (REIA) for the atmospheric releases during normal operation according to recent local weather conditions.

The Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) tool is used to simulate the air concentration and deposition of radioactive releases for ¹³¹I and ¹³⁷Cs for the two pronounced seasons in the Bulacan-Pampanga-Bataan airshed in the months of February (dry season) and August (wet season) 2023. Meteorological data from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAG-ASA) at Cubi Point Weather Station, Zambales confirms the dominant ENE wind direction during the dry season for the months of November to April and a SW direction in the months of May to October reflected in the Global Data Assimilation System (GDAS) used in the dispersion simulations.

Ground level air concentration at a critical residence 1.5 km ENE from the plant was calculated to be 4.02x10⁻⁶ Bq/m³ for ¹³⁷Cs and 1.08x10⁻⁵ Bq/m³ for ¹³¹I. Results also show that topographic effects play a significant role in the dispersion of radionuclides during the wet season. Dispersion simulations show that the Cordillera Range in the north-central part of the Luzon Island act as physical obstruction and reduce the overall horizontal dispersion of the radionuclides in the immediate downwind direction. During the dry season, the prevailing wind direction carries the radionuclides toward the West Philippine Sea, resulting to minimal exposure of the public. This study also demonstrates the use of HYSPLIT as an assessment tool for atmospheric releases at potential sites of nuclear power plants and its implications for REIA.

References

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