

Modelling the transport of radionuclides released in the Ilha Grande bay (Brazil) after a LBLOCA in the primary system of a PWR

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Introduction

It was postulated, in the cooling system of the core, a LOCA, where 431 m³ of soda almost instantaneously was lost. This inventory contained 1.87x10¹⁰ Bq/m³ of tritium, 2.22x10⁷ Bq/m³ of cobalt, 3.48x10⁸ Bq/m³ of cesium and 3.44x10¹⁰ Bq/m³ of iodine and was released in liquid form near the Itaorna cove, Angra dos Reis – RJ [1-2].

Applying the model in the proposed scenario (Angra 1 and 2 in operation and Angra 3 progressively reducing the capture and discharge after the accident), the simulated dilution of the specific activity of radionuclide spots, reached values much lower than report levels for seawater (1,1x10⁶ Bq/m³, 1,11x10⁴ Bq/m³ and 1,85x10³ Bq/m³) after 22 hours, respectively for ³H, ⁶⁰Co, ¹³¹I and ¹³⁷Cs [1-2]. From the standpoint of public exposure to radionuclide dispersion, the results of activity concentration obtained by the model suggest that the observed radiological impact is negligible. Based on these findings, we conclude that there would be no radiological impact related to a further release of controlled effluent discharges into Itaorna cove.

Discussion and conclusion

Based on the above, from the standpoint of public exposure to radionuclide dispersion, the results of activity concentration obtained by the model after

22 hours suggest that the observed radiological impact is negligible and far below the detection limits recommended by the IAEA [3], and the reference ranges for sea water. For the area of direct influence of the maximum value after 22 hours of radionuclides is simulated with values far below the detection limits recommended by the IAEA and to the limits in seawater. As the model only succeeds to simulate the transport after around 22 hours due to constraints in hydrodynamic circulation caused by numeric deviations, it is noted that radionuclide concentrations in the early hours could exceed the detection limit, but never the report levels for seawater.

Finally, it would be advisable to isolate the location of the discharge in the first 22 hours in order to avoid the undue exposure of individuals from the public, and such action is already provided in the facility emergency plan. Based on these findings, we conclude that there would be no radiological impact related to a further release of controlled effluent discharges into Itaorna cove.

References

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