

CONSIDERATION OF OFF-SITE EMERGENCY PLANNING AND RESPONSE USING PROBABILISTIC ACCIDENT CONSEQUENCE ASSESSMENT MODELS

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Nuclear Safety Commission of Japan (NSC) provides the guideline on emergency preparedness for nuclear facilities¹. This guideline describes several numerical criteria such as Emergency Planning Zone (EPZ) for each nuclear installation and intervention levels for each protective measure such as sheltering, evacuation, administration of stable iodine, and food restrictions. However, this document does not provide a practical guidance for developing the strategy of protective measures. This study showed the methodology and results of the technical considerations for off-site emergency planning using a probabilistic accident consequence assessment models.

Postulated accidents with source terms were derived from a generic level 2 PSA of the reference plant (BWR-5 with Mark-II containment) in Japan. Then, representative accident scenarios were selected (large early release, large late release and control release). For these source terms, the preliminary analysis was performed using the probabilistic accident consequence model (OSCAAR) to evaluate the effectiveness of protective action strategy involving a combination of evacuation, sheltering and administration of stable iodine. The metabolic model of iodine² was introduced to OSCAAR in order to evaluate the effect of reducing thyroid dose due to the timing of intake of stable iodine.

The study indicated following findings for three accident scenarios. The preliminary results provided the insights of technical guidance for the development of protective actions such as evacuation, sheltering and iodine prophylaxis.

Large early release

- Precautionary evacuation is needed before the start of release.
- Early stable iodine intake can be very effective to reduce the thyroid dose even the delay of evacuation.
- It is important to develop the preparedness action before occurring accident (e.g. Emergency Action Level (EAL), Precautionary Action Zone (PAZ), method for distribution of stable iodine).

Large late release

- Evacuation and sheltering areas can be decided to consider weather conditions at the time of accident.
- Sheltering or evacuation with administration of stable iodine is very important to reduce the thyroid dose.

Control release

- Evacuation area is unlikely to occur beyond a few kilometers and sheltering area is unlikely to occur beyond about 10 km.
- For very severe weather conditions, sheltering with stable iodine intake is needed.

Reference

1. Nuclear Safety Commission of Japan, *The Emergency Preparedness Guidelines, "Emergency Preparedness of Nuclear Installations"* (1980, latest 2008).
2. J. R. Johnson, "Radioiodine Dosimetry", *Journal of Radioanalytical Chemistry*, 65, 223-238 (1981).