

**Question 10**

**How to conduct radiation impact assessment under accident condition in siting phase? How to make hypothesis of accident source term? Do we need to consider factors like spraying system failure?**

**Response**

- (1) How to conduct radiation impact assessment under accident condition in siting phase?

The radiological accident analyses performed to assess site suitability are governed by several requirements in the United States Nuclear Regulatory Commission (NRC) regulatory framework. There are safety requirements to comply with the expectations under the Atomic Energy Act (AEA) of 1954, as amended, and environmental requirements to fulfill NRC's responsibilities under the National Environmental Policy Act (NEPA) of 1969, as amended.

The safety requirements and procedures for performing radiological consequence assessments under accident conditions are specified in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, for an early site permit (ESP), at 10 CFR 52.17, and, if an ESP was not obtained, then it must be considered at the time of the combined license, at 10 CFR 52.79(b). In both cases, 10 CFR 50.34(a)(1) is invoked and it states, among other things, that the assessment must contain an analysis and evaluation of the major structure, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation factors. The NRC's safety standard review plan (SRP), NUREG-0800, Section 15.0.3, "Design Basis Accident Radiological Consequence Analyses for Advanced Light Water Reactors," has been prepared to establish areas of review, acceptance criteria, review procedures, and evaluation findings to use in evaluating whether an applicant meets the USNRC's regulations in areas of the radiological consequence evaluation factors specified in 10 CFR 50.34(a)(1).

The environmental requirements to comply with Section 102 of NEPA directs that an environmental impact statement (EIS) is required for major Federal actions that significantly affect the quality of the human environment; both the ESP and the combined license are major Federal actions. The NRC implemented Section 102 of NEPA in its regulations at 10 CFR Part 51. As set forth in 10 CFR 52.18, the NRC prepares an EIS during the review of an application for an early site permit. The review procedures to conduct the radiological accident assessment are described in the environmental standard review plan (ESRP), NUREG-1555, "Section 7.0, "Environmental Impacts of Postulated Accidents Involving Radioactive Material."

- (2) How to make hypothesis of accident source term?

The fission product release from the reactor core into the containment atmosphere is referred to as "source term," and it is characterized by the composition and magnitude of the radioactive material, chemical and physical properties of the material, and the timing of release from the reactor core. The NRC accident source terms are described in NUREG-1465 (February 1995), "Accident source Terms for Light-Water Nuclear Power Plants," and Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors."

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These source terms were derived from examining a set of severe accident sequences of current operating reactors and using a group of computer codes, known as the source term code package, which examined core-melt progression and fission product release and transport in light-water reactors. In developing these source terms, the NRC sponsored a significant effort involving peer reviewers, international partners in NRC research programs, industry groups, and the general public.

(3) Do we need to consider factors like spraying system failure?

Yes. The NRC analysis procedures credit the safety-related containment spray system in the radiological design-basis accident analysis for removal of fission products in the containment atmosphere provided that it is a safety-related system. The review procedures to be used by the NRC in considering the containment spray system are described in SRP Section 6.5.2, "Containment Spray as a Fission Product Cleanup System."