

Performance Requirements for a Geologic Repository as Specified in Nuclear Regulatory Commission Regulation 10 CFR Part 60

Paragraph **Performance requirement**

60. 113(a)(1) Engineered Barrier System—Containment of the high-level waste within the waste package must be substantially complete during the period when radiation and thermal conditions in the engineered barrier system are dominated by fission products decay. Such period would be between 300 and 1,000 years as determined by the NRC for individual cases according to factors specified in 60. 113(b).

Any subsequent release of radionuclides shall be a gradual process of small fractional releases to the geologic setting over long periods of time. For disposal in the saturated zone, both partial and complete filling with ground water of available void spaces in the underground facility shall be appropriately considered and analyzed among the anticipated processes and events in designing the engineered barrier system.

The release rate for any radionuclide shall not exceed 10⁻⁵ per year of its inventory calculated to be present 1,000 years after emplacement [60.113(a)(1)(B)]. This requirement does not apply to any radionuclide which is released at a rate less than 0.1 percent of the calculated total release rate limit. The calculated total release rate limit shall be taken to be one part in 100,000 per year of the inventory of radioactive waste originally emplaced in the underground facility that remains after 1,000 years of radioactive decay. Other fractional release limits may be specified by NRC for individual cases [60. 113(b)].

60. 113(a)(2) Geologic Setting—The repository shall be located so that pre-waste-emplacment ground water travel time from the disturbed zone to the accessible environment shall be at least 1,000 years, or other travel time approved or specified by the Commission [60.113(b)].

Paragraph **Performance requirement**

60. 113(b) On a case-by-case basis NRC may determine the required waste package containment period, subsequent radioactive nuclide release rates, or pre-waste-emplacment ground water travel time, taking into account the overall system performance objective and factors such as the following:

- generally applicable EPA standards for radioactivity;
- age and nature of waste as well as design of the underground facility, particularly with respect to the time when the thermal pulse is dominated by the decay heat of fission products;
- geochemical characteristics of the host rock, surrounding strata, and ground water; and
- particular sources of uncertainty in predicting the repository performance.

60.131 General design criteria for the geologic repository operations area.

60. 131(a) Radiological Protection—The geologic repository operation area shall be designed to maintain radiation doses, levels, and concentrations of radioactive material in air-restricted¹ areas within the limits specified in part 20² of this chapter.

60. 131(b) Structures, Systems, and Components Important to Safety—The repository system must include the following protective features:

- protection against anticipated natural phenomena and environmental conditions,
- protection against dynamic effects of equipment failure and similar events,

¹A restricted area is any area, access to which is controlled for purposes of protection of individuals from exposure to radiation.

²10 CFR 20 establishes standards for protection against radiation hazards from licensed activities. Standards are established to protect both the workers and the general public.

SOURCE: U.S. Department of Energy.

Paragraph

Performance requirement

- protection against fires and explosions,
- emergency capability,
- utility services under normal and accident conditions,
- periodic inspection testing and maintenance,

Paragraph

Performance requirement

- control against critical conditions under normal and accidental conditions,
- instrumentation and control systems,
- compliance with mining regulations,
- safe shaft conveyances for radioactive waste handling.