United States regulations for institutional controls at high-level waste repositories

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The United States regulations for disposal of spent nuclear fuel and high-level radioactive waste are found at Title 10 of the Code of Federal Regulations (10 CFR) Parts 60 and 63, which cover deep geologic disposal at a generic site and at Yucca Mountain, Nevada, respectively. As an independent regulator, the US Nuclear Regulatory Commission (NRC) is responsible for licensing and oversight of a high-level waste repository in the United States.

The licensing approach for disposal has discreet decisions, made by the NRC, that include approval of construction authorization, approval to receive and possess high-level radioactive waste, and approval for permanent closure. For construction authorization approval, the applicant must provide a description of the programme to be used to maintain the records. The NRC will have an active oversight role during the construction and operation period, which can be on the order of 100 years for the facility before permanent closure.

The oversight activities are part of the active institutional controls, and serve as a means of conveying knowledge for that initial period, given that this will likely involve multiple generations of workers for both the implementer and the regulator. Additionally, the NRC provides requirements for the physical protection of stored spent nuclear fuel and high-level radioactive waste at 10 CFR § 73.51. For permanent closure approval, the applicant must provide a detailed description of the measures to be employed—such as land use controls, construction of monuments, and preservation of records. The NRC’s regulations at 10 CFR § 63.51, “Licence amendment for permanent closure”, require the applicant to provide, among other things:

- A description of the programme for post-permanent closure monitoring of the geologic repository.

- A detailed description of the measures to be employed—such as land use controls, construction of monuments, and preservation of records—to regulate or prevent activities that could impair the long-term isolation of emplaced waste within the geologic repository and to assure that relevant information will be preserved for the use of future generations. As a minimum, these measures must include:

- Identification of the site and geologic repository operations area by monuments that have been designed, fabricated, and emplaced to be as permanent as is practicable.

- Placement of records in the archives and land record systems of local, state, and federal government agencies, and archives elsewhere in the world, that would be likely to be consulted by potential human intruders—such records to identify the location of the geologic repository operations area, including the underground
facility, boreholes, shafts and ramps, and the boundaries of the site, and the nature and hazard of the waste.

- A programme for continued oversight, to prevent any activity at the site that poses an unreasonable risk of breaching the geologic repository's engineered barriers; or increasing the exposure of individual members of the public to radiation beyond allowable limits.

The NRC’s regulatory role in any licensing action is to apply the applicable regulations and guidance, and to review applications for proposed actions to determine if compliance with regulations has been achieved. The burden of proof is on the applicant or licensee to show that the proposed action is safe, to demonstrate that regulations are met, and to ensure continued compliance with the regulations. In conducting its reviews, the NRC evaluates whether an applicant or licensee has demonstrated that its proposed approach is adequate to meet the codified requirements. As such, the NRC does not select sites or designs, or participate with licensees or applicants in selecting proposed sites or designs.