



Standards and Regulations Yucca Mountain (Dose Limits and Approaches)

High-Level Waste Repository Health
Physics Course (H-403)

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Outline

- EPA Standards Current and Proposed
 - public dose limits
 - dose methodology
- NRC Regulations Current and Proposed
 - public and occupational dose limits
 - dose methodology



EPA Standards

Based on proposed revisions to standards
and regulations



EPA's Public Health and Environmental Standards for Storage

Preclosure Period

- No member of the public in the general environment receives more than an annual committed effective dose equivalent of 15 mrem
 - general environment defined as everywhere outside the Yucca Mountain site, the Nellis Air Force Range, and the Nevada test site
- Reasonable assurance
 - consistent with 40 CFR 191



EPA's Public Health and Environmental Standards for Disposal

Postclosure Period

- Reasonably Maximally Exposed Individual (RMEI) receives no more than an annual committed effective dose equivalent of:
 - 15 mrem (initial 10,000 years)
 - 350 mrem (after 10,000 years up 1 million years)
- Dose limits also apply to human intrusion scenario
- Reasonable expectation
 - consistent with 40 CFR 191

EPA's Separate Limits for Protection of Groundwater

Applicable for initial 10,000 years after disposal

- 5 pCi/liter for Ra 226 plus Ra 228
 - includes background
- 15 pCi/liter for gross alpha activity (includes Ra 226, excludes radon and uranium)
 - includes background
- 4 mrem/yr to the whole body or any organ for combined beta and photon emitting radionuclides
 - excludes background
 - based on drinking 2 liters per day
- Reasonable expectation

Dosimetry in EPA's Standard

- Specified weighting factors to be used for calculation of doses for RMEI and members of the public (reflects current dosimetry and allows for use of updated values in the future)



NRC Regulations

Based on proposed revisions to standards
and regulations

Dosimetry

- NRC regulations adopt EPA's specified weighting factors to be used for calculation of doses by modifying the definition of TEDE
 - DOE may update to most current models and methodologies (weighting factors must be consistent with methodology used to perform calculation)
 - calculation of doses to meet requirements of Part 20 shall use TEDE as defined in Part 63 (i.e., current dosimetry used for public and occupational doses)

Occupational Dose Limits

- Part 20 annual occupational dose limits
 - total effective dose equivalent: 5 rem
 - sum of deep-dose equivalent and committed dose equivalent to any individual organ (except lens of eye): 50 rem
 - Dose equivalent for the lens of the eye: 15 rem
 - Shallow dose equivalent for the skin or any extremity: 50 rem
- Geologic Repository Operations Area (GROA) designed to limit occupational dose from normal operations and Category 1 events to the Part 20 limits



Public Dose Limits for Operations

Normal Operations and Category 1 Event Sequences

- Geologic Repository Operations Area (GROA) must meet Part 20 requirements
 - 100 mrem/yr
 - 2 mrem/hour in any unrestricted area from external sources
- GROA designed to limit dose to any real member of the public beyond the site boundary (i.e., general environment) to 15 mrem/year



Public Dose Limits for Operations (cont.)

Category 2 Event Sequences

- GROA Designed such that dose to an individual located on or beyond the boundary of the site is limited, as a result of a single category 2 event, to:
 - 5 rem
 - sum of deep dose equivalent and committed dose equivalent to any individual organ or tissue (other than the lens of the eye) of 50 mrem
 - lens dose equivalent of 15 rem
 - shallow dose equivalent to skin of 50 rem



Postclosure Dose Limits

- NRC's regulations adopt EPA's standards
 - 15 mrem (initial 10,000 years)
 - 350 mrem (after 10,000 years up to 1 million years)
 - separate limits for protection of groundwater



Reasonably Maximally Exposed Individual (RMEI)

- Lives in the accessible environment above the highest concentration of radionuclides in the plume (location identified by DOE – approximately 18 kilometers from site)
- Diet and living style representative of residents of Amargosa Valley (mean values)
- Drinks 2 liters per day from wells drilled into the ground water

Reasonable Expectation

- Requires less than absolute proof
- Accounts for inherently greater uncertainty in making long-term projections of performance
- Does not exclude important parameters due to difficulties to quantify precisely with high confidence
- Focuses on full range of defensible and reasonable parameter ranges rather than only upon extreme physical situations and parameters