U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

NRC Position on Optimization for a Potential Geologic Repository

Dr. Brittain Hill

Senior Advisor for Repository Science

Division of High-Level Waste Repository Safety

U.S. Nuclear Regulatory Commission

brittain.hill@nrc.gov

NEA Radioactive Waste Management Committee – Regulators' Forum

20-22 January 2009, Tokyo, Japan

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Regulatory Framework

- 10 CFR Part 63: Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada

- 10 CFR Part 20: Standards for Protection Against Radiation
  - 20.1101(b): achieve doses As Low As is Reasonably Achievable (ALARA)

Performance Objectives - Preclosure

- 10 CFR Part 20 Requirements, including ALARA
- Normal Operations and >10^{-2}/yr Event Sequences
  - Radiation worker = 50 mSv/yr
  - On-site person = 1 mSv/yr
  - Real member of the public at the site boundary = 0.15 mSv/yr
- 10^{-2}/yr to 10^{-6}/yr Event Sequences
  - 50 mSv/event

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Performance Objectives - Postclosure

- Must include multiple barriers, at least one natural and one engineered.
- Performance Assessment
  - Includes uncertainties in models and data
  - Considers likelihood of events to 10^{-8}/yr
  - Calculates expected annual dose
- Individual Protection Standard: Mean expected dose
  - To 10,000 years = 0.15 mSv/year
  - 10,000 to 1,000,000 years = 1 mSv/year

Performance Objectives – Postclosure (cont.)

- Ground Water Protection Standard
  - To 10,000 years = 0.04 mSv/year to the whole body or any organ, based on drinking 2 liters of water per day from a $3.7x10^9$ liter representative volume of the plume
- Human Intrusion Standard:
  - To 10,000 years = 0.15 mSv/year for a stylized drilling scenario
- Performance Confirmation program (until closure)
- Protection following permanent closure
  - Monitoring of repository system
  - Permanent land-use controls
  - Permanent monuments
  - Preservation of Records

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

NRC Position on Optimization

- Compliance with post-closure performance objectives is sufficient and appropriately optimized for safety.
- ALARA principle, while appropriate for preclosure and decommissioning, is not applied for post-closure because it would involve considerations of cost incurred today versus a reduction of potential dose in future.
- Deep geologic disposal, by its very nature, is ALARA, and there are few technological alternatives in repository design (U.S. National Academy of Sciences).

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Summary

- NRC believes that the current regulatory framework for the potential geologic repository at Yucca Mountain, Nevada, U.S.A., provides sufficient and optimized protection for public health and safety, and the environment.
- The principle of optimized protection (ALARA) is applied for preclosure operations and decommissioning phases of the repository.
- Long term safety is optimized through compliance with post-closure requirements.