U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

NUCLEAR WASTE TECHNICAL REVIEW BOARD
FULL BOARD MEETING

SUBJECT: **PERFORMANCE ASSESSMENT EFFORTS IN SUPPORT OF NATIONAL ACADEMY OF SCIENCES STUDY**

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Background

The National Academy of Sciences (NAS) Committee on Technical Bases for Yucca Mountain Standards will examine

- **Whether a standard based on dose to an individual is reasonable**
- **Whether a system of post-closure oversight will prevent intrusion**
- **Whether it is possible to predict human intrusion over 10,000 years**

Objectives of Performance Assessment Analyses

- To provide sensitivity analyses of alternative performance measures for use as background information to the NAS committee on Yucca Mountain standards
- To compare alternative approaches to developing environmental standards

Approach

- Use NAS Waste Isolation Systems Panel (WISP) results as a starting point (Study of the Isolation System for Disposal of Radioactive Wastes, 1983)
- Update calculations to current understanding of Yucca Mountain
- Conduct sensitivity/uncertainty analyses to define potential dose limits and time periods

Approach

(Continued)

- Compare results using different models
  - RIP, basis for TSPA II
  - NEFTRAN-S, basis for 40 CFR 191
  - UCBNE-41, basis for WISP
- Briefly examine alternative approaches and population constraints

Possible Performance Measures

- Release
- Concentration (peak)
- Individual dose
- Dose to critical population
- Average dose to population
- Health effects
- Risk

Alternative Approaches

- **Uranium ore body**
  - **Individual dose**
  - **Health effects**
- **Comparison of standards for other radioactive materials**

Critical Group Size Based on Available Water

- Use water budget for Buckboard Mesa, Jackass Flats, and Crater Flat subbasins
- Available ground water is between the annual safe yield (300 acre-feet) and the annual recharge (2300 acre-feet), which is 3.7×10^8 to 2.8×10^9 liter/year
- Household use is 150 gal/day/capita (2.1×10^5 liter/year/capita)
- Farming requires 20,000 square meters/capita/year; 150 liters/square meter/month; and, the growing season is 6 months (1.8×10^7 liter/capita/year)

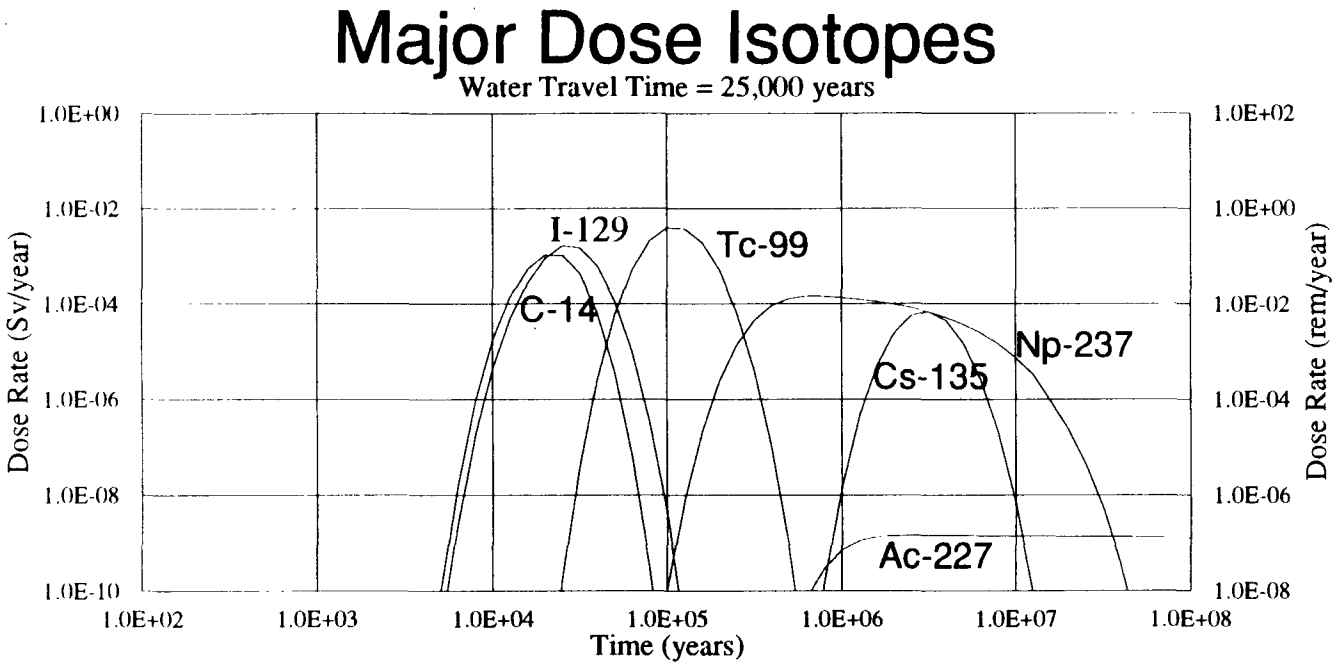
Critical Group Size

- Household Use = 1,800 to 13,000 persons
- Farming = 21 to 160 persons

Individual Dose Assumptions

- Ground-water travel time = 25,000 years
- Infiltration = 1.0 mm/year
- Porosity = 0.1
- Aquifer thickness = 2400 m
- Dilution factor = 1.15×10^{-4}
- Dispersion coefficient = 50 m^2/year
- ^{129}I, ^{14}C, ^{99}Tc, ^{79}Se, ^{135}Cs are alteration-controlled
- Other radionuclides are solubility-limited

Individual Dose Rate (UCBNE-41)



Distance = 5,000 meters
FUEL AGE = 30 YEARS

Status

- Sensitivity analyses using UCBNE-41 are complete
- Sensitivity analyses using RIP and NEFTRAN-S are well underway
- Work on uranium ore bodies is underway