

X.X.X REVIEW PLAN FOR PERFORMANCE CONFIRMATION

X.X.X.1 Approach

Section 60.137 of 10 CFR 60 requires a Performance Confirmation Program that meets the requirements set forth in Subpart F. One of these requirements explicitly states that performance confirmation should start during site characterization and continue until permanent closure. The SCP should present a discussion on the Performance Confirmation Program and how the program intends to meet the requirements of Subpart F. The staff will review the SCP to determine if the plan considers those aspects of the performance confirmation plan that need to be implemented during site characterization.

X.X.X.2 Criteria

Discussions in the SCP pertaining to Performance Confirmation should satisfy the following criteria which have been derived from requirements of Subpart F.

I. Confirmation Parameters

1. All performance confirmation parameters should be identified.
2. Parameters for which performance confirmation will be initiated during site characterization should be identified as such.
3. A rationale should be provided as to why performance confirmation will not be initiated for the remaining parameters until repository construction begins.

II. Goals During Site Characterization

Much of the data on which the repository design for licensing review is based will be obtained during site characterization.

1. All relevant preliminary data that can later be refined as a result of subsequent performance confirmation measurements should be obtained.

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2. During exploratory shaft sinking, instrumentation needed for long-term performance confirmation should be installed to the extent practicable.
3. Data to establish subsurface baseline conditions (prior to repository construction) should be collected.
4. Performance confirmation monitoring activities should not adversely affect the ability of the natural and engineered elements of the repository system to meet the performance objectives.

### III. Goals During Construction and Operation

1. Perturbation of the subsurface conditions as a result of construction and emplacement activities should be measured (or monitored) and evaluated against design assumptions.
2. Measurements of rock deformation, rock stresses and strains, rates of water inflow, pore pressure, changes in ground water flow conditions, and thermomechanical response should be made. Provisions should be made for appropriate design/construction changes if these measurements are significantly different from the anticipated response.
3. The thermomechanical response of the underground facility should be monitored until permanent closure.
4. Backfill performance should be evaluated in-situ by conducting appropriate tests prior to emplacing permanent backfill.
5. The condition of representative waste packages should be monitored in an environment that is representative of the emplacement environment. Waste package monitoring should continue until permanent closure.

#### IV. Instrumentation

1. To the extent practicable, instruments with proven reliability should be used.
2. Redundancy in the type of instrument to measure a given parameter should be provided.
3. Provisions should be made to inspect instruments that are emplaced in-situ.
4. Instruments should be calibrated with respect to temperature and humidity.
5. Multiple monitoring location should be provided to capture the uncertainty due to spatial variations.

#### X.X.X.3 Applicable Parts of 10 CFR 60

60.137

Subpart F

#### X.X.X.4 Other documents

## 5.2.X.X. REVIEW PLAN FOR PRECLOSURE ANALYSIS

### 5.2.X.X.1 Approach

Activities related to construction and operation of surface and subsurface facilities at a repository site are expected to meet certain radiological safety criteria. The design must not preclude an option to retrieve some or all of the emplaced waste in a timely fashion. The plan should describe a methodology for analyzing important scenarios (consisting of events and processes during pre-closure) and estimating their consequences. Alternatively, a plan to develop such a methodology should be described. In reviewing the SCP, the staff will evaluate the presentation of Preclosure Analysis.

### 5.2.X.X.2 Criteria

The program of preclosure analysis should result in adequate information to resolve issues related to preclosure.

- I. On-site Handling of Radioactive Waste
- A. Accident and radionuclide-release data
  - 1. A comprehensive plan should be included for the compilation of existing data and collection of new data during handling that can be applied to these operations.
  - 2. The data to be compiled or collected should include:
    - a. human error in the use of equipment
    - b. equipment failure, including consideration of poor maintenance
    - c. accidents initiated by geological events (earthquakes, landslides)
    - d. accidents initiated by hydrological occurrences (floods)
    - e. accidents initiated by meteorological factors (rain, sleet, snow, tornadoes, wind)
    - f. estimates of data uncertainty

## B. Selection of scenarios

1. A generally accepted methodology for the identification of initiating events of accidents should be used.
2. The plan should include a recognized and generally accepted methodology for the selection of accident and radionuclide-release scenarios.
3. If an acceptable methodology is not available, plans to develop such a methodology should be described.

## C. Movement of radioactive material

1. The plan should include a description of how the source term is to be determined.
2. Methods of determining the amounts of radionuclides released as a result of an accident should be explicitly stated.
  - a. It should be stated whether some fixed fraction of the total inventory is assumed to be released or whether the accident is independently modeled to determine the released fraction.
  - b. Consideration should be given to the highly disparate mobilities of certain radionuclides.
  - c. It should be stated whether a variety of meteorological conditions will be used to determine the dispersal and deposition of radionuclides or whether "worst-case" conditions will be used.
  - d. It should be stated how future changes in the demographics of the area will be considered when determining health effects.
  - e. It should be stated whether the techniques used to determine health effects will include both direct and indirect exposure of individuals.

## II. Repository Operations - Surface and Subsurface Facilities

1. The plan should include a description of how pertinent data on human activities will be collected.
  2. The types of data collected should include:
    - a. probabilities of human error
    - b. estimate of data uncertainty
    - c. the effects of human redundancy in monitoring activities
    - d. the incorporation of high-stress factors on subterranean activities when using surface-activity data.
  3. The plan should provide assurance that the amount of data will be adequate and representative.
  4. The plan should provide for the compilation of existing data and pertinent reliability data for
    - a. hoist systems
    - b. canister-handling equipment
    - c. ventilation systems
    - d. discharge confinement systems
    - e. environmental monitoring systems
- B. Selection of scenarios
1. A generally accepted methodology should be used to identify the initiating events of accidents
  2. This methodology should:
    - a. provide a means of determining a comprehensive set of initiating events

- b. consider both emplacement and retrieval activities
  - 3. The plan should contain a recognized and generally accepted methodology for the selection of accident and radionuclide-release scenarios
  - 4. The scenario-selection methodology should:
    - a. incorporate geologic, hydrologic, and meteorologic considerations
    - b. provide a means of determining a comprehensive set of scenarios
- C. Movement of radioactive material
- 1. The plan should contain a description of how the initial inventory and the source term will be determined.
  - 2. For scenarios that result in releases to the subsurface facility, the plan should:
    - a. consider all possible mechanisms for radionuclide release
    - b. present techniques by which the amount of releases can be determined.
    - c. consider the environmental transport and deposition of radionuclides for a variety of conditions.
  - 3. For scenarios that result in releases to the surface and atmosphere, the plan should:
    - a. provide techniques for determining the amounts of releases
    - b. incorporate meteorological conditions to determine the dispersal and the deposition of radionuclides as either a variety of conditions or "worst-case" conditions

- c. include provisions to consider the demographic changes in the surrounding area
- d. include techniques for determining the health effects resulting from direct contact and inhalation as well as indirect ingestion and secondary inhalation (previously deposited dust)
- e. include considerations of how emergency response and clean-up activities will affect the determination of health effects.

D. Other considerations

- 1. The plan should contain provisions that consider the aging of structures and equipment.
- 2. The plan should contain provisions for dealing with engineering and operational changes during the lifetime of the facility.

5.2.X.X.3 10 CFR Part 60

60.2, "Important to Safety"

5.2.X.X.4 Other documents

NUREG/CR 4304, High Level Waste Preclosure Systems

NUREG/CR 4846, Safety Analysis, Phase 1 and 2 Final Reports

## Input for Postclosure Analysis Data Collection

The following general criteria for data collection arise from concerns related to the performance assessment program. They are provided to ensure that these concerns are covered in detailed criteria related to collecting data.

### I. Identification of data needs

- A. The plan should define in detail the areas where data are needed to support modeling activities
- B. The specific data needs within these areas should be defined.
- C. The data collection plans for field data, field experimental data, and laboratory experimental data should be sufficiently comprehensive such that the issues of representativeness, size and scale effects, and inhomogeneities can be appropriately addressed.

### II. Techniques to be used to collect data

#### A. Field data

1. Both regional and local scales should be considered.
2. The plan should provide for the collection of sufficient data for the resolution of issues, such as:
  - a. multiple conceptual models for a process or a system
  - b. screening of postclosure events and processes
3. The possible interrelationship between events and/or processes must be considered in the plans for data collection.
4. Plans to supplement insufficient data in a particular area should be presented.

5. The plans for documenting interpretation of data should be described.
6. The experiments planned should provide the amount of data needed for site characterization and performance assessment.
7. The plans should consider the possible interrelationship between rock properties

**B. Laboratory experimental data**

1. The experiments planned should provide data for the appropriate units/rock types.
2. The experiments should provide data for the complete ranges of expected in-situ conditions.
3. The plans for considering the interrelationship of rock properties should be sensitive to how coupled and nonlinear effects are going to be modeled.
4. The proposed experiments and the techniques to be used to interpret results should be understood well enough for the sources of uncertainty to be noted.
5. Alternate plans should be proposed in case insufficient data are obtained in the experiments.

**III. The plan should contain provisions for the performance assessment to be used as feedback to the data collection efforts.**

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