COMPLIANCE DETERMINATION STRATEGY
RRT 8.2 PERFORMANCE CONFIRMATION FOR STRUCTURES, SYSTEMS, AND COMPONENTS OF THE GEOLOGIC REPOSITORY OPERATIONS AREA

APPLICABLE REGULATORY REQUIREMENTS:

10 CFR 60.140(a-d)
10 CFR 60.141(a-e)
10 CFR 60.142(a-d)

TYPES OF REVIEW:

Acceptance Review (Type 1)
Safety Review (Type 3)

RATIONALE FOR TYPES OF REVIEW:

Acceptance Review (Type 1) Rationale:

This regulatory requirement topic is related to the license application because, as specified in the license application content requirements of 10 CFR 60.21(c) and regulatory guide "Format and Content for the License Application for the High-Level Waste Repository (FCRG)," it must be addressed by the U.S. Department of Energy (DOE) in its license application. Therefore, the staff will conduct an *Acceptance Review* of the license application for this regulatory requirement topic.

Safety Review (Type 3) Rationale:

This regulatory requirement topic is related to containment, retrievability, and waste isolation, and therefore, it is associated with public radiological health and safety. It concerns the performance confirmation program for those structures, systems, and components (SSC) of the geologic repository operations area (GROA) (including those needed for waste retrieval operations that may be necessary), and focuses on DOE's plans and activities which are intended to support the assumptions made in the design of the GROA. It is a requirement for which compliance is necessary to make a safety determination for construction authorization as defined in 10 CFR 60.31(a) (i.e., regulatory requirements in Subparts E, G, H, and I). Therefore, the staff will conduct a *Safety Review* of the license application to determine compliance with this regulatory requirement topic.

REVIEW STRATEGY:

Acceptance Review:

In conducting the *Acceptance Review* for the performance confirmation program for structures, systems, and components (SSC) of the geologic repository operations area, the reviewer should determine if the content of the license application is complete in technical breadth and depth with respect to the

confirmation program for GROA SSC. The program described in this plan is applicable to the following sections of the license application and to the engineered components of the GROA, which are described therein:

License Application Section	*Section Title*
4.2	Assessment of Compliance with Design Criteria for Surface Facilities
4.3	Assessment of Compliance with Design Criteria for Shafts and Ramps
4.4	Assessment of Compliance with Design Criteria for the Underground Facility
4.5.1	Protection against Radiation Exposures and Releases of Radioactive Material to Unrestricted Area
4.5.2	Retrievability of Waste

The reviewer should determine that the information contained in the license application is presented in such a way that the reasoning, analyses, assumptions, and data lead to a clear demonstration of compliance with the requirements. The reviewer should not be required to conduct extensive independent analyses or literature searches. The reviewer should also determine whether controversial information and appropriate alternative interpretations and models have been acceptably described and considered.

Finally, the reviewer should determine if the U.S. Department of Energy (DOE) has either resolved all the NRC staff objections that apply to this requirement or provided all the information requested in Section 1.6.2 of the FCRG regarding unresolved objections. The reviewer should evaluate the effects of any unresolved objections, both individually and in combination with others, on: (1) the reviewer's ability to conduct a meaningful and timely review; and (2) the Commission's ability to make a decision regarding construction authorization within the three-year statutory period.

Safety Review:

The purpose of the performance confirmation program is to ensure that the natural and engineered systems and components required for geologic repository operations, or which are designed or assumed to operate as barriers after permanent closure, are functioning as intended and anticipated. In conducting the Safety Review, the reviewer will, at a minimum, determine the adequacy of the plans presented in the license application to support DOE's demonstrations regarding the acceptability of its performance confirmation program for SSC of the geologic repository operations area (GROA) (including those needed for waste retrieval operations that may be necessary). The specific aspects of the license application on which the reviewer will focus are described below, and the *Acceptance Criteria* are identified in Section 3.0 of this review plan.

Specifically, the reviewer will review DOE's plans and make the following determinations to ensure that an adequate performance confirmation program is planned for SSC of the GROA:

(1) the program begins as early as is practical during site characterization and continues until permanent closure;

(2) the program includes plans for using the confirmation period to firmly establish that the actual GROA and its components are performing as assumed or better than indicated in the original design;

(3) the program includes adequate plans for surveillance, measurement, laboratory experiments, and any *in situ* tests that may be necessary for evaluating the design parameters;

(4) the program includes plans for evaluating whether the differences between values of measured parameters and those assumed (in calculations made in the design) are within the limits assumed in the licensing review;

(5) the program includes plans for detection, monitoring, and analysis of changes in any assumed baseline conditions of the environmental parameters that are important for meeting the performance objectives;

(6) the program includes plans: (a) for reviewing the significant differences between original design bases/assumptions and observations; (b) for determining the need for modifications (in design or construction methods); and (c) for reporting any differences with respect to the baseline conditions of the environmental parameters, design, and construction methods, and recommended design changes, where appropriate, so as to assure that the repository will function as intended; and

(7) the program includes plans to modify and analyze effects of the changes that may result from Item (6), above, so as to assure that the geologic repository can still meet the pertinent 10 CFR Part 60 regulatory requirements.

The reviewer should also determine if DOE's performance confirmation program includes plans for: (1) *in situ* testing of the thermal interaction effects of the waste packages, backfill, rock, and groundwater during the early or developmental stages of construction; (2) *in situ* testing of borehole and shaft seals before full-scale operation proceeds to seal boreholes and shafts and backfill before permanent backfill placement is begun; and (3) *in situ* monitoring until permanent closure of the thermomechanical response of the underground facility, to confirm that the performance of the natural and engineering features is within the assumed design limits.

The reviewer should also determine if DOE's performance confirmation program includes plans to confirm that the GROA has been designed and constructed to preserve the option of waste retrieval so

that any or all of the emplaced waste could be retrieved on a reasonable schedule starting at any time up to 50 years after waste emplacement operations are initiated.[1]

Consistent with safety operation at the geologic repository operations area, DOE's performance confirmation program should also include plans to construct a backfill test section and, using this section, DOE should be able to demonstrate, before permanent backfill placement is begun, the effectiveness of backfill and compaction procedures against design requirements in the underground facility.

In evaluating DOE's plans for performance confirmation, the reviewer should determine if the program can be implemented so that:

(1) it does not adversely affect the ability of the natural and engineered elements of the geologic repository to meet the performance objectives;

(2) it provides baseline information and analysis of that information on those parameters and natural processes pertaining to the geologic setting that: (a) may be changed by site characterization, construction, and operational activities; and (b) could have an adverse impact on GROA SSC;

(3) it monitors and analyzes changes that may depart from the baseline conditions of parameters that could affect the performance of a geologic repository; and

(4) it provides an established plan for feedback and analysis of data, as well as implementation of appropriate actions, including plans to ensure that suitable and timely action is taken to inform the Commission of changes in the field conditions being monitored and the subsequent need for corrective actions.

In order to conduct an effective review, the reviewer will rely on staff expertise and independently acquired knowledge, information, and data such as the results of research activities being conducted by NRC's Office of Nuclear Regulatory Research, in addition to that provided by the DOE in its license application. The reviewer should focus on additional data which can refine knowledge of the performance confirmation of the GROA structures, systems, and components that are important to safety, and should perform, as necessary, additional analyses to confirm the resolution capabilities of the methodologies. It is incumbent upon the reviewer to acquire a body of knowledge regarding these and other critical considerations in preparing to conduct the review.

As part of the Safety Review, the reviewer may be required to use additional information provided in other sections of the license application. The information in this section of the license application should be cross-referenced to information and analyses submitted in other sections of the license application as listed in Table 8.2-1.

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[1] Section 60.111(b) provides that a different time period for waste retrieval may be established on a case-by-case basis consistent with the emplacement schedule and the planned performance confirmation program. Section 60.111(b)(3) notes that "a reasonable schedule for retrieval is one that would permit retrieval in about the same time as that devoted to construction of the geologic repository operations area and the emplacement of wastes."

Finally, it is possible that the performance confirmation program may identify deviations from the original design baseline. Procedures for evaluating the implications of any changes from the original baseline for design and/or performance will be treated in Section 8.5 ("Analysis of Changes from the Performance Confirmation baseline") of the license application.

Contributing Analysts:

NRC: M.P. Lee, S.J. Chern, M.S. Nataraja

CNWRA: Sui-Min (Simon) Hsiung, John P. Hageman

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APPLICABLE REGULATORY REQUIREMENTS FOR EACH TYPE OF REVIEW:

Type 1

10 CFR 60.140(a-d)
10 CFR 60.141(a-e)
10 CFR 60.142(a-d)

Type 3

10 CFR 60.140(a-d)
10 CFR 60.141(a-e)
10 CFR 60.142(a-d)

REFERENCES:

Nuclear Regulatory Commission, "Format and Content for the License Application for the High-Level Waste Repository." Office of Nuclear Regulatory Research. November, 1990

TABLE 8.2-1: Sections of the License Application That Might Provide Input to the "Performance Confirmation Program for Structures, Systems, and Components of the Geologic Repository Operations Area" Section of the License Application.

License Application Section	*Section Title*
Design Criteria	
4.2	Assessment of Compliance with Design Criteria for Surface Facilities
4.3	Assessment of Compliance with Design Criteria for Shafts and Ramps
4.4	Assessment of Compliance with Design Criteria for the Underground Facility
5.3	Assessment of Compliance with the Design Criteria for the Post-Closure Features of the Underground Facility
Performance Confirmation Program	
8.1	Performance Confirmation Program for the Natural Systems of the Geologic Setting
8.3	Performance Confirmation Program for the Engineered Barrier System
Performance Objectives	
4.5	Assessment of Integrated GROA Compliance with the Performance Objectives: 4.5.1 Protection against Radiation Exposures and Releases of Radioactive Material to Unrestricted Area 4.5.2 Retrievability of Waste
Siting Criteria	
3.1	Description of Individual Systems and Characteristics of the Natural System: 3.1.5 Integrated Natural System Response to the Maximum Design Thermal Loading