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U.S. Nuclear Regulatory Commission  
Attn: Dr. Jeffrey Pohle  
Division of Waste Management  
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Subject: Transmittal of Intermediate Milestone 20.06002.01.191.340 "NRC Performance Confirmation Oversight White Paper"

Dear Dr. Pohle:

This letter transmits the deliverable "NRC Performance Confirmation Oversight White Paper." As we have discussed, the objective of this paper is to provide a focused description of the requirements for the U.S. Department of Energy Performance Confirmation program and corresponding U.S. Nuclear Regulatory Commission (NRC) oversight activities. Enclosed with this White Paper is a graphic that illustrates the components of the NRC Performance Confirmation Oversight activities.

Please note that this deliverable also fulfills the Performance Confirmation action item from the last Center for Nuclear Waste Regulatory Analyses Program Review. I appreciate the interactions with you in developing this deliverable.

Sincerely yours,



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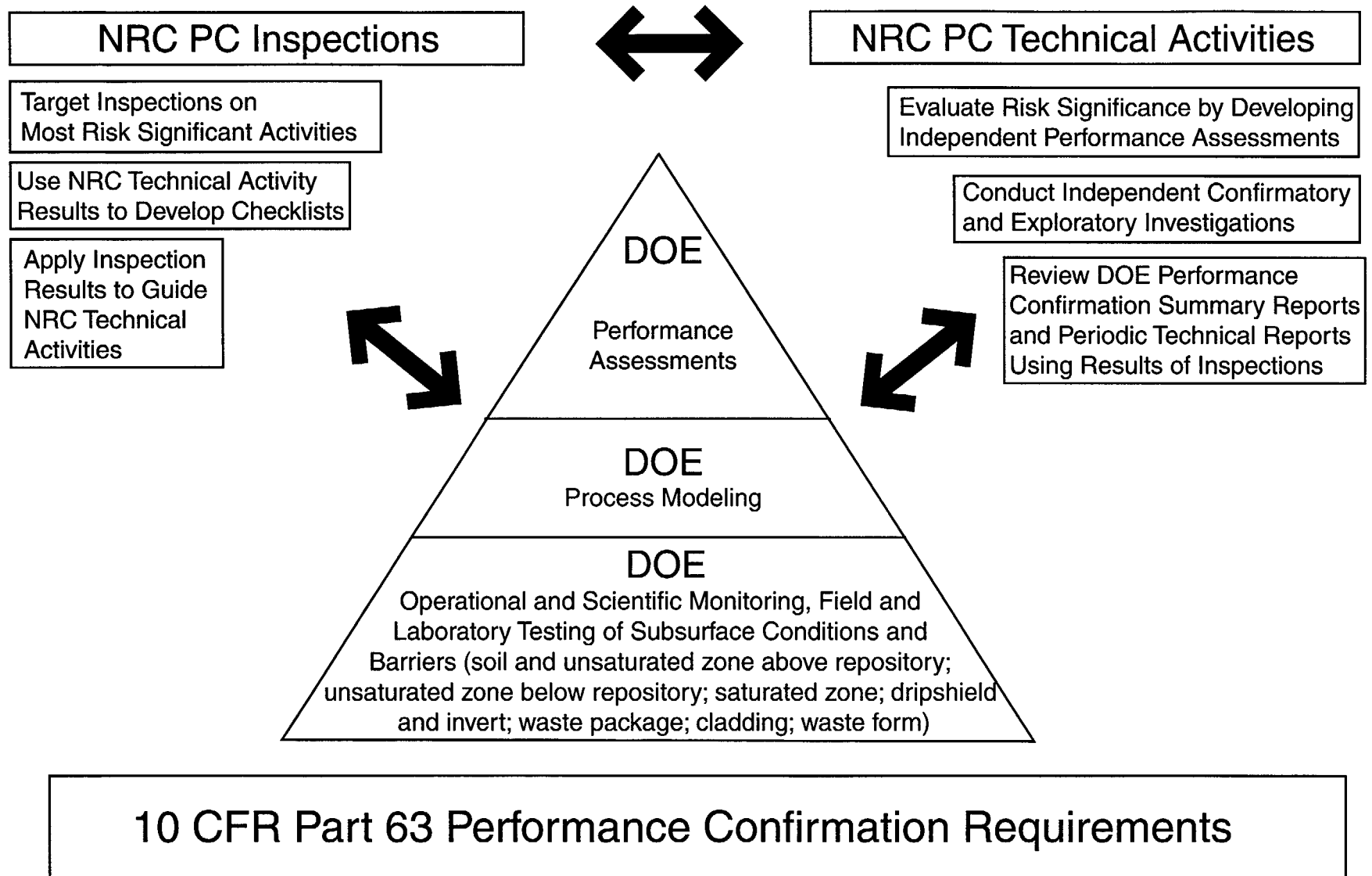
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# NRC PERFORMANCE CONFIRMATION OVERSIGHT



# **NRC PERFORMANCE CONFIRMATION OVERSIGHT WHITE PAPER**

## **Objective**

The objective of this White Paper is to provide a focused description of the requirements for the U.S. Department of Energy (DOE) Performance Confirmation program and corresponding U.S. Nuclear Regulatory Commission (NRC) oversight activities. NRC Performance Confirmation activities will include oversight of the DOE programs to assure that the ranges of subsurface conditions and the performance of natural barriers and engineered barriers are as described in the Safety Analysis Report.

## **Overview of Performance Confirmation**

Performance Confirmation comprises a continuous, broad-based, technical program of tests, experiments, analyses, and monitoring conducted to confirm the information that led to the findings that permitted construction of the repository and emplacement of wastes. Included in Performance Confirmation are continuing evaluations to confirm the understanding of natural features, events, and processes; as well as geologic and hydrologic responses to excavation and waste emplacement. A specific program of monitoring and testing waste packages is also included in Performance Confirmation. NRC staff will continually evaluate the results of DOE Performance Confirmation activities so that maintenance of the retrievability option is assured and so that any new information related to long-term performance of the repository is considered in any future decision on permanent closure. These DOE activities will be overseen by NRC through an integrated program of independent technical work and related inspections targeted at the most risk-significant aspects of the DOE program. NRC Performance Confirmation oversight ensures continuity and consistency in regulatory oversight and builds public confidence. If approvals are granted for DOE to construct and operate a repository, the Performance Confirmation program will become a major NRC oversight activity.

## **Performance Confirmation Requirements**

The regulation at 10 CFR 63.21(c)(17) requires DOE to submit a description of the Performance Confirmation program with the license application for construction authorization. This program must satisfy the requirements of Subpart F of 10 CFR Part 63 (Code of Federal Regulations, 2003). Staff review of DOE's Performance Confirmation program will be guided by Section 2.4 of the Yucca Mountain Review Plan (NRC, 2003).

The general requirements of Subpart F divide the Performance Confirmation information to be provided by DOE into two parts (i) subsurface conditions and (ii) natural and engineered systems anticipated to operate as barriers after permanent closure. For each of these two parts, DOE is required to conduct *in situ* monitoring, laboratory and field testing, and *in situ* experiments, as appropriate. DOE Performance Confirmation activities are to provide data that indicate if actual subsurface conditions encountered and changes to those conditions that occur during construction and operation are within limits assumed for licensing, and if the natural and engineered barriers are functioning as intended and anticipated.

DOE is responsible for specifying the important geotechnical and design parameters to be evaluated, subject to NRC review and approval. The barriers defined by DOE in its Site Suitability Evaluation (DOE, 2002) are (i) surficial soils and topography, (ii) unsaturated zone above the repository, (iii) dripshield, (iv) waste package, (v) cladding, (vi) waste form, (vii) drift invert, (viii) unsaturated zone below the repository, and (ix) volcanic tuff and alluvial deposits below the water table. To evaluate the subsurface conditions at the site and the barriers designed or assumed to operate after permanent closure, DOE will monitor and analyze parameters that could affect the performance of the repository for significant changes from baseline conditions. DOE will continue to gather subsurface information to confirm the ability to retrieve the waste, if necessary.

DOE will incorporate the results of Performance Confirmation activities into detailed process modeling to interpret the significance of the results. DOE is required to use performance confirmation data in updates to their performance assessments for the repository. These periodic performance assessments will be used to evaluate the risk significance of observations and insights from process models and field and laboratory work. DOE is also required to supplement its environmental impact statement to take into account any new information relevant to environmental concerns. NRC staff expects DOE to submit reports of Performance Confirmation program results and to submit periodic technical reports about specific Performance Confirmation field and laboratory tests and process modeling.

## **NRC Performance Confirmation Oversight**

NRC Performance Confirmation oversight will have two main and complementary aspects: (i) technical activities and (ii) inspections. These two aspects of the NRC Performance Confirmation program will be integrated in a manner that allows for effective exchange of information and efficient use of resources.

NRC Performance Confirmation technical activities will include review of DOE Performance Confirmation summary reports and periodic reports and evaluation of the results of DOE Performance Confirmation activities. These NRC activities will encompass independent confirmatory and exploratory investigations (including field studies, laboratory investigations, and computer modeling) to probe the adequacy of DOE submittals. Prioritization of such investigations will be based on the risk significance to public health and safety of the DOE activity being evaluated. Compliance with the regulations and any license conditions will be assessed. The significance of observations and measurements resulting from Performance Confirmation studies and variances from baseline conditions will be evaluated. The NRC technical staff will conduct independent detailed analyses and performance assessments to evaluate the risk significance of observations and insights gained from Performance Confirmation activities. The results from these activities will support the technical bases for evaluating compliance with any applicable license conditions or specifications, as well as any changes, tests, and experiments that may be implemented under 10 CFR 63.44.

NRC inspections related to Performance Confirmation are a subset of a broader program of NRC repository inspections. Inspections related to Performance Confirmation will make use of information resulting from NRC Performance Confirmation technical activities and other sources so subsequent inspections will be based on the risk significance of the Performance Confirmation activity. Inspection procedures will be developed and refined based on regulatory requirements and insights from NRC Performance Confirmation technical activities.

Specifically, NRC inspections will be targeted at the most risk significant aspects of repository operational performance and long-term safety. Inspection checklists will be focused on aspects of DOE work found to be uncertain during technical reviews. This focus will efficiently concentrate NRC inspection resources on potentially important repository performance issues. In a complementary manner, the results of the inspections will provide critical feedback to NRC technical staff to guide ongoing reviews of DOE submittals and related technical activities.

## **Other Testing Requirements Outside the Regulatory Scope of Performance Confirmation**

The regulation at 10 CFR 63.21(16) requires DOE to identify those structures, systems, and components of the geologic repository, both surface and subsurface, that require research and development to confirm the adequacy of design. The regulation also requires that for structures, systems, and components important to safety and for the engineered and natural barriers important to waste isolation, DOE shall provide a detailed description of the programs designed to resolve safety questions, including a schedule showing when these questions would be resolved. Currently, DOE has not identified any safety questions. Should the DOE identify safety questions in the license application for a construction authorization, NRC review of the safety questions would be guided by Section 2.3 of the Yucca Mountain Review Plan (NRC, 2003). The staff does not anticipate DOE including any safety question related programs or schedules in their Performance Confirmation Plan. The staff expects NRC oversight of any DOE safety question related activities to be similar to NRC oversight related to DOE's Performance Confirmation program. However, given the likely high visibility of safety questions, the staff expects that DOE safety question related activities, if any, would be tracked separately from DOE's routine Performance Confirmation activities.

The regulation at 10 CFR 63.74 requires the DOE to perform, or permit the Commission to perform, certain tests. One aspect of required testing is the Performance Confirmation program under Subpart F. However, tests other than those required under Subpart F will likely be required. This includes tests related to (i) radioactive waste; (ii) radiation detection equipment and monitoring instruments; and (iii) other equipment and devices used in connection with the receipt, handling, or storage of radioactive waste. Similar to other licensed facilities, it is expected that activities will be undertaken to ensure that "important to safety" structures, systems, and components will perform their intended safety functions when called upon. These activities could include periodic surveillance tests and inspections to test the functionality of the structures, systems, and components important to safety. Staff oversight of these activities would be similar to that done for such activities at other licensed facilities. However, this type of operational (preclosure) testing does not fall within the regulatory scope of Performance Confirmation (postclosure performance of barriers). The staff does not expect DOE to include such operational testing in their Performance Confirmation Plan.

## **Reference**

Code of Federal Regulations. "Energy." Title 63—Disposal of High-Level Radioactive Waste in A Geologic Repository at Yucca Mountain, Nevada, Part 63." Washington, DC: U.S. Government Printing Office. 2003

DOE. "Yucca Mountain Site Suitability Evaluation." DOE/RW-0549. Washington, DC: DOE, Office of Civilian Radioactive Waste Management. 2002.

NRC. NUREG-1804, "Yucca Mountain Review Plan, Final Report." Rev. 2. Washington, DC: NRC. July 2003.