COMPLIANCE DETERMINATION STRATEGY
RRT 3.2.1.2 - FAVORABLE CONDITIONS: MINIMUM WASTE EMPLACEMENT DEPTH

1.0 APPLICABLE REGULATORY REQUIREMENTS:

10 CFR 60.21(c)(1)(ii)(A)
10 CFR 60.21(c)(1)(ii)(B)
10 CFR 60.21(c)(1)(ii)(F)
10 CFR 60.122(b)(5)

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 considered to be license application-related because, as specified in the License Application (LA) content requirements of 10 CFR 60.21(c) and the 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 LA. Therefore, the staff will conduct an Acceptance Review of the LA for this regulatory requirement topic.

Safety Review (Type 3) Rationale:

This regulatory requirement topic is considered to be related to containment and waste isolation. 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, I). Therefore, the staff will conduct a Safety Review of the LA to determine compliance with this regulatory requirement topic.

This regulatory requirement topic, concerning waste emplacement at a minimum depth of 300 meters (~1,000 ft) from the ground surface, is a favorable condition (FAC) and focuses on reducing the likelihood that the waste will be disturbed following permanent closure of the repository [Nuclear Regulatory Commission (NRC), 1983; pp. 58-59]. (The ground surface shall be deemed to be the elevation of the lowest point on the surface above the disturbed zone.) The minimum waste emplacement depth of 300 meters (~1,000 ft) is considered a FAC because the depth is considered advantageous for the isolation of waste by minimizing the effects of potential disruptive events such as human intrusion (Nuclear Regulatory Commission, 1983; p. 58) and extreme erosion (10 CFR Part 960.4-2-5).

Early site suitability studies (Younker et al., 1992; p. 2-74) have indicated that the proposed repository horizon can not accommodate all waste at depths greater than 300 meters (~1,000 ft) from the ground surface. For this reason, it is anticipated that the DOE will not take credit for the presence of this FAC. However, because it is a FAC, the inability to emplace the waste in the proposed horizon at a minimum depth of 300 meters (~1,000 ft) from the ground surface is not in itself a reason for disqualifying the site from further consideration. If a shallower depth of waste emplacement is indicated in the LA,

combinations of other FACs will be relied on to meet the performance objectives (Nuclear Regulatory Commission, 1983; pp. 58-59).

If the DOE reports that the FAC is present, geological methods and techniques, combined with standard surveying techniques that are currently available are sufficient to both identify the proposed repository horizon and to determine the depth to this horizon. For example, identification of the repository horizon can be made through careful examination of the core samples, geophysical well logs, and chemical analyses. The depth to a given horizon can be determined from a combination of both surface and subsurface surveying techniques. Engineering design information showing the locations of drifts and tunnels, as well as planned canister emplacement can be used to locate the depth to waste emplacement more exactly. Based on previous technical experience in this area, the staff have concluded that a safety determination can be made by evaluating the technical information submitted by the DOE in its LA, and that the review is expected to require no additional analyses or tests (Types 4 or 5 reviews).

Based on the above considerations, this regulatory requirement topic will be reviewed by the staff as a Type 3 (Safety Review). Should future analyses and/or data arise such that this initial assessment is questioned, the type of review this regulatory requirement should receive will be reassessed in light of the additional information.

To summarize, the following statements and assumptions have been made in developing this CDS:

(1) This regulatory requirement topic is limited to consideration of the DOE plans and design for waste emplacement at a minimum depth of 300 meters (~1,000 ft) from the ground surface; and

(2) If it is determined that waste emplacement at a minimum depth of 300 meters (~1,000 ft) from the ground surface is not possible, the effects of shallower emplacement on the performance objectives pertaining to the isolation of waste must be evaluated in the context of FACs and the other potentially adverse conditions [e.g., 10 CFR 60.21(c)(1)(ii)(B)]. Evaluation of the performance of the repository will be achieved in those regulatory requirement topics dealing with the overall system performance objective (e.g., 10 CFR 60.112).

2.0 REVIEW STRATEGY:

2.1 Acceptance Review:

To determine whether this section of the DOE LA is acceptable for docketing, the staff will determine whether the information submitted is consistent with that identified in the corresponding section of the Regulatory Guide FCRG.

Before the receipt of the LA, the staff will have conducted prelicensing reviews of the DOE program, including technical reviews and quality assurance reviews and audits. The staff will have documented its concerns, resulting from these pre-LA reviews, as open items. Some of these open items, referred to as objections to LA submittal, may be critical to the staff's LA review, because lack of acceptable DOE resolution would prevent NRC from conducting a meaningful review. Therefore, as part of its Acceptance Review for docketing, the staff will evaluate how significant any unresolved objection to LA submittal

is, to the effective conduct of licensing activities, using the criteria given in Section 3.1 of this review plan.

2.2 Compliance Review:

2.2.1 Safety Review:

This regulatory requirement topic is limited to consideration of the DOE demonstration, through appropriate investigations, of the presence (or absence) of the FAC regarding waste emplacement at a minimum depth of 300 meters (~ 1,000 ft) from the ground surface. It is not concerned with considering the effects of extreme erosion or human intrusion associated with the presence of naturally occurring materials (e.g., Nuclear Regulatory Commission, 1983; pp. 15–18). These topics will be covered under Sections 3.2.1.10 and 3.2.1.11, respectively, of the LA and its respective review plans. The specific aspects of the LA on which the reviewer will focus are described below, and the Acceptance Criteria are identified in Section 3.2 of this review plan.

Based on early site suitability studies (Younker et al., 1992; Section 2.3.5), it is anticipated that the DOE will not take credit for the presence of this FAC. If this is the case, then the reviewer should require no additional information relative to the presence of this FAC, and combinations of other FACs will be relied on to meet the performance objectives (Nuclear Regulatory Commission, 1983; pp. 58–59).

If the DOE reports the FAC to be present, however, the reviewer should determine if the DOE has included a description of the proposed host horizon. To assess the depth at which the selected host horizon occurs, it may be necessary to describe how the proposed host horizon is identified in well logs and/or by geophysical means. Based on the elevation of the lowest point on the ground surface above the disturbed zone, the reviewer should then determine that the DOE has included a listing of depth to intercept in all boreholes that penetrate the chosen horizon. In conducting the Safety Review, the reviewer will also, at a minimum, determine the adequacy of the data and analyses presented in the LA to support the DOE demonstrations regarding 10 CFR 60.122(b)(5). Specifically, the DOE will need to: (1) provide site characterization and design information to determine the degree to which the FAC has been characterized, and (2) ensure the sufficiency of the lateral and vertical extent of the data collection.

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 the NRC Office of Nuclear Regulatory Research, in addition to that provided by DOE in its LA. The reviewer should focus on additional data that can refine knowledge of the FAC, and should acquire, as necessary, additional information to confirm the resolution capabilities of the methodologies. The reviewer should have acquired a body of knowledge regarding these and other critical considerations in anticipation of conducting the Safety Review to ensure that the DOE site characterization program is sufficient in scope and depth to provide the information necessary for resolution of the concerns.

RATIONALE FOR REVIEW STRATEGY:

Not Applicable.

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APPLICABLE REGULATORY REQUIREMENTS FOR EACH TYPE OF REVIEW:

Type 1:

10 CFR 60.21(c)(1)(ii)(A)
10 CFR 60.21(c)(1)(ii)(B)
10 CFR 60.21(c)(1)(ii)(F)
10 CFR 60.122(b)(5)

Type 3:

10 CFR 60.21(c)(1)(ii)(A)
10 CFR 60.21(c)(1)(ii)(B)
10 CFR 60.21(c)(1)(ii)(F)
10 CFR 60.122(b)(5)

6.0 REFERENCES:

References for Rationales:

Nuclear Regulatory Commission. 1983. *Staff Analysis of Public Comments on Proposed Rule 10 CFR Part 60, 'Disposal of High-Level Radioactive Wastes in Geologic Repositories*. NUREG-0804. Washington, DC: Nuclear Regulatory Commission.

Nuclear Regulatory Commission. "Format and Content for the License Application for the High-Level Waste Repository," Office of Nuclear Regulatory Research. [Refer to the "Products Lists" for the Division of High-Level Waste Management to identify the most current edition of the FCRG in effect.]

References for Review Strategies:

Nuclear Regulatory Commission. 1983. *Staff Analysis of Public Comments on Proposed Rule 10 CFR Part 60, 'Disposal of High-Level Radioactive Wastes in Geologic Repositories*. NUREG-0804. Washington, DC: Nuclear Regulatory Commission.

Nuclear Regulatory Commission, "Format and Content for the License Application for the High-Level Waste Repository," Office of Nuclear Regulatory Research. [Refer to the "Products Lists" for the Division of High-Level Waste Management to identify the most current edition of the FCRG in effect.]

Younker, J.L., et al. 1992. *Report of Early Site Suitability Evaluation of the Potential Repository at Yucca Mountain, Nevada*. Science Applications International Corporation, SAIC-91/8000.