
Staff Technical Position on Regulatory Considerations in the Design and Construction of the Exploratory Shaft Facility

U.S. Nuclear Regulatory Commission

Office of Nuclear Material Safety and Safeguards

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ABSTRACT

The staff of the U.S. Nuclear Regulatory Commission has prepared this staff technical position for the purpose of compiling and further clarifying previous staff positions on regulatory considerations in the design and construction of the exploratory shaft facility (ESF). (The U.S. Department of Energy (DOE) now refers to the ESF as

the "exploratory studies facility." DOE's change in terminology does not affect the positions taken in this guidance.) This document lists the key regulations in 10 CFR Part 60 that should be considered in the design and construction of the ESF and presents the staff position statements and corresponding discussions.

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1.0 INTRODUCTION

The Nuclear Waste Policy Act of 1982 (NWPA), as amended, and 10 CFR Part 60 require that the U.S. Department of Energy (DOE) conduct a program of site characterization to obtain the data necessary to determine the suitability of the Yucca Mountain site for a geologic repository for high-level radioactive waste (HLW). As part of its site characterization program, DOE will construct an exploratory shaft facility (ESF), the purpose of which is to facilitate site characterization activities. The ESF is expected to consist of surface-support facilities, shafts/ramps, a main underground test area, and exploratory drifts. (DOE now refers to the ESF as the "exploratory studies facility." DOE's change in terminology does not affect the positions taken in this guidance.)

The need for the collection of sufficient data to determine site suitability, and later to support a license application to construct and operate a potential HLW repository, is the main issue for DOE to consider during site characterization. However, this staff technical position (STP) does not deal primarily with the need for DOE to collect sufficient data from its site characterization program. Rather, this STP focuses on the need for DOE to demonstrate that an approach has been used, to design and construct the ESF, that considers the applicable 10 CFR Part 60 regulatory requirements, should any components of the ESF become part of (i.e., become "collocated" with) the future geologic repository operations area (GROA). In doing so, DOE's design needs to establish that the investigations conducted in the ESF will obtain the necessary site characterization data and will be conducted in such a manner as to limit, to the extent practical, any adverse effects of the ESF on the long-term performance of the geologic repository. (For the purpose of demonstrating compliance with 10 CFR Part 60 requirements, the term "ESF" refers to only the permanent components of the ESF that may become a part of an eventual GROA.)

In the ESF and the GROA, the surface and the underground facility will be connected by shafts or ramps. (For the purposes of this STP, the term "shaft," as used in 10 CFR 60.2, is understood to include both shafts and ramps.) DOE currently plans to collocate the permanent components of the ESF with the GROA (DOE, 1988a, p. 8.4.2-216). Therefore, the GROA design requirements would constrain, somewhat, the degrees of freedom for the design of the ESF and thus activities within the ESF during site characterization. Such a constraint implies that the ESF design would also have to meet the same 10 CFR Part 60 regulatory requirements regarding containment and isolation that are applicable to the GROA design. Proper coordination between ESF design and GROA design is essential to ensure that the ESF, as constructed, will not interfere with the waste isolation

capability of the site, to the extent practical, and will facilitate site characterization activities.

As previously noted, the data collected from the ESF during site characterization are to be used to both evaluate the suitability of the site for a HLW repository and to design the GROA. Therefore, the design of the ESF must be completed on the basis of only very limited subsurface information, in-situ testing, and exploration. Consequently, uncertainties associated with the available, limited site data should be accounted for in the design of the ESF.

Both NWPA and the U.S. Nuclear Regulatory Commission's (NRC's) geologic repository disposal regulation (10 CFR 60.16) require that DOE submit a Site Characterization Plan (SCP) before proceeding to sink [exploratory] shafts at a site and to defer sinking of shafts until such time as there has been an opportunity for Commission comments to have been solicited and considered by DOE. On December 28, 1988, DOE submitted the statutory SCP for the Yucca Mountain Site (DOE, 1988b) including plans for the ESF. NRC's regulations do not require licensing of the ESF or approval of its design. The regulations, however, do require NRC to state its specific objections to the SCP and to provide an analysis of the plan. NRC prepared such an analysis and issued it on July 31, 1989 (see NRC, 1989a). It should be noted that NRC does not undertake, in the pre-licensing phase, the responsibility for ensuring that DOE designs are adequate to obtain all data necessary for characterization, or for ensuring that the ESF design is adequate to limit adverse effects on waste isolation and containment. However, during the pre-licensing phase, the staff is concerned with ascertaining that DOE's programs, as described in its SCP, adequately reflect consideration of all 10 CFR Part 60 regulatory requirements. Therefore, the objective of providing guidance to DOE on ESF design and construction during the pre-licensing phase is to identify, at an early time, the potential for significant problems in the future, so that they can be avoided.

By cooperating on the use of informal methods such as the submission of reports, technical meetings, the opportunity for onsite visits, or quality assurance (QA) audits, DOE can assist the staff in its review when and if DOE submits a license application. The Commission recognizes and has stated in this regard, it "... cannot direct the Department to comply with the provisions for involving it during site characterization activities" (44 FR 70409). Although the Commission cannot direct the Department to comply with the provisions for involving it during site characterization activities, the Commission also noted that "... any failure to do so is likely to result in imprudent expenditures and subsequent delays, and ultimately could

1.0 Introduction

result in the denial of the application for the proposed site" (44 FR 70409).

In reviewing DOE's ESF Title I design and related documents (DOE, 1989), the NRC staff noted that several 10 CFR Part 60 requirements applicable to GROA design were not considered (NRC, 1989a, pp. 4-1-4-3). Moreover, the NRC staff has had several interactions with DOE and provided DOE with written comments on this subject that represent, in fact, *de facto* staff positions. This STP is a compilation of these previous staff positions, and includes further clarification of the specific staff positions on regulatory considerations in the design and construction of the ESF.

This STP also describes an approach acceptable to the NRC staff for implementation of applicable 10 CFR Part 60 requirements related to the ESF. It covers topics that include certain aspects of the design control process, coordination of ESF design with GROA design, consideration of alternatives, excavation methods, test interference, and site characterization. The positions and discussions in this STP are based on the premise that the permanent components of the ESF may eventually become a part of the GROA (see DOE, 1988a, p. 8.4.2-216), and the guidance in this STP is intended only for that case where DOE intends to incorporate the permanent components of the ESF into the final GROA design. Under these circumstances, all 10 CFR Part 60 requirements applicable to the GROA design are considered applicable to the ESF design. Figure 1 gives an example of an approach that DOE can use to achieve compliance of the ESF design with 10 CFR Part 60 requirements.

In reviewing DOE's work on the ESF design and related documents, NRC used the following two general guidelines: (1) the ESF design, construction, and operation should facilitate the collection of needed site data; and (2) the ESF design, construction, and operation should limit adverse impacts on waste isolation capabilities of the site, to the extent practical. This STP gives specific guidelines by which DOE can approach the ESF design; these guidelines are the technical position statements listed in Section 3.0.

Section 2.0 of this document focuses on the key 10 CFR Part 60 requirements that relate to the design and the construction of the GROA and, therefore, are considered by the staff to be applicable to the design and construction of the ESF. The technical position statements are listed in Section 3.0. Section 4.0 provides a discussion of the supporting rationale behind the technical positions stated in Section 3.0. Appendix D contains the staff's response to the public comments received on an earlier draft STP noticed in the Federal Register on August 14, 1990 (55 FR 33193).

STPs are issued to describe and make available to the public methods acceptable to the NRC staff for implementing specific parts of the Commission's regulations, or to provide guidance to DOE. Moreover, STPs are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those given in the STP will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of an authorization or license by the Commission.

2.0 REGULATORY FRAMEWORK

The 10 CFR Part 60 requirements to be considered in the design and construction of the ESF are listed in Appendix C of this document. These requirements would be applicable for those permanent components of the ESF that may eventually become part of the GROA. Although the list has been developed to provide general guidance, it is recognized that some of the requirements may not, in fact, impact the design of the ESF. Some of the key regulations are discussed next, and their texts are provided in Appendix B of this document. For the texts of other applicable 10 CFR Part 60 requirements, refer to *U.S. Code of Federal Regulations*, Title 10, "Energy." Definitions of some of the relevant regulatory terms are provided in Appendix A.

- Section 60.15(c) addresses site characterization requirements. These requirements state that: (1) the investigations should be conducted so as to limit adverse effects on the long-term performance of the geologic repository, to the extent practical; (2) the number of exploratory boreholes and shafts should be limited, to the extent practical, consistent with obtaining the required information; (3) to the extent practical, the exploratory boreholes and shafts should be located where shafts are planned for underground facility construction and operation, or where large unexcavated pillars for the geologic repository are planned; and (4) subsurface exploratory drilling, excavation, and in-situ testing before and during construction should be planned and coordinated with the design and construction of the GROA.
- Section 60.16 requires DOE to submit an SCP to NRC; in accordance with 10 CFR 60.17(c), the SCP must contain a conceptual design for the GROA that takes into account likely site-specific requirements.
- Section 60.21(c)(1)(ii)(D) requires DOE, in its license application, to assess the effectiveness of engineered and natural barriers, including barriers that may not be themselves a part of the GROA, against

the release of radioactive material to the environment. The analysis shall also include a comparative evaluation of alternatives to the major design features that are important to waste isolation.

- Section 60.112 states the requirements for selecting the geologic setting and design of the engineered barrier system and the shafts, boreholes, and their seals, to meet the overall system performance objectives for the geologic repository after permanent closure, with respect to both anticipated and unanticipated processes and events.
- Section 60.113(a)(2) states the subsystem performance requirement for the geologic setting. It specifies that the geologic repository shall be so located that pre-waste-emplacement groundwater travel time along the fastest path of likely radionuclide travel from the disturbed zone to the accessible environment shall be at least 1,000 years, or such other travel time as may be approved or specified by the Commission.
- Sections 60.131 and 60.133 specify certain minimum design criteria for the geologic repository operations area. (For the text of these regulatory requirements, refer to 10 CFR Part 60.)
- Section 60.134 specifies criteria for the design of seals and the selection of materials and placement methods.
- Sections 60.151 and 60.152 require DOE to implement a QA program based on the criteria of Appendix B to 10 CFR Part 50, as applicable. If the components of the ESF are determined to be important to safety or waste isolation, they and the activities that affect their performance should be covered by the applicable QA program.

The NRC staff has issued STPs to provide guidance in the following related areas: design information needs in the SCP (NRC, 1985a), in-situ testing (NRC, 1985b), and borehole and shaft sealing (NRC, 1989b). DOE should consider these earlier STPs in conjunction with this STP.

3.0 STAFF TECHNICAL POSITIONS

The following technical position statements relate to the design and construction of the ESF. They apply to that case where DOE intends to incorporate the permanent components of the ESF into the final GROA design. All these technical positions should be considered important; no particular significance should be attributed to the order in which they are given.

(1) **Approach for Compliance with 10 CFR Part 60 Requirements**

A defensible approach should be developed to consider and implement 10 CFR Part 60 GROA design requirements applicable to the ESF design. An example of an acceptable approach is given in Figure 1.

(2) **QA**

Items and activities of the ESF that are potentially important to safety and waste isolation should be identified in accordance with the NRC staff guidance in NUREG-1318 (NRC, 1988). The identified structures, systems, and components should be designed, constructed, and operated under the appropriate parts of the QA program. The QA program, including the design control process, should be established in accordance with the NRC staff positions identified in the "Review Plan for High-Level Waste Repository Quality Assurance Program Descriptions" (NRC, 1989c).

(3) **Planning and Coordination of the ESF Design and Construction with the GROA Design**

A conceptual design of the GROA should be considered in the design of the ESF. For example, to the extent practical, the shafts, ramps, and drifts for the ESF should be selected in locations where these features are planned for the GROA, unless a need for different design can be justified, and their impact on the waste isolation capability of the site and impact on data collected from site characterization are acceptable.

(4) **Consideration of Alternatives for Design Features**

For the design of the ESF, a comparative evaluation of alternatives to major GROA design

features should be considered, with particular attention to the alternatives that would provide longer radionuclide containment and isolation. Such major design features include the following: (a) waste emplacement depth; (b) underground facility boundary; (c) location, number, and size of shafts or ramps; (d) excavation methods; (e) drainage design; and (f) sealing methods.

(5) **Excavation Methods**

To the extent practical, the methods of constructing the ESF should be selected to limit, rather than attempt to account for, mechanical, hydrological, or chemical damage to rock, and to limit the creation of potential pathways for radionuclide migration around the shafts, ramps, and the underground openings. The excavation methods should be selected to provide confidence that the ESF will facilitate site characterization while not adversely impacting the waste isolation capability of the site.

(6) **Test Interference**

To the extent practical, the ESF should be designed so as to limit or avoid the potential effects of interference of ESF activities with those of site characterization testing. It is preferable to obviate the consequences of these effects at the ESF design stage rather than to account for them later. In this regard, special attention should be given to those aspects of the ESF design such as test layout, test sequencing, and/or separation between the test area and proposed future GROA.

(7) **Establishment of Ranges of Site Parameters**

The orientation, spacing, and extent of ESF design features (such as shafts, ramps, drifts, boreholes, and test area) should facilitate the collection of data on the entire range of parameters that are likely to be important to repository performance, GROA design, and site characterization. The data collected should also include information on the distribution of these parameters.

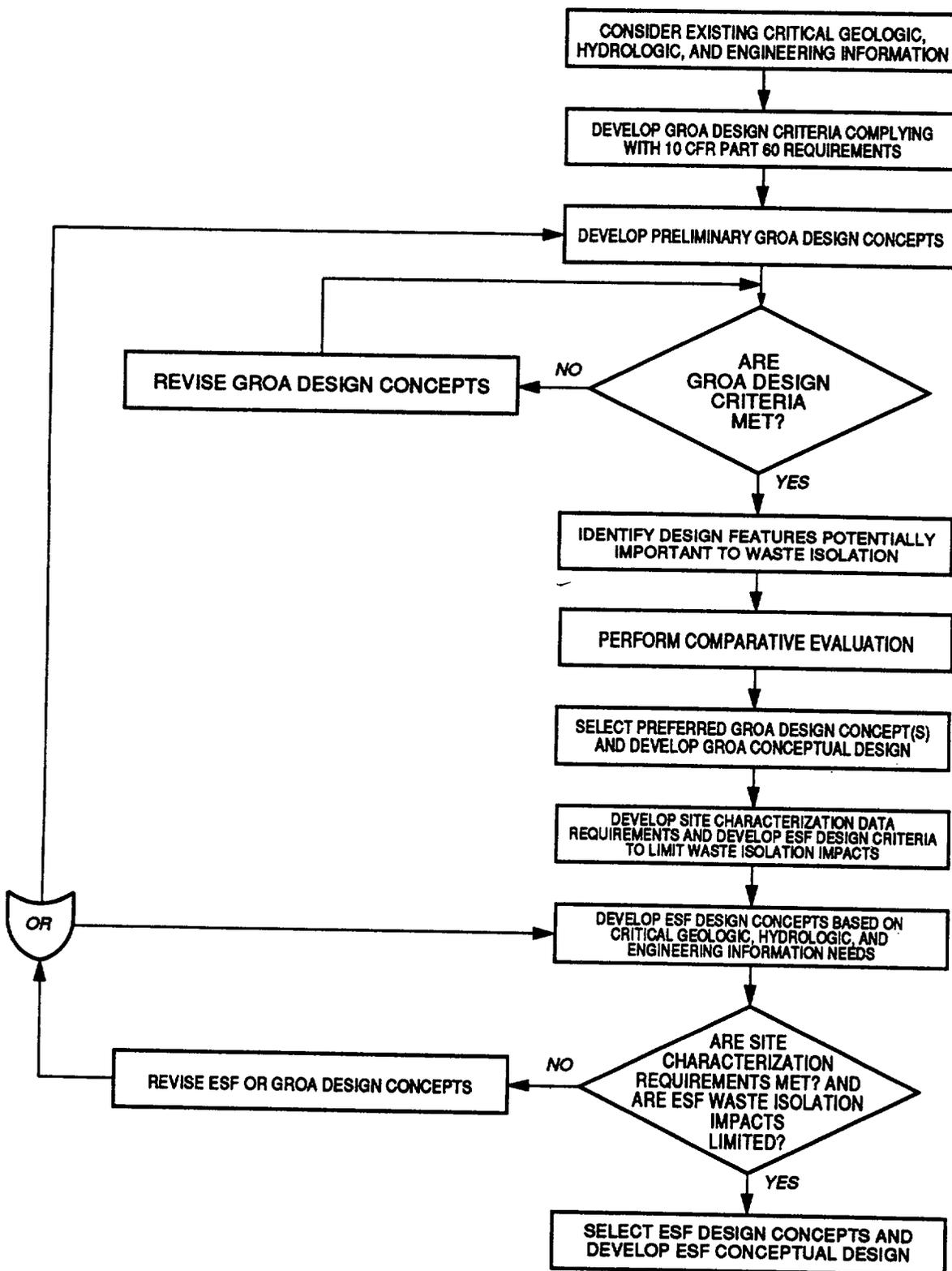


FIGURE 1 -- An example of an acceptable approach to achieve compliance of the ESF design with 10 CFR Part 60 requirements. Refer to the text in Section 4.0 (Technical Position No. 1) for a discussion of this approach.

4.0 DISCUSSION

The staff technical positions outlined in Section 3.0 are motivated by several primary purposes, which include:

- (1) That DOE management and its supporting contractors know well in advance those regulatory requirements applicable to an ESF collocated with the repository, and that those requirements be reflected in the design control process and the designs themselves;
- (2) That DOE management has a methodology to evaluate how well such regulatory requirements have been integrated into the design requirements for the ESF and GROA; and
- (3) That although 10 CFR Part 60 requirements do not require DOE to submit certain ESF/GROA design decision-making information to NRC until the time of license application, DOE management is aware that certain decisions made during the design of the collocated ESF will be binding on the GROA design. Therefore, at such time in the future that DOE may elect to submit a license application for a repository that includes a collocated GROA, documentation of ESF design decisions will then be required to show that they were derived through a process that is in compliance with the requirements of 10 CFR Part 60.

The order of discussion below follows the order of the technical position statements given in Section 3.0.

(1) Approach for Compliance with 10 CFR Part 60 Requirements

To achieve the purposes just outlined, it is essential that an approach to meet the applicable GROA design requirements contained in 10 CFR Part 60 be developed to guide supporting contractor activities and to provide a baseline for management evaluation of those activities. It would be prudent for such an approach to have as its underlying philosophy two general principles: (1) the ESF design facilitates the gathering of sufficient data to demonstrate site suitability and to design the GROA; and (2) this design limits adverse effects on the long-term performance of the geologic repository, to the extent practical. These principles are derived from 10 CFR Part 60, which conveys both the purposes of an ESF and caution regarding the potential adverse impact of the ESF on the long-term performance of the repository.

An example of one approach that would be acceptable to the NRC staff for implementation of the applicable 10 CFR Part 60 regulatory requirements

for the ESF is given in Figure 1. This approach is acceptable because it encompasses a systematic approach to: (1) determining applicable regulatory requirements; and (2) applying those requirements in a coordinated and integrated design of the two facilities. For example, it also includes specific steps to identify design features potentially important to containment and waste isolation, to conduct comparative evaluations of those important design features, and to integrate the design of the ESF with that of the repository. These are all included in 10 CFR Part 60 as applicable regulatory requirements.

The various steps illustrated in the example should not be interpreted as an NRC staff suggestion that DOE should develop separate evaluation documents corresponding to the particular steps in the process. The structured process selected and the manner by which DOE satisfies itself with the effectiveness of that process are DOE management prerogatives.

In the NRC example approach, the staff elected to begin by considering critical geologic, hydrologic, and engineering information as a first step in the GROA design and then using this information for developing the GROA design criteria. Based on these design criteria, which are influenced by 10 CFR Part 60 requirements, a number of preliminary design concepts are developed. Next, these design concepts are reviewed to verify that the required design criteria identified in the second step are met. If not, the GROA design concepts are revised until all required design criteria are met.

The next step is to identify which GROA design features are potentially important to containment and waste isolation. (Such an analysis is required to comply with 10 CFR 60.21(c)(1)(ii)(D). For example, see NUREG-1318 for guidance.) For those design features so identified (e.g., construction method, number of openings, shafts vs. ramps, etc.), comparative evaluations are performed to identify those alternatives to the major design features that provide for longer radionuclide containment and isolation. Based on these evaluations, preferred GROA design concepts would be selected, and a GROA conceptual design would be developed.

In the example, attention is now focused on the requirements for site characterization. In this step, these requirements are developed with a view toward identifying those alternatives that limit adverse impact on long-term repository performance. This step leads to the development of ESF design

concepts. In selecting a preferred design concept, there is a need to consider what are the critical geologic, hydrologic, and engineering information needs during site characterization.

At this point, an evaluation is made to determine whether the site characterization requirements have been met and the ESF waste isolation impacts limited. In making this determination, the design concepts for the GROA and the ESF are coordinated and iterated, if necessary, to optimize those site characterization activities providing the critical information needs, while at the same time limiting, to the extent practical, long-term impacts to the containment and waste isolation of the repository. If the requirements for site characterization have not been met and the ESF waste isolation impacts are not limited, revisions to the GROA and/or the ESF design concepts may be necessary. Having this information in hand, the designer is now in a position to make an informed decision on the selection of a preferred ESF design concept and the development of the ESF conceptual design.

For the purposes of illustration only, we have shown the two design efforts (repository and ESF) as proceeding sequentially. However, we recognize that there is some possibility that DOE may choose to undertake the two design efforts simultaneously, provided that DOE begins with a good understanding of all applicable regulatory requirements, that the on-going design efforts are well-integrated, and that the design concepts are coordinated and iterated to get good integration of the two designs before selecting a final design concept for either facility.

The example conveys the necessity for a structured approach, to effect a thorough and careful coordination and iteration of the engineering designs for the ESF and GROA facilities, to determine their compliance with applicable regulatory requirements and compatibility with each other, before the ESF is constructed. There are many other ways in which compliance could be demonstrated. DOE needs to select an approach suitable to its own needs.

(2) QA

10 CFR 60.151 and 60.152 require that any portions of the ESF design process related to items important to safety or waste isolation be subjected to prescribed [or defined] QA programs. Adequate implementation of the QA program is considered vital to successful coordination of the ESF design with the GROA design. Section 3.0 of the NRC "Review Plan for High-Level Waste Repository Quality Assurance Program Descriptions," (NRC, 1989c) provides acceptance criteria for those activi-

ties, related to design control, that represent solutions and approaches acceptable to the NRC staff.

As previously noted, NUREG-1318 provides guidance on how to identify items and activities important to safety and important to waste isolation. DOE should review all the structures, systems, and components associated with the ESF, using the methodology described in NUREG-1318, to identify those that may be potentially important to safety or waste isolation. The identified structures, systems, and components should then be designed, constructed, and operated under an appropriate QA program. Those aspects of design that may affect waste isolation should be translated into requirements that consider the need to meet the performance objectives for the geologic repository. Moreover, the design control process should ensure that 10 CFR Part 60 requirements are incorporated into the various stages of design.

For those components of the ESF that may become part of a future repository, an adequate design control process will take into account 10 CFR Part 60 requirements that deal with site characterization, retrieval, containment, and long-term waste isolation. As previously noted, Appendix B of this document lists those 10 CFR Part 60 requirements that should be considered in the ESF design. An adequate design control process will establish a correlation between NRC's regulatory requirements and the proposed design. It would be prudent to clearly and systematically document how each of the relevant 10 CFR Part 60 requirements has been translated into design requirements, drawings, specifications, and procedures, as stated in Criterion III of Appendix B to 10 CFR Part 50 (applicable by virtue of 10 CFR 60.152). An adequate design control process would include the control of design interfaces, design verification, control of design changes, and use of appropriate standards. The staff intends to monitor changes made to the ESF design during construction through site visits, staff reviews of DOE's semiannual progress reports of site characterization activities, and through observation of DOE's QA audits in the implementation of the ESF and GROA design control process.

(3) Planning and Coordination of the ESF Design and Construction with the GROA Design

This technical position is based on the requirements of 10 CFR 60.15. Section 60.15(c)(4) requires that the "Subsurface exploratory drilling, excavation, and in-situ testing before and during construction shall be planned and coordinated with geologic repository operations area design and construction." Also, 10 CFR 60.15(c)(3) requires that "To the extent practical, exploratory boreholes and shafts in the geologic repository operations area

shall be located where shafts are planned for underground facility construction and operation or where large unexcavated pillars are planned.” One way to meet these regulatory requirements is to establish a systematic approach to ensure the coordination and integration of the collocated ESF and GROA conceptual designs. This implies that attention must be given to such GROA functions as retrieval, containment, and waste isolation, as well as site characterization, at the time the design of the collocated ESF is undertaken. As previously noted, Appendix B of this document lists those 10 CFR Part 60 requirements that are considered applicable to the design of a collocated ESF.

It would be prudent to establish a correlation between regulatory requirements and the manner by which these regulatory requirements were translated into design requirements for the collocated ESF and the GROA, as well as into relevant drawings, specifications, and procedures. (For reference, see 10 CFR 60.152 and Criterion III of Appendix B to 10 CFR Part 50.) A design control process that provides for this capability as well as for the capability to control design interfaces, design verification, design changes, and use of appropriate standards would facilitate both DOE’s management of these activities as well as NRC’s timely evaluation of the extent to which DOE’s license application complies with the appropriate regulatory requirements.

It is recognized that at the time of ESF design, only a limited amount of information would be available for the development of a conceptual design of the GROA. A final GROA design will not be developed by DOE until after the needed site characterization data are collected. However, 10 CFR 60.17(c) requires that at the time of SCP submittal, DOE develop a conceptual design of the GROA based on current knowledge/estimates of the site at that time. As site characterization proceeds, the staff expects that revisions to the original GROA conceptual design will emerge. The need for coordination stated in this technical position addresses the coordination of the ESF design with the GROA conceptual design available before the start of ESF construction.

The thermal effects of emplaced waste (e.g., uplift, subsidence), as well as fault movement and tectonics, could pose potentially acute engineering challenges. These factors must be carefully considered in selecting the location of shafts and ramps of the collocated ESF, to minimize uncertainties regarding long-term repository performance.

The collocated ESF shafts and/or ramps will become the first major penetrations through the geo-

logic setting. Such penetrations could become preferential pathways for water inflow into the repository, or for gaseous radionuclide releases from the repository. It is recognized that at the time of ESF construction, considerable uncertainties will likely remain about the dominant radionuclide flow paths. Therefore, a prudent approach to the design and construction of the collocated ESF would carefully consider alternatives to avoid or minimize the creation of additional uncertainties. This could include, for example, such considerations as conservatism in locating openings, to minimize uncertainties regarding flooding; and conservative designs of shafts and ramps, to accommodate future needs for sealing and drainage.

(4) Consideration of Alternatives for Design Features

As required by 10 CFR 60.21(c)(1)(ii)(D), a comparative evaluation of several possible alternatives to the major design features should be performed at the initial stages of the GROA design. For example, this comparative evaluation could include a study of possible variations in the depth of the waste emplacement area and its boundary, the location and number of shaft(s) and/or ramp(s), the excavation methods, and other major design and construction features. Preliminary design concept(s) for the GROA would be developed from these comparative evaluations of alternative design features, with particular attention to those alternatives that provide longer radionuclide containment and isolation. On the basis of the selected preliminary design concept(s), reference conceptual design(s) for the GROA would be developed. The ESF design would be planned and coordinated with the reference GROA design(s).

It is recognized that in 10 CFR Part 60, the requirements of 10 CFR 60.21 are applicable to the submission of a license application for a construction authorization. This requirement becomes applicable to the ESF only if the ESF is planned to be collocated with the repository. However, the purpose of this technical position is to call attention to the fact that, at the time of that submittal, DOE will be required to demonstrate that the ESF design decisions made years earlier were made under a process that meets the requirements of 10 CFR 60.21. This is so because, at the time of the license submittal, those permanent components of the ESF become an integral part of the GROA.

(5) Excavation Methods

The methods for constructing the underground features of the collocated ESF will become an important consideration in NRC’s license review of the long-term performance of the repository. It would

therefore be prudent to consider alternative methods for constructing the ESF, and their likely effects on residual uncertainties regarding long-term repository performance, before a final design for the ESF is selected.

In addition to regulatory concerns raised by possible excavation methods on long-term repository performance, those concerns also extend to safety and site characterization activities. The degree of damage to the rock surrounding the openings and the extent of the damage zone will be important factors to NRC staff in assessing uncertainties regarding induced mechanical, hydrological or chemical contamination of site characterization data. It would be prudent to assess the extent to which foreign substances such as construction water and blasting fumes from chemical explosives would add uncertainties to site characterization data.

(6) Test Interference

As previously noted, the primary purpose of the ESF is to support the collection of site characterization data. However, because of the manner in which the data are collected (e.g., the physical layout and/or time-sequencing of the tests themselves), test interference, if not avoided, could affect the quality of the data collected and thus confidence in its reliability. Recognizing that the NRC staff will consider the issue of data reliability at the time of a license application submittal, the staff has begun to scrutinize the implementation of DOE's plans and procedures for the collection of site-specific data. In this regard, as available, the staff will evaluate those design factors, pertinent to a collocated ESF, that may have adverse impacts on the validity of site characterization data. The staff will also consider those design factors of a collocated ESF that contribute to maintaining confidence in the reliability of test data collected. Of particular concern will be the identification of uncertainties in the validity of site characterization data introduced as a result of the designs. For example, the designs will be evaluated to ascertain the extent to which tests could interfere with each other as well as with construction activities of the ESF and/or repository. Therefore, it would be prudent for DOE, during the design of the ESF, to consider the need to avoid or minimize the uncertainties associated with the reliability of site characterization data; for example, with respect to the potential effects of test interference.

An alternative course would be to attempt to account for such test interference in the design of the repository. This will likely involve making certain assumptions and conducting analyses. If such assumptions and analyses were to be based on very

limited or no actual data, the resulting additional uncertainties could potentially reduce confidence significantly, and thereby jeopardize a timely licensing decision. Therefore, the prudent course of action would be to avoid uncertainties, to the extent practical, rather than attempt to account for them.

In some instances, it may be desirable for certain in-situ performance confirmation tests to begin during site characterization. It would be prudent to assess such potential requirements that could have an impact on the design requirements of the collocated ESF and GROA, before these designs are selected. Such analyses and coordination of designs could minimize the likelihood of interference between such long-term tests and construction and operation of the GROA.

(7) Establishment of Ranges of Site Parameters

Confidence in the adequacy of the design of the GROA depends on many factors. Of these, it is essential that site parameters represent a credible basis for design. An important element in establishing that credibility is a demonstration that the range of site parameters likely to be encountered is reflected in the data that are gathered during site characterization. Questions about data credibility at the time of license application submittal will create potential problems concerning licensability because of the uncertainties introduced. Therefore, it would be prudent to plan the site characterization activities so as to provide a sufficient range and distribution of data for designing the GROA and analyzing likely site performance. The ESF design and surface-based testing are key elements for ensuring that data collected credibly represent the range of conditions and processes throughout the site.

It is recognized that site characterization is an iterative procedure. Understanding developed as a result of initial testing will lead to requirements for additional testing. For this reason, it would be prudent to build-in considerable flexibility in the ESF design, to allow modifications and expansion of the site characterization efforts.

Various techniques are available to help gain an understanding of the geologic setting. However, drifting remains one of the most promising methods to resolve uncertainties. It also represents one of the more difficult challenges for coordinating the ESF design with the GROA design. Optimum ESF drift orientation and length may not necessarily coincide with the preferred GROA layout. A careful balancing of site characterization needs with geologic repository performance objectives will be essential.

5.0 REFERENCES

U.S. Code of Federal Regulations, "Domestic Licensing of Production and Utilization Facilities," Part 50, Chapter I, Title 10, "Energy."

U.S. Code of Federal Regulations, "Disposal of High-Level Radioactive Wastes in Geologic Repositories," Part 60, Chapter I, Title 10, "Energy."

U.S. Department of Energy, "Chapter 8, Section 8.4.2, Description and Location of Characterization Operation," in "Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada," Vol. VIII, Part B, DOE/RW-0199, December 1988a.

U.S. Department of Energy, "Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada," 9 Vols., DOE/RW-0199, December 1988b.

U.S. Department of Energy, "Review Record Memorandum—Exploratory Shaft Facility (ESF) Title I Design Acceptability Analysis and Comparative Evaluation of Alternative ESF Locations," Nevada Operations Office/Yucca Mountain Project Office, Nevada, YMP/89-3, 4 Vols., February 3, 1989.

U.S. Nuclear Regulatory Commission, "Disposal of High-Level Radioactive Wastes in Geologic Repositories; Proposed Licensing Procedures," *Federal Register*, Vol. 44, No. 236, December 6, 1979, pp. 70408-70421.

U.S. Nuclear Regulatory Commission, "Generic Technical Position on Design Information Needs in the Site

Characterization Plan," Division of High-Level Waste Management, December 1985a.

U.S. Nuclear Regulatory Commission, "Generic Technical Position on In-Situ Testing during Site Characterization for High-Level Nuclear Waste Repositories," Division of High-Level Waste Management, December 1985b.

U.S. Nuclear Regulatory Commission, "Technical Position on Items and Activities in the High-Level Waste Geologic Repository Program Subject to Quality Assurance Requirements," NUREG-1318, April 1988.

U.S. Nuclear Regulatory Commission, "NRC Staff Site Characterization Analysis of the Department of Energy's Site Characterization Plan, Yucca Mountain Site, Nevada," NUREG-1347, August 1989a.

U.S. Nuclear Regulatory Commission, "Technical Position on Postclosure Seals, Barriers, and Drainage System in an Unsaturated Medium," NUREG-1373, August 1989b.

U.S. Nuclear Regulatory Commission, "Review Plan for High-Level Waste Repository Quality Assurance Program Descriptions (Revision 2)," Division of High-Level Waste Management, March 1989c.

U.S. Nuclear Regulatory Commission, "Availability of Draft Staff Technical Position on Regulatory Considerations in the Design and Construction of the Exploratory Shaft Facility," *Federal Register*, Vol. 55, No. 157, August 14, 1990, p. 33193.

APPENDIX A

GLOSSARY*

“Geologic repository” means a system which is intended to be used for, or may be used for, the disposal of radioactive wastes in excavated geologic media. A geologic repository includes: (1) The geologic repository operations area, and (2) the portion of the geologic setting that provides isolation of the radioactive waste.

“Geologic repository operations area” means a high-level radioactive waste facility that is part of a geologic repository, including both surface and subsurface areas, where waste handling activities are conducted.

“Site characterization” means the program of exploration and research, both in the laboratory and in the field, undertaken to establish the geologic conditions and the ranges of those parameters of a particular site relevant to

the procedures under this part. Site characterization includes borings, surface excavations, excavation of exploratory shafts, limited subsurface lateral excavations and borings, and in-situ testing at depth needed to determine the suitability of the site for a geologic repository, but does not include preliminary borings and geophysical testing needed to decide whether site characterization should be undertaken.

For definitions of other relevant terms, see 10 CFR 60.2.

References

U.S. Code of Federal Regulations, “Disposal of High-Level Radioactive Wastes in Geologic Repositories,” Part 60, Chapter I, Title 10, “Energy.”

*Source: 10 CFR 60.2, “Definitions.”

APPENDIX B

APPLICABLE 10 CFR PART 60 REGULATIONS

§60.15(c) Site characterization.

- (c) The program of site characterization shall be conducted in accordance with the following:
- (1) Investigations to obtain the required information shall be conducted in such a manner as to limit adverse effects on the long-term performance of the geologic repository to the extent practical.
 - (2) The number of exploratory boreholes and shafts shall be limited to the extent practical consistent with obtaining the information needed for site characterization.
 - (3) To the extent practical, exploratory boreholes and shafts in the geologic repository operations area shall be located where shafts are planned for underground facility construction and operation or where large unexcavated pillars are planned.
 - (4) Subsurface exploratory drilling, excavation, and in-situ testing before and during construction shall be planned and coordinated with geologic repository operations area design and construction.

§60.16 Site characterization plan required.

Before proceeding to sink shafts at any area which has been approved by the President for site characterization, DOE shall submit to the Director, for review and comment, a site characterization plan for such area. DOE shall defer the sinking of such shafts until such time as there has been an opportunity for Commission comments thereon to have been solicited and considered by DOE.

§60.17(c) Contents site characterization plan.

The site characterization plan shall contain—

- (c) A conceptual design for the geologic repository operations area that takes into account likely site-specific requirements.

§60.21(c)(1)(ii)(D)

[The assessment of the site at which the proposed geologic repository operations area is to be located, that is to be included in the Safety Analysis Report of the license application, shall include:] (D) The effectiveness of engineered and natural barriers, including barriers that may

not be themselves a part of the geologic repository operations area, against the release of radioactive material to the environment. The analysis shall also include a comparative evaluation of alternatives to the major design features that are important to waste isolation, with particular attention to the alternatives that would provide longer radionuclide containment and isolation.

§60.112 Overall system performance objective for the geologic repository after permanent closure.

The geologic setting shall be selected and the engineered barrier system and the shafts, boreholes and their seals shall be designed to assure that releases of radioactive materials to the accessible environment following permanent closure conform to such generally applicable environmental standards for radioactivity as may have been established by the Environmental Protection Agency with respect to both anticipated processes and events and unanticipated processes and events.

§60.113(a)(2) Performance of particular barriers after permanent closure. [General Provisions]

- (2) Geologic Setting. The geologic repository shall be located so that pre-waste-emplacement groundwater travel time along the fastest path of likely radionuclide travel from the disturbed zone to the accessible environment shall be at least 1,000 years or such other travel time as may be approved or specified by the Commission.

§60.134 Design of seals for shafts and boreholes.

- (a) General design criteria. Seals for shafts and boreholes shall be designed so that following permanent closure they do not become pathways that compromise the geologic repository's ability to meet the performance objectives or the period following permanent closure.
- (b) Selection of materials and placement methods. Materials and placement methods for seals shall be selected to reduce, to the extent practicable: (1) The potential for creating a preferential pathway for groundwater to contact the waste packages or (2) For radionuclide migration through existing pathways.

§60.151 Applicability.

The quality assurance program applies to all systems, structures and components important to safety, to design and characterization of barriers important to waste isolation and to activities related thereto. These activities include: site characterization, facility and equipment construction, facility operation, performance confirmation,

permanent closure, and decontamination and dismantling of surface facilities.

§60.152 Implementation.

DOE shall implement a quality assurance program based on the criteria of Appendix B of 10 CFR Part 50 as applicable, and appropriately supplemented by additional criteria as required by §60.151.

APPENDIX C

LIST OF 10 CFR PART 60 REQUIREMENTS TO BE CONSIDERED IN THE DESIGN OF THE EXPLORATORY SHAFT FACILITY (ESF)

This appendix lists requirements in 10 CFR Part 60 that pertain to the portions of the geological repository operations area that incorporate or may be affected by the ESF. These requirements should, therefore, be considered in the design of the ESF.

The appendix also includes requirements of 10 CFR Part 60 that pertain to site characterization. As the ESF is to be used as part of the site characterization program, to

establish needed background information related to the suitability of the site, these requirements must also be considered.

Although the list has been developed to provide general guidance, it is recognized that some of the requirements may not in fact impact the design of the ESF and that other requirements may have relevance even though not listed below.

Subpart A—General Provisions

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.1	
60.2	A
60.3	
60.4	
60.5	
60.6	
60.7	
60.8	
60.9	
60.10	

Subpart B—Licenses

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.15(a)	
60.15(b)	A
60.15(c)	A
60.16	A
60.17(a)	A
60.17(b)	A
60.17(c)	A
60.18	
60.21(a)	
60.21(b)(1)	

*The letter "A" appearing in this column indicates that the 10 CFR Part 60 requirement listed in the first column should be considered in the ESF design.

Subpart B—Licenses (continued)

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.21(b)(2)	
60.21(b)(3)	
60.21(b)(4)	
60.21(b)(5)	
60.21(c)(1)(i)	
60.21(c)(1)(ii)(A-C)(F)	
60.21(c)(1)(ii)(D)	A
60.21(c)(1)(ii)(E)	A
60.21(c)(2)	
60.21(c)(3)	
60.21(c)(4)	
60.21(c)(5)	
60.21(c)(6)	
60.21(c)(7)	
60.21(c)(8)	
60.21(c)(9)	
60.21(c)(10)	
60.21(c)(11)	A
60.21(c)(12)	
60.21(c)(13)	
60.21(c)(14)	
60.21(c)(15)	
60.22 60.23	
60.24(a)	A
60.31	
60.32	
60.33	
60.41	
60.42	
60.43	
60.44	
60.45	
60.46	
60.51	
60.52	

**Subpart C—Participation by State Governments
and Affected Indian Tribes**

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.62	
60.63	
60.64	
60.65	

*The letter "A" appearing in this column indicates that the 10 CFR Part 60 requirement listed in the first column should be considered in the ESF design.

Subpart D—Records, Reports, Tests, and Inspections

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.71	
60.72(a)	A
60.72(b)	A
60.73	
60.74	A
60.75	

Subpart E—Technical Criteria

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.101	
60.102	
60.111(a)	A
60.111(b)(1)	A
60.111(b)(2)	
60.111(b)(3)	A
60.112	A
60.113(a)(1)(i)	A
60.113(a)(1)(ii)	A
60.113(a)(2)	A
60.113(b)(1)	
60.113(b)(2)	A
60.113(b)(3)	A
60.113(b)(4)	A
60.113(c)	
60.121	
60.122(a)(1)	A
60.122(a)(2)	A
60.122(b)	A
60.122(c)	A
60.130	A
60.131(a)	A
60.131(a)(1)	
60.131(a)(2)	
60.131(a)(3)	
60.131(a)(4)	
60.131(a)(5)	
60.131(a)(6)	
60.131(b)(1)	A
60.131(b)(2)	A
60.131(b)(3)	A
60.131(b)(4)(i)	A
60.131(b)(4)(ii)	A

*The letter "A" appearing in this column indicates that the 10 CFR Part 60 requirement listed in the first column should be considered in the ESF design.

Subpart E—Technical Criteria (continued)

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.131(b)(5)	
60.131(b)(6)	A
60.131(b)(7)	
60.131(b)(8)	A
60.131(b)(9)	A
60.131(b)(10)	A
60.132(a)	
60.132(b)	
60.132(c)	
60.132(d)	
60.132(e)	
60.133(a)	A
60.133(b)	A
60.133(c)	A
60.133(d)	A
60.133(e)(1)	A
60.133(e)(2)	A
60.133(f)	A
60.133(g)	A
60.133(h)	A
60.133(i)	A
60.134(a)	A
60.134(b)	A
60.135(a)	
60.135(b)	
60.135(c)	
60.135(d)	
60.137	A

Subpart F—Performance Confirmation Program

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.140(a)	
60.140(b)	A
60.140(c)	A
60.140(d)(1)	A
60.140(d)(2)	
60.140(d)(3)	
60.140(d)(4)	
60.141(a)	A
60.141(b)	A

*The letter "A" appearing in this column indicates that the 10 CFR Part 60 requirement listed in the first column should be considered in the ESF design.

Subpart F—Performance Confirmation Program (continued)

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.141(c)	A
60.141(d)	A
60.141(e)	A
60.142(a)	A
60.142(b)	A
60.142(c)	A
60.142(d)	A
60.143(a)	A
60.143(b)	A
60.143(c)	A
60.143(d)	A

Subpart G—Quality Assurance

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.150	
60.151	A
60.152	A

Subpart H—Training and Certification of Personnel

<u>10 CFR Part 60 Requirement</u>	<u>Requirement to be Considered in the ESF Design*</u>
60.160	
60.161	
60.162	

*The letter "A" appearing in this column indicates that the 10 CFR Part 60 requirement listed in the first column should be considered in the ESF design.

APPENDIX D

DISPOSITION OF PUBLIC COMMENTS

Note: Throughout this appendix, "TP" refers to the public comment draft technical position noticed in the *Federal Register* on August 14, 1990 (55 FR 33193), and "STP" refers to the current staff technical position, NUREG-1439.

Department of Energy (DOE) Comments

1. Section 3.0 and Section 4.0

On page 2 the TP states: "The technical position statements are listed in Section 3.0. Section 4.0 of this paper provides a discussion of the supporting rationale behind the stated technical positions."

Section 4.0 provides very little supporting rationale for the technical positions stated in Section 3.0. In fact, Section 4.0 actually presents additional technical positions. Based on our review, over three-quarters of all of the technical positions are found in Section 4.0.

The following are some examples of technical positions for "Planning and Coordination of ESF Design with GROA Design," Item (3) in Section 3.0 and Section 4.0.

Technical Positions in Section 3.0 (p. 5):

"A conceptual design of the GROA should be considered in the design of the ESF."

"For example, the shafts, ramps, and drifts for the ESF should be selected in locations where these features are planned for the GROA unless a need for different design can be justified and their impact on the waste isolation capability of the site and impact on data collection from site characterization are acceptable."

Additional technical positions in Section 4.0 (pp. 10-11):

"The ESF test area and exploratory drifts should be at the same depth as that proposed for waste emplacement, and the shafts or ramps designed for the ESF should be selected for those planned for the GROA, to the extent practical."

"In general, the requirements for the ESF should not unnecessarily increase the number of the repository shafts or ramps."

"The location of ESF shafts or ramps should take into account possible uplift or subsidence caused by the thermal effects of waste emplacement, fault movement, and tectonics."

"Potential effects of fault movements caused by thermal or tectonic effects should also be considered when selecting the locations for the ESF access openings."

"The shaft or ramp locations, construction methods, and liner material for the access openings should accommodate future needs for sealing and drainage."

"The approach to the selection, design, and construction of the ESF shafts and/or ramps should account for uncertainties in the likely dominant flowpaths into or out of the repository."

"Suitable provisions should be made for proper drainage from the underground openings and the design should facilitate future sealing options."

We suggest that all technical positions be placed in Section 3.0 and that Section 4.0 be rewritten to provide the supporting rationale for the technical positions, for DOE review and comment prior to finalization of this TP.

Resolution

The staff agrees with most of this comment and has rewritten the discussion in Section 4.0 to provide additional supporting rationale for the technical position statements cited in Section 3.0. However, the staff does not intend to provide the supporting rationale section (Section 4.0) to DOE for its review and comment prior to finalization of the STP.

2. Page 1, 1st Paragraph, Last sentence

The TP states: "However, since *the ESF* may become part of an eventual geologic repository operations area (GROA), the ESF design will be required to satisfy applicable GROA design requirements." (emphasis added)

We agree with the statement, but would like to clarify that only the permanent components of the

ESF would be incorporated into the repository. We suggest, therefore, that "the ESF" be replaced with "permanent components of the ESF."

Resolution

The staff agrees with this comment in so far that only the permanent components of the ESF would be incorporated into the repository and thus the second sentence of the third paragraph of Section 1.0 of the STP now reads as follows:

"DOE currently plans to collocate the permanent components of the ESF with the GROA (DOE, 1988a, p. 8.4.2-216)."

In addition, the last sentence of the second paragraph in Section 1.0 now reads as follows:

"(For the purpose of demonstrating compliance with 10 CFR Part 60 requirements, the term "ESF" refers to only the permanent components of the ESF that may become a part of an eventual GROA.)"

3. Page 5, Item (3), Planning and Coordination of ESF Design with GROA Design

The TP states: "For example, the shafts, ramps, and drifts for the ESF should be selected where these features are planned for the GROA unless a need for *different designs can be justified* and their impact on the waste isolation capability of the site and the impact on data collected from characterization are acceptable." (emphasis added)

With respect to the statement regarding the justification for different designs, it is logical to expect that the design of subsurface penetrations may need to be modified as ESF construction proceeds, to take into account conditions encountered at the site, as well as new data obtained. Such modifications in the design would need to be approved internally by DOE as part of our design control process, and would take into consideration impacts on waste isolation and the ability to obtain the needed site characterization data. The actual level of control required would be dependent on the extent of the modification. We believe that it is not necessary, nor would it be efficient, for the DOE to justify to the NRC every change made to the design, as long as our design control process is acceptable. We suggest that the TP statement be clarified accordingly.

Resolution

The statement in the technical position regarding the need for justification of different designs does not refer to modification of the ESF design to account for in-situ conditions encountered at the site or to new site characterization data obtained. Rather, the position statement refers to a case where DOE might consider a need for ESF design in which the shaft(s), ramp(s), and drift(s) are selected in locations that are different from those where these features are planned for the GROA in the current conceptual design.

Technical Position No. 3 attempts to note the need for coordination of the ESF design and construction with GROA design in order to ensure that the construction of the ESF does not adversely impact the waste isolation capability of the geologic repository. Section 60.15(c)(4) requires that the "Subsurface exploratory drilling, excavation, and in-situ testing before and during construction shall be planned and coordinated with geologic repository operations area design and construction." Moreover, 10 CFR 60.15(c)(3) requires that "To the extent practical, exploratory boreholes and shafts in the geologic repository operations area shall be located where shafts are planned for underground facility construction and operation or where large unexcavated pillars are planned." To meet these requirements, it is necessary that a conceptual design of the GROA be developed so that the exploratory shaft(s) can be located where shaft(s) or unexcavated pillars for the GROA are planned, to the extent practical. This technical position suggests that if DOE proposes that there is need for a different design in which shafts, ramps, and drifts for the ESF are not selected in locations where these features are planned for the GROA, it should justify this need and determine that the impact of these features on the waste isolation capability of the site and impact on data collected from site characterization are acceptable.

The staff agrees with the portion of DOE's comment that states it is logical to expect that the design of subsurface penetrations may need to be modified as ESF construction proceeds. As stated in the last sentence of the second paragraph of the discussion behind Technical Position No. 7 (see Section 4.0), the staff suggests that "... it would be prudent to build-in considerable flexibility in the ESF design, to allow modifications and expansion of the site characterization efforts." The staff agrees with DOE that changes or modifications to the ESF design during construction, to take into account conditions encountered at the site, as well as new data obtained, should be performed under the requirements of DOE's design control process. The staff intends to monitor any changes to the ESF design during construction through site visits, the staff review of DOE's semiannual progress reports of the site characterization activities, and through observations of DOE's QA audits of the ESF design control process.

To clarify this position, as suggested by DOE, the staff has added the following sentence to the end of the discussion (in Section 4.0) behind Technical Position No. 2:

“The staff intends to monitor changes made to the ESF design during construction through site visits, staff reviews of DOE’s semiannual progress reports of site characterization activities, and through observation of DOE’s QA audits in the implementation of the ESF and GROA design control process.”

4. Page 6, Item (5), Excavation Methods

The guidance states that excavation methods “... should be selected to limit, rather than attempt to account for, mechanical, hydrological, or chemical damage to rock and to limit the creation of potential pathways for radionuclide migration around the shafts, ramps, and the underground openings.”

The TP overstates the requirements in 10 CFR 60.133(f) which only states that: “The design of the underground facility shall incorporate excavation methods that will limit the potential for creating a preferential pathway for groundwater to contact the waste packages or radionuclide migration to the accessible environment.”

The phrase “... limit, rather than attempt to account for...” is overly restrictive. There may be situations where the DOE is faced with some perceptible but inconsequential damage to rock where avoiding such damage would involve extraordinary costs to the program. In these situations, the DOE would account for that inconsequential damage and proceed. This would be consistent with the requirement of 10 CFR 60.133(f).

The above phrase also appears in Item (6), Test Interference. Our comment applies there as well.

Also, the TP statement specifies the types of damages to the rock that the excavation method should limit, which could constrain DOE’s selection of the appropriate method of excavation. We suggest that the TP be revised to conform more closely with the intent of 10 CFR 60.133(f) and the sentence containing the phrase “... limit, rather than attempt to account for...” be deleted from Items (5) and (6).

Resolution

We agree with DOE that the technical position on excavation methods should be consistent with the requirements of 10 CFR 60.133(f). This regulation requires that “The design of an underground facility shall incorporate excavation methods that will limit the potential for creating a

preferential pathway for groundwater to contact the waste packages or radionuclide migration to the accessible environment.” However, the staff believes that the position, as stated in the STP, does conform with the intent of 10 CFR 60.133(f).

The comment appears to imply that the staff is overstating the requirements of 10 CFR 60.133(f) because: (1) the position states that, to the extent practical, the methods of constructing the ESF should be selected to limit, rather than attempt to account for, damage to rock; and (2) the position specifies the types of damage to the rock that the excavation method should limit. The staff has provided these statements in the STP not to overstate the requirements of 10 CFR 60.133(f); rather, they have been added in order to provide guidance to DOE on a way to meet the requirements of the regulation. The staff does not believe there is much value in restating the requirements of 10 CFR 60.133(f). Doing so will not provide any meaningful guidance to DOE on how the requirements of this regulation can be met.

The use of the phrase “... limit, rather than ... account for ... damage” is based on the staff consideration that, in the initial stages of site characterization, there may be large uncertainties present with respect to consequences of any damage done to the site. Since the requirements for impact on the site must be considered for a long period of time (10,000 years), the staff considers that it may be inappropriate to assume that certain magnitudes or types of damage would be inconsequential without adequate support of in-situ information from site characterization. Therefore, the staff takes the position that it is appropriate to limit excavation damage rather than attempt to account for it, to the extent practical. The staff considers that the phrase “to the extent practical” in the technical position statement provides the needed flexibility to DOE, in interpreting the staff position.

The NRC staff does not agree with DOE that specification of the types of damage to be limited in the position statement (mechanical, hydrological, or chemical) would constrain the selection of excavation method in a way that is not needed. The staff considers that giving particular attention to the need for limiting these types of possible damages in its selection of the excavation methods would help DOE in demonstrating compliance with the requirements of 10 CFR 60.133(f) at the licensing stage.

The comment also suggests that the phrase “... limit or avoid, rather than attempt to account for...” is overly restrictive for selecting ESF design features for the potential for interference with site characterization. The staff disagrees with DOE’s assertion. The staff considers that the phrase “to the extent practical” in the technical position statement allows sufficient flexibility in meeting the intent of the regulation. The staff believes that if testing interference is not limited or avoided, there are likely to be large uncertainties in the potential effects of

test interference on data adequacy, at least during the initial stages of site characterization. Therefore, to maintain confidence in the reliability of data collected from site characterization, the tests should be conducted in such a manner that they do not interfere with each other or with construction activities, rather than attempt to account for such interference when interpreting site characterization data.

5. Page 7, Item (1), Second paragraph

The TP states that the logic used to comply with 10 CFR 60 requirements should be based on two general principles: "(1) The ESF design limits adverse impacts on the waste isolation capability of the geologic repository, and (2) this design does not preclude the gathering of sufficient data necessary to demonstrate site suitability and for the design of the GROA."

The TP should recognize that principles (1) and (2) could conflict and the tradeoffs may be necessary. For example, principle (1) implies that we should limit our underground drifting and thereby limit adverse impacts on waste isolation. At the same time, principle (2) implies and the TP recommends, "Extensive drifting may be the most promising approach to reduce certain data uncertainties" (page 14).

We suggest that, for clarity, the TP combine the two principles into the following single statement: "The ESF must be designed to obtain the data necessary to determine the suitability of the site and to design the GROA and, to the extent practicable, limit adverse effects on the repository's long-term performance." This statement better reflects the actual requirement in 10 CFR 60.15(c)(1).

The same paragraph of the draft TP closes with the statement, "The ESF design and construction should also permit flexibility to modify, if necessary, the reference conceptual design of the GROA based on data collected during site characterization." The TP makes a similar statement on page 12, item (4), first paragraph, last sentence.

With regard to such flexibility, the ESF will be designed based on the GROA conceptual design and site characterization data needs. The detailed design of the GROA will be based on the results of the site characterization program. We suggest that the TP statement be deleted or revised to more closely reflect this situation.

Resolution

In consideration of DOE's comment, the staff has deleted the following sentence in paragraph two of the discussion (in Section 4.0), behind Technical Position No. 1:

"The ESF design and construction should also permit flexibility to modify, if necessary, the reference conceptual design of the GROA based on data collected during site characterization."

In addition, the staff has also deleted the following two sentences from paragraph one of the discussion (in Section 4.0), behind Technical Position No. 4:

"The reference GROA design(s) may require change as a result of data gathered during site characterization. Therefore, to the extent practical, the selected ESF design should allow sufficient flexibility to revise the reference GROA design(s) to allow adjustments where necessary to accommodate specific site conditions identified during site characterization."

The staff does not believe that combining the two general principles stated in the discussion (in Section 4.0) behind Technical Position No. 1 would further clarify the intent of this technical position. By stating these as two separate principles, it can be readily seen that in order to comply with both of them, some balancing of design requirements may be necessary. DOE has recognized this point by stating that "... (general) principles (nos.) (1) and (2) could conflict and the tradeoffs may be necessary." However, to further clarify the staff's intent behind this technical position, the following sentence has been added to the end of the first paragraph of the discussion (in Section 4.0), behind Technical Position No. 1:

"These principles are derived from 10 CFR Part 60, which conveys both the purposes of an ESF and caution regarding the potential adverse impact of the ESF on the long-term performance of the repository."

In addition, the staff has reversed the order of the two general principles. The staff has also added the phrase "to the extent practical" to general principle no. (2), to make it consistent with the language of 10 CFR 60.15(c)(1). General principle no. (2) now reads as follows:

"... (2) this design limits adverse effects on the long-term performance of the geologic repository, to the extent practical."

6. Page 11, Item (4), Consideration of Alternatives for Design Features, 1st sentence

The TP states: "As required by 10 CFR 60.21(c)(1)(ii)(D), a comparative evaluation of

several possible alternatives to the major design features should be performed at the initial stages of the GROA design." Figure 1 of the TP illustrates an approach the NRC staff considers acceptable for the ESF to achieve compliance with 10 CFR 60 requirements.

The TP indicates that GROA design features potentially important to waste isolation should be identified, and a comparative evaluation of such features be performed (consistent with 10 CFR 60.21(c)(1)(ii)(D)), prior to selection of the GROA design concept(s) and development of the conceptual design. While the DOE acknowledges that such an evaluation is needed to support the license application, we believe that this comparative evaluation at such an early stage of the design, prior to obtaining site-specific information from the site characterization program, would not provide a meaningful basis upon which decisions could be made with regard to a preferred design concept or set of concepts.

Prior to developing ESF design concepts, it is important that the appropriate ESF criteria be established for both waste isolation and site characterization needs. It is also useful to have at least a preliminary understanding of which GROA design features are potentially important to waste isolation, using the GROA conceptual design as a basis.

The DOE understands that since the permanent components of the ESF are expected to be eventually incorporated into the repository, and the ESF will be constructed prior to designing the repository, an early comparative evaluation of the major design features of the ESF that are potentially important to waste isolation needs to be conducted, using data currently available. Enclosed is a recommended revision to Figure 1 [see Figure D1] in the draft TP which incorporates the process discussed above. The actual comparative evaluation of major GROA design features important to waste isolation would be conducted after site characterization data are available, and hence is not shown on the figure. As required by 10 CFR 60.21(c)(1)(ii)(D), that evaluation will be included in the license application.

Figure 1 of the TP also introduces the concept of "minimizing" waste isolation impacts, which we believe is beyond the intent of the regulations. 10 CFR 60.15(c)(1) indicates that such impacts should be limited "to the extent practical," which implies that they be acceptable. The revised Figure 1 [Figure D1] also provides recommended changes to this.

Resolution

The staff considers that the exploratory shaft facility (ESF) shaft(s), ramp(s), and/or drifts will become the first major penetrations through the geological barrier. Therefore, the staff agrees with DOE's understanding, as noted in the comment above, that "... since the permanent components of the ESF are expected to be eventually incorporated into the repository, and the ESF will be constructed prior to designing the repository, an early comparative evaluation of the major design features of the ESF that are potentially important to waste isolation needs to be conducted, using data currently available." However, the staff does not believe that the proposed revision to Figure 1 (Figure D1), as recommended by DOE in this comment, is consistent with this understanding. The comment states that an early comparative evaluation of major ESF design features needs to be conducted, but the suggested revision to Figure 1 (Figure D1) indicates that an early comparative evaluation of major ESF design features is not necessary.

DOE's comment further states that "While DOE acknowledges that such an evaluation (comparative evaluation of major GROA design features) is needed to support the license application, we believe that this comparative evaluation at such an early stage of the design, prior to obtaining site-specific information from the site characterization program, would not provide a meaningful basis upon which decisions could be made with regard to a preferred design concept or set of concepts." In this regard, the Commission's statement of considerations sets forth those requirements applicable to DOE when submitting site characterization plans, and it clarifies 10 CFR 60.21(c)(1)(ii)(D) with respect to a comparative evaluation of the major design features. It states that "The Commission has stressed the importance of evaluating alternatives to major [GROA] design features that are important to waste isolation, see 10 CFR 60.21(c)(1)(ii)(D), and *in the case of the design and location of the shafts this can only be done prior to their sinking.* (emphasis added) It is important to the Commission that the comments which it may provide to DOE with respect to shaft sinking be taken into account as the Department proceeds" (51 FR 27159).

Therefore, the NRC staff does not agree with DOE's assertion that a comparative evaluation of the major GROA design features would not provide a meaningful basis upon which decisions could be made on a preferred design concept or set of concepts, because site-specific information from the site characterization program is not available. The opportunity to use the results of a comparative evaluation for the major GROA design features exists only before the ESF is constructed. Although an

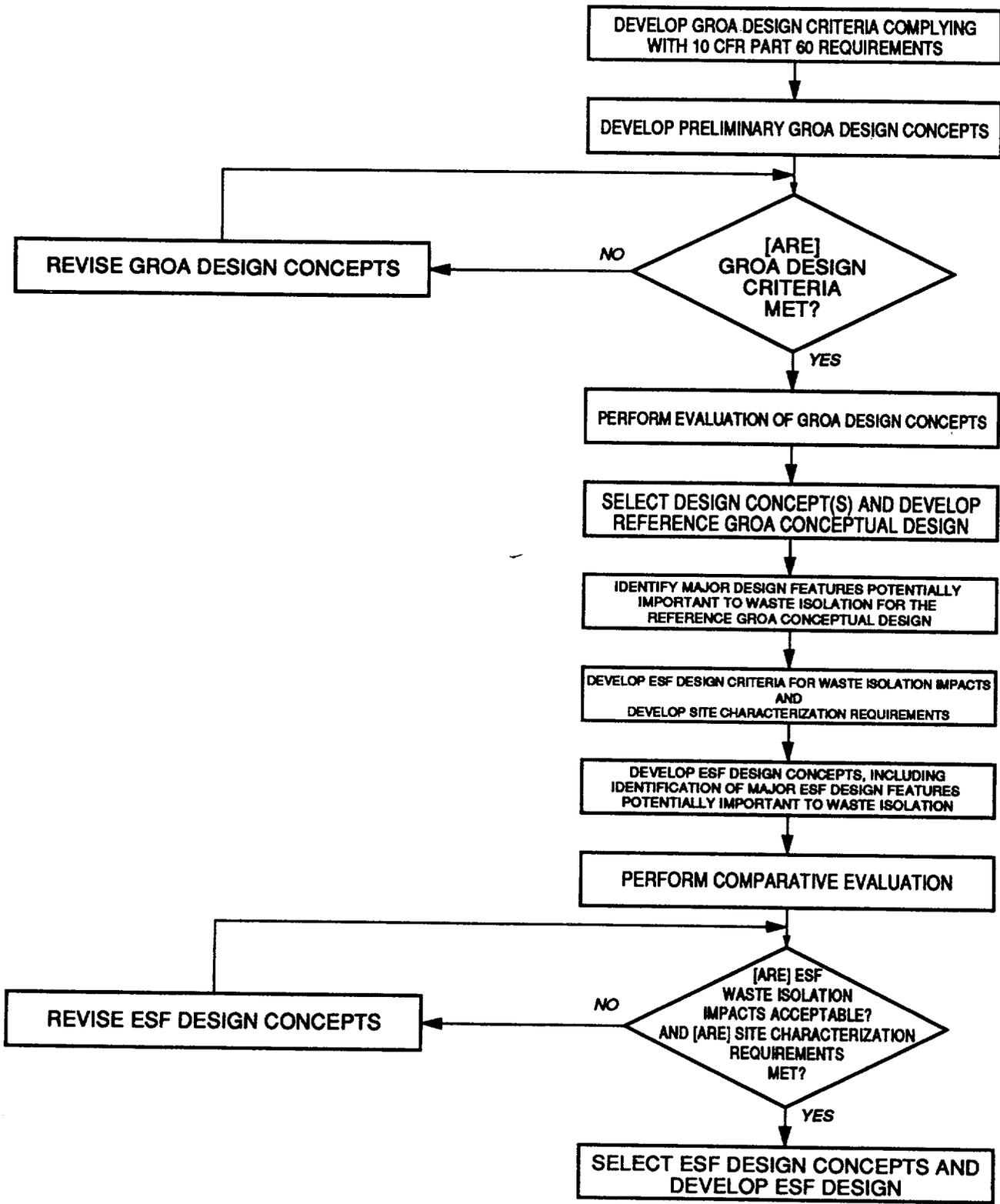


FIGURE D1 -- DOE-proposed example of an acceptable approach to achieve compliance of the ESF design with 10 CFR Part 60 requirements.

analysis may be conducted on a more informed basis, once the ESF is constructed, it may be too late to use the results of such an analysis for incorporation in the design.

The staff agrees with the comment that the waste isolation impacts should be limited "to the extent practical" and they need not be minimized. However, should a design feature be acceptable and, based on existing information, an alternative to this feature is known to have significant advantages, the alternative design feature should not be dismissed merely because the original design feature was acceptable. In this context, the staff has revised the phrase in the process block in Figure 1 reading "Develop ESF Design Criteria to Minimize Waste Isolation Impacts" with the phrase "...Develop ESF Design Criteria to Limit Waste Isolation Impacts."

Also, in the same figure, the process block reading "ESF Waste Isolation Impacts Minimized and Site Characterization Requirements Met?" now reads "Are Site Characterization Requirements Met? and Are ESF Waste Isolation Impacts Limited?" The discussion (in Section 4.0) behind Technical Position No. 1, has been revised accordingly, to track with these changes.

7. Page 14, Item (7), 1st Paragraph, Last sentence

The TP states: "Therefore, the ESF design should ensure that the data collected will provide the ranges of conditions and processes throughout the site."

Surface-based testing as well as the ESF will provide such data. We suggest that the quoted sentence be revised to state, "Therefore, the ESF design, in conjunction with the surface-based testing program, should ensure that data will be collected to evaluate the ranges of conditions and processes throughout the site."

Resolution

The staff agrees with this comment. Per DOE's suggestion, the last sentence in the first paragraph of the discussion (in Section 4.0), behind Technical Position No. 7, has been revised to read as follows :

"The ESF design and surface-based testing are key elements for ensuring that data collected credibly represent the range of conditions and processes throughout the site."

Edison Electric Institute/Utility Nuclear Waste and Transportation Program (EEI/UWASTE) Comments

General Comments

1. Recognition of Need for Flexible Approach

The appropriate approach to Exploratory Shaft Facility (ESF) design is that outlined on page 14 of the draft TP under number 7 wherein NRC emphasizes flexibility in approach, the need to obtain a sufficient range of data, and an iterative approach to site characterization. This approach is also consistent with that outlined in the Department of Energy's (DOE) Site Characterization Plan (SCP), which recognizes that due to the limited amount of information available prior to site characterization, plans must be flexible and incremental to permit modification as new information becomes available. [SCP at 8.4.2-2.] However, because this discussion does not appear until the very end of the draft TP, it seems to be more of an afterthought than a guiding principle for ESF design. We urge that this approach be adopted by the NRC.

There are several additional points in the draft TP that appropriately recognize the need for flexibility in ESF design. Unfortunately, however, these statements are overshadowed by other provisions in, and the general tone of, the draft TP. For example, an evaluation of alternative designs for the ESF *may* indicate that the preferred ESF design and location for purposes of data collection and site characterization is not optimal for purposes of radionuclide containment and isolation. The draft TP belatedly recognizes this fact at page 12, but indicates that, in such a case, the ESF design should be justified and its impact on waste isolation of the geologic repository studied. However, this statement is at odds with the discussion on page 8 of the TP, which appears to indicate that waste isolation should be given priority in repository design and, therefore, in planning and design of the ESF.

Similarly, page 7 of the draft TP, paragraph 2 acknowledges that the ESF design and construction should permit flexibility to modify the design of the geologic repository operations area (GROA) based on data collected during site characterization. However, this critical assumption does not appear to be reflected through the remainder of the document. Accordingly, we urge the NRC to reorganize the draft TP, using the discussion on page 14 as guidance for both the approach to ESF design and the relationship between the ESF design and the GROA design.

Resolution

The staff agrees with that part of the EEI/UWASTE comment which states that the appropriate approach to the design of the ESF is described in the STP, where flexibility in the approach, the need to obtain a sufficient range of data, and an iterative approach to [design during] site characterization are emphasized. However, we do not agree with the concern that because the technical position appears near the end, it seems to be an afterthought, and the STP needs to be modified to further emphasize these points. The reason for the order in which discussion appears is due to the logic in which various technical positions are organized. The order of discussion does not imply that a given technical position is any more or less important than the another. In addition, as suggested by the comment, there are several additional points in the STP that appropriately recognize the need for flexibility in ESF design. However, to clarify the point that the technical positions themselves are not rank-ordered, the following statement has been added at the beginning of Section 3.0:

“The following technical position statements relate to the design and construction of the ESF. They apply to that case where DOE intends to incorporate the permanent components of the ESF into the final GROA design. All these technical positions should be considered important; no particular significance should be attributed to the order in which they are given.”

With respect to the EEI/UWASTE comment on the possibility that data-collection activities and site characterization needs may be at odds with waste isolation requirements, the staff has recognized the importance of both, when reviewing DOE’s work related to site characterization and waste isolation analysis. However, in view of the EEI/UWASTE comment, the staff has added the following sentence to the end of the first paragraph to the discussion (in Section 4.0), behind Technical Position No. 1, to indicate that some tradeoffs in ESF design may be necessary to meet the two requirements:

“These principles are derived from 10 CFR Part 60, which conveys both the purposes of an ESF and caution regarding the potential adverse impact of the ESF on the long-term performance of the repository.”

The staff does, however, consider that waste isolation impacts should be considered extremely important while planning the ESF design, because if the site is adversely impacted by site characterization, DOE might find it impossible to demonstrate that the requirements of 10 CFR Part 60 have been met during the licensing process.

2. NRC Role in ESF Design

The draft TP is based on the premise that, because the ESF may eventually become part of the GROA, the ESF design “will be required to satisfy applicable GROA design requirements” specified in 10 CFR Part 60. [Draft TP at 1.] However, at this early stage in the repository development program, when DOE has not even made an assessment of site suitability, the possibility that the ESF will not become part of the GROA still exists. It is important that NRC plays a role in reviewing the design and construction of the ESF; however, it is not clear that NRC has a statutory or regulatory basis to license the ESF design as an independent facility. Any such licensing authority would arise if and when the ESF is incorporated into the repository.

The Nuclear Regulatory Commission’s (NRC) appropriate role in the site characterization process consists of commenting on the DOE’s Site Characterization Plan as it has already done, overseeing DOE’s quality assurance program, specifying general guidelines for the conduct of site characterization activities (as it has done in 10 CFR 60.15), and to facilitate communications between DOE and NRC such that there are no “surprises” during the licensing process. To the extent that the draft TP attempts to reach beyond this appropriate role, and regulate the ESF on the assumption that it may become part of the GROA, EEI/UWASTE submits that the draft TP is inappropriate.

Resolution

The staff agrees that the STP is applicable only if DOE decides that permanent components of the ESF are intended to become a part of the GROA. Based on DOE’s current position, as stated in Section 8.4.2.3.6.3 of the SCP (DOE, 1988, pp. 8.4.2-216–8.4.2-217), “the ESF was designed to maintain compatibility with the repository layout and operations.” Paragraph eight of the “Introduction” section (Section 1.0) of the STP clearly states the premise for development of the STP. To further clarify the premise of this STP, the staff has rewritten the third sentence of paragraph eight in Section 1.0 to read as follows:

“The positions and discussions in this STP are based on the premise that the permanent components of the ESF may eventually become a part of the GROA (see DOE, 1988a, p. 8.4.2–216), and the guidance in this STP is intended only for that case where DOE intends to incorporate the permanent components of the ESF into the final GROA design.”

Therefore, the NRC staff considers it appropriate to provide guidance to DOE at this time in such areas as ESF

design and construction, because the ESF is currently intended by DOE to become a part of an eventual GROA. The staff will consider revising the existing STP or developing additional guidance if and when DOE changes its current position to incorporate part of the ESF into a future GROA.

However, to further clarify the NRC staff's role during the site characterization phase, the fifth paragraph of the "Introduction" section (Section 1.0) has been revised to read as follows:

"Both NWPA and the U.S. Nuclear Regulatory Commission's (NRC's) geologic repository disposal regulation (10 CFR 60.16) require that DOE submit a Site Characterization Plan (SCP) before proceeding to sink [exploratory] shafts at a site and to defer sinking of shafts until such time as there has been an opportunity for Commission comments to have been solicited and considered by DOE. On December 28, 1988, DOE submitted the statutory SCP for the Yucca Mountain Site (DOE, 1988b) including plans for the ESF. NRC's regulations do not require licensing of the ESF or approval of its design. The regulations, however, do require NRC to state its specific objections to the SCP and to provide an analysis of the plan. NRC prepared such an analysis and issued it on July 31, 1989 (see NRC, 1989a). It should be noted that NRC does not undertake, in the pre-licensing phase, the responsibility for ensuring that DOE designs are adequate to obtain all data necessary for characterization, or for ensuring that the ESF design is adequate to limit adverse effects on waste isolation and containment. However, during the pre-licensing phase, the staff is concerned with ascertaining that DOE's programs, as described in its SCP, adequately reflect consideration of all 10 CFR Part 60 regulatory requirements. Therefore, the objective of providing guidance to DOE on ESF design and construction during the pre-licensing phase is to identify, at an early time, the potential for significant problems in the future, so that they can be avoided."

3. Purpose of the ESF

The purpose of the ESF is to provide a means for the DOE to access the subsurface and proposed repository host-rock. This would allow DOE to obtain the data necessary "to establish the geologic condition and the ranges of the parameters of [the Yucca Mountain site] relevant to the location of a repository...and the suitability of [the site] for the location of a repository..." [42 U.S.C. 10101(21)(B)] Although the draft TP appears to recognize this fact at several points, the draft TP taken as a whole creates the impression that the

NRC has subordinated the ESF's chief role of data collection to that of ensuring that the ESF (1) will not interfere with the waste isolation capability of the site and (2) will become a part of the repository. This is done in several ways.

First, throughout the draft TP the NRC lists two "guidelines" for ESF design. Typically, the need for data collection is secondary to limiting adverse impacts on the waste isolation capabilities of the site. For example, the first page of the draft TP states:

"Proper coordination between ESF design and GROA design is essential to ensure that the ESF, as constructed, will not interfere with the waste isolation capability of the site, and will facilitate site characterization activities."

[Draft TP at 1, para. 3.] This inversion of the relative priorities is reflected at several other points in the draft TP, as noted in the specific comments below.

Second, the NRC repeatedly states the purposes of data collection in the negative rather than the positive. In other words, while the purpose of the ESF should be to facilitate data collection, the draft TP speaks in terms of not precluding data collection. For example, on page 2 of the draft TP, NRC words the second of its two general guidelines as follows:

"(1) the ESF design, construction and operation should not preclude the collection of needed site data."

Thus, in addition to subordinating the role of data collection to a secondary consideration in ESF design, the draft TP denigrates the importance of designing and locating the ESF so as to facilitate the collection of sufficient and representative data concerning the site characteristics.

Third, the draft TP is based on the assumption that the ESF "... will eventually become a part of a future GROA." [Draft TP at p. 2, para. 1. See also page 9, para. 3 ("... the ESF is likely to become a part of a future repository").] As a result of this assumption, the NRC would require that the ESF design meet all applicable GROA design requirements. This requirement is premature. DOE has not yet even begun the scientific investigations described in the Site Characterization Plan to determine whether the site is suitable for a repository. Until those investigations are underway, it is not possible to determine whether the ESF will become part of the GROA. Although the NRC appears to

recognize this fact at certain points in the draft TP¹, it nevertheless would require a high level of certainty with respect to the design of the GROA and the placement of the ESF in that design. The net result of this requirement is to overemphasize the need for design compatibility at the expense of data collection and site characterization.

NRC has previously recognized the need to reconcile the competing concerns of data collection and waste isolation capability. In adopting the regulation that is now 10 CFR 60.15, the Commission felt itself obligated to clarify the rule describing the site characterization process. The NRC noted that:

“The original language could have been construed to mean that the purpose of the [site characterization] investigations was to limit [adverse] effects.”

The final rule modified the proposed rule so that it was clear that the primary purpose of the investigations was to collect site characterization data, not to protect the site:

“The provision calling, as a minimum, for the selection of borehole locations to limit subsurface penetrations was said to be confusing; the revision, which expresses the Commission’s intention more clearly, includes a phrase that emphasizes that the number of penetrations must be adequate to obtain needed site characterization data.”

[48 Red. Reg. 28195, 28206 (1983).] Unfortunately, because of the subordinate role data collection takes relative to limiting adverse impacts in the language of the draft TP, the draft TP is not consistent with the Commission’s position as stated in 10 CFR 60.15.

Resolution

The staff does not consider that the STP implies that data collection is a subordinate role of the ESF. The staff has clearly noted that “... the purpose of [the ESF] is to facilitate site characterization activities” (see the first paragraph of Section 1.0). However, the staff considers, and the STP acknowledges, that site characterization activities should be performed in such a way that the process does not adversely impact the waste isolation capability of the site. EEI/UWASTE’s Comment No. 4 on “overemphasis on GROA design certainty” notes this point by stating that “EEI/UWASTE agrees that minimizing adverse impacts and maintaining the integrity of the site

should be a major consideration in the design of the ESF.”

However, in order to avoid the impression that the role of the ESF in data collection is considered by the NRC staff to be secondary to the requirement to limit the adverse impacts on the waste isolation capabilities of the site, the language of the STP has been modified, as appropriate, to suggest that the ESF’s primary role in site characterization has not been subordinated to waste isolation concerns. In this regard, the language of the STP has also been modified to reflect the function of the ESF in the “positive,” rather than in the “negative,” as also recommended by EEI/UWASTE in its comment.

Finally, the EEI/UWASTE comment notes that “... the NRC would require that the ESF design meet all applicable GROA design requirements. This requirement is premature.” In this regard, as previously noted, DOE’s SCP states that the permanent components of the ESF will become part of the GROA. Therefore, it is not considered premature by the NRC staff that DOE needs to consider GROA design requirements in the design of the ESF, at this time.

4. Overemphasis on GROA Design Certainty

As noted above, the NRC’s assumption that the ESF eventually will become part of the GROA has led it to require a high level of certainty with respect to the GROA design at the very early stages of site characterization. This approach creates a significant dilemma for DOE. Prior to designing the ESF, DOE must have a relatively complete GROA design. However, final GROA design can not be completed until the host rock is characterized.

EEI/UWASTE agrees that minimizing adverse impacts and maintaining the integrity of the site should be a major consideration in the design of the ESF. However, NRC and DOE must keep in mind that the primary purpose of the ESF is to characterize the host rock. If DOE finds the site suitable and then decides to make the ESF part of the GROA, the ESF must eventually meet the GROA requirements. Ultimately, DOE may need to take steps to alter or modify the ESF in order to bring it into compliance; it is imperative that DOE keep this in mind as they design the ESF. However, it is not necessary for NRC to take regulatory steps to *ensure* such compliance until DOE determines that the ESF should be part of the GROA.

This problem is perhaps best illustrated by the NRC’s indication on page 11 under paragraph (4) that, in order to plan the ESF design, the DOE must undertake a comparative evaluation of several possible alternatives to the major design features

¹See, e.g., page 1, para. 1 (the ESF “may” become part of the GROA); page 7, para. 1 (“if” the ESF becomes part of the repository).

for the GROA as required by 10 CFR 60.21(c)(1)(ii)(D). That regulation specifies the required content of the Safety Analysis Report (SAR) to be submitted with the DOE's application for a construction authorization for the repository. To prepare a SAR, however, DOE must first conduct the detailed site characterization effort, of which the ESF is a major component. The point is that the design of the GROA should be based on the data gathered through site characterization and the ESF. Although the GROA design should be considered, it should not be the prime consideration in ESF location and design.

The draft TP's undue emphasis on GROA design certainty when designing the ESF is a vivid example of the concern expressed by the National Research Council's Board on Radioactive Waste Management (Board) in its July 1990 Position Statement entitled "Rethinking High-Level Radioactive Waste Disposal." In that Statement, the Board criticizes the Nuclear Waste Policy Act program and its regulatory structure for placing too much emphasis on certainty and not enough emphasis on the need to maintain sufficient flexibility to modify the program as it develops: "[t]his 'perfect knowledge' approach is unrealistic, given the inherent uncertainties of this unprecedented undertaking, and it runs the risk of encountering 'show-stopping' problems and delays that could lead to a further deterioration of public and scientific trust."

The NRC's overemphasis on the GROA design and the role of the ESF in the repository will not only unduly complicate the ESF design process and delay site characterization, but is inconsistent in certain regards with the DOE's approach as outlined in the Site Characterization Plan (SCP), and analyzed in the NRC's Site Characterization Analysis (SCA). For example, in Volume VIII of the SCP, DOE explains that the requirements of 10 CFR Part 60 must be considered during site characterization "... to ensure that the proposed characterization activities will not only allow the DOE to obtain the necessary data for a license application, but also to ensure that the activities are carried out in a manner consistent with meeting licensing requirements for maintaining site integrity and consistency with the repository design." [SCP at 8.4.1-3.] In connection with the rock characterization program, the NRC expressed concern in the SCA over the extent to which the "... [ESF] combined with the surface-based test program, may not yield data representative of conditions and processes throughout the repository block." [SCA at 2-2.] Thus, DOE and—within the contexts of the SCA—the NRC, recog-

nize the priority of data collection during the site characterization process.

Resolution

The staff does not believe that the STP unduly emphasizes GROA design certainty when designing the ESF. However, 10 CFR Part 60 requires that the ESF design be planned and coordinated with the GROA design. Therefore, it is necessary for DOE to develop preliminary design concepts for the GROA at the time ESF design is developed. 10 CFR Part 60 requires DOE to submit such design concepts with the SCP for review. If it is intended that the ESF will become a part of the repository, it is considered essential by the staff that DOE evaluate alternatives to major design features of the GROA that are important to waste isolation, with particular attention to the alternatives that would provide longer radionuclide containment and isolation. In this regard, it is important to note that NRC is referring to the preliminary design concepts or conceptual design of the GROA. The staff recognizes that the final design of the GROA and the final selection of alternatives to major design features will not be made until a significant amount of site characterization is performed.

Finally, the Commission's statement of considerations sets forth those requirements applicable to DOE when submitting site characterization plans, and it clarifies 10 CFR 60.21(c)(1)(ii)(D) with respect to a comparative evaluation of the major design features. It states that "The Commission has stressed the importance of evaluating alternatives to major [GROA] design features that are important to waste isolation, see 10 CFR 60.21(c)(1)(ii)(D), and *in the case of the design and location of the shafts this can only be done prior to their sinking*" (emphasis added) (51 FR 27159). This technical position is consistent with the Commission's statement.

Specific Comments

1. Section 1.0, Page 1, Paragraph 1

This language appropriately recognizes that the "primary purpose" of the ESF is to support site characterization activities. It also appropriately recognizes that it is not a certainty that ESF will become part of GROA. In light of this uncertainty, the NRC should not require that the ESF design satisfy applicable GROA design requirements. If in fact the ESF does become part of the GROA, DOE will bear the risk of demonstrating to the NRC that the GROA meets applicable licensing criteria. It is also inappropriate to use the word "require" in a TP. As noted subsequently in the document, a TP only provides guidance.

Resolution

The recommended guidance in this technical position is applicable for the case where the ESF is intended to become a part of the GROA. As noted earlier, DOE has indicated that the permanent components of the ESF are designed to become a part of the GROA (see DOE, 1988, p. 8.4.2-216). In view of DOE's intention, the staff has modified the language after the first sentence in paragraph three of the "Introduction" section of the STP to read as follows:

"DOE currently plans to collocate the permanent components of the ESF with the GROA (DOE, 1988a, p. 8.4.2-216). Therefore, the GROA design requirements would constrain, somewhat, the degrees of freedom for the design of the ESF and thus activities within the ESF during site characterization. Such a constraint implies that the ESF design would also have to meet the same 10 CFR Part 60 regulatory requirements regarding containment and isolation that are applicable to the GROA design."

The EEI/UWASTE comment also states that it is inappropriate to use the word "require" in an STP. The staff does not agree with this comment. The staff considers that it is entirely appropriate to use the word "require" in an STP or in any other document if it refers to the requirements of 10 CFR Part 60. However, the STP has not used the word "require" for instances where specific guidance is provided on an acceptable methodology to meet the requirements of 10 CFR Part 60.

If DOE elects to use alternative approaches, the staff will review and provide comments on such approaches. The approach discussed in the STP is only one of several possible acceptable approaches.

2. Section 1.0, Page 1, Paragraph 3

The draft inappropriately reverses the priority of the guidelines applicable to ESF design. In addition, the statement of the need to ensure that the ESF "will not interfere with the waste isolation capability of the site" is inconsistent with the language of 10 CFR 60.15(c)(1), which states that site characterization should be conducted so as "to limit adverse effects on the long-term performance of the geologic repository to the extent practical."

Resolution

The staff considers that all guidelines applicable to the ESF design are important and should be considered as such. However, in response to this comment, the staff has reversed the order of the general guidelines cited in Section 1.0. In addition, to further clarify the intent of the

statement in the technical position on the need to ensure that the ESF, as constructed, will not interfere with the waste isolation capability of the site, and to make it consistent with 10 CFR 60.15(c)(1), the words "to the extent practical" have been added to the sentence.

3. Section 1.0, Page 2, Carryover paragraph

The NRC should not base the TP on the assumption that the ESF will eventually become a part of the GROA.

Resolution

The staff does not agree with the suggestion made in this comment. As noted earlier, DOE has indicated that it intends to design the permanent components of the ESF to become a part of the GROA.

4. Section 1.0, Page 2, First full paragraph

The general guidelines are stated in inverse order. In addition, the first guideline should track the language of 10 CFR 60.15(c)(1) by including the phrase "to the extent practical." The second guideline should be rewritten to be stated in a positive manner (e.g., the ESF design, construction, and operation should facilitate the collection of needed site data).

Resolution

The staff considers that all guidelines applicable to the ESF design are important and should be considered as such. However, the staff agrees with the recommendations made by EEI/UWASTE with regard to the subject paragraph. Paragraph nine of Section 1.0 now reads as follows:

"In reviewing DOE's work on the ESF design and related documents, NRC used the following two general guidelines: (1) the ESF design, construction, and operation should facilitate the collection of needed site data; and (2) the ESF design, construction, and operation should limit adverse impacts on waste isolation capabilities of the site, to the extent practical. This STP gives the specific guidelines by which DOE can approach the ESF design; these guidelines are the technical position statements listed in Section 3.0."

5. Section 1.0, Page 2, Second full paragraph

The word "important" should be changed to "primary" or "chief." The last sentence is too vague. The NRC should indicate an acceptable approach to accounting for such uncertainties.

Resolution

This comment is noted. The staff considers that the purpose of the ESF is to collect site data for two reasons: (1)

to evaluate if the site is suitable for a geologic repository; and (2) to use the data for GROA design. As stated later in the STP, the staff considers that "an important purpose of the ESF is to collect site characterization data for use in designing the GROA." The use of the word "primary" or "chief" instead of "important" in this context is not considered appropriate by the staff, because data are also needed to evaluate the suitability of the candidate site under investigation. However, in view of the EEI/UWASTE comment, the staff has deleted the sentence containing the word "important" from the STP.

With respect to an acceptable approach to accounting for data uncertainties, the staff considers that an appropriate method to account for data uncertainties would have to be developed and justified by DOE on a case-by-case basis. Development of a generic and/or prescriptive guidance in this area by the staff is beyond the scope of this STP.

6. Section 1.0, Page 2, Last paragraph

It should not be taken as a given that 10 CFR Part 60 requirements relating to GROA design are applicable to the ESF design.

Resolution

This comment is noted. The guidance provided by this STP is based on DOE's decision that the permanent components of the ESF will eventually become a part of a future GROA. Therefore, all 10 CFR Part 60 requirements applicable to the GROA design are considered applicable to the permanent components of the ESF design.

7. Section 1.0, Page 3, First paragraph

Although the TP is essentially a guidance document, it nevertheless will play an important role in DOE's site characterization activities. Thus, the TP should properly reflect the role of the NRC in the regulatory scheme and the purpose of the site characterization program. In particular, the TP should not imply that the NRC has licensing authority over the ESF design as a prerequisite to site characterization. Nor should it obscure the purpose of the ESF.

Resolution

The staff agrees with this comment. NRC's licensing authority does not start until after DOE has submitted a license application for the geologic repository. However, DOE needs to plan the design of the ESF in such a manner that if any or all of it does become part of an eventual geologic repository, it can demonstrate compliance with relevant regulations at the license application stage. The STP provides guidance based on this premise.

8. Section 2.0, Page 3, Introductory paragraph

The first two sentences are inconsistent. The language should be clarified to indicate clearly that the list provided in Appendix B is preliminary.

Resolution

The staff does not agree with this comment that the first two sentences of Section 2.0 are inconsistent. For example, the last sentence on page 18 of the public comment draft clearly states that "While the list has been developed to provide general guidance, it is recognized that some of the requirements may not in fact impact the design of the ESF and that other requirements may have relevance even though not listed below."

However, in order to avoid confusion regarding the applicability of 10 CFR Part 60 requirements to the design and construction of the ESF, the following sentence has been added to the introduction of Section 2.0: "These requirements would be applicable for those permanent components of the ESF that become part of the GROA."

9. Section 2.0, Page 3, Bulleted paragraph

The language should track the provision of 10 CFR 60.15(c). For example, the phrase "to the extent practical" should be added to (1), and (4) should be modified to be consistent with 10 CFR 60.15(c)(4).

Resolution

The STP has been modified as suggested by this comment.

10. Section 2.0, Page 4, 10 CFR 60.21(c)(1)(ii)(D)

To be consistent with Part 60, the word "not" should be inserted in the second line after the word "may." The alternatives analysis can only be properly done following site characterization, when the required data to perform the analysis will be available. This is evidenced by the fact that this regulation describes the contents of the SAR to support the repository license application. To conduct such an analysis prior to site characterization would require reliance on too many assumptions, thereby distorting the value of the analysis. There is no regulatory basis for performing the alternatives analysis at this time.

Resolution

The staff has noted this comment and the word "not" has been inserted in the second line after the word "may."

This comment also states that the alternatives analysis can only be properly done following site characterization.

Although it is obvious that a final and detailed alternatives analysis can be performed on a more informed basis only after the data from site characterization become available, it is possible to perform a preliminary alternatives analysis with available data and reasonable assumptions. Opportunity to utilize the results of a comparative evaluation for major design features and for these results to be factored into the ESF design does exist only before the ESF is constructed. To wait until the license application stage to conduct an alternatives analysis might result in an irreversible and unmitigable design that may not be in compliance with the requirements of 10 CFR Part 60. Therefore, DOE should perform a comparative evaluation of alternatives to the major design features at this stage in the ESF design process.

In this regard, the Commission's statement of considerations sets forth those requirements applicable to DOE when submitting site characterization plans, and it clarifies 10 CFR 60.21(c)(1)(ii)(D) with respect to a comparative evaluation of the major design features. It states that "The Commission has stressed the importance of evaluating alternatives to major [GROA] design features that are important to waste isolation, see 10 CFR 60.21(c)(1)(ii)(D), and *in the case of the design and location of the shafts this can only be done prior to their sinking*" (emphasis added) (51 FR 27159). This technical position is consistent with the Commission's statement.

11. Section 2.0, Page 4, 10 CFR 60.112

This is another example of the type of assessment that should be done after site characterization.

Resolution

This comment is noted. The referencing of the requirements of 10 CFR 60.112 in the subject paragraph was not intended to suggest that DOE undertake a final performance assessment before the commencement of site characterization. Rather, DOE needs to consider that this requirement has to be met at the time it submits a license application.

12. Section 2.0, Page 4, 10 CFR 60.131 and 10 CFR 60.133

Again, this is the type of analysis that should be done after site characterization. Indeed, the purpose of site characterization is to obtain the necessary information to determine the appropriate design criteria for the underground facility in the GROA.

Resolution

This comment is noted. The staff recognizes that the purpose of the site characterization is to collect the neces-

sary data to perform site assessments and to design the GROA. Section 2.0 has identified those requirements in 10 CFR Part 60 that need to be considered in the design and construction of the ESF, including the requirements set forth in 10 CFR 60.131 and 60.133. It is not intended that final assessment for meeting these requirements needs to be done before site characterization. Rather, DOE needs to consider that these requirements have to be met at the time it submits a license application.

13. Section 2.0, Page 4, 10 CFR 60.152

It is not possible at this preliminary point in the repository development process to determine which components are important to safety or waste isolation. However, the entire site characterization process will be subject to an approved quality assurance program. In any event, the language should be modified to track the language of 10 CFR 60.151, particularly with respect to waste isolation.

Resolution

This comment is noted. The intent of Section 2.0 is to identify the pertinent regulations that form the basis for the technical positions stated in Section 3.0; Appendix B of the STP contains the full texts of the regulatory requirements referenced in Section 2.0.

Moreover, it should be noted that DOE has already identified those structures, systems, and components that it considers to be important to safety and important to waste isolation (see DOE, 1990).

14. Section 3.0, Paragraph (1)

This statement, as well as Figure 1, implies that a GROA conceptual design has not yet been developed by DOE. In fact, the SCP includes a GROA conceptual design as required by the NWPA and 10 CFR 60.17(c). See SCP, Vol. VI. Figure 1 provides a graphic confirmation of the inverted priority assigned by the TP to the purpose of the ESF by totally subordinating it to the GROA design. A more fundamental problem with Figure 1 is that it assumes the necessity for compliance of the ESF design with 10 CFR Part 60, when there is no basis for such an assumption.

Resolution

The need for the ESF design to comply with relevant 10 CFR Part 60 requirements stems from the premise that the permanent components of the ESF may become a part of an eventual GROA. DOE has elected to collocate the ESF with the planned GROA. Therefore, the staff does not agree with the comment that the role of the ESF is being subordinated to the GROA design and the

comment that Figure 1 of the draft STP implies that a GROA conceptual design has not been developed by DOE.

Moreover, 10 CFR 60.15(c)(4) sets forth the requirement for DOE to plan and coordinate the subsurface exploratory drilling, excavation, and in-situ testing, before and during construction, with the GROA design and construction. Accordingly, the staff does not agree with EEI/UWASTE's comment.

15. Section 3.0, Paragraph (2)

See previous comments regarding quality assurance requirements during site characterization.

Resolution

This comment is noted. The staff has provided guidance to DOE in NUREG-1318 (NRC, 1988) for identifying items and activities of the ESF that are potentially important to safety and waste isolation.

16. Section 3.0, Paragraph (3)

The primary criteria for ESF design and location should be to optimize data collection and site characterization activities. The language of this paragraph fails to recognize this fact by making consistency of the ESF design with GROA design the predominant concern. In addition, the language of this paragraph is inconsistent with the requirements of 10 CFR 60.15(c) and should be modified to track the regulation ("to the extent practical").

Resolution

This comment is noted. The need for ESF design and location to optimize data collection is addressed in Technical Position No. 7 of the STP. The staff does not consider that it is necessary to repeat that objective in other technical positions as well.

The staff has no objection to the revision proposed by EEI/UWASTE in its comment. Accordingly, the words "to the extent practical" have been added to the second sentence of the subject technical position, to resolve the concern expressed in this comment.

17. Section 3.0, Paragraph (4)

This type of comparative evaluation is not necessary or appropriate when designing an ESF. Rather, it should be applied after site characterization, as recognized by the provisions of 10 CFR 60.21.

Resolution

See staff response to EEI/UWASTE Specific Comment #14.

18. Section 3.0, Paragraph (5)

The first sentence indicates an approach dominated by the avoidance of presumed problems, rather than optimization of site characterization activities that may identify means of accommodating problems. This type of approach will hinder data collection efforts and, given the range of uncertainties and likely problems, make it extremely difficult to excavate the ESF. Moreover, there is no indication of why it is inherently undesirable to compensate for certain rock damage or other problems created by the ESF. The last sentence provides another example of the reversal of priorities for the ESF.

Resolution

This comment is noted. The staff considers that in the initial stages of site characterization, there may be large uncertainties present with respect to consequences of any damage done to the site. Since the requirements for impact on the site must be considered for a long period of time (10,000 years), the staff considers that it may be inappropriate to assume that certain magnitudes or types of damages would be inconsequential without adequate backup of in-situ information from site characterization. Therefore, the staff takes the position that it is appropriate to limit excavation damage rather than attempt to account for it, to the extent practical. The staff considers that the phrase "to the extent practical" in the position statement provides the needed flexibility to DOE in interpreting the staff position.

The staff does not consider that the last sentence of the position assigns priorities to any aspects of ESF design and construction.

19. Section 3.0, Paragraph (6)

This paragraph suffers from the same infirmity as that discussed above in that it suggests an approach to ESF design geared towards avoiding interference with site characterization when some interference may be necessary to optimize data collection.

Resolution

This comment is noted. The staff recognizes that there are certain interferences associated with site characterization that are unavoidable and there are others that may have minimal impact. The staff also differentiates between such interferences that are absolutely necessary in order to optimize data collection, and the ones that can be avoided with due consideration to the regulatory

requirements that need to be complied with. However, the staff believes that test interference should be limited or avoided whenever possible, rather than an attempt be made to account for its impact.

20. Section 4.0

As a general comment, if subsections (1) through (7) are intended to be listed according to priority, with the most important first, then the list should be reversed. The top priority should be accorded to subsection (7), which discusses the primary need to gather site-specific data during the site characterization process, and to ensure that the ESF design is sufficient to facilitate adequate data collection. In fact, the discussion under subsection (7) should provide the guiding principles for the TP. On the other hand, subsection (1), which defines an approach to meeting the requirements in 10 CFR Part 60 applicable to GROA design, should be accorded lesser priority in ESF design.

Resolution

This comment is noted. All technical positions in the STP are considered important by the staff. They are not ranked to suggest any relative priority and should not be interpreted as such.

21. Section 4.0, Page 7, Part (1)

This entire section indicates that the draft TP is placing undue emphasis on compliance with Part 60 requirements and repository licensing during ESF design, when the emphasis should be on site characterization. The second sentence in the first paragraph appropriately recognizes that it is not a certainty that the ESF will become part of a future repository.

The second paragraph provides another example of the reversal of priorities for the ESF. Moreover, number (2) is stated in the negative and should be rewritten to replace the words "does not preclude" with "should facilitate." The last sentence of the second paragraph appropriately recognizes the need for flexibility in the ESF and GROA designs.

Resolution

This comment is noted. As stated in the introduction, although the primary purpose of the ESF is to support site characterization activities, the ESF design will be required to satisfy applicable 10 CFR Part 60 requirements because it may become a part of an eventual GROA. Therefore, the staff considers that it is important

for DOE to keep this ultimate objective in perspective during ESF design and construction.

As suggested by the comment, the staff has reversed the order of the two general guidelines, and the general guideline related to data gathering has been rewritten to read as follows:

"(1) the ESF design facilitates the gathering of sufficient data to demonstrate site suitability and to design the GROA ..."

22. Section 4.0, Page 8, Paragraphs 2 and 3

This approach to ESF design, by requiring coordination with GROA design, may result in inappropriate emphasis being placed on waste isolation during ESF design. Given the chief purpose of the ESF to facilitate data collection, the preferred ESF design may not be the optimal design with respect to waste isolation. The approach to ESF design must provide for an appropriate balancing of the need to collect adequate and representative data and to provide for waste isolation.

Resolution

The staff disagrees with the first portion of this comment. 10 CFR 60.15(c)(4) requires that the subsurface exploratory drilling, excavation, and in-situ testing before and during construction shall be planned and coordinated with GROA design and construction. Therefore, the STP provides an acceptable approach for DOE to meet this requirement.

The staff agrees with the last portion of the comment that the approach to ESF design must provide for an appropriate balancing of the need to collect adequate and representative data and to provide for waste isolation. To clarify this point, though, the staff has added the following sentence after stating the two principles in the first paragraph of the discussion (in Section 4.0), behind Technical Position No. 1:

"These principles are derived from 10 CFR Part 60, which conveys both the purposes of an ESF and caution regarding the potential adverse impact of the ESF on the long-term performance of the repository."

23. Section 4.0, Page 8, Last paragraph

This paragraph appropriately recognizes the possibility that the ESF design may need to be modified during the construction process.

Resolution

The staff agrees with this comment. No modification of the STP is called for.

24. Section 4.0, Page 9, Last paragraph

The NRC should not assume that it is likely that the ESF will become a part of a future repository.

Resolution

See staff response to EEI/UWASTE General Comment #2.

25. Section 4.0, Page 10, (3), Paragraph 1

This paragraph suggests that the ESF design and site characterization activities should be dictated by the GROA design, when in fact the GROA design should reflect the information and data gathered during site characterization. Although the ESF design and the GROA design should be coordinated to the extent practical, coordination is not desirable to the extent that it would hinder data collection activities during site characterization. The last sentence of the paragraph should be revised to read as follows: "Also, the ESF test area and exploratory drifts should be at least as deep as the depth proposed for waste emplacement," It may be necessary for DOE to assess the geologic conditions below the proposed depth of waste emplacement to make a complete assessment of repository performance.

Resolution

In consideration of the first portion of this comment, the staff has added the following sentence to the first paragraph of the discussion in Section 4.0, behind Technical Position No. 1:

"These principles are derived from 10 CFR Part 60, which conveys both the purposes of an ESF and caution regarding potential adverse impact of the ESF on the long-term performance of the repository."

In response to the second portion of the comment, the staff has modified the first paragraph of the discussion in Section 4.0, behind Technical Position No. 3 so that it does not imply that exploration and testing at depths other than that where wastes would be emplaced may not be performed.

26. Section 4.0, Page 10, (3), Paragraph 2

This paragraph suggests that DOE should eliminate ESF shafts, ramps, and drifts or otherwise restrict its site characterization activities if it will not be possible to integrate such excavations into the GROA design. There is no justification for the

imposition of such a restriction on DOE's site characterization activities. There is no technical reason why shafts, drifts, and ramps that are used during site characterization but not incorporated in the GROA cannot be backfilled and sealed or otherwise rendered benign.

Resolution

This comment is noted. The staff agrees that the shafts, drifts, and ramps that are used during site characterization, but not incorporated in the GROA can be backfilled and sealed. In this regard, 10 CFR 60.15(c)(3) requires that "To the extent practical, exploratory boreholes and shafts in the geologic repository operations area shall be located where shafts are planned for underground facility construction and operation or where large unexcavated pillars are planned."

However, the potential issues related to long-term effectiveness of seals and backfills as barriers have not been fully resolved. Until the issues related to effective sealing of the shafts, ramps, drifts, and other openings are resolved, the staff considers that it would be prudent for DOE to assume that openings within the geologic repository boundary could be potential pathways for radionuclide migration to the accessible environment; therefore, its potential adverse impacts on the future performance should be taken into account in limiting the impact of the ESF on the GROA design.

27. Section 4.0, Page 11, Paragraph 1

This paragraph assumes both that DOE will have a considerable amount of knowledge concerning the geologic conditions at the site when it conducts site characterization activities, and that the ESF will eventually become a part of the GROA. The purpose of the ESF and site characterization is to assess the site and to determine whether the types of problem areas identified in this paragraph exist. Whether the ESF will be optimally located with respect to the GROA remains to be seen. Thus, while DOE should attempt to avoid these problem areas to the extent practical in excavating the ESF, it should also have wide discretion to locate the ESF so as to obtain a broad and sufficient range of representative data.

Resolution

The staff agrees with the statement in the comment that "... DOE should also have wide discretion to locate the ESF so as to obtain a broad and sufficient range of representative data." However, DOE has already stated that the permanent components of the ESF will become part of the GROA. Accordingly, in its ESF design, DOE should consider the need to demonstrate compliance with

the applicable regulatory requirements of 10 CFR Part 60 at the time of a license application submittal.

28. Section 4.0, Page 11, Paragraph 2

The third sentence of this paragraph requires DOE to account for "considerable uncertainties" in designing and constructing the ESF. There is no indication of how DOE should account for these uncertainties. While this is a desirable goal in the abstract, given the range of uncertainties, it simply may not be possible to account for all such uncertainties consistent with optimization of the site characterization program.

Resolution

This comment is noted. Consideration of uncertainties is essential for reliable data gathering as well as for properly estimating the impact of ESF construction on GROA performance. It is beyond the scope of this STP to provide guidance to DOE on how it should account for the consideration of uncertainties in the design and construction of the ESF. However, DOE needs to recognize and allow for flexibility in its design, to accommodate any site-specific data that may deviate from the current design bases. In addition to this recognition, DOE should adopt conservative design parameters and procedures until site-specific data become available.

29. Section 4.0, Page 12, Paragraph 1

This paragraph appropriately recognizes that the reference GROA design may require changes as a result of the data gathered during site characterization and, therefore, that flexibility in design is essential.

Resolution

The staff agrees with the comment. No modification of the STP is called for.

30. Section 4.0, Page 12, Paragraph 2

This paragraph provides another example of the draft TP's subordination of the goal of site characterization to that of repository waste isolation. The paragraph appropriately recognizes that there may be justification for an ESF design for site characterization purposes that is not within the constraints of the GROA design (including location).

Resolution

The staff disagrees with the conclusion reached in this comment that "This paragraph provides another example of the draft TP's subordination of the goal of site charac-

terization to that of repository waste isolation." The staff considers that both site characterization needs as well as the potential impact of ESF on long-term performance of the site should be considered in the design and construction of the ESF. As previously indicated, the staff has modified the STP in a number of places, as appropriate, to suggest that the ESF's primary role in site characterization has not been subordinated to waste isolation concerns.

31. Section 4.0, Pages 12-13, Carryover paragraph

This paragraph provides a good example of a generic problem with the draft TP. Although the paragraph is titled "Excavation Methods," it discusses the "construction and operation" of the ESF. An ESF is not a typical construction project or operating facility. In technical terms, it is "excavated" rather than "constructed." By consistently referring to the ESF as a constructed facility, the draft TP overemphasizes the role of the ESF as a potential element in the GROA and detracts from the fact that its primary function is one of exploration.

In the carryover sentence, the word "should" should be replaced with the word "must." The chief purpose of the ESF is to facilitate data collection, not to provide a repository shaft.

Resolution

This comment is noted. The term "construction" of the ESF includes excavating the rock and providing necessary roof and wall support (e.g., rock bolts, lining, etc.). Similarly, "operation" of the ESF refers to activities necessary to support testing of the underground facility. Therefore, the staff does not consider that by referring to the ESF as a constructed facility, it detracts from its role in site characterization.

In response to the second part of the EEI/UWASTE comment, the staff has revised the text of the discussion in Section 4.0.

32. Section 4.0, Page 14, (7)

As noted above, the discussion under this subsection should provide the guiding principles for the TP. This section recognizes the primary purpose of the ESF—data collection—and the need for flexibility in both ESF and GROA design to ensure the ability to modify designs as dictated by the site characterization results. Moreover, the last sentence of this section recognizes the need for a balancing of site characterization needs with geologic repository performance objectives, rather than a subordination of site characterization needs to repository

design. Unfortunately, because this section is located at the end of the draft TP, it appears as an afterthought. It is not sufficient to override the tone of the previous sections of the draft TP, which places an undue emphasis on the ESF's role in the repository design. The approach outlined in this subsection should be explained at the beginning of the TP, and should be followed throughout the document.

Resolution

The staff disagrees with the conclusion reached in this comment that the STP places "... undue emphasis on the ESF's role in the repository design." As noted in the staff's response to EEI/UWASTE General Comment #4, the language of the STP has been modified, as appropriate, to suggest that the ESF's primary role in site characterization has not been subordinated to waste isolation concerns.

STATE OF NEVADA COMMENTS

The purpose of the TP is to provide regulatory guidance to the U.S. Department of Energy (DOE) on an approach acceptable to the NRC staff for consideration of the requirements of 10 CFR Part 60 related to the exploratory shaft facility (ESF) for a potential high-level nuclear waste repository. The TP addresses the design control process, coordination of ESF design with the design of the geologic repository operations area (GROA), consideration of alternatives, excavation methods, test interference, and site characterization.

The TP is stated to be based on the premise that the ESF will eventually become part of a future GROA, although it is also acknowledged that the primary purpose of the ESF is to support site characterization activities. As a result of this premise, all 10 CFR Part 60 requirements applicable to the GROA design are considered applicable to the ESF design.

In order to meet the objectives of 10 CFR Part 60, two general guidelines are employed by the NRC staff relative to their considerations of an ESF: (1) the ESF design, construction, and operation should limit adverse impacts on waste isolation capabilities of the site; and (2) the ESF design, construction, and operation should not preclude the collection of needed site data.

In previous comments on the DOE's repository conceptual design, ESF Title I design, and ESF alternative locations, we have indicated concern for

the safe design and construction of an ESF, and the presumption of future incorporation of an ESF into a geologic repository.

The example scheme in the draft TP of an acceptable approach to achieve compliance of the ESF design with 10 CFR Part 60 requirements (page 16) points up the fundamental problem with the presumption that the ESF will become part of the repository. Such a presumption requires the development of repository conceptual designs and identification of features potentially important to waste isolation prior to the development of the ESF conceptual design. Backfitting the ESF conceptual design to the GROA conceptual design is fundamentally incompatible with the stated primary purpose of the ESF, which is to support site characterization activities. And the first and most important goal of site characterization is to determine whether the site itself provides acceptable waste isolation performance characteristics.

One of the many other purposes of the ESF during site characterization is to collect data to facilitate the design of the GROA, yet it is some of these same data that are necessary to design, construct and operate the ESF in a manner that complies with the 10 CFR Part 60 requirements for the GROA. As such, it can be argued that the ESF cannot be designed, constructed and operated with confidence that it is in accord with all applicable requirements of 10 CFR Part 60. The NRC staff response to this apparent "catch-22" is that while the ESF design will be required to meet applicable GROA requirements, uncertainties associated with the limited data available should be accounted for in the design of the ESF itself.

From a conceptual standpoint, the ESF is intended to facilitate subsurface site characterization. Hence, the design objective of the ESF should not be to conform to the location and conceptual design of the GROA, but rather the GROA should be designed to incorporate the existing ESF, if the site is determined to be acceptable and the ESF meets, or can meet the applicable 10 CFR Part 60 requirements to be included in the GROA.

The TP places considerable emphasis on the use of the ESF to assist future design of the GROA, rather than on the design of the ESF itself. Notwithstanding the NRC staff's apparent interpretation that the GROA conceptual design should be the driver for ESF conceptual design, we believe more appropriate guidance for ESF considerations should be: (1) the ESF should be designed to facilitate data collection necessary to meet site characterization purposes; and (2) the ESF should be

designed so as not to preclude advantageous location and design options for the GROA.

With respect to the excavation methods, drifting, and overall layout of an ESF, the TP points out the need for ensuring the waste isolation capabilities of the site are not compromised by the excavation methods and construction techniques employed. Yet it offers little in resolving the problem of maximizing necessary data collection by sufficient drifting to demonstrate representative data have been collected, versus the risk of drifting and drift layout compromising the waste isolation capabilities of the site.

The TP acknowledges that extensive drifting may be the best approach to reducing uncertainty regarding such matters as fault movements, thermal behavior, tectonic activity, etc. Yet it also states that it "... presents one of the more difficult challenges for coordination of the ESF design with the GROA design." This difficulty may be considerably mitigated if the design objective were not presumed to be the necessity to fit the ESF to a premature GROA conceptual design, but rather to preserve what may be advantageous GROA design options, if possible.

The TP further notes: "Optimum drift orientation and length may not necessarily coincide with preferred GROA layout. A careful balancing of the site characterization needs with the geologic repository performance objectives will be essential." Until the site is fully characterized, it is difficult to conceive a "preferred GROA layout," especially at a site with highly variable geologic conditions. Optimum access for subsurface data collection should not be traded against, or balanced with repository performance objectives in an effort to preserve a so-called "preferred GROA layout" when that preference is largely based upon speculation about the site's geologic characteristics. Instead, the objectives should be first the collection of all necessary data for site characterization purposes, and then, if possible, the preservation of advantageous GROA design options.

In conclusion, it appears that the NRC staff in this TP has committed itself to an interpretation that the ESF must be backfit to a GROA conceptual design and the features potentially important to waste isolation relative to that design. This does not appear to be the only option for meeting the requirements of 10 CFR Part 60. A number of potentially advantageous conceptual GROA designs can be generated, based upon initial site data. ESF design, construction and operation, with a priority on

necessary data collection, can then be coordinated with these options, to the extent possible during the site characterization period, eventually leading to the determination of a preferred GROA design, if appropriate for the site.

Resolution

In its November 1990 review of the draft STP, the State of Nevada made several comments, as just noted. In its first comment, the State of Nevada said that there is a "... fundamental problem with the presumption that the ESF will become part of the repository." This presumption is based on the decision made by DOE to collocate the ESF and the GROA. The staff believes that the primary purpose of the ESF is to facilitate site characterization. However, in the matter of the ESF and its relationship to the GROA, admittedly there is no regulatory requirement that the ESF must be collocated with the GROA. That option is at the programmatic discretion of DOE. In fact, DOE has elected to collocate the ESF with the planned geologic repository (see DOE, 1988, p. 8.4.2-216). Therefore, the result of this decision is to constrain both the design of the ESF and the way in which site characterization data can be obtained from within the ESF, so as to meet the same regulatory requirements regarding containment and isolation that are applicable to the GROA.

The State of Nevada's first comment also goes on to note that "Backfitting the ESF conceptual design to the GROA conceptual design is fundamentally incompatible with the stated purpose of the ESF..." The staff does not consider that the need for coordination of the ESF and GROA designs is "fundamentally incompatible" with the stated purpose of the ESF. Section 60.15(c)(4) requires that "Subsurface exploratory drilling, excavation, and in situ testing before and during construction shall be planned and coordinated with geologic repository operations area design and construction." The need for this coordination is necessary because the investigations to obtain the required information for determining site suitability must be conducted so as to limit adverse effects on the long-term performance of the geologic repository, to the extent practical.

In the second comment, the State of Nevada noted that the staff has apparently interpreted "... that the GROA conceptual design should be the driver for ESF conceptual design." The NRC staff does not agree with the State's comment. The critical issue to the NRC staff is not that the GROA conceptual design drive the ESF conceptual design. Rather, the critical issue is that the designs for the ESF and GROA facilities be coordinated and iterated before construction of the ESF proceeds. The staff has further clarified this point in the STP by adding the following sentences to the last paragraph of the discussion (in Section 4.0), behind Technical Position No. 1:

“The example conveys the necessity for a structured approach, to effect a thorough and careful coordination and iteration of the engineering designs for the ESF and GROA facilities, to determine their compliance with applicable regulatory requirements and compatibility with each other, before the ESF is constructed. There are many ways in which compliance could be demonstrated. DOE needs to select an approach suitable to its own needs.”

In its next comment, the State of Nevada noted that the STP “... offers little in resolving the problem of maximizing necessary data collection by sufficient drifting to demonstrate representative data have been collected, versus the risk of drifting and drift layout compromising the waste isolation capabilities of the site.” The staff considers that a defensible logic be used in developing the approach to demonstrate compliance with applicable 10 CFR Part 60 requirements. As stated in the STP (paragraph one of the discussion for Technical Position No. 1 in Section 4.0), this logic should be based on two general principles: (1) the ESF design facilitates the gathering of sufficient data to demonstrate site suitability and to design the GROA, and (2) this design limits adverse effects on the long-term performance of the geologic repository, to the extent practical. The staff considers both these principles to be important. As noted earlier, the principal focus of the STP is the need for coordination of the ESF and GROA designs and not the subject of the extent to which site characterization data are representative of processes, conditions, or events taking place at the site. The NRC staff has addressed this issue of data representativeness in its analysis of the SCP (see NRC, 1989, pp. 4-36-4-37). The NRC staff agrees that attempts to maximize data collection are necessary, and some adverse impact on the site in this regard may be unavoidable; however, ESF construction and data-collection activities should be conducted so as to limit the impacts of such activities on waste isolation characteristics of the site, to the extent practical.

As stated in paragraph one of this comment resolution, the staff basically agrees with the State of Nevada comment that the objectives of the ESF design should be first the collection of all necessary data for site characterization purposes. However, the staff considers that the issue here is one of timing. The staff also agrees with the State of Nevada assertion that the “preferred layout” of the GROA will not be finally determined until all site characterization data are collected. However, 10 CFR 60.17(c) requires that at the time the SCP is submitted, the SCP contain a conceptual design of the GROA that includes the “preferred layout,” based on knowledge/estimates of the site at that time. As site characterization proceeds, the staff expects that other “preferred layouts” are likely to emerge. Recognizing this, the STP speaks to the need for coordinating the design of the ESF with the “pre-

ferred layout” that exists at the time of the GROA conceptual design. To further clarify this point in the STP, the staff has added the following sentences after the third paragraph of the discussion (in Section 4.0), behind Technical Position No. 3:

“It is recognized that at the time of ESF design, only a limited amount of information would be available for the development of a conceptual design of the GROA. A final GROA design will not be developed by DOE until after the needed site characterization data are collected. However, 10 CFR 60.17(c) requires that at the time of SCP submittal, DOE develop a conceptual design of the GROA based on current knowledge/estimates of the site at that time. As site characterization proceeds, the staff expects that revisions to the original GROA conceptual design will emerge. The need for coordination stated in this technical position addresses the coordination of the ESF design with the GROA conceptual design available before the start of ESF construction.”

The staff considers that the data-collection needs for the site and the ESF design must take into account preliminary concepts for the GROA design. Accordingly, 10 CFR 60.17(c) requires that the site characterization plan shall contain a conceptual design for the GROA that takes into account likely site-specific requirements. This concept is essential to accomplish a focused site characterization program. The staff believes that any conceptual design of the GROA developed before the completion of site characterization data collection is subject to revision, and the ESF design and construction should permit flexibility to modify, if necessary, the reference conceptual design of the GROA, based on data collected during site characterization.

As stated in paragraph eight of the “Introduction” section of the STP (Section 1.0), the technical positions and discussion are based on the premise that the ESF will eventually become a part of a future GROA. This premise is based on the fact that the DOE has elected to collocate the ESF with the planned GROA. The result of this decision is to constrain the ESF design, and to constrain the way in which site characterization data can be obtained within the ESF, so as to meet the same regulatory requirements regarding containment and isolation that are applicable to the repository. Some of the technical positions in the STP may not be applicable if DOE decides not to collocate the ESF and the GROA.

The State of Nevada’s final comment noted that “It appears that the NRC staff in this technical position has committed itself to an interpretation that the ESF must be backfit to a GROA conceptual design.” As noted above, DOE has previously stated that its current planning assumptions call for the permanent components of the ESF to become a part of the GROA. Such a decision

by DOE constrains, somewhat, the degrees of freedom for the design of the ESF, and for those activities contained within the ESF during site characterization. Once decisions are made and implemented in the construction of the collocated ESF, they become fact-of-life design features for the GROA, if and when a license application is submitted.

The STP should not be interpreted to suggest that the design of the ESF or the conceptual design of the GROA are "frozen" and that changes cannot be made. As a matter of fact, the staff believes that DOE needs to maintain flexibility and the ability to change the design as more information becomes available from site characterization data.

Also, the STP (paragraph 11 of the "Introduction" (Section 1.0)) clearly states that "... STPs are not substitutes for regulations, and compliance with them is not required." It further states that "Methods and solutions different from those given in the STP will be acceptable if they provide a basis for the findings requisite to the issuance of an authorization or license by the Commission." If DOE decides to use a method different from that given in the technical position, DOE bears the burden to convincingly demonstrate that the logic of its approach is sound and complete, is consistent with the intent of 10 CFR Part 60, and is defensible on the basis of merits of the available data.

References

- U.S. Department of Energy, Chapter 8, Section 8.4.2, "Description and Location of Characterization Operation," in "Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada," Vol. VIII, Part B, DOE/RW-0199, December 1988.
- U.S. Department of Energy, "Yucca Mountain Project Q-List, Quality Activities List (QAL), [and] Project Requirements List (PRL)," Nevada Operations Office/Yucca Mountain Project Office, Nevada, YMP/90-55, YMP/90-56, and YMP/90-57, July 1990.
- U.S. Nuclear Regulatory Commission, "Disposal of High-Level Radioactive Wastes in Geologic Repositories; Amendments to Licensing Procedures," *Federal Register*, Vol. 51, No. 146, July 30, 1986, p. 27158-27165.
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- U.S. Nuclear Regulatory Commission, "Availability of Draft Staff Technical Position on Regulatory Considerations in the Design and Construction of the Exploratory Shaft Facility," *Federal Register*, Vol. 55, No. 157, August 14, 1990, p. 33193.

APPENDIX E

DISPOSITION OF ACNW COMMENTS

Note: The Advisory Committee on Nuclear Waste (ACNW) comments listed in this appendix were made on the final draft of the subject staff technical position (STP), dated February 1991.

ACNW COMMENT #1

We believe the STP needs a clear introductory statement that the singular purpose of the ESF is to facilitate the characterization of the proposed high-level waste repository. However, the STP should then focus on the requirements as stated in 10 CFR 60.15(c)(1), "Investigations to obtain the required information (on site characterization) shall be conducted in such a manner as to limit adverse effects on the long-term performance of the geologic repository to the extent practical."

Response

The staff agrees with this comment and has replaced the second sentence of the first paragraph of Section 1.0 with the following sentence:

"As part of its site characterization program, DOE will construct an exploratory shaft facility (ESF), the purpose of which is to facilitate site characterization activities."

and has added the following paragraph:

"The need for the collection of sufficient data to determine site suitability, and later to support a license application to construct and operate a potential HLW repository, is the main issue for DOE to consider during site characterization. However, this staff technical position (STP) does not deal primarily with the need for DOE to collect sufficient data from its site characterization program. Rather, this STP focuses on the need for DOE to demonstrate that an approach has been used to design and construct the ESF that considers the applicable 10 CFR Part 60 regulatory requirements, should any components of the ESF become part of (i.e., become "collocated" with) the future geologic repository operations area (GROA). In doing so, DOE's design needs to establish that the investigations conducted in the ESF will obtain the necessary site characterization data and will be conducted in such a manner as to limit, to the extent practical, any adverse effects of the ESF on the long-term performance of the geologic repository. (For the purpose of demonstrating compliance with

10 CFR Part 60 requirements, the term "ESF" refers to only the permanent components of the ESF that may become a part of an eventual GROA.)

In addition, the first sentence of the fourth paragraph of Section 1.0 has been revised to now read as follows:

"As previously noted, the data collected from the ESF during site characterization are to be used to both evaluate the suitability of the site for a HLW repository and to design the GROA."

ACNW COMMENT #2

We recommend that the staff issue a clarification, either in this STP or as a staff position, of the phrase "to the extent practical."

Response

This comment is noted. The language in 10 CFR 60.15(c)(1-4) reflects the fact that the site characterization program must address the characteristics of the particular site and the conceptual design of the repository. The site characterization program must provide a sound documented basis for describing and assessing site characteristics of the repository, but it is desirable that DOE should try to avoid actions that might compromise the ability of the repository to meet 10 CFR Part 60 performance objectives. There must be a balance between these two policies that may very well give rise to some conflict.

Because of site- and design-specific considerations, the cited regulation is intentionally non-prescriptive; that is, it leaves to DOE in the first instance the opportunity and responsibility to determine how the site characterization program should be developed that takes these policies into account. Of course, it is DOE's responsibility to describe, on an iterative basis, how it is addressing these concerns. Similarly, NRC (and other interested parties) will have an opportunity to review how DOE is meeting this responsibility, and NRC can then apply its own judgment and provide more specific guidance to DOE.

In addition, the staff considers that it may not be feasible to provide generic guidance for the phrase "to the extent practical," to cover a rather unlimited range of possible scenarios. The staff considers that a clarification of this phrase can be best provided to DOE, if needed, on a case-by-case basis, to suit the particular situation under consideration. In fact, the staff has provided such guidance to DOE, in the past, for specific cases. For example, when DOE had proposed to excavate the ESF using a drill and blast method of construction (DOE, 1988, p. 8.4-24

and 8.4-27), the NRC staff provided a recommendation to DOE (Browning, 1988, p. 139) to consider a smooth wall blasting technique, so as to limit adverse effects on the long-term performance of the geologic repository, to the extent practical.

The staff considers that providing guidance on a case-by-case basis would be the most appropriate and effective way to provide the needed guidance to DOE in this area, in the future. The staff believes that this approach, involving a dialogue on specific activities and issues, will result in a more appropriate balance of policies and concerns than could be accomplished by a more prescriptive statement in advance of what may be required.

For those reasons, the staff considers the regulatory language "to the extent practical" to be appropriate and also considers it appropriate for guidance at this time to be limited to the more general kinds of principles that are set out in the final STP.

ACNW COMMENT #3

We urge that the staff include an additional statement that the principal focus of this STP is the need for DOE to demonstrate that an approach has been used to design and construct the ESF that will avoid adverse impacts on the site should the ESF be collocated with the geologic repository operations area.

Response

The staff agrees with this comment. See staff response to ACNW Comment #1.

ACNW COMMENT #4

Several other revisions suggested during our discussions with the NMSS staff include removal of wording in the STP that could be considered as adversarial, modification of the flow chart presented in Figure 1, and expansion of Item (7) (Establishment of Ranges of Site Parameters) [in Section 3.0].

Response

With regard to the ACNW's first comment on the wording in the STP (in Section 1.0) that could be regarded as adversarial, the staff notes the ACNW's concern and has removed the language that appears to have prompted this comment. However, the staff considers it important to include in the document some explanation of the basis for providing guidance to DOE, with respect to its conduct of site characterization activities, bearing in mind that NRC has no direct licensing role in that phase of the repository project. Thus, some of the remaining language that appears in Section 1.0 reflects the Commission's previously stated position on this matter.

In revising the STP, as noted in Appendix D, the staff has revised Section 1.0 to further clarify the NRC staff's role relative to the design of the ESF, during the site characterization phase.

As regards the ACNW's comments on the modification of the flow chart presented in Figure 1, the staff has modified the figure and the text in Item (1) of Section 4.0, accordingly. Four ACNW-recommended changes were made to Figure 1: (1) The addition of a new process block entitled "Consider Existing Critical Geologic, Hydrologic, and Engineering Information" at the beginning of the example approach; (2) changing of the title of the process block entitled "Develop ESF Design Concepts" to "Develop ESF Design Concepts Based on Critical Geologic, Hydrologic, and Engineering Information Needs"; (3) the connection of the two process blocks entitled "Revise ESF or GROA Design Concepts" and "Develop Preliminary GROA Design Concepts" by an activity line (through an "Or" gate); and (4) the shifting of an activity line from the "Revise ESF or GROA Design Concepts" process block to a new position (through an "Or" gate) as input to the process block entitled "Develop ESF Design Concepts" from an original position that was between "Develop ESF Design Concepts" process block and the decision block entitled, "Are Site Characterization Requirements Met? and Are ESF Waste Isolation Impacts Limited?"

Finally, in response to the ACNW's comment on expansion of Technical Position No. 7 (Establishment of Ranges of Site Parameters) in Section 3.0, this technical position has been rewritten as follows:

"The orientation, spacing, and extent of ESF design features (such as shafts, ramps, drifts, boreholes, and test area) should facilitate the collection of data on the entire range of parameters that are likely to be important to repository performance, GROA design, and site characterization. The data collected should also include information on the distribution of these parameters."

ACNW COMMENT #5 (pages 25-27 of the ACNW/staff meeting transcript)

In describing the role of the ESF and its relationship to the site characterization program, several terms are used such as "primary," "important," and "major." What is the role of the ESF in the overall repository program and how should one accurately describe it?

Response

See staff response to ACNW Comment #1.

ACNW COMMENT #6 (pages 25 and 109 of the ACNW/staff meeting transcript)

There might be some point in having some remarks in the STP about what (the STP) is not trying to

accomplish. For instance, data collection is an issue for DOE and secondary to what we're trying to accomplish in this technical position.

Response

See staff response to ACNW Comment #1.

ACNW COMMENT #7 (page 43 of the ACNW/staff meeting transcript)

Is the word "also" in the second sentence of the abstract a misnomer with regard to the listing of key 10 CFR Part 60 regulations?

Response

The staff agrees with this comment and has deleted the word "also" in the second sentence of the abstract.

ACNW COMMENT #8 (pages 68 and 82 of the ACNW/staff meeting transcript)

Why doesn't Figure 1 reflect the statement in the STP that "In reality, we recognize that both efforts (ESF and repository (i.e., GROA) design) may well proceed simultaneously ..., " et cetera.

Response

This comment is noted. The staff considers that although it is possible to proceed with the design of the ESF and the GROA simultaneously, this approach is not likely to be used. Therefore, Figure 1 does not reflect this approach. However, the approach shown in Figure 1 is only one of the acceptable ways DOE can proceed with the ESF design process. It does not preclude DOE from using other possible acceptable approaches.

To further clarify the staff position on this subject, the second sentence in the eighth paragraph of the discussion (in Section 4.0), behind Technical Position No. 1, has been rewritten as follows:

"However, we recognize that there is some possibility that DOE may choose to undertake the two design efforts simultaneously, provided that DOE begins with a good understanding of all applicable regulatory requirements...."

ACNW COMMENT #9 (page 118 of the ACNW/staff meeting transcript)

The opening sentence of the STP should clearly say that a program of site characterization is required to be conducted "for the site under consideration" before submitting a license application "for a high-level nuclear waste repository."

Response

The staff agrees with this comment and has revised the first sentence of Section 1.0 to read as follows:

"The Nuclear Waste Policy Act of 1982 (NWPA), as amended, and 10 CFR Part 60 require that the U.S. Department of Energy (DOE) conduct a program of site characterization to obtain the data necessary to determine the suitability of the Yucca Mountain site for a geologic repository for high-level radioactive waste (HLW)."

References

R.E. Browning, Office of Nuclear Material Safety and Safeguards/Division of High-Level Waste Management, letter to R. Stein, U.S. Department of Energy [Subject: NRC Staff Review of the Department of Energy January 8, 1988, Consultation Draft Site Characterization Plan—Final Point Papers], U.S. Nuclear Regulatory Commission, May 11, 1988.

U.S. Department of Energy, "Completed Analytical Techniques, Chapter 8," in "Consultation Draft Site Characterization Plan, Yucca Mountain Site, Nevada Research and Development Area, Nevada," Vol. 8, DOE/RW-0160, January 1988.

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The staff of the U.S. Nuclear Regulatory Commission has prepared this staff technical position for the purpose of compiling and further clarifying previous staff positions on regulatory considerations in the design and construction of the exploratory shaft facility (ESF). (The U.S. Department of Energy (DOE) now refers to the ESF as the "exploratory studies facility." DOE's change in terminology does not affect the positions taken in this guidance.) This document lists the key regulations in 10 CFR Part 60 that should be considered in the design and construction of the ESF and presents the staff position statements and corresponding discussions.

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