

NRC ASSESSMENT OF THE
HIGH-LEVEL WASTE REPOSITORY
QUALITY ASSURANCE PROGRAM

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ABSTRACT

As part of its licensing responsibilities, the NRC is independently reviewing the DOE quality assurance program applied to the site characterization phase activities. Data collected and other information generated during this phase of the program will ultimately be used in a license application to demonstrate the suitability of one site for long-term isolation of waste. They must therefore fall under the quality assurance program to provide confidence in their adequacy. This NRC review consists of three main activities: development of staff guidance on quality assurance measures appropriate for site characterization activities; review of DOE QA plans and procedures; and audits and other reviews of the implementation of the program.

INTRODUCTION

Data collected during the site characterization phase of the high-level waste (HLW) repository program will ultimately be used in licensing to demonstrate that a site is acceptable for long-term isolation of waste. To help assure that data are valid, analyses are correct, and documentation is available for demonstrating the quality of work, the NRC regulations in 10 CFR Part 60 require that a quality assurance (QA) program be implemented. The QA program provides the evidence required for the NRC, affected States and Tribes, and public to independently assess the repository program. It also is a management tool for DOE and their contractors for helping to achieve the necessary quality of work and assuring themselves that it is acceptable. This paper describes how the NRC is assessing the QA program for the high-level waste repository. As the regulatory body authorized to license a HLW repository, the NRC has the responsibility to independently oversee the development and implementation of the QA program of DOE.

The NRC assessment QA program for the high-level waste repository involves three broad areas: development of QA program guidance; review of DOE QA plans and procedures which interpret this guidance; and audits and other reviews of the implementation of the program. All phases will need to be accomplished to such a degree before site characterization that the NRC staff has confidence that the program will be suitable for licensing. Each of these areas of review is discussed in detail below.

Guidance Development

NRC regulations for licensing of a high-level waste repository are contained in 10 CFR Part 60 and include procedural requirements and technical criteria for evaluating a selected site. The criteria for the QA program for site characterization are given in Subpart G of Part 60, which states that the nuclear power reactor criteria in Appendix B of Part 50 are to be used "as applicable and appropriately supplemented by additional criteria ..." The NRC staff efforts to date have concentrated on developing guidance which interprets this phrase for the repository program.

In June 1984, the staff issued the QA Review Plan (1) which interprets each of the 18 criteria of Appendix B for use during the site characterization phase. Although there are differences between the repository and a reactor, most of the reactor program criteria can be applied directly to the repository work. Establishment of an independent QA organization, using procedures describing the work to be performed, conducting inspections and other verifications of work, and retaining records of completed work are the types of areas covered in Appendix B which apply equally as well to this program. Those QA practices which are peculiar to the data collection and analyses are described in the Plan.

The QA Review Plan was issued by the staff immediately after the Ford Study (2) of reactor program problems was published. This study was conducted by the NRC staff at the request of Congress and identified a number of improvements both the industry and the NRC could implement to help to prevent the kinds of reactor program problems which surfaced in the late 1970's and early 1980's. In addition, the DOE has had experience in the last several years in implementing the QA Review Plan and has made some specific recommendations for changes. The staff is therefore considering several improvements in the QA Review Plan. A draft revision is expected to be issued for public comment in the next several months.

In addition to the QA Review Plan, the staff is also developing guidance for selected issues addressed only generally in the QA Review Plan. This guidance is contained in the staff's Generic Technical Positions (GTPs) which are similar to Regulatory Guides or Branch Technical Positions. Each of these is discussed below.

Q-List

The QA program in 10 CFR Part 60 Subpart G applies only to those items and activities which are important to waste isolation or important to safety, i.e., those items and activities which can affect the protection of the radiological health and safety of the public or the environment (the Q-list). This GTP on the Q-list (3) addresses the technical criteria

in Part 60 which define the scope of the program and the methods by which specific items and activities can be determined. Items important to safety include any which prevent or mitigate the consequences of an accident leading to a dose of 500 mr or more at or beyond the site boundary. By definition, the term "important to safety" applies only to the pre-closure phase. Barriers important to waste isolation include any items and activities which contribute to meeting the numerical performance objectives in Part 60, viz. the EPA standard for releases to the accessible environment, the 10^{-5} release rate after waste package failure, the 300-1000 year lifetime for the waste package, and the 1000 year groundwater travel time. By definition, "important to waste isolation" applies to the post-emplacment phase. At this early stage of the program when it is unknown which barriers will ultimately contribute to meeting the waste isolation performance objectives, the staff believes that all should be considered to be on the Q-list. Positions are also presented in the GTP on grading QA measures for specific items and activities.

In addition to those items and activities falling under Subpart G, staff positions are given on QA measures to be applied to other items and activities related to licensing by the NRC, such as Part 20 worker radiological health and safety. Although these are not covered by Subpart G, some assurance measures need to be applied to be able to demonstrate in licensing that they have been fulfilled.

This draft GTP was noticed for public comment in the Federal Register in July 1986. The staff expects to issue a final GTP in the next few months.

Peer Review

In order to obtain a license to operate a high-level waste repository, the DOE must be able to demonstrate in the license application that the applicable health, safety, and environmental regulations in 10 CFR Part 60 have been fulfilled. Confidence in the adequacy of the data, data analyses, modeling, and other activities associated with the license application is obtained through the QA program. Peer reviews will be employed as one part of the QA program where expert judgment will be needed in assessing the adequacy of work. Expert judgment will be necessary due to the inherent uncertainty of geotechnical data and their analysis, the lack of unanimity among experts, and the first-of-a-kind nature of geologic repository technical issues.

This Generic Technical Position (4) provides guidance on the definition of peer reviews, the areas where a peer review is appropriate, the qualifications of peers, and the conduct and documentation of a peer review. It was noticed in the Federal Register in July 1986 for public comment. A final version is expected to be issued in the next several months.

Qualification of Existing Data

Another important issue in this program is the usefulness of data collected prior to the establishment of, or outside of, the DOE QA program for licensing. DOE has not had a Subpart G program in place in recent years, even though data have been collected at the sites. Some of these data could be useful in licensing if it can be shown that adequate QA measures were in place. There are also other sources of data such as from oil companies and universities not having Subpart G programs which may

be useful and which would need to be examined. The GTP (5) describes four methods by which "existing data" can be reviewed and a determination made as to whether they are acceptable for licensing: peer review, use of corroborating data, use of confirmatory testing, and demonstrating that the QA program in place was equivalent to that required in Subpart G. Like the peer review GTP, it was noticed in the Federal Register in July 1986 and is expected to be issued in final form in the next few months.

Review of DOE QA Plans and Procedures

The next major part of the staff's assessment of the repository QA program involves examination of the DOE and DOE contractor QA plans and procedures which interpret the NRC QA guidance. At present, the staff plans to review about a dozen QA plans including those of DOE Headquarters, each of the three project offices, and the prime contractors. Two have been reviewed to date with formal comments given to DOE. Other document reviews are underway.

Review of the Implementation of the QA Program

The most important and challenging part of the NRC staff's assessment is the review of the implementation of the QA program. In the reactor program, this is the area where problems have most often occurred. Power plants had QA plans and procedures in place but sometimes failed to follow them in their work activities. It is also the area requiring the largest effort. The repository program has approximately 250 contractors and subcontractors managed by three DOE project offices and DOE Headquarters. These organizations are in diverse locations and include national laboratories, site geotechnical contractors, architect-engineers, universities, and others. The staff's responsibility is to review and audit enough of the activities related to public health and safety to have confidence that the program is working satisfactorily.

It should be emphasized that DOE has the burden of proof in licensing to demonstrate that their QA program is adequate. The NRC will need to rely in part on their rationale for the adequacy of their programs. The staff's role is to audit enough of the overall program to determine with a level of confidence if the DOE conclusions concerning its adequacy are correct.

The staff's assessment of program implementation will consist of a combination of different techniques. At the present time, the staff is observing audits within the DOE program and reviewing and commenting on the effectiveness of the audits. In the future, when the DOE program is ready, the staff will conduct its own independent audits and participate in DOE readiness reviews. The staff is encouraging DOE to invite NRC to perform mini-audits of discrete program areas as soon as possible so that the DOE may better understand the expectations of the NRC staff in these audits. Waiting until later when the start of site characterization is imminent could cause a delay in the program if significant problems were discovered in NRC audits. The staff's Site Characterization Analyses of the SCP's will explain fully the oversight program and how it gives confidence in the DOE QA program or, if it is found to have problems, the bases for their identification.

Although this paper is focusing on the staff efforts needed before site characterization, it should be noted that the staff will continue to oversee the DOE program through permanent closure.

One significant feature of NRC inspection programs developed as a result of lessons learned from the reactor program is that they must measure the effectiveness of QA programs in producing quality work, rather than just checking for compliance with the QA procedural requirements. The ultimate objective, of course, is to design and build a repository that will protect the public health and safety. Past programs of both the NRC and licensees have sometimes tended to focus on procedural aspects rather than the achievement of quality. Although documentation and compliance with procedural requirements are necessary to demonstrate in licensing that the regulations have been met, the actual results produced are obviously of equal or greater importance. For the audits requested by DOE, the staff intends to examine selected technical products such as a design or a site characterization test program with a team of technical and quality assurance specialists. The quality of the work will be assessed, and when problems are identified, particular emphasis will be given to the QA program breakdowns that allowed the problems to occur. The staff will examine reasons why it was able to identify problems that should have been detected and corrected by the DOE QA program. The staff will also consider whether the findings apply more broadly than the specific problem identified.

SUMMARY

As the independent regulatory agency responsible for licensing of the high-level waste repository, the NRC, as part of its review prior to site characterization, will assess the adequacy of the quality assurance program of the DOE and its

contractors. This paper has reviewed the methods by which the NRC staff will conduct this assessment. They include development of quality assurance criteria, principally in Generic Technical Positions (GTPs), by which the staff will evaluate the program; review of DOE and DOE contractor plans and procedures which interpret this guidance; and audits and other reviews of program implementation.

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