

LICENSING A HIGH LEVEL RADIOACTIVE WASTE REPOSITORY – THE PATH FORWARD

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ABSTRACT

With the formal designation in July 2002 of Yucca Mountain as the site for disposal, the nuclear waste disposal program moved into the licensing phase of the development process. DOE will enter into the licensing process defined by the NRC at 10 CFR Part 2, Subpart J, with the initial certification that documentary material has been made available to the NRC's Licensing Support Network (LSN). The license application that DOE submits to the NRC will contain those general arrangement drawings and high-level system descriptions necessary to show that the design and the accompanying safety analysis will meet regulatory requirements. If DOE receives a construction authorization from the NRC, DOE would begin developing the facilities needed for initial operations. Simultaneously, DOE would complete enhancements to its technical and regulatory bases in anticipation of updating the application for a license to receive and possess waste. By continuing the development of its repository design and demonstrating the validity of its models of long-term waste isolation, DOE will be ready to begin safely constructing a repository upon receipt of the NRC's construction authorization and begin safe operations a few years later following NRC's issuance of a license.

INTRODUCTION

Disposal of the byproducts of nuclear power generation, nuclear weapons production, naval nuclear reactors, and nuclear research and development activities has been an issue since they began accumulating in the mid-1940s. As a part of its mission, the U.S. Department of Energy (DOE) is the lead federal agency for disposal of the high-level nuclear waste and spent fuel portions of these byproducts. Development of a disposal strategy in the United States and the process of selection of an appropriate site for disposal began in the 1950's. This process was first documented in a 1957 report by the National Academy of Sciences (NAS 1957), recommending geologic disposal, and moved slowly forward during the latter half of the twentieth century. In 1982, Congress passed the Nuclear Waste Policy Act of 1982. The act, amended in 1987 and supplemented by The Energy Policy Act of 1992, codified the process the United States would follow in siting and building a repository for disposing of high-level waste and spent nuclear fuel.

Characterization of Yucca Mountain as a potential geologic repository site for high-level radioactive waste and spent nuclear fuel was the most recent major step in the decision-making process for disposal of these materials. With the formal designation in July 2002 of Yucca Mountain as the site for disposal, the program moved into the licensing phase of the process. Formal site characterization activities, as defined under the Nuclear Waste Policy Act (NWPA), ended with the designation of the site, but scientific activities will continue throughout licensing and the operational life of the repository, should construction be authorized and a license to operate be granted.

Post-characterization scientific work, focussed on confirming, or validating, conceptual and numeric models of the natural and engineered systems, is required by the Nuclear Regulatory Commission at 10 Code of Federal Regulations (CFR) Part 63 and will complement design and construction activities. This paper provides an overview of the activities the DOE will undertake in the period from site designation through receipt of authorization to begin construction of a repository at Yucca Mountain.

INITIAL LICENSE APPLICATION SUBMITTAL

DOE will enter into the licensing process defined by the NRC at 10 CFR Part 2, Subpart J, with the initial certification that documentary material has been made available to the NRC's Licensing Support Network (LSN). The LSN, an internet-based electronic discovery tool maintained by the NRC, will contain material relevant to or potentially relevant to the licensing process. Thirty days after DOE's initial certification, NRC must also certify that its holdings have been included in the LSN. All other parties, potential parties, and interested governmental participants must certify that their holdings have been included in the LSN within 90 days of DOE's initial certification.

At the time of DOE's initial certification, the final draft versions of the license application chapters will be nearing completion and most of the source materials will have been identified and included in the LSN. Any material produced or identified subsequent to the initial LSN certification will be entered into the system prior to the required update of the certification at the time of license application submittal. During the license review and hearing process, materials may be added to the LSN upon direction of the Presiding Officer or member of the Atomic Safety Licensing Board panel designated by the NRC to preside over the hearing and related matters. The role of the LSN in licensing actions subsequent to the construction authorization is unclear. In 10 CFR Part 2, the NRC specifies that DOE's initial certification of the LSN should occur six months before submittal of a license application. During those six months, DOE will continue its scientific analyses and design activities as well as other activities necessary to complete the license application.

The license application that DOE submits to the NRC will contain those general arrangement drawings and high-level system descriptions necessary to show that the design and the accompanying safety analysis will meet regulatory requirements. More detail will be available for those structures, systems, and components (SSCs) that are important to safety or waste isolation (Quality- or "Q"-related) and less detail will be presented for non-Q related SSCs. It is the important-to-safety and important-to-waste-isolation SSCs that are necessary to show that the preclosure and postclosure performance of the repository will meet the safety requirements. The license application may be updated during the licensing process to incorporate additional information as the design becomes increasingly detailed, as new design elements are included, and to reflect responses to NRC's requests for additional information, however, DOE anticipates that the design will remain conceptually as described in the initial license application. The focus of the LA and, in particular, the Safety Analysis Report (SAR) portion of the LA, is the demonstration that the safety of the public and the workers will be protected.

WORK DURING THE LICENSE REVIEW

After completion of the initial license application, project engineers will focus on developing the detailed designs needed for procurement and construction. Designs must be developed for not only those facilities at the surface that will be used to receive and transfer waste, but also the "balance of plant" facilities and infrastructure at the site. Designs and prototypes must also be developed to prepare for procurement of waste packages and the equipment that will be used to handle them. Designs for the underground repository must be sufficiently mature to initiate procurement of a tunneling contractor in time to support the start of work once a construction authorization is granted.

DOE's Total System Performance Assessment (TSPA), the suite of computer models used to analyze the long-term waste isolation capability of the repository, and scientific activities will focus on a formal program of performance confirmation as well as testing and evaluation conducted while the repository is being constructed and operated. This sophisticated modeling capability will also be needed to help respond to requests for additional information from the NRC, a central feature of the NRC's licensing process. Test and analysis activities that are included in the performance confirmation program or that

may enhance our understanding of the repository system will provide additional information that may be reported to the NRC and used to update the license application. DOE's Preclosure Safety Analysis (PSA) will focus on safety during the active operation of the facility, before the underground repository is permanently closed. During repository construction, work will begin on defining the revisions that may be required to analyses and models to support the update of the application for a license to receive and possess spent nuclear fuel and high-level radioactive waste.

LONG TERM ACTIVITIES

If DOE receives a construction authorization from the NRC, DOE would begin developing the facilities needed for initial operations. Simultaneously, DOE would complete enhancements to its technical and regulatory bases in anticipation of updating the application for a license to receive and possess waste. Issuance of this license by the NRC would mark DOE's regulatory authority to begin repository operations and underground emplacement of spent nuclear fuel and high-level waste. DOE would then enter a phase of parallel construction and operations until all surface and subsurface facilities have been constructed. Following completion of emplacement, DOE would monitor repository conditions for some period of time before beginning plans for permanent closure. DOE would ultimately apply to the NRC for an amendment to the license to seal the underground repository and put in place an agreed upon post-closure monitoring program before filing an application for termination of the license.

CONCLUSION

DOE is confident that by continuing the development of its repository design and demonstrating the validity of its models of long-term waste isolation, it will be ready to begin safely constructing a repository upon receipt of the NRC's construction authorization and begin safe operations a few years later following NRC's issuance of a license.

REFERENCES

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- 2 Nuclear Waste Policy Act of 1982. Public Law 97-425. 96 Stat. 2201; 42 U.S.C. 10101 et seq.
- 3 Nuclear Waste Policy Amendments Act of 1987. Public Law 100-203. 101 Stat. 1330.
- 4 Energy Policy Act of 1992. Public Law 102-486, 106 Stat. 2276; 42 U.S.C. 10141 et seq.
- 5 Title 10, Part 2, Code of Federal Regulations (10 CFR Part 2), Rules of Practice for Domestic Licensing of Proceedings and Issuance of Orders, U.S. Nuclear Regulatory Commission, Washington, DC
- 6 Title 10, Part 50, Code of Federal Regulations (10 CFR Part 50), Domestic Licensing of Production and Utilization Facilities, U.S. Nuclear Regulatory Commission, Washington, DC
- 7 Title 10, Part 63, Code of Federal Regulations (10 CFR Part 63), Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada, U.S. Nuclear Regulatory Commission, Washington, DC