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YUCCA MOUNTAIN

DOE Has Improved Its Quality Assurance Program, but Whether Its Application for a NRC License Will Be High Quality Is Unclear





Highlights of [GAO-07-1010](#), a report to the Honorable Jon C. Porter, House of Representatives

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Why GAO Did This Study

Nuclear power reactors generate highly radioactive waste. To permanently store this waste, the Department of Energy (DOE) has been working to submit a license application to the Nuclear Regulatory Commission (NRC) for a nuclear waste repository at Yucca Mountain about 100 miles from Las Vegas, Nevada. Although the project has been beset with delays, in part because of persistent problems with its quality assurance program, DOE stated in July 2006 that it will submit a license application with NRC by June 30, 2008. NRC states that a high-quality application needs to be complete, technically adequate, transparent by clearly justifying underlying assumptions, and traceable back to original source materials.

GAO examined (1) DOE's development of its schedule for submitting a license application and the stakeholders with whom it consulted, (2) NRC's assessment of DOE's readiness to submit a high-quality application, and (3) DOE's progress in addressing quality assurance recommendations and challenges identified in GAO's March 2006 report. GAO reviewed DOE's management plan for creating the license application, reviewed correspondence and attended precicensing meetings between DOE and NRC, and interviewed DOE managers and NRC on-site representatives for the Yucca Mountain project. In commenting on a draft of the report, both DOE and NRC agreed with the report.

www.gao.gov/cgi-bin/getrpt?GAO-07-1010.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Mark Gaffigan, (202) 512-3841, gaffiganm@gao.gov.

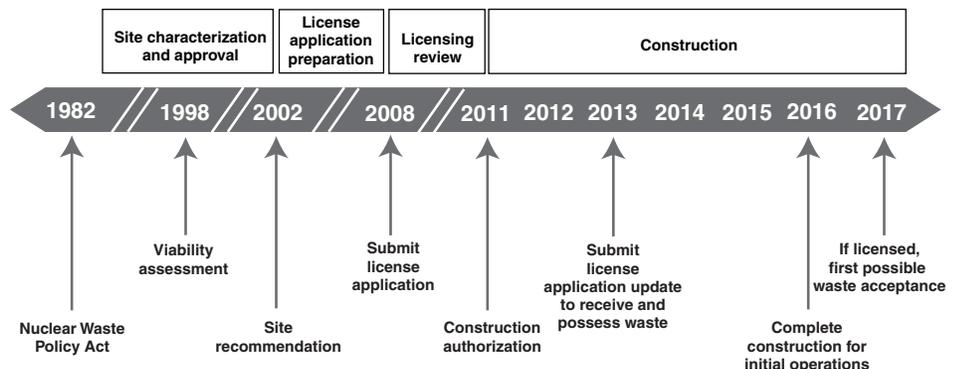
What GAO Found

The director of DOE's Office of Civilian Radioactive Waste Management set the June 30, 2008, date for filing the license application with NRC in consultation with the DOE and contractor managers for the Yucca Mountain project. DOE officials told us that external stakeholders were not consulted because there was neither a legal requirement nor a compelling management reason to do so. According to the director, the June 2008 schedule is achievable because DOE has already completed a large amount of work, including the completion of a draft license application in 2005 that DOE decided not to submit to NRC.

NRC officials believe it is likely that DOE will submit a license application by June 30, 2008, but until NRC receives the application, officials will not speculate about whether it will be high quality. NRC has not seen a draft of the license application, and NRC's long-standing practice is to maintain an objective and neutral position toward a future application until it is filed. To help ensure that DOE understands its expectations, NRC has, among other things, held periodic precicensing management and technical meetings with DOE.

DOE has made progress in resolving the quality assurance recommendations and challenges identified in GAO's March 2006 report. For example, DOE has replaced the one-page summary of performance indicators that GAO had determined was ineffective with more frequent and rigorous project management meetings. DOE has addressed the management challenges GAO identified to varying degrees. For example, regarding management continuity, DOE has worked to fill and retain personnel in key management positions, such as the director of quality assurance. However, for various reasons—including the long history of recurring problems and likely project leadership changes in January 2009 when the current administration leaves office—it is unclear whether DOE's actions will prevent these problems from recurring.

Major Milestones in the Yucca Mountain Project



Sources: DOE and NRC.

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Abbreviations

BSC	Bechtel/SAIC Company, LLC
DOE	Department of Energy
EPA	Environmental Protection Agency
NRC	Nuclear Regulatory Commission
OCRWM	Office of Civilian Radioactive Waste Management
USGS	U.S. Geological Survey

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United States Government Accountability Office
Washington, DC 20548

August 2, 2007

The Honorable Jon C. Porter
House of Representatives

Dear Mr. Porter:

Nuclear power reactors generate nearly 20 percent of the nation's electricity, but they create waste that can remain highly radioactive for hundreds of thousands of years and requires proper disposal to protect public health and the environment. More than 50,000 metric tons of this radioactive waste is stored temporarily at 72 sites around the country—primarily at commercial nuclear power plants. The Nuclear Waste Policy Act of 1982 established the Office of Civilian Radioactive Waste Management (OCRWM) within the Department of Energy (DOE) and directed OCRWM to construct an underground geological repository to permanently dispose of spent nuclear fuel and other radioactive waste. The act also set 1998 as the target date for DOE to start accepting this waste and required the owners of spent nuclear fuel and high-level radioactive wastes to enter into contracts with DOE for the disposal of these materials and to pay for the repository's construction and operations. In 2002, the Congress approved the President's recommendation of the Yucca Mountain site in Nevada for the repository. However, construction has not yet begun. DOE currently estimates that 2017 is the earliest date that the repository could open. Since DOE was unable to begin the acceptance of waste in 1998 as required by the statute and contracts, the government has incurred a liability that DOE now estimates to be approximately \$7 billion. Each year of delay in the operation of the repository beyond 2017 could increase the government's liability by up to \$500 million.

Before construction of the repository can begin, DOE must submit a license application to obtain a construction authorization from the Nuclear Regulatory Commission (NRC).¹ The act directs NRC to issue or deny construction authorization within 3 years after receiving DOE's license

¹Under 10 C.F.R. Part 63.121, NRC also requires, among other things, that (1) the geologic repository operations be located in and on lands that are either owned by DOE or are permanently withdrawn and reserved for its use and (2) DOE obtain necessary water rights for the project.

application, unless NRC extends this period by not more than 1 year and reports the reasons for doing so to the Secretary of Energy and the Congress. To ensure that its license application review is completed within the allotted 3- to 4-year time frame, NRC expects the application to be high quality—that is, to contain the information necessary and sufficient to support the technical positions it presents. Specifically, NRC has stated that a high-quality license application would be complete, technically adequate, transparent—clearly justifying and explaining any underlying assumptions and conclusions—and traceable back to original source materials.

As part of the licensing process, DOE must demonstrate that its repository will meet NRC's regulations, which implement the Environmental Protection Agency's (EPA) standard for protecting public health and the environment from harmful exposure to the radioactive waste. In preparation to file a license application, DOE has been conducting numerous scientific and technical studies at the Yucca Mountain site that will serve as supporting documentation to demonstrate that it can meet these standards. DOE has also developed computer models to measure the probability that various combinations of natural and engineered features of the repository could safely contain waste for the long term, taking into account possible water infiltration, waste package corrosion, earthquakes, volcanic action, or other scenarios.

NRC requires a license applicant to support its technical analysis by implementing a quality assurance program that ensures that the scientific, engineering, procurement, recordkeeping, and other work at the project is performed under controlled conditions and can be verified by others. DOE project teams are responsible for carrying out various functions or aspects of the work and creating their own policies and procedures to implement the quality assurance requirements. DOE has established a quality assurance program that, for example, contains general requirements for calibrating equipment before conducting scientific tests, such as stipulating when and how the equipment should be calibrated and how to document the results.

In March 2006, we reported that DOE had experienced persistent problems with its quality assurance program for the Yucca Mountain project.² We concluded that the project's management tools were

²GAO, *Yucca Mountain: Quality Assurance at DOE's Planned Nuclear Waste Repository Needs Increased Management Attention*, [GAO-06-313](#) (Washington, D.C.: Mar. 17, 2006).

ineffective for monitoring performance and detecting new quality assurance problems. We recommended that DOE take action to strengthen the project's management tools to better identify problems and track progress in addressing them. Our report also identified three substantial management challenges facing the project. First, in March 2005, DOE announced the discovery of e-mail messages implying that some U.S. Geological Survey (USGS) employees responsible for analyzing water infiltration in Yucca Mountain may have falsified scientific data and had shown disdain for quality assurance program requirements. Subsequently, in January 2007, we reported that DOE had spent about \$20.5 million to survey e-mail messages to determine the extent and nature of the problem, rework the USGS analysis, and conduct quality assurance and e-mail training.³ Second, DOE needs to ensure that specific engineering designs reflected high-level plans and regulatory requirements. For example, design changes to a spent fuel handling building led to the description of different design requirements regarding the need for a water-based, fire-suppression system. The activation of such a system could facilitate a nuclear reaction, if there were also an inadvertent release of spent nuclear fuel inside the building. The requirement for the system, therefore, was eliminated, but not all building design documents reflected the change. Third, DOE has experienced substantial turnover in key project management positions. NRC has stressed the importance of a continuity of qualified managers rather than a series of acting managers, but 9 of 17 key management positions at DOE turned over between 2001 and 2006.

Quality assurance problems are not new at the project and over time have contributed to delays in filing a license application. In 2001, DOE determined that, in part because of ongoing efforts to resolve quality assurance problems, it would be unable to submit a license application to NRC by December 2002, the target date scheduled when the Congress approved the Yucca Mountain site. DOE was also unable to meet a December 2004 goal for submitting a license application. Past initiatives to address these problems and prepare for the submission of a license application have included changes to improve the project's organizational culture and ability to quickly detect and resolve problems. Subsequently, in October 2005, DOE implemented its "New Path Forward" by making major changes to the project's design, organization, and management. For

³GAO, *Yucca Mountain Project: Information on Estimated Costs to Respond to Employee E-mails That Raised Questions about Quality Assurance*, GAO-07-297R (Washington, D.C.: Jan. 19, 2007).

example, to improve accountability at the project, it reorganized project staff to create a single manager in charge of the project's major tasks in science, engineering, and licensing. DOE also designated Sandia National Laboratories as the project's lead laboratory to integrate the scientific work that Bechtel/SAIC Company, LLC (BSC), the project's lead contractor, had previously overseen.

Shortly after his Senate confirmation in May 2006, OCRWM's director announced a new schedule to submit DOE's license application for the repository to NRC by June 30, 2008. The director has also fundamentally changed DOE's management of the Yucca Mountain project—DOE now directly manages the project, rather than limiting its role to overseeing BSC's implementation of its management and operating contract. OCRWM's director and deputy director now hold monthly program review meetings with DOE and contractor project managers and routinely participate in quality assurance management meetings with a focus on identifying and correcting problems. OCRWM's director has also identified specific performance measures for each project employee to improve the organizational culture.

In light of persistent quality assurance problems and other delays that the Yucca Mountain project has experienced, we examined (1) DOE's development of its schedule for filing a license application by June 30, 2008, and the stakeholders with whom it consulted; (2) NRC's assessment of DOE's readiness to file a license application that is high quality and enables NRC to complete its evaluation within 3 to 4 years; and (3) DOE's progress in implementing the recommendations and resolving the additional challenges identified in our March 2006 report and the extent to which these challenges were considered in setting the license application schedule.

To examine DOE's development of its license application schedule, we reviewed Yucca Mountain project documents, including DOE's license application management plan and progress reports, and interviewed senior OCRWM managers. To obtain NRC's assessment of DOE's readiness to file a high-quality license application, we attended prelicensing meetings and other interactions between NRC and DOE and reviewed NRC correspondence and statements regarding DOE's planned license application submission. We also interviewed NRC officials regarding these interactions and their views of the planned license application. Finally, to determine DOE's progress in implementing the recommendations in our March 2006 report and resolving the additional challenges we identified, we reviewed prior GAO reports, corrective action reports, and related

Yucca Mountain project documents; interviewed senior OCRWM managers in DOE headquarters and the Yucca Mountain project office in Las Vegas, Nevada; and interviewed NRC officials. We conducted our work from February 2007 through July 2007 in accordance with generally accepted government auditing standards.

Results in Brief

The decision to submit a license application to NRC by June 30, 2008, was made by OCRWM's director in consultation with DOE and contractor project managers; the director did not consult with nonfederal stakeholders, including the state of Nevada and the nuclear power industry. DOE officials told us they did not consult with external stakeholders because there was no legal requirement or compelling management reason for them to do so. They noted that the NRC review process includes public hearings on the application, which will provide stakeholders with an opportunity to comment on the substance of the application. OCRWM's director told us that he announced the decision to expedite the license application process shortly after taking office to jump-start what he viewed as a stalled project. The director believes the June 30, 2008, schedule is achievable because DOE has already completed a substantial amount of work, including the completion of a draft license application in 2005 that DOE ultimately determined was not ready to submit to NRC. To develop the internal schedule to meet the June 2008 date, project managers created a management plan to (1) assess the statutory and regulatory requirements for the license application; (2) identify any gaps and inadequacies in previous efforts to draft a license application; (3) rework the problem areas; and (4) create a management process to review, revise, and then seek DOE management's approval for filing the license application.

NRC officials expect that DOE will file a license application by June 30, 2008, but the officials would not speculate on its quality or whether it will enable NRC to complete its evaluation within the 3- to 4-year time frame cited by the act because of NRC's long-standing practice to maintain an objective and neutral position toward proposed license applications until they are filed with NRC. NRC has expressed concern about the lack of a rigorous quality assurance program and the reliability of USGS's scientific work, which DOE had certified before it discovered the USGS e-mails indicating quality assurance problems. However, NRC recognizes that DOE has taken steps to address these problems. To better ensure that DOE understands its expectations, NRC has held periodic precicensing management and technical meetings with DOE officials that are open to external stakeholders. NRC officials stated that DOE will need to file a

high-quality application to enable NRC to complete its review within the 3- to 4-year time frame.

DOE has made progress in implementing the quality assurance recommendations in our March 2006 report and resolving the challenges we identified, but it is unclear whether its actions will prevent similar problems from recurring. Specifically, DOE has eliminated the one-page summary of performance indicators—the primary management tool DOE program managers had used to monitor project performance—that we determined was ineffective. In its place, OCRWM’s director has instituted more frequent and rigorous project management meetings and is introducing a new trending report that synthesizes information from the project’s corrective action program. In addition, in response to the USGS e-mail issue, Sandia National Laboratories developed a new water infiltration model to replace USGS’s technical analysis to ensure that the license application’s scientific analysis is accurate and supportable, and DOE reviewed e-mail and other documents to determine the root cause and extent of the problem. Regarding the rigor of the engineering design process, DOE has implemented new systems to ensure that specific engineering designs reflect high-level plans and regulatory requirements. Regarding management continuity, DOE has worked to fill and retain personnel in key management positions, such as the director of quality assurance. However, DOE continues to lose key project managers, most recently with the departure of OCRWM’s deputy director. In addition, OCRWM’s director is a political appointee whose term is expected to end in January 2009 when a new administration takes office, and the management style and priorities of future directors may be different. Furthermore, DOE project officials anticipate that changing the project’s culture and history of recurring quality assurance problems will take a long time.

Background

The Nuclear Waste Policy Act of 1982, as amended, establishes a comprehensive policy and program for the safe, permanent disposal of commercial spent nuclear fuel and other highly radioactive wastes in one or more geologic repositories. The act charges DOE with (1) establishing criteria for recommending sites for repositories; (2) “characterizing” (investigating) the Yucca Mountain site to determine its suitability for a repository;⁴ (3) if the site is found suitable, recommending it to the

⁴The 1987 amendments to the act directed that DOE investigate only the Yucca Mountain site.

President, who would submit a recommendation to the Congress if he agreed that the site was qualified; and (4) seeking permission from NRC to construct and operate a repository at the approved site. Under the Nuclear Waste Policy Act, users of nuclear-power-generated electricity pay \$0.001 per kilowatt-hour into a Nuclear Waste Fund, which may be used only to pay for the siting, licensing, and construction of a nuclear waste repository. In fiscal year 2006, DOE reported that the fund had \$19.4 billion.⁵ DOE also reported that it had spent about \$11.7 billion (in fiscal year 2006 dollars) from project inception in fiscal years 1983 through 2005 and estimated that an additional \$10.9 billion (in fiscal year 2006 dollars) would be incurred from fiscal years 2006 to 2017 to build the repository.

Since the early 1980s, DOE has studied the Yucca Mountain site to determine whether it is suitable for a high-level radioactive waste and spent nuclear fuel repository. For example, DOE completed numerous scientific studies of water flow and the potential for rock movement near the mountain, including the likelihood that volcanoes and earthquakes will adversely affect the repository's performance. To allow scientists and engineers greater access to the rock being studied, DOE excavated two tunnels for studying the deep underground environment: (1) a 5-mile main tunnel that loops through the mountain, with several research areas or alcoves connected to it, and (2) a 1.7-mile tunnel that crosses the mountain, allowing scientists to study properties of the rock and the behavior of water near the potential repository area. Since July 2002, when the Congress approved the President's recommendation of the Yucca Mountain site for the development of a repository, DOE has focused on preparing its license application.

In October 2005, DOE announced a series of changes in the management of the project and in the design of the repository to simplify the project and improve its safety and operation. Previously, DOE's design required radioactive waste to be handled at least four separate times by transporting the waste to the Yucca Mountain site, removing the waste from its shipping container, sealing it in a special disposal container, and moving it into the underground repository. The new repository design relies on uniform canisters that would be filled and sealed before being shipped, reducing the need for direct handling of most of the waste prior

⁵The Nuclear Waste Fund provided \$8.3 billion and funding for defense waste provided \$3 billion. Both commercial spent nuclear fuel and high-level defense waste are planned for disposal at Yucca Mountain.

to being placed in the repository. As a result, DOE will not have to construct several extremely large buildings costing millions of dollars for handling radioactive waste. In light of these changes, DOE has been working on revising the designs for the repository's surface facilities, developing the technical specifications for the canisters that will hold the waste, and revising its draft license application.

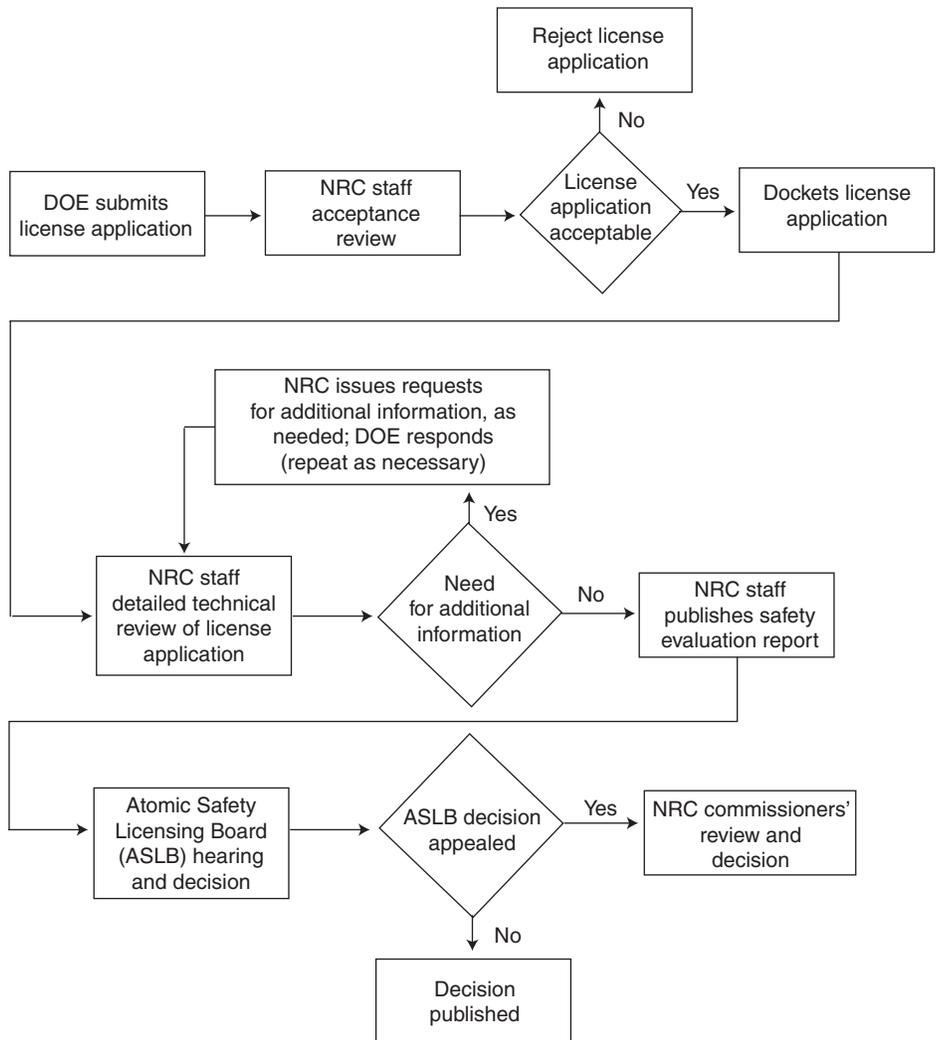
In accordance with NRC regulations, before filing its license application, DOE must first make all documentary material that is potentially relevant to the licensing process electronically available via NRC's Internet-based document management system. This system, known as the Licensing Support Network, provides electronic access to millions of documents related to the repository project. DOE is required to initially certify to NRC that it has made its documentary material available no later than 6 months in advance of submitting the license application. NRC, Nevada, and other parties in the licensing process must also certify their documentary material was made available following DOE's initial certification. This information will then be available to the public and all the parties participating in the licensing process. OCRWM currently expects to certify its material in the Licensing Support Network by December 21, 2007. In addition, OCRWM expects to complete the necessary designs and have the draft license application ready for DOE management's review by February 29, 2008.

NRC is charged with regulating the construction, operation, and decommissioning phases of the project and is responsible for ensuring that DOE satisfies public health, safety, and environmental regulatory requirements. Once DOE files the license application, NRC will begin a four-stage process to process the application and decide whether to (1) authorize construction of the repository, (2) authorize construction with conditions, or (3) deny the application. As shown in figure 1, this process includes the following steps:

- *Acceptance review.* NRC plans to take up to 180 days to examine the application for completeness to determine whether the license application has all of the information and components NRC requires. If NRC determines that any part of the application is incomplete, it may either reject the application or require that DOE furnish the necessary documentation. NRC will docket the application once it deems the application complete, indicating its readiness for a detailed technical review.

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- *Technical review.* The detailed technical review, scheduled for 18 to 24 months, will evaluate the soundness of the scientific data, computer modeling, analyses, and preliminary facility design. The review will focus on evaluating DOE's conclusions about the ability of the repository designs to limit exposure to radioactivity, both during the construction and operation phase of the repository (known as preclosure) and during the phase after the repository has been filled, closed, and sealed (known as postclosure.) If NRC discovers problems with the technical information used to support the application, it may conduct activities to determine the extent and effect of the problem. As part of this review, NRC staff will prepare a safety evaluation report that details staff findings and conclusions on the license application.
 - *Public hearings.* NRC will also convene an independent panel of judges—called the Atomic Safety Licensing Board—to conduct a series of public hearings to address contested issues raised by affected parties and review in detail the related information and evidence regarding the license application. Upon completion, the board will make a formal ruling (called the initial decision) resolving matters put into controversy. This initial decision can then be appealed to the NRC commissioners for further review.
 - *NRC commission review.* In the likely event of an appeal, the NRC commissioners will review the Atomic Safety Licensing Board's initial decision. In addition, outside of the adjudicatory proceeding, they will complete a supervisory examination of those issues contested in the proceeding to consider whether any significant basis exists for doubting that the facility will be constructed or operated with adequate protection of the public health and safety. The commissioners will also review any issues about which NRC staff must make appropriate findings prior to the authorization of construction, even if they were not contested in the proceeding.

Figure 1: NRC's License Application Review Process



Source: NRC.

However, until DOE submits a license application, NRC's role has involved providing regulatory guidance; observing and gathering information on DOE activities related to repository design, performance assessment, and environmental studies; and verifying site characterization activities. These preclicensing activities are intended to identify and resolve potential licensing issues early to help ensure that years of scientific work are not

found to be inadequate for licensing purposes. DOE and NRC have interacted since 1983 on the repository. In 1998, they entered into a prelicensing interaction agreement that provides for technical and management meetings, data and document reviews, and the prompt exchange of information between NRC's on-site representatives and DOE project personnel. Consistent with this prelicensing interaction agreement and NRC's regulations, NRC staff observe and review activities at the site and other scientific work as they are performed to allow early identification of potential licensing issues for timely resolution at the staff level.

EPA also has a role in the licensing process—setting radiation exposure standards for the public outside the Yucca Mountain site. In 2001, EPA set standards for protecting the public from inadvertent releases of radioactive materials from wastes stored at Yucca Mountain, which are required by law to be consistent with recommendations of the National Academy of Sciences. In July 2004, the U.S. Court of Appeals for the District of Columbia Circuit ruled that EPA's standards were not consistent with the National Academy of Sciences' recommendations.⁶ In response, EPA proposed a revised rule in August 2005.⁷ The director of EPA's Office of Air and Radiation Safety told us that EPA plans to finalize its rule this year. In addition, NRC must develop exposure limits that are compatible with EPA's rule. NRC published a proposed rule which it states is compatible with EPA's rule,⁸ received public comments in 2005, but has not yet finalized the rule. If EPA's rule does not change significantly in response to public comments, NRC's rule would not require major revisions either and could be finalized within months. However, if EPA's final rule has major changes, it could require major changes to NRC's rule, which could take more than a year to redraft, seek and incorporate public comments, and finalize, according to NRC officials.

⁶*Nuclear Energy Institute v. EPA*, 373 F.3d 1251 (D.C. Cir 2004). Prior to establishing the original standards, EPA requested recommendations from the National Academy of Sciences that resulted in the National Research Council's report, *Technical Bases for Yucca Mountain Standards* (Washington, D.C.: 1995).

⁷70 Fed. Reg. 49014 (Aug. 22, 2005).

⁸70 Fed. Reg. 53313 (Sept. 8, 2005).

DOE's Schedule to Submit a License Application to NRC by June 30, 2008, Was Developed in Consultation with Yucca Mountain Project Managers

In July 2006, DOE announced its intent to file a license application to NRC no later than June 30, 2008. OCRWM's director set the June 30, 2008, goal to jump-start what he viewed as a stalled project. OCRWM's director told us that he consulted with DOE and contractor project managers to get a reasonable estimate of an achievable date for submitting the license application and asked OCRWM managers to develop a plan and schedule for meeting the June 30, 2008, goal. OCRWM's director believes this schedule is achievable, noting that DOE had already performed a significant amount of work toward developing a license application. Specifically, DOE completed a draft license application in September 2005, but opted not to file it with NRC to allow more time to address the USGS e-mail issue, revise the repository's design to simplify the project and improve its safety and operation, and consider revising its technical documents in response to the possibility that EPA would revise the radiation standards for the proposed repository. Table 1 shows the project's major milestones.

Table 1: Major Milestones in DOE's Proposed Yucca Mountain Repository Schedule

Milestone	Date
Complete repository designs for use in the license application	November 30, 2007
Certify the License Support Network	December 21, 2007
Submit draft application to OCRWM's director for DOE management review	February 29, 2008
Issue supplement to the environmental impact statement	May 30, 2008
File the license application with NRC	June 30, 2008
License application docketed by NRC ^a	September 30, 2008
Start Nevada rail construction	October 5, 2009
Receive construction authorization from NRC	September 30, 2011
Update the license application to receive a license from NRC to receive and possess nuclear waste ^b	March 29, 2013
Complete construction for initial operations	March 30, 2016
Complete start-up testing	December 31, 2016
Begin receipt of radioactive waste canisters	March 31, 2017

Source: DOE.

^aAssumes a 90-day docketing review by NRC.

^bDOE would need to receive a license to receive and possess before it can begin to receive waste.

DOE did not consult with external stakeholders in developing this schedule because there was no legal or regulatory requirement or compelling management reason to do so, according to senior OCRWM

officials. However, these officials noted that the NRC review process includes extensive public hearings on the application, which will provide stakeholders with an opportunity to comment on and challenge the substance of the application. In addition, regarding other aspects of the program, senior OCRWM officials noted that they have often consulted with external stakeholders, including city and county governments near the proposed repository site, NRC, USGS, and nuclear power companies. OCRWM has also consulted with Nevada, the U.S. Department of the Navy, and other DOE offices. For example, in developing its standards for the canisters that will be used to store, transport, and place the waste in the repository, DOE consulted with the Navy and the nuclear power plant operators that generate the nuclear waste and will use the proposed canisters. In addition, DOE has worked with the local city and county governments near the repository to develop the plans for transporting the waste to the proposed repository.

OCRWM's director has made the submission of the license application by June 30, 2008, the project's top strategic objective and management priority. Accordingly, each OCWRM office has created business plans detailing how its work will support this objective. Furthermore, DOE has developed a license application management plan that incorporates the lessons learned from previous license application preparation efforts and works to ensure that the license application meets all DOE and NRC statutory, regulatory, and quality requirements. The plan establishes a process whereby teams assess the statutory and regulatory requirements for the license application, identify any gaps and inadequacies in the existing drafts of the license application, and draft or revise these sections. Since the license application is expected to be thousands of pages long, the plan divides the license application into 71 subsections, each with a team assigned specific roles and responsibilities, such as for drafting a particular subsection or approving a particular stage of the draft. Finally, the plan also creates new project management controls to provide oversight of this process and manage risks. For example, the plan details how issues that may pose risks to the schedule or quality of the license application should be noted, analyzed, and resolved, and how the remaining issues should be elevated to successively higher levels of management.

NRC Officials Are Uncertain Whether DOE Will File a High-Quality License Application That Will Facilitate Completion of a Timely Review

NRC officials believe it is likely that DOE will submit a license application by June 30, 2008, but will not speculate about its quality due to a long-standing practice to maintain an objective and neutral position toward proposed license applications until they are filed with NRC. According to NRC officials, NRC's ability to review an application in a timely manner is contingent on the application being high quality, which NRC officials define as being complete and accurate, including traceable and transparent data that adequately support the technical positions presented in the license application. NRC has expressed concern about the lack of a rigorous quality assurance program and the reliability of USGS scientific work that DOE had certified before the USGS e-mails were discovered.⁹ Based on its precicensing review, NRC recognizes that DOE is addressing problems with its quality assurance program and, by developing a new water infiltration model, is restoring confidence in the reliability of its scientific work.

When the Nuclear Waste Policy Act of 1982 gave NRC responsibility for licensing the nuclear waste repository, NRC staff began engaging in precicensing activities aimed at gathering information from DOE and providing guidance so that DOE would be prepared to meet NRC's statutory and regulatory requirements and NRC would be prepared to review the license application. NRC issued high-level waste disposal regulations containing criteria for approving the application and publicly available internal guidance detailing the steps and activities NRC will perform to review the application. NRC also established a site office at OCRWM's Las Vegas, Nevada, offices to act as NRC's point of contact and to facilitate prompt information exchanges. NRC officials noted that they have also been working for several years to communicate NRC's expectations for a high-quality license application.

Although NRC has no formal oversight role in the Yucca Mountain project until DOE files a license application, NRC staff observe DOE audits of its quality assurance activities to identify potential issues and problems that may affect licensing. The NRC staff then report their findings in quarterly reports that summarize their work and detail any problems or issues they identify. For example, after observing a DOE quality assurance audit at the Lawrence Livermore National Laboratory in August 2005, NRC staff

⁹NRC expressed concerns in 1984 that some project staff viewed quality assurance requirements as unnecessary and burdensome, and, in 1986, DOE issued a stop-work order based on its determination that USGS staff did not appreciate the importance of quality assurance and that USGS work would not meet NRC's expectations.

expressed concern that humidity gauges used in scientific experiments at the project were not properly calibrated—an apparent violation of quality assurance requirements. Due in part to concerns that quality assurance requirements had not been followed, BSC issued a February 7, 2006, stop-work order affecting this scientific work. In June 2007, OCRWM project managers told us that because quality assurance rules were not followed, DOE could not use this scientific work to support the license application.

To facilitate prelicensing interactions, NRC and DOE developed a formal process in 1998 for identifying and documenting technical issues and information needs. As shown in table 2, issues were grouped into nine key technical issues focused mainly on postclosure performance of the geologic repository. Within this framework, NRC and DOE defined 293 agreements in a series of technical exchange meetings. An agreement is considered closed when NRC staff determines that DOE has provided the requested information. Agreements are formally closed in public correspondence or at public technical exchanges. As of June 2007, DOE has responded to all 293 of the agreements. NRC considers 260 of these to be closed. NRC considers 8 of the remaining 33 agreements to be potentially affected by the USGS e-mail issue that emerged in 2005. Their resolution will be addressed after NRC examines the new water infiltration analysis. NRC considers that the remaining 25 have been addressed but still need additional information. DOE has indicated that it does not plan any further responses on these agreements, and that the information will be provided in the June 2008 license application.

Table 2: Key Technical Issues Identified by NRC and DOE

Key technical issue	Short description
Container Life and Source Term	Prediction of the waste package container lifetime, including estimates of the amount of radioactivity that may escape from deteriorated waste packages
Evolution of the Near-Field Geochemical Environment	Changes in the waste package environment over long periods
Igneous Activity	The likelihood and consequences of volcanic activity
Repository Design and Thermal-Mechanical Effects	Evaluation of how heat from the waste may affect the mechanical properties of the geologic repository design
Radionuclide Transport	Identification of key geochemical processes that may control radionuclide transport at Yucca Mountain
Structural Deformation and Seismicity	Evaluation of earthquake and fault activity
Thermal Effects on Flow	Understanding of the effects of heat generated by the waste on moisture flow around the repository
Total System Performance Assessment and Integration	Development of the capability to conduct and review total system performance assessments
Unsaturated and Saturated Flow under Isothermal Conditions	Characterization of groundwater flow near the repository

Source: NRC.

NRC determined that adding agreements to the original 293 was not an efficient means to continue issue resolution during prelicensing, given DOE's stated intent to submit its license application, first in 2004, and now in 2008. NRC is now using public correspondence, as well as public technical exchanges and management meetings, to communicate outstanding and emerging technical issues. For example, NRC's September 2006 correspondence provided input on DOE's proposed approach for estimating seismic events during the postclosure period and requested further interactions on the topic. Also, since May 2006, NRC and DOE have conducted a series of technical exchanges to discuss such topics as DOE's total system performance assessment model, the seismic design of buildings, and other DOE design changes. Other interactions are planned to ensure that NRC has sufficient information to conduct its prelicensing responsibilities.

DOE Has Made Progress in Implementing Our Quality Assurance Recommendations and Resolving Challenges We Identified

DOE is implementing the recommendations and addressing the challenges identified in our March 2006 report, but it is unclear whether the department's actions will prevent similar problems from recurring. Specifically, in response to our recommendations that DOE improve its management tools, DOE has eliminated the one-page summary (or panel) of performance indicators and has revised its trend evaluation reports. DOE is supplementing these changes with more rigorous senior management meetings that track program performance to better ensure that new problems are identified and resolved. DOE has also begun addressing additional management challenges by independently reworking USGS's water infiltration analysis, fixing problems with a design and engineering process known as requirements management, and reducing the high-turnover rate and large number of acting managers in key project management positions.

DOE Has Replaced or Improved Two Previously Ineffective Management Tools

Our March 2006 report found that two of the project's management tools—the panel of performance indicators and the trend evaluation reports—were ineffective in helping DOE management to monitor progress toward meeting performance goals, detecting new quality assurance problems, and directing management attention where needed. In response, DOE has stopped using its panel of performance indicators and replaced them with monthly program review meetings—chaired by OCRWM's director and attended by top-level OCRWM, BSC, Sandia, and USGS managers—that review the progress of four main OCRWM projects: (1) the drafting of the license application; (2) the effort to select and load documents and records into NRC's Licensing Support Network; (3) work supplementing DOE's environmental impact statement to reflect the October 2005 changes in repository design, which shift from direct handling of waste to the use of canisters; and (4) the development of a system to transport waste from where it is generated, mainly nuclear power plants, to the repository. In addition, DOE has developed the following four new, high-level performance indicators that it evaluates and discusses at its monthly program review meetings:

- safety, including injuries and lost workdays due to accidents at the project;
- quality, including efforts to improve OCRWM's corrective action program, which works to detect and resolve problems at the project and the performance of the quality assurance program;
- cost, including actual versus budgeted costs, staffing levels, and efforts to recruit new employees; and

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- culture, including the project's safety conscious work environment program, which works to ensure that employees are encouraged to raise safety concerns to their managers or to NRC without fear of retaliation and that employees' concerns are resolved in a timely and appropriate manner according to their importance.

Although DOE plans to develop additional performance indicators, these four simplified indicators have replaced about 250 performance indicators on the previous performance indicator panel. According to a cognizant DOE official, the previous performance indicator panel was ineffective, in part, because it focused on what *could* be measured, as opposed to what *should* be measured, resulting in DOE focusing its efforts on developing the performance indicator panel instead of determining how to use this information as a management tool. The monthly program review and the new performance indicators are designed to be more useful to OCRWM management by being simpler and more focused on the key mission activities.

DOE has also revised its trend evaluation reports to create new organizational structures and procedures that detail the processes and steps for detecting and analyzing trends and preparing trend evaluation reports for senior management review. DOE has appointed a trend program manager and implemented a work group to oversee these processes. Furthermore, as we recommended, the new trend program has an increased focus on the significance of the monitored condition by synthesizing trends projectwide instead of separating OCRWM's and BSC's trend evaluation reports.

To improve the utility of trend evaluation reports as a management tool, the procedures now identify the following three types of trends and criteria for evaluating them:

- *Adverse trends* are (1) repeated problems that involve similar tasks or have similar causes and are determined by management to be significant or critical to the success of the project; (2) repeated problems that are less significant but collectively indicate a failure of the quality assurance program, may be precursors to a more significant problem, or pose a safety problem; and (3) patterns of problems that management determines warrant further analysis and actions to prevent their recurrence.
- *Emerging trends* are problems that do not meet the criteria for an adverse trend, but require actions to ensure that they do not evolve into an adverse trend.

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- *Monitored trends* are fluctuations in the conditions being monitored that OCRWM management determines do not warrant action, but each fluctuation needs close monitoring to ensure that it does not evolve into an emerging or adverse trend.

DOE has also implemented changes to its corrective action program—the program that provides the data that are analyzed in the trend evaluation program. The corrective action program is the broader system for recognizing problems and tracking their resolution. It is one of the key elements of the project’s quality assurance framework and has been an area of interest to NRC in its prelicensing activities. The corrective action program consists of a computer system that project employees can use to enter information about a problem they have identified and create a record, known as a condition report, and a set of procedures for evaluating the condition reports and ensuring these problems are resolved.

Regarding our broader conclusions that the OCRWM quality assurance program needed more management attention, in spring 2006, DOE requested a team of external quality assurance experts to review the performance of the quality assurance program. The experts concluded that 8 of the 10 topics they studied—including the corrective action program—had not been effectively implemented. Specifically, the team found that the corrective action program did not ensure that problems were either quickly or effectively resolved. Furthermore, a follow-up internal DOE study, called a root cause analysis report, concluded that the corrective action program was ineffective primarily because senior management had failed to recognize the significance of repeated internal and external reviews and did not aggressively act to correct identified problems and ensure program effectiveness.

In response, DOE has revised the corrective action program in an effort to change organizational behaviors and provide increased management attention. For example, DOE has restructured the condition screening team, which previously had poor internal communication and adversarial relationships among its members, according to a senior project manager. Similarly, a December 2006 external review of the quality assurance program found that OCRWM staff had focused its efforts on trying to downgrade the significance of condition reports to deflect individual and departmental responsibility, rather than ensuring that the underlying causes and problems were addressed. In response, DOE (1) reorganized the condition screening team to reduce the size of the team but include more senior managers; (2) identified roles, responsibilities, and management expectations for the team, including expectations for

collaborating and communicating; and (3) formalized processes and criteria for screening and reviewing condition reports. The condition screening team now assigns one of four significance levels to each new condition report and assigns a manager who is responsible for investigating the problem.

In addition, DOE has restructured the management review committee, which oversees the corrective action program and the condition screening team. The management review committee is charged with, among other things, reviewing the actions of the condition screening team, particularly regarding the condition reports identified as having the highest two levels of significance. The management review committee also reviews draft root cause analysis reports, and any condition reports that could affect the license application. Whereas these functions were previously performed by BSC, the management review committee is now sponsored by OCRWM's deputy director and includes senior DOE, BSC, and Sandia managers. DOE has also created written policies to clarify the roles, responsibilities, and expectations of the management review committee. The goal of these changes is to refocus management attention—with OCRWM's deputy director serving as a champion for the corrective action program—and ensure that problems are resolved in a timely and efficient manner.

DOE Has Addressed Other Management Challenges

DOE has addressed to varying degrees three other management challenges identified in our March 2006 report: (1) restoring confidence in USGS's scientific documents; (2) problems with a design and engineering process known as requirements management; and (3) managing a changing and complex program, particularly given the high turnover in key management positions. Specifically:

- *USGS e-mail issue.* DOE has taken three actions to address concerns about the reliability of USGS's scientific work after a series of e-mails implied that some USGS employees had falsified scientific and quality assurance documents and disdained DOE's quality assurance processes. Specifically, DOE (1) evaluated USGS's scientific work; (2) directed Sandia to independently develop a new water infiltration model to compare with USGS's model and reconstruct USGS's technical documents; and (3) completed a root cause analysis, including a physical review of more than 50,000 e-mails and keyword searches of nearly 1 million other e-mails sampled from more than 14 million e-mails. DOE's evaluation of USGS's scientific work concluded that there was no evidence that the USGS employees falsified or modified information. DOE's root cause

analysis team concluded that there was no apparent widespread or pervasive pattern across OCRWM of a negative attitude toward quality assurance or willful noncompliance with quality assurance requirements. However, the analysis found that OCRWM's senior management had failed to hold USGS personnel accountable for the quality of the scientific work, fully implement quality assurance requirements, and effectively implement the corrective action program. These internal studies and reports and Sandia's independent development of a new water infiltration model are intended to restore public confidence in the water infiltration modeling work in the license application.

- *Problems with design control and the requirements management process.* DOE has revised its design control and requirements management processes to address the problems that our March 2006 report identified. In addition, to gauge the effectiveness of these changes, DOE conducted an internal study called a readiness review, in which it determined that the changes in the processes were sufficient and that BSC was prepared to resume design and engineering work. Subsequently, in January 2007, DOE's independent assessment of BSC and the requirements management process concluded that the processes and controls were adequate and provided a general basic direction for the design control process. DOE has also contracted with Longenecker and Associates to review the project's engineering processes with the final report due in the summer of 2007.
- *Management turnover.* DOE has worked to fill and retain personnel in key management positions that had been vacant for extended periods of time, most notably the director of quality assurance and the OCRWM project director. In addition, as part of an effort to change the organizational culture, OCRWM's director has created a team to evaluate how to improve succession planning and identify gaps in the skills or staffing levels in OCRWM. However, DOE continues to lose key project managers, most recently with the departure of OCRWM's deputy director. Furthermore, additional turnover is possible after the 2008 presidential election, when the incoming administration is likely to replace OCRWM's director. Historically, new directors have tended to have different management priorities and have implemented changes to the organizational structure and policies. To address this concern, OCRWM's director suggested legislatively changing the director position by making it a long-term appointment to reflect the long-term nature of the Yucca Mountain project.

Concluding Observations

The OCRWM director's schedule for filing a repository license application with NRC by June 30, 2008, will require a concerted effort by project personnel. However, given the waste repository's history since its

inception in 1983, including two prior failed efforts to file a license application, it is unclear whether DOE's license application will be of sufficient quality to enable NRC to conduct a timely review of the supporting models and data that meet the statutory time frames. DOE has taken several important actions to change the organizational culture of the Yucca Mountain project since the issuance of our March 2006 report. These actions appear to be invigorating, for example, the quality assurance program by focusing management attention on improving quality by resolving problems. However, for a variety of reasons, it has yet to be seen whether DOE's actions will prevent the kinds of problems our March 2006 report identified from recurring or other challenges from developing. First, some of DOE's efforts, such as its efforts to reduce staff turnover, are in preliminary or planning stages and have not been fully implemented. Therefore, their effectiveness cannot yet be determined. Second, improving the quality assurance program will also require changes in the organizational behaviors of OCRWM's staff and contractors. OCRWM's director told us that these types of cultural changes can be particularly difficult and take a long time to implement. Consequently, it may be years before OCRWM fully realizes the benefits of these efforts. Finally, as we have previously reported, DOE has a long history of quality assurance problems and has experienced repeated difficulties in resolving these problems.

Agency Comments

We provided DOE and NRC with a draft of this report for their review and comment. In their written responses, both DOE and NRC agreed with our report. (See apps. I and II.) In addition, both DOE and NRC provided comments to improve the draft report's technical accuracy, which we have incorporated as appropriate.

Scope and Methodology

To examine the development of DOE's license application schedule, we reviewed DOE documents related to the announcement and creation of the license application. We also reviewed the DOE management plan for creating the license application and other internal reports on the progress in drafting the application. We interviewed OCRWM's director and other OCRWM senior management officials in DOE headquarters and its Las Vegas project office about the process for creating the schedule, including consultations with stakeholders. In addition, we observed meetings covering topics related to the license application schedule between DOE and NRC, the Advisory Committee on Nuclear Waste and Materials, and the Nuclear Waste Technical Review Board. These meetings were held in Rockville, Maryland; Las Vegas, Nevada; and Arlington, Virginia.

To obtain NRC's assessment of DOE's readiness to file a high-quality license application, we obtained NRC documents—such as the status of key technical issues and briefing slides on NRC's technical exchanges with DOE. We also attended NRC staff briefings for the Commission's Advisory Committee on Nuclear Waste and Materials, including a briefing on NRC's prelicensing activities; reviewed meeting transcripts; and observed a NRC-DOE quarterly meeting and recorded NRC's comments. In addition, we interviewed NRC's project manager who is responsible for reviewing the postclosure portion of a license application, NRC's on-site representative at the Las Vegas office, and other NRC regional officials. Furthermore, we interviewed the director of EPA's Office of Air and Radiation Safety regarding the status of EPA's rulemaking to set radiation exposure standards for the public outside the Yucca Mountain site.

To determine DOE's progress in implementing the recommendations and resolving the additional challenges identified in our March 2006 report, we reviewed prior GAO reports that assessed DOE's quality assurance process and relevant DOE corrective action reports, root cause analyses, and other internal reviews that analyzed DOE's efforts to improve its management tools and its corrective action program in general. We also reviewed related NRC documents, such as some observation audit reports. We observed NRC and DOE management meetings and technical exchanges in Rockville, Maryland, and Las Vegas, Nevada, that covered related issues. We also interviewed OCRWM's director in DOE headquarters and senior managers at the Yucca Mountain project office in Las Vegas about their efforts to address our recommendations. Regarding the quality assurance challenges noted in our prior report, we reviewed a January 2007 GAO report discussing the USGS issue and reviewed DOE documents detailing their actions to restore confidence in the scientific documents. We reviewed internal DOE documents regarding requirements management and interviewed the program's chief engineer in charge of resolving this issue. Finally, regarding staff turnover in key management positions, we reviewed OCRWM's strategic objectives, business plan, and project documents and interviewed OCRWM's director and other senior project managers about their efforts to improve succession planning.

As agreed with your office, unless you publicly announce the contents of this report, we plan no further distribution of it until 30 days from the date of this letter. At that time, we will send copies of this report to the appropriate congressional committees, the Secretary of Energy, the Chairman of the Nuclear Regulatory Commission, the director of the Office of Management and Budget, and other interested parties. We will

also make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or gaffiganm@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report were Richard Cheston, Casey Brown, Omari Norman, Alison O'Neill, and Daniel Semick.

Sincerely yours,

A handwritten signature in black ink that reads "Mark E. Gaffigan". The signature is written in a cursive, flowing style.

Mark E. Gaffigan
Acting Director, Natural Resources
and Environment

Appendix I: Comments from the Department of Energy



Department of Energy
Washington, DC 20585

QA: NA

July 26, 2007

Mr. Mark Gaffigan
Acting Director
Natural Resources and Environment
U.S. Government Accountability Office
Washington, D.C. 20548

Dear Mr. Gaffigan:

Thank you for the opportunity to review and provide comments on the draft Government Accountability Office (GAO) report entitled *YUCCA MOUNTAIN: DOE Has Improved Its Quality Assurance Program, But Whether Its Application for a NRC License Will Be High Quality Is Unclear*. We appreciate GAO's recognition of the Office of Civilian Radioactive Waste Management's (OCRWM) increased management focus on quality assurance improvements and the progress we have made in addressing issues identified in your March 2006 report.

OCRWM has taken numerous actions to ensure a high-quality license application that can be docketed will be submitted to the Nuclear Regulatory Commission (NRC) no later than June 30, 2008. We have established a cadre of personnel with substantial licensing, regulatory, and NRC experience. We have also fundamentally revised our approach to the license application by establishing a rigorous process approach to ensure the license application is a high-quality document based on sound science.

Personnel and Organization Changes

In July 2006, I announced four strategic objectives for the Program. One of these objectives is to design, staff, and train the OCRWM organization such that it has the skills and culture needed to design, license, and manage the construction and operation of the Yucca Mountain Project with safety, quality, and cost effectiveness. A Senior Executive Service-level individual, reporting directly to me, has been assigned as the project manager to plan and implement the organization's development. In part, this effort is intended to ensure that organizational culture changes will extend beyond my tenure.

In the meantime, OCRWM has substantially changed the offices and personnel responsible for developing the license application. We completed a transition of responsibility for the post-closure safety assessment from Bechtel SAIC Company, LLC (BSC), OCRWM's management and operating contractor, to Sandia National Laboratories (SNL), our designated lead laboratory. Sandia is managing all national



laboratory post-closure analysis and science work on the Yucca Mountain Project. BSC now focuses on its core competency of engineering design and pre-closure safety analysis. The top three license application individuals in OCRWM, BSC, and SNL are new hires since 2005, and each has significant utility and nuclear facility licensing experience.

OCRWM also has contracted with 12 nationally and internationally recognized nuclear safety experts who support OCRWM, BSC, and SNL. Finally, OCRWM established a license strategy team which includes Program participants, academia, private sector law firms, and former NRC executives.

Changes to Processes and Procedures

In early 2006, OCRWM projectized the license application by establishing a scope, cost, and schedule for license application development with clear quality criteria. An OCRWM project manager with nuclear engineering and nuclear safety expertise and proven nuclear project successes was selected to lead the project.

A license application development and review organization has been established with individuals experienced in engineering, science, and licensing. This organization is divided into surface design, subsurface design, pre-closure safety analysis, post-closure safety analysis, and programmatic. Each of these areas is further divided into 71 specific sections that are directly traceable to the NRC's NUREG 1804, *Yucca Mountain Review Plan*.

Nearly all the processes and procedures related to developing the license application have been revised over the past two years. OCRWM and its contractors have established a rigorous approach to developing the license application that was not employed with previous license application development efforts. The final license application is expected to contain nearly 10,000 pages of technical information.

The license application development process consists of four successive phases: a storyboard, an interim draft, a final draft, and a final license application section. Each phase is approved by the appropriate science, engineering, licensing, Navy Nuclear Propulsion Program, and Office of General Counsel staff prior to proceeding to the next phase. A total of 284 line management reviews by teams averaging 10 people each will be conducted. When a section proceeds to the final license application phase and is validated, it is ready for transmittal to the NRC, and only the OCRWM Director can authorize changes.

In summary, OCRWM has substantially modified the organizations; established rigorous license application development expectations, processes, and procedures that are maintained through configuration control; and hired national and international experts to assess the processes. We are confident that all these changes will result in a high-quality license application that is complete, docketable, and, ultimately, licenseable.

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If you have any questions, please contact me or Victor Trebules of my staff.
Mr. Trebules can be reached on 202-586-8793.

Sincerely,



Edward F. Sproat, III, Director
Office of Civilian Radioactive
Waste Management

Appendix II: Comments from the Nuclear Regulatory Commission



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 30, 2007

Mr. Mark Gaffigan, Acting Director
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, D.C. 20548

Dear Mr. Gaffigan:

Thank you for providing the U.S. Nuclear Regulatory Commission (NRC) the opportunity to review and comment on the U.S. Government Accountability Office's (GAO) draft report GAO-07-1010, "YUCCA MOUNTAIN - DOE Has Improved Its Quality Assurance Program, but Whether Its Application for a NRC License Will Be High Quality Is Unclear." The NRC staff has reviewed the draft report and generally agrees with GAO's findings and conclusions. Although we did not identify any significant issues regarding accuracy, completeness, and sensitivity of information, we have separately transmitted editorial comments to your staff. In addition, we have a comment on page 15 of the draft report, the first sentence of the second paragraph which states "...the commission staff began engaging in pre-licensing activities..." This statement should be clarified to indicate that it is the NRC staff, and not the personal staff of the Commission, who began engaging in pre-licensing activities.

If you have any questions regarding this response, please contact Lawrence E. Kokajko, Director of the Division of High-Level Waste Repository Safety. Mr. Kokajko can be reached by telephone at (301) 492-3165.

Sincerely,

A handwritten signature in black ink, appearing to read "Luis A. Reyes".

Luis A. Reyes
Executive Director
for Operations

cc: Casey Brown, GAO
Richard Cheston, GAO

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