United States Government Accountability Office

GAO

Testimony
Before the Subcommittee on Energy and Water Development and Related Agencies, Committee on Appropriations, House of Representatives

For Release on Delivery
Expected at 10 a.m. EDT
Thursday, April 11, 2013

COMMERCIAL SPENT NUCLEAR FUEL

Observations on the Key Attributes and Challenges of Storage and Disposal Options

Statement of Frank Rusco, Director
Natural Resources and Environment

April 11, 2013

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Highlights

Highlights of GAO-13-532T, a testimony before the Subcommittee on Energy and Water Development and Related Agencies, Committee on Appropriations, House of Representatives

Why GAO Did This Study

Spent nuclear fuel, the used fuel removed from commercial nuclear power reactors, is one of the most hazardous substances created by humans. Commercial reactors have generated nearly 70,000 metric tons of spent fuel, which is currently stored at 75 reactor sites in 33 states, and this inventory is expected to more than double by 2055. The Nuclear Waste Policy Act of 1982, as amended, directs DOE to investigate the Yucca Mountain site in Nevada—100 miles northwest of Las Vegas—to determine if the site is suitable for a permanent repository for this and other nuclear waste. DOE submitted a license application for the Yucca Mountain site to the Nuclear Regulatory Commission in 2008, but in 2010 DOE suspended its licensing efforts and instead established a blue ribbon commission to study other options. The commission issued a report in January 2012 recommending a new strategy for managing nuclear waste, and DOE issued a new nuclear waste disposal strategy in 2013.

This testimony is primarily based on prior work GAO issued from November 2009 to August 2012 and updated with information from DOE. It discusses the key attributes and challenges of options that have been considered for storage or disposal of spent nuclear fuel.

GAO is making no new recommendations at this time.

View GAO-13-532T. For more information, contact Frank Rusco at (202) 512-3841 or ruscof@gao.gov.

What GAO Found

In November 2009, GAO reported on the attributes and challenges of a Yucca Mountain repository. A key attribute identified was that the Department of Energy (DOE) had spent significant resources to carry out design, engineering, and testing activities on the Yucca Mountain site and had completed a license application and submitted it to the Nuclear Regulatory Commission, which has regulatory authority over the construction, operation, and closure of a repository. If the repository had been built as planned, GAO concluded that it would have provided a permanent solution for the nation's commercial nuclear fuel and other nuclear waste and minimized the uncertainty of future waste safety. Constructing the repository also could have helped address issues including federal liabilities resulting from industry lawsuits against DOE related to continued storage of spent nuclear fuel at reactor sites. However, not having the support of the administration and the state of Nevada proved a key challenge. As GAO reported in April 2011, DOE officials did not cite technical or safety issues with the Yucca Mountain repository project when the project's termination was announced but instead stated that other solutions could achieve broader support.

Temporarily storing spent fuel in a central location offers several positive attributes, as well as challenges, as GAO reported in November 2009 and August 2012. Positive attributes include allowing DOE to consolidate the nation's nuclear waste after reactors are decommissioned. Consolidation would decrease the complexity of securing and overseeing the waste located at reactor sites around the nation and would allow DOE to begin to address the taxpayer financial liabilities stemming from industry lawsuits. Interim storage could also provide the nation with some flexibility to consider alternative policies or new technologies. However, interim storage faces several challenges. First, DOE's statutory authority to develop interim storage is uncertain. Provisions in the Nuclear Waste Policy Act of 1982, as amended, that allow DOE to arrange for centralized interim storage have either expired or are unusable because they are tied to milestones in repository development that have not been met. Second, siting an interim storage facility could prove difficult. Even if a community might be willing to host a centralized interim storage facility, finding a state that would be willing to host such a facility could be challenging, particularly since some states have voiced concerns that an interim facility could become a de facto permanent disposal site. Third, interim storage may also present transportation challenges since it is likely that the spent fuel would have to be transported twice—once to the interim storage site and once to a permanent disposal site. Finally, developing centralized interim storage would not ultimately preclude the need for a permanent repository for spent nuclear fuel.

Siting, licensing, and developing a permanent repository at a location other than Yucca Mountain could provide the opportunity to find a location that might achieve broader acceptance, as GAO reported in November 2009 and August 2012, and could help avoid costly delays experienced by the Yucca Mountain repository program. However, developing an alternative repository would restart the likely costly and time-consuming process of developing a repository. It is also unclear whether the Nuclear Waste Fund—established under the Nuclear Waste Policy Act of 1982, as amended, to pay industry's share of the cost for the Yucca Mountain repository—will be sufficient to fund a repository at another site.

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Chairman Frelinghuysen, Ranking Member Kaptur, and Members of the Subcommittee:

I am pleased to be here today to discuss our work on issues related to the management of commercial spent nuclear fuel. Spent nuclear fuel—which has been used and removed from the reactor core of a commercial nuclear power plant—is considered one of the most hazardous substances on earth, and without protective shielding, its intense radioactivity can kill a person exposed directly to it within minutes, as well as cause environmental contamination and long-term health hazards, such as cancer, in those who receive smaller doses. As you know, the Nuclear Waste Policy Act of 1982 (NWPA) directed the Department of Energy (DOE) to investigate sites for a federal deep geologic repository to dispose of both civilian and defense-related spent nuclear fuel and other high-level nuclear waste.[1] DOE studied several sites throughout the country. In May 1986, the Secretary of Energy recommended three candidate sites for site characterization, including Yucca Mountain, Nevada, and in 1987, Congress amended the act to direct DOE to focus its efforts only on Yucca Mountain—a site about 100 miles northwest of Las Vegas.

DOE began studying the Yucca Mountain site as early as 1978 and has spent billions of dollars on this effort. Activities at the site have included investigating the characteristics of the site through surface, underground, and laboratory tests, as well as computer simulations; constructing a 25-foot diameter, 5-mile-long main tunnel, located 800 feet underground and a smaller tunnel nearly 2 miles long; and developing and submitting an application for a license to construct a nuclear waste repository. After submitting the license application in 2008 to the Nuclear Regulatory Commission, which has regulatory authority over the construction, operation, and closure of a repository, DOE took steps to terminate the Yucca Mountain repository program. DOE officials did not cite technical or safety issues with the Yucca Mountain site but stated that it was no longer a workable solution and that there are better solutions that can achieve a broader national consensus. DOE established the Blue Ribbon Commission on America's Nuclear Future in 2010 to review policies for

[1]This testimony concerns the disposal of civilian spent nuclear fuel (i.e., spent nuclear fuel that is periodically removed from commercial power reactors) and not defense-related spent nuclear fuel and other high-level waste from nuclear weapons production.

managing the back end of the nuclear fuel cycle, including nuclear waste management approaches. Staff from the commission consulted with us and used some of our prior work in their analysis.

In its January 2012 report, the Blue Ribbon Commission recommended a strategy for managing nuclear waste with eight key elements. These included a new, consent-based approach to siting future nuclear waste management facilities; a new organization, rather than DOE, dedicated solely to implementing the program and empowered with the authority and resources to succeed; and prompt efforts to develop facilities both for interim storage and final disposal of spent nuclear fuel. According to the commission's report, an interim storage site should be developed first and focus on the spent fuel that is stored at closed reactor sites where nothing exists at the site except for the spent nuclear fuel. At the same time, the nation could be developing a final repository, which is likely to take decades to develop but that needs to be started in conjunction with any interim plans. In January 2013, DOE issued a strategy for the management of spent nuclear fuel, which used the Blue Ribbon Commission's recommendations as a starting point and endorsed the commission's key principles. In summary, DOE's strategy includes a consent-based approach to siting and implementing a waste management system and consists of developing and making available a pilot interim storage facility by 2021, a larger interim storage facility by 2025, and a geologic repository by 2048. DOE's January 2013 spent nuclear fuel strategy also stated that legislation should include requirements for a third party to manage the nation's spent nuclear fuel program.

Over the past decade, we have issued several reports related to the management of spent nuclear fuel.[2] We assessed in the findings of these reports the safety and security of spent nuclear fuel; the benefits,

[2]For example, see GAO, Spent Nuclear Fuel: Options Exist to Further Enhance Security, GAO-03-426 (Washington, D.C.: July 15, 2003); GAO, Nuclear Waste Management: Key Attributes, Challenges, and Costs for the Yucca Mountain Repository and Two Potential Alternatives, GAO-10-48 (Washington, D.C.: Nov. 4, 2009); GAO, Yucca Mountain: Information on Alternative Uses of the Site and Related Challenges, GAO-11-847 (Washington, D.C.: Sept. 16, 2011); GAO, Commercial Nuclear Waste: Effects of a Termination of the Yucca Mountain Repository Program and Lessons Learned, GAO-11-229 (Washington, D.C.: April 8, 2011); and GAO, Spent Nuclear Fuel: Accumulating Quantities at Commercial Reactors Present Storage and Other Challenges, GAO-12-797 (Washington, D.C.: Aug. 15, 2012).

challenges, and costs of the Yucca Mountain repository and two potential alternatives; lessons learned from the past 30 years of spent nuclear fuel management; alternative uses of the Yucca Mountain site and related challenges; and the challenges of accumulating quantities of spent nuclear fuel at reactor sites. This testimony is primarily based on prior work GAO issued from November 2009 to August 2012 and updated with information from DOE. It discusses the key attributes and challenges of options that have been considered for storage or disposal of spent nuclear fuel. A detailed description of our methodologies can be found in our published reports. We conducted the performance audit work that supports this testimony in accordance with generally accepted government auditing standards. Those standards require that we plan and perform audits to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Since the publication of a 1957 report by the National Academy of Sciences,[3] a geologic repository has been considered the safest and most secure method of isolating spent nuclear fuel and other types of nuclear waste from humans and the environment.[4] During the 1950s and 1960s, managing spent nuclear fuel received relatively little attention from policymakers. The early regulators and developers of nuclear power viewed spent fuel disposal primarily as a technical problem that could be solved when necessary by application of existing technology. Attempts were made to reprocess the spent nuclear fuel, but they were not

[3]National Academy of Sciences, *The Disposal of Radioactive Waste on Land* (Washington, D.C.: September 1957). This report suggested several potential alternatives for disposal of spent nuclear fuel, stressing that there are many potential sites for geologic disposal of spent fuel at various depths and in various geologic formations. Subsequent reports by the National Academy of Sciences and others have continued to endorse geologic isolation of spent nuclear fuel and have suggested that engineered barriers, such as corrosion-resistant containers, can provide additional layers of protection to such sites. International consensus also supports geologic disposal.

[4]In addition to commercial spent nuclear fuel, DOE manages about 13,000 metric tons of defense-related spent nuclear fuel and other high-level waste—primarily generated by the nation's nuclear weapons program. We issued a separate report on the impacts of terminating Yucca Mountain on the spent nuclear fuel and high-level waste managed by DOE. See GAO, *DOE Nuclear Waste: Better Information Needed on Waste Storage at DOE Sites as a Result of the Yucca Mountain Shutdown*, GAO-11-230 (Washington, D.C.: Mar. 23, 2011).

successful because of economic issues and concerns that reprocessed nuclear materials raised proliferation risks. The Atomic Energy Commission, a predecessor to DOE, attempted to develop high-level waste repositories in Kansas and New Mexico in the late 1960s and early 1970s, but neither succeeded because of local community and state opposition. NWPA established the disposal of spent nuclear fuel and high-level nuclear waste as a federal responsibility. Briefly, NWPA provided for the development of two geologic repositories and directed the Secretary of Energy to recommend three candidate sites and conduct studies to characterize each site. This same process was to be used for a second set of sites for the second repository. Table 1 summarizes some of the key decisions and events just prior to and as a result of NWPA.

Table 1: Summary of Key Decisions and Events Related to Spent Nuclear Fuel Management

Year	Summary of key decision or event
1978	As part of the National Waste Terminal Storage program, DOE began exploring Yucca Mountain, one of more than 25 sites that were being examined.
1983	The President signed the Nuclear Waste Policy Act of 1982 (NWPA), which directed the DOE to investigate sites for a federal deep geologic repository to dispose of spent nuclear fuel and other high-level waste. The act also authorized DOE to contract with commercial nuclear reactor operators to take custody of their spent nuclear fuel for disposal at the repository beginning in January 1998.
1983	DOE initially considered nine sites for the first repository; six of these were in the West, and three were in the South.
1984	DOE issued draft environmental assessments on all nine sites for the first repository.
1984	DOE issued general guidelines (with the concurrence of the Nuclear Regulatory Commission and after public review and comment) to be used by the Secretary of Energy in considering candidate sites for recommendation.
1986	Of the nine sites for the first repository, the Secretary nominated five sites (Richton Dome, MS; Yucca Mountain, NV; Deaf Smith County, TX; Davis Canyon, UT, and Hanford, WA) as suitable for site characterization. Each nomination was accompanied by an environmental assessment, as required by NWPA.
1986	Of the five nominations for the first repository, DOE recommended to the President three candidate sites for characterization: Yucca Mountain, NV; Deaf Smith County, TX; and Hanford, WA. The recommendation document stated that DOE assessed the sites using 14 performance measures including health and safety of the public and workers, environmental and socioeconomic factors, and repository and transportation costs. Yucca Mountain was the top-ranked site; the site that would cause, in aggregate, the least adverse impact.
1987	Congress amended NWPA to direct DOE to investigate only Yucca Mountain for a permanent repository. NWPA, as amended, authorized DOE to perform studies to determine if the Yucca Mountain site was suitable for a repository and make a site recommendation to the President if it met certain requirements. The amendments also directed the phaseout of funding for all research programs designed to evaluate the suitability of crystalline rock, which DOE had been studying for the second repository.
1987 - 1998	DOE continued to study the Yucca Mountain site.
1998	DOE was unable to begin taking custody of spent nuclear fuel in 1998 because of a series of delays due to, among other things, state and local opposition to the construction of a permanent nuclear waste repository in Nevada and technical complexities. However, DOE issued a viability assessment stating that Yucca Mountain was still a viable alternative.

Year	Summary of key decision or event
2002	As per the process outlined in NWPA, DOE recommended to the President approval of the Yucca Mountain site as a repository for spent nuclear fuel. The then-President subsequently recommended the site as suitable for a repository to Congress. The Governor of Nevada submitted a notice of disapproval to the Congress, and Congress effectively overrode the disapproval by voting to approve the site for the development of a permanent, high-level waste repository.
2008	DOE submitted a license application to the Nuclear Regulatory Commission for the construction of a permanent repository at Yucca Mountain.
2009	DOE announced plans to terminate its licensing efforts on Yucca Mountain.
2010	DOE terminated its efforts on Yucca Mountain and undertook an ambitious set of steps to dismantle the Yucca Mountain program by September 30, 2010: DOE took steps to preserve scientific and other data, eliminated the jobs of all federal employees working on the program, terminated program activities by contractors, and disposed of property from its Las Vegas offices by declaring the property abandoned.
2011	The Nuclear Regulatory Commission terminated its licensing efforts on Yucca Mountain.

Source: GAO analysis of DOE documents.

In the Secretary of Energy's February 2002 recommendation to the President that Yucca Mountain be developed as the site for an underground repository for spent fuel and other radioactive wastes, the Secretary described the three criteria to make the determination that Yucca Mountain was the appropriate site. Specifically:

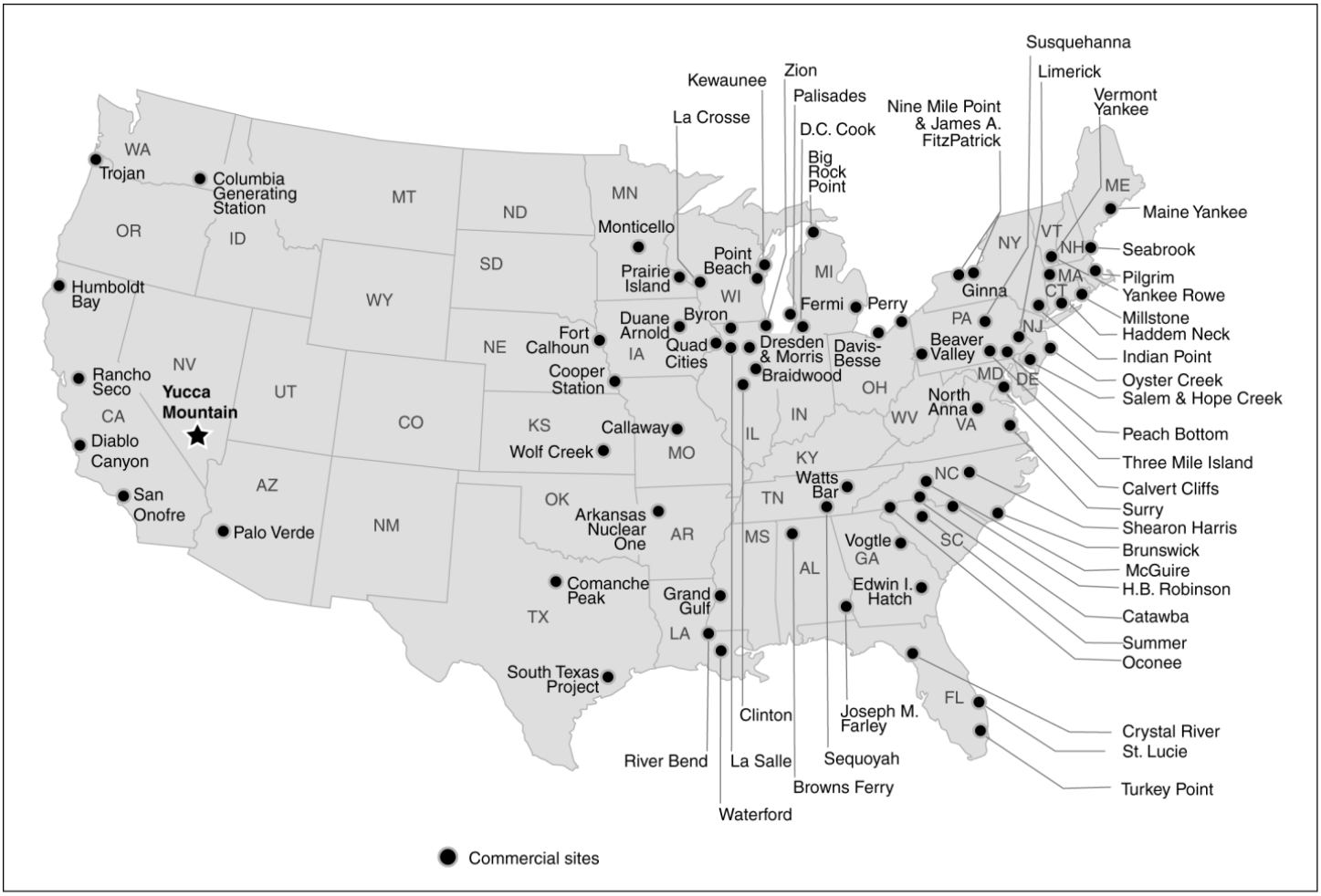
- Is Yucca Mountain a scientifically and technically suitable site for a repository?
- Are there compelling national interests that favor proceeding with the decision to site a repository there?
- Are there countervailing considerations that would outweigh those interests?

The Secretary also described the steps DOE had taken to inform residents and others. Specifically, DOE held meetings in the vicinity of the prospective site to inform the residents of the site's consideration as a repository and receive their comments, as directed by NWPA. The Secretary added that DOE went beyond NWPA's requirements for providing notice and information prior to the selection of Yucca Mountain. He concluded that the Yucca Mountain site was qualified as the site for the repository and accordingly recommended the site to the President.

Since the Secretary's recommendation was made, the nation's inventory of commercial spent nuclear fuel has continued to grow. The nation currently has about 70,000 metric tons of commercial spent nuclear fuel stored at 75 sites in 33 states (see fig. 1). This inventory is expected to more than double by 2055—assuming that the nation's current reactors continue to produce spent nuclear fuel at the same rate and that no new reactors are brought online, and that some decline in the generation of

spent fuel takes place as reactors are retired. Although some elements of spent nuclear fuel cool and decay quickly, becoming less dangerous, others remain dangerous to human health and the environment for tens of thousands of years.

Figure 1: Current Storage Sites for Commercial Spent Nuclear Fuel



Source: DOE.

Note: Locations are approximate. DOE has reported that it is responsible for managing nuclear waste at 121 sites in 39 states, which includes high-level waste from nuclear weapons production and spent nuclear fuel at 5 sites managed by DOE—2 of which are licensed by the Nuclear Regulatory Commission and contain commercial spent nuclear fuel, at Fort St. Vrain in Colorado, and at the Idaho National Laboratory—and several sites that have only research reactors that generate small amounts of waste that will be consolidated at the Idaho National Laboratory for packaging prior to disposal.

Most commercial spent nuclear fuel is stored at operating reactor sites; it is immersed in pools of water designed to cool and isolate it from the environment. Without a nuclear waste repository to move the spent nuclear fuel to, the racks in the pools holding spent fuel have been rearranged to allow for more dense storage of the spent fuel. Even with this rearrangement, spent nuclear fuel pools are reaching their capacities. As reactor operators have run out of space in their spent nuclear fuel pools, they have turned increasingly to dry cask storage systems that generally consist of stainless steel canisters placed inside larger stainless steel or concrete casks. A dry storage facility typically consists of security and safety mechanisms, such as a defensive perimeter with intrusion detection devices and radiation monitors surrounding a concrete pad with the dry storage casks emplaced on it. Regulatory requirements for radiation exposure for this type of facility are significantly different from those of a repository. For example, spent fuel need only be stored safely for the life of the storage facility, currently 40 years, which is in contrast to the 1 million year period for which safe storage must be demonstrated under the Environmental Protection Agency regulation promulgated for the Yucca Mountain repository. In August 2012, we reported that reactors at nine sites have been retired and that seven of these sites have completely removed spent fuel from their pools, as well as removing all infrastructure except that needed to safeguard the spent fuel. Since then, an eighth site has also emptied its pool, and is in the process of removing associated infrastructure. These sites serve no other purpose than to continue storing this spent fuel. As additional reactors retire, reactor operators will likely move all their spent nuclear fuel to dry storage and remove all other structures. We reported in November 2009 that experts we spoke with stated that dry cask storage systems are expected to be able to safely store spent nuclear fuel for at least 100 years.[5] The experts said that, if these systems degrade over time, the spent nuclear fuel may have to be repackaged, which could require construction of new spent nuclear fuel pools or other structures to safely transfer the spent nuclear fuel to new storage systems. In addition, the experts said that spent fuel in centralized interim storage could present future security risks because, as spent fuel cools, it loses some of its self-protective qualities, potentially making it a more attractive target for sabotage or theft.

[5]GAO-10-48.

NWPA also authorized DOE to contract with commercial nuclear reactor operators to take custody of their spent nuclear fuel for disposal at the repository beginning in January 1998. Ultimately, DOE was unable to meet this 1998 date. As we reported in August 2012,[6] because DOE did not take custody of the spent fuel starting in 1998, as required under NWPA, DOE reported that, as of September 2011, 76 lawsuits had been filed against it by utilities to recover claimed damages resulting from the delay. In August 2012, we reported that these lawsuits have resulted in a cost to taxpayers of about $1.6 billion from the U.S. Treasury's judgment fund. We also reported that DOE estimated that future liabilities would total about an additional $21 billion through 2020.[7] In November 2012, DOE reported that the cost to taxpayers is now $2.6 billion and that future liabilities are now approximately $19.7 billion for a total of about $22.3 billion. DOE has also estimated that future liabilities may cost about $500 million each year after 2020.

Attributes and Challenges of the Yucca Mountain Repository

In November 2009, we reported on the attributes and challenges of a Yucca Mountain repository.[8] We reported that DOE had spent billions of dollars for design, engineering, and testing activities for the Yucca Mountain site and had submitted a license to the Nuclear Regulatory Commission. If the repository had been built as planned, we stated that it would have provided a permanent solution for the nation's nuclear waste, including commercial nuclear fuel, and would have minimized the uncertainty of future waste safety. Based on a review of key documents and interviews with DOE, Nuclear Regulatory Commission, and numerous other officials, we also reported in November 2009 that the construction of a repository at Yucca Mountain could have allowed the government to begin taking possession of the nuclear waste in about 10 to 30 years. DOE had reported in July 2008 that its best achievable date for opening the repository, if it had received Nuclear Regulatory Commission approval, would have been 2020. If the Yucca Mountain repository was completed and operational sooner than one or more temporary storage facilities or an alternative repository, it could have helped address the federal liabilities resulting from industry lawsuits

[6]GAO-12-797.

[7]GAO 12-797.

[8]GAO-10-48.

related to continued storage of spent nuclear fuel at reactor sites. We also reported in August 2012 that states and community groups had raised concerns that the Nuclear Regulatory Commission was extending the licenses of current reactors or approving licenses for new reactors without a long-term solution for the disposition of spent nuclear fuel.[9] If Yucca Mountain was licensed and constructed and began accepting spent nuclear fuel for disposal by 2027, which was the earliest likely opening date we estimated in our August 2012 report, some of these concerns could have been addressed.

However, we reported in November 2009 that the Yucca Mountain repository also faced challenges. The key challenge that we reported was that the repository did not have the support of the administration or the state of Nevada. Although the President in 2002 recommended the Yucca Mountain site for a repository, by 2010, the President's fiscal year 2011 budget submission proposed eliminating all funding for the repository. In April 2011, we reported that DOE officials did not cite technical or safety issues with the Yucca Mountain repository project when the project's termination was announced.[10] Instead officials stated that other solutions could achieve broader support. The state of Nevada and other groups that oppose the Yucca Mountain repository have raised technical points, site-specific concerns, and equity issues. These efforts to delay or terminate the repository could continue if the licensing process were resumed. For example, the state of Nevada had previously denied the water rights DOE needs for construction of a rail spur and facility structures at Yucca Mountain. DOE officials told us that constructing the rail line or the facilities at Yucca Mountain without those water rights would be difficult. Second, as we reported in April 2011, DOE could also

[9]In December 2010, the Nuclear Regulatory Commission issued a determination and associated rule stating that spent fuel can be safely stored for up to 60 years beyond the licensed life of the reactor, or up to 120 years. Four states, an Indian community, and environmental groups petitioned for review of the Nuclear Regulatory Commission's rule, however, arguing in part that the commission violated the National Environmental Policy Act by failing to prepare an environmental impact statement in connection with the determination. On June 8, 2012, the U.S. Court of Appeals for the District of Columbia Circuit held that the rulemaking required either an environmental impact statement or a finding of no significant environmental impact and remanded the determination and rule back to the Nuclear Regulatory Commission for further analysis. The commission is conducting an environmental review and is not approving any new licenses or license extensions until the review is complete.

[10]GAO-11-229.

face challenges in reconstituting its work force. According to DOE, contractor, and former DOE officials we spoke with, it could take years for DOE to assemble the right mix of experts to restart work on the license application. When DOE terminated its licensing efforts, many of the federal and contractor staff working on the program retired or moved on to other jobs. Third, project funding could continue to be a challenge. As we reported, DOE's budget for the Yucca Mountain repository program was not predictable because annual appropriations varied by as much as 20 percent from year to year. We recommended that Congress consider a more predictable funding mechanism for the project, which the Blue Ribbon Commission also recommended in its January 2012 report.

Attributes and Challenges of Centralized Interim Storage

We reported in November 2009 on several positive attributes of centralized interim storage—a near-term temporary storage alternative for managing the spent fuel that has accumulated and will continue to accumulate. First, centralized interim storage could allow DOE to consolidate the nation's nuclear waste after reactors are decommissioned, thereby decreasing the complexity of securing and overseeing the waste located at reactor sites around the nation and increasing the efficiency of waste storage operations. Second, by moving spent nuclear fuel from decommissioned reactor sites to DOE's centralized interim storage facility and taking custody of the spent fuel, DOE would begin to address the taxpayer financial liabilities stemming from industry lawsuits. Third, centralized interim storage could prevent utilities from having to build additional dry storage to store nuclear waste at operating reactor sites. Fourth, centralized interim storage could also provide the nation with some flexibility to consider alternative policies or new technologies by giving more time to consider alternatives and implement them. For example, centralized interim storage would keep spent fuel in a safe, easily accessible configuration for future recycling, if the nation decided to pursue recycling as a management option in the future.

However, centralized interim storage also presents challenges. First, as we reported in November 2009 and August 2012, a key challenge confronting centralized interim storage is the uncertainty of DOE's statutory authority to provide centralized storage.[11] Provisions in NWPA

[11]GAO-10-48 and GAO-12-797.

that allow DOE to arrange for centralized storage have either expired or are unusable because they are tied to milestones in repository development that have not been met. It is not clear what other authority DOE or an independent entity might use for providing centralized interim storage of spent nuclear fuel. A second, equally important, challenge is the likelihood of opposition during site selection for a centralized interim storage facility. As we reported in November 2009, even if a community might be willing to host such a facility, finding a state that would be willing to host it could be extremely challenging, particularly since some states have voiced concerns that a centralized interim facility could become a de facto permanent disposal site. In 2011, the Western Governors Association passed a resolution stating that no centralized interim storage facility for spent nuclear fuel can be established in a western state without the expressed written consent of the governors. Third, centralized interim storage may also present transportation challenges. As we reported in August 2012, it is likely that the spent fuel would have to be transported twice—once to the centralized interim storage site and once to a permanent disposal site. The total distance over which the spent fuel would have to be transported would likely be greater than with other alternatives. The Nuclear Energy Institute has reported that of all the spent fuel currently in dry storage, only about 30 percent is directly transportable because of its current heat load, particularly since the nuclear industry packaged some spent nuclear fuel in dry storage containers to maximize storage capacity. We also reported in August 2012 that officials from a state regional organization that we spoke with said that transportation planning could be a complex endeavor, potentially taking 10 years to reach agreement on transportation routes and safety and security procedures. Fourth, although DOE had previously estimated that it could site, license, construct, and begin operations of a centralized interim storage facility within 6 years, it could take considerably longer depending on how long it takes to find a willing state and community, as well as license and construct the facility. Finally, as we reported in November 2009, developing centralized interim storage would not ultimately preclude the need for final disposal of the spent nuclear fuel.

Attributes and Challenges of a Permanent Repository at a Location Other Than Yucca Mountain

As we reported in November 2009, siting, licensing, and developing a permanent repository at a location other than Yucca Mountain could provide the opportunity to find a location that might achieve broader acceptance than the Yucca Mountain repository program. If a more widely accepted approach or site is identified, it carries the potential for avoiding costly delays experienced by the Yucca Mountain repository program. In addition, a new approach that involves a new entity for spent fuel management, as we concluded in our April 2011 report and the Blue Ribbon Commission recommended in January 2012, could add to transparency and consensus building.

However, there are also key challenges to developing an alternative repository. First, as we reported in April 2011,[12] developing a repository other than Yucca Mountain will restart the likely time-consuming and costly process of siting, licensing, and developing a repository. We reported that DOE had spent nearly $15 billion on the Yucca Mountain project.[13] It is not yet clear how much it will ultimately cost to begin the process again and develop a repository at another location. Moreover, it is uncertain what legislative changes might be needed, if any, in part because the Nuclear Waste Policy Act, as amended, directs DOE to terminate all site specific activities at candidate sites other than Yucca Mountain. Second, it is unclear whether the Nuclear Waste Fund will be sufficient to fund a repository at another site. The fund was established under NWPA to pay industry's share of the cost for the Yucca Mountain repository and was funded by a fee of one-tenth of a cent per kilowatt-hour of nuclear-generated electricity. The fund paid about 65 percent, or about $9.5 billion, of the expenditure for Yucca Mountain. According to DOE's fiscal year 2012 financial report, the Nuclear Waste Fund currently has about $29 billion and grows by over $1 billion each year from accumulated fees and interest. However, utilities only pay into the fund for as long as their reactors are operating, and it is not clear how much longer reactor operators will be paying into the fund. For example, two utilities have announced plans—one in 2010 and the other in 2013—to shut down two reactor sites prior to their license expiration. As reactors are retired, they will need to be replaced by new reactors paying into the fund, or according to DOE officials, the fund might be drawn down faster than it can be replenished when developing a new repository.

[12]GAO-11-229.

[13]In 2010 dollars. GAO-11-229.

When more comprehensive information becomes available both about the process that DOE, or another agency, will be using to select a site and possible locations for a permanent repository, additional positive attributes as well as challenges may also come to light.

Chairman Frelinghuysen, Ranking Member Kaptur, and Members of the Subcommittee, this completes my prepared statement. I would be pleased to respond to any questions you may have at this time.

GAO Contact and Staff Acknowledgments

If you or your staff members have any questions about this testimony, please contact me at (202) 512-3841 or ruscof@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Janet Frisch, Assistant Director, and Kevin Bray, Robert Sánchez, and Kiki Theodoropoulos made key contributions to this testimony.