Consolidated Storage for Spent Nuclear Fuel from Decommissioned Commercial Sites

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to the

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Blue Ribbon Commission on America's Nuclear Future

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Good morning, members of the Commission. Thank you for the opportunity to discuss the need for action by the federal government or other parties in cooperation with the federal government to remove spent nuclear fuel from shutdown reactor sites and consolidate it at a state of the art storage installation pending the final fulfillment of policy of the Nuclear Waste Policy Act, whether it be burial in a geologic repository, another disposal method or for recycling/ reprocessing. Since there has been no decision on the means of disposing or further reclamation of energy from the "spent" or used nuclear fuel under the mandate of the NWPA or any other law, there is also no schedule for when the spent fuel will be removed from any of the 104 active commercial reactors or the 14 shutdown reactors. It is only speculation on my part that unless there is a dramatic change in the civilian radioactive waste management program, I do not foresee movement of spent fuel to a disposal or reprocessing facility any sooner than 2030.

This delay from the date of January 1998 set in the NWPA and memorialized in contracts with each of the owners of commercial nuclear reactors to have begun acceptance by the Department of Energy (DOE) for transport to a geologic repository has caused the owners extra expenses for the added storage of the spent fuel past the time they had expected from their contracts with DOE. Just about all of those owners have sued in federal courts or will do so to seek compliance with the terms of the contracts or compensation for damages. The United States Court of Federal Claims has determined that the Government is liable for damages due to the delayed acceptance. Individual cases are being reviewed and judgments handed down, as the Commission was briefed at the initial meetings in March.

For many of the owners, knowing that their expenses to expand pool storage capacity or add dry cask storage capacity will be compensated in court or through settlements seems to have become manageable in most instances. But, there is a cohort of owners for which the delay places a different hardship. These are the owners of the ten shutdown reactors at nine sites that have shutdown for economic or other reasons and are either dismantled or are planned to

be as they head toward decommissioning as required by the Nuclear Regulatory Commission (NRC.) But full decommissioning cannot be completed because the spent fuel remains, mostly in dry casks, but in three instances fuel remains in cooling pools. Until DOE removes this fuel, the storage must be safely managed in accordance with NRC license requirements and the storage facilities and other facilities necessary for performance monitoring and security must remain in place. Because the decommissioning cannot be completed, the property cannot be put back into other economic uses. To varying degrees, this uncertainty either impedes return of the property to productive community use and/or increases the concern about when the Government is ever going to honor its obligation to remove the used fuel.

It is the recommendation of the National Association of Regulatory Utility Commissioners (NARUC) that the spent fuel from these nine decommissioned reactor sites be removed and consolidated at a single site once it is licensed and ready to safely receive and store that material until DOE is ready to move it once again to a disposal or reprocessing facility. DOE can be charged with leading, planning, seeking licenses and permits, constructing and operating the facilities and transporting the used fuel to it, or it can cooperate with other parties with the capability and interest in managing the facilities. DOE would need to be involved because:

- DOE would need to interface with the owners with which it has contracts and would probably retain title to the fuel once it is accepted.
- DOE or another party can conduct the transportation under federal regulations.
- DOE would have to budget for and pay for its own expenses or those of the storage facility operator.
- DOE would likely need to ensure compliance with the National Environmental Policy Act (NEPA.)

We further recommend and, dare I say, urge that the Commission not wait until the rest of your findings and draft recommendations are ready next July, but instead report to the Secretary by this fall that:

> The Commission has examined the special circumstances of nine sites where the reactors have shut down but the associated spent fuel remains on the sites and prevents the site from final decommissioning and reclamation of the property for other productive use. The Commission supports removal of that spent fuel and consolidation in a location that is better suited and optimally designed to NRC safety and security standards. Such consolidation makes good sense, is likely more economic and the Commission foresees no conflict between this consolidated storage and any likely recommended disposition the Commission is likely to recommend. Thus, DOE can begin a planning process without having to wait for the final report of the Commission and lead to movement of the fuel sooner.

Taking such an action now, will allow DOE to begin a planning process with owners, communities, possibly other parties who may seek to be the consolidated facility licensee and operator and with potential site hosts. Since DOE has stated it lacks authority to store commercial spent fuel, this early Commission action can cause DOE to seek legislation from Congress with the FY 2012 Budget cycle.

What is the Extent of the Need for Consolidation?

The focus of this proposal is to move the spent fuel from shutdown commercial reactors where there is no adjacent operating reactor. There are nine sites with ten shutdown reactors in eight States, see Table 1 for listing. Not included are some other shutdown reactors at Indian Point, Three Mile Island, Millstone, San Onofre or Shoreham. The nine sites are similar to the former Maine Yankee site at Wiscasset where the power plants have been dismantled and all that remains is the spent fuel storage and other infrastructure for management and security associated with it.

We also would suggest a survey be done among owners of active reactors to "means test" for any other situation that might make that site eligible for special consideration in a consolidated storage facility.

It is the premise of this proposal that it would be more economical to consolidate and manage the spent fuel at a central location than to manage it at nine or more scattered sites. We are unaware of any of these sites being designed for dry cask storage since that technology was developed out of necessity when it became apparent that the repository would not be ready to accept spent fuel in 1998. They were likely developed on an ad hoc basis. In contrast, the consolidated facility could be selected on a better set of selection criteria and would be required to meet 21st century state of the art safety and security requirements. There are 2813 metric tons (MTHM) of spent fuel at the nine sites.

If the fuel from the nine sites were consolidated, it would reduce the number of reactor storage sites to 64.

2008 DOE Report to Congress on Interim Storage

In the House Appropriations Committee report accompanying the FY 2008 Appropriations for the civilian radioactive waste management program, DOE was asked to develop a plan to take custody of the spent fuel from the decommissioned reactor sites and consolidate it at an existing federal site, one or more operating reactor sites or at a competitively-selected storage site chosen from among eleven sites where various local organizations had expressed an interest in having facilities associated with an earlier Global Nuclear Energy Partnership initiative. DOE submitted their report to Congress in December 2008.[i]

If communities such as Wiscasset were even aware of the report it would not have been through contact with DOE before, during or after the report was made. It is our understanding

that no contact was made with any of the nine communities in which these storage sites are located nor was there any contact with the owners with which DOE has contracts that call for the government to remove the spent fuel.

Far from seeing the report as an opportunity to remove the spent fuel from these sites, the report dwells on the opinion by DOE that the Department lacks the authority to "store" commercial spent fuel. Indeed, the NWPA states that owners of reactors have the primary responsibility for providing interim storage of spent fuel[ii], although the NWPA also had provisions for an away-from-reactor interim storage program for 1,900 metric tons, but that authority expired in 1990. But, of course, the NWPA and standard contracts with each reactor owner also promised waste acceptance for geologic disposal beginning in 1998 as well.

After presenting the arguments that DOE lacked the authority to develop a consolidated storage facility for its customers with decommissioned reactors, the report then turned to reasons why the agency would rather not pursue that course:

- With all the preparation needed to develop an interim storage facility (for which no planning had been done before) the permanent repository would be ready nearly as fast
- As with Yucca Mountain, there would likely be opposition to the site which would lead to delays and be a distraction
- While not explaining why, the report concluded that the Nuclear Waste Fund would be used for the consolidated facility in which case it would compete for funds with the repository, leading to further delays
- The report alluded to the possibility of a "negative impact" on the fee adequacy, without showing any calculations
- The report speculated that there could be additional litigation from other spent fuel owners if the decommissioned spent fuel were given priority out of sequence from the oldest fuel first basis of the standard contracts

The conclusion one could draw from the report is that it reluctantly "answered the mail," but DOE did not see the proposition as an opportunity to solve a problem for its customers nor to help lead to the final decommissioning and release of property to other beneficial uses for the adjoining communities. There was no public input nor was there broad distribution of the report beyond providing it to Congress. For its part, Congress took no follow-up action.

Elements of the DOE Plan

The report outlines the needed steps from planning, siting, licensing, construction, transportation and storage, spanning from 2009 through 2027 with further transport from the interim storage facility to the repository beginning in 2025 for three years. Cost estimates for each function are included for each year as shown in Table 3, with a total of $743 million, although whether that is in constant or discounted dollars is not indicated.

The report discusses siting at the three types of locations suggested in the tasking:

1. Existing Federal Site. DOE or other federal sites could likely be well suited with infrastructure, but it could be difficult importing waste from other sites to the three otherwise well suited sites (Hanford, Idaho National Laboratory and the Savannah River Sites) where DOE was to have removed some waste and there are consent agreements to that effect. The Governor of Washington expressed quite plainly at the Commission meeting in July how that State views the prospect of bringing more waste to Hanford.

2. Existing Operating Reactor Sites. The report indicated DOE could solicit expressions of interest from operating sites to see if any would volunteer to host additional spent fuel, but presented a potential obstacle in that under NRC regulations reactor operators are licensed to possess only that quantity of spent fuel "as required to operate their reactors." To modify the license would require public hearings which could be contentious.

3. Competitively Selective Sites. DOE acknowledged that there were expressions of interest in hosting GNEP facilities from communities, industry and partnerships of both. It is an open question of whether the interest shown in hosting a potential reprocessing facility with substantial capital investment and good paying jobs also translates into being a host to waste storage alone.

Riley's Law of Nuclear Waste Storage

Former South Carolina Governor Richard Riley expressed the aversion to having nuclear waste storage, by stating, "Nuclear waste tends to stay where you put it last." This is NIMBY phenomena which is seemingly a dominant factor in siting facilities that people (and their elected representatives and the media) are quick to invoke. There are several particular concerns that must be dealt with in terms of interim storage of spent nuclear fuel:

a. Distrust of the Federal Government. It is particularly evident in some Western States where the federal government owns or controls lands, that there is a skeptical or even hostile attitude over actions taken or proposed by the federal government. This was once called the Sagebrush Rebellion and it was evident in the Yucca Mountain case.

b. How Can We be Sure Storage is Temporary? Aside from having no nuclear power plants of their own, this seemed to be the concern in Utah when the Private Fuel Storage interim storage facility was proposed in Skull Valley. Utah was well aware that neighboring Nevada was opposed to Yucca Mountain and that if the PFS facility was built and spent fuel brought in for temporary storage, what would happen if Yucca was not built? A 2001 joint report by Harvard and the University of Tokyo, *Interim Storage of Spent Nuclear Fuel*[iii], put it well, saying, "Interim storage is likely to be difficult to implement as well, since potential hosts will ask the central question: what is the final destination for spent fuel?" The report concluded, **"To be fully credible, interim storage must be a part of a comprehensive plan for managing spent fuel."**

2009 GAO Report on Nuclear Waste Management

If the Commission has any interest in cost of interim storage you may wish to consult a GAO Report on Nuclear Waste Management in November 2009 at the request of Senators Harry Reid, Barbara Boxer and John Ensign that examined "key attributes, challenges and costs for the Yucca Mountain repository and two potential alternatives." The report is cautious in discouraging comparisons among the alternatives because they have different assumptions. For example, the report used a cost model to estimate costs from $23 billion to $81 billion to provide central storage of 153,000 metric tons for 100 years followed by geologic disposal. in another scenario it estimated $12 to $20 billion to store 70,000 metric tons for 100 years without disposal. The appendices give some useful unit cost factors.

Cost in Perspective

The Congressional Budget Office (CBO)[iv] now estimates the potential liability for damages for the failure of DOE to fulfill its obligation to begin waste acceptance in January 1998 will total $13.1 billion if DOE were to begin waste acceptance in 2021. DOE has previously used a figure of $500 million annually for each additional year of delay. All damage awards and settlement agreements are paid from the Judgment Fund (taxpayers) rather than the Nuclear Waste Fund (ratepayers.)

If we accept the DOE estimate of $743 million for the cost of transportation and consolidated storage for 2813 metric tons through 2027 (actually over a 19 year span from initial year) that figure approximates the $770 million in total fees paid each year to the Nuclear Waste Fund. While our State utility commissioners are opposed to having the money collected from ratepayers used to "pay for the government's avoidable delay," most take a more practical viewpoint and would agree that if one year's worth of fees will consolidate the spent fuel from these nine sites and free up those sites for decommissioning and return to productive use, that would be a worthwhile tradeoff. Besides, it does not get funded all at once (see Table 3) as the peak spending year calls for $123 million in the seventh year.

Who Should be in Charge?

Recognizing that the Commission Subcommittees are each to consider what entity should have responsibility for implementation of whatever activities the Commission recommends, here is a discussion of some alternatives included in the DOE report and some others.

The choices that might be considered for the task of developing and managing a consolidated storage could include:

1. DOE. It appears that the Office of Civilian Radioactive Waste Management (OCRWM), set up under the NWPA to manage the repository program is all but disbanded. Residual functions are being divided up among other DOE organizations, with the plan for the

Office of Nuclear Energy to be assigned to implement the disposal strategy that the Commission recommends and the Administration decides. To move forward on the relatively small-scale consolidation project, we are impressed with the capability to plan and implement the DOE consolidated storage project if it was assigned to the Office of Environmental Management. EM has demonstrated project management skills, contracting experience and is accustomed to community relations. The organization has coordinated some radioactive waste shipments and has worked with State and local governments. We would expect DOE would accept and retain title to the spent fuel.

2. Public-Private Partnership. Under the volunteer community and/or industry approach suggested in the congressional tasking, the site selection and licensing actions would be handled by the non-federal entity. DOE would still need to be involved in coordinating the transfer of title for the fuel, arranging and possibly conducting the transport and working out which entity retains title to the fuel. The Nuclear Energy Institute has been seeking interest from communities which may be potential hosts to a central interim storage facility.

3. A New Fedcorp. There have been suggestions over the years that a new quasi-governmental organization be created along the lines of what seems to be having success in Sweden, Finland and Canada. In May of this year, Senator Voinovich introduced a very comprehensive bill (S.3322)[v] that would create a United States Nuclear Fuel Management Corporation to "support all options for a long-term nuclear fuel cycle." It might take longer to get this new organization established since it is a sweeping change from the past repository-focused, government organization. On the other hand if a new used fuel management organization were to be created, developing a consolidated storage facility for decommissioned site fuel could be a good first project to start with. Under the so-called "Fedcorp" approach of the Voinovich bill, the new organization would assume the Secretary of Energy's responsibilities under the NWPA (although the bill seeks to amend the Atomic Energy Act.)

The PFS Example

Yucca Mountain was not the only proposed nuclear waste project to encounter political opposition in recent years. When it became apparent that the repository was not going to be ready to accept commercial spent nuclear fuel in 1998, a group of reactor owners looked into what they might do to adapt to the continued prospects of delay. They formed Private Fuel Storage LLC and negotiated a lease with the Skull Valley Band of the Goshute Tribe for use of tribal land in Utah for development of a storage facility for up to 40,000 metric tons of spent fuel from the member firms and other which would seek to have their spent fuel stored there. Planning proceeded well with the Goshutes, who sought economic development for a chronically depressed area. There was a far different reaction in Salt Lake City and among State elected officials. Nonetheless, PFS pressed ahead and in 1997 submitted a license application to the NRC to build the storage facility. The State of Utah opposed the project and there were

numerous delays, including a detailed risk assessment of proximity to the use of live ordnance in a nearby Air Force bombing range. The license was issued in 2005.

The project was also dependent on approvals by two agencies of the Department of Interior. Despite having earlier approved the proposed lease, the Bureau of Indian Affairs reversed course and said it could not sign off on the lease until the Bureau of Land Management approved a PFS request for a right of way for a rail line to connect the site to the Union Pacific main line. While one member of Congress appealed to the White House to have those approvals denied, another was successful in having the Cedar Mountain Wilderness Area established for the area of the right of way—by amending the *Defense* authorization bill for FY 2006. The net result was that while PFS was successful in getting a license to build the storage facility, it was prevented from getting rail access to the site. On July 27, 2010 a federal judge ruled for PFS in determining that the Department of Interior had been "arbitrary and capricious" and directed DOI to reconsider the lease and right of way requests.

PFS wrote to then-Senate Energy and Natural Resources Committee Chairman Domenici and House counterpart in 2005 with a proposal to provide a "solution to the issue of spent nuclear fuel," by having DOE transfer up to 40,000 metric tons to the licensed storage site at Skull Valley for around $60 million per year. The Committee asked that PFS make the offer to DOE. That was done, but if there was a response it was not made public.

It might be useful for the Subcommittee or Commission staff to have a presentation or discussion with PFS to evaluate what the prospects are for the storage facility being built and what cooperation they may need from the federal government.

Why Consolidation of Spent Fuel from Decommissioned Sites Makes Sense

The benefits of consolidation of this spent fuel include:

- Return nine sites to other productive use after final decommissioning
- Improved security at an optimal state-of-the-art storage facility
- Build public confidence in safe transportation of spent fuel
- Likely reduces costs to taxpayers
    - Presumed economies of scale of single site vs nine
    - Reduced legal fees for all concerned
- Greater peace of mind in nine communities
- Demonstrates federal government can do something about waste

While agreeing with the position of the NRC and the nuclear industry that spent fuel is securely managed and well regulated, public intuition suggests that this material would be even more secure if moved to a central location selected and designed to the most current security requirements. If it is true that an accident at a nuclear facility anywhere in the world is a concern at any other nuclear facility, it may have a corollary that a security incident at a spent nuclear fuel storage facility is a cause for concern at all other storage facilities. There is no way of verifying that to be substantiated with threat assessments that are not publicly available, but it not too far-fetched that the concerns might be more evident at a decommissioned site with spent fuel remaining. There are two studies/reports pertaining to spent fuel security from the National Research Council and the GAO that are valuable references.[vi]

Downside of Consolidation

- Need for support, or at least neutrality at receiving storage site
- There may be some access and/or handling challenges at present storage sites (that would have to be addressed eventually)
- Possible disputes with owners of older fuel
- Likely requires legislation
- Congress has become accustomed to using the surplus fee revenue for other uses

The last point is a potential obstacle that NARUC has previously described in testimony before the Commission on May 25. It should not be insurmountable, if Congress embraces the use of the Nuclear Waste Fund for the consolidation project, but if the new disposition strategy has some funding concurrency such that the Fund appropriations approach or exceed fee revenue during the same period, there might be some resistance. There has only been one year in which appropriations for the repository program have exceeded fee revenue, so Congress has routinely spent the surplus on other unrelated programs and leaves $25 billion in IOU's for the Fund to be returned by future congresses.

The Appeal for Commission Action Now

If you accept the premise highlighted in page 2 of this paper that the Commission finds that there is unlikely to be any conflict between the disposition strategies the Commission may recommend and developing and relocating spent nuclear fuel from the nine decommissioned reactor storage sites (and possibly another similar quantity in other special needs) to a new location to be built and operated by DOE or another party with DOE cooperation, then we request that this conclusion be conveyed to the Secretary of Energy before November. Sending such an initial partial report by that time would allow DOE to draft legislative language that would give the agency authority to develop a consolidated facility as discussed here in time for submittal to Congress with the FY 2012 Federal Budget.

We urge this action because it could result in getting started on a consolidated central storage facility two years sooner than if the recommendation had to await the submittal of the final Commission report in January 2012.

The other reason may seem bureaucratic, but it reflects budgetary realities. With the FY 2011 DOE budget requesting zero dollars from the Nuclear Waste Fund, it is likely to be the same for FY 2012 being formulated in the next several months (for final inclusion in the President's Budget presented to Congress in January 2011. If a "budget line" has zero dollars two years in a row it would be difficult to resume funding in the third year. It might be risky for DOE or even OMB to insert a "placeholder" request for contingency funding to provide the initial funding requirements for the disposal strategy the Commission will recommend in its final report. Congress may not go along with such a request, but it could be conditioned to restrictions. Remember, the Nuclear Waste Fund appropriations are "available until expended," meaning they can be retained for use when the disposal strategy is agreed to between Congress and the Administration. Left to "due course" sequence, the next normal available budget to begin appropriations for the Commission's strategy implementation is likely to be in FY 2013.

It is even more likely that Congress would deliberate and issue authorization in FY 2013 that would begin the appropriations cycle in the following year. We are unable to do much more than speculate how the Administration and Congress will reach agreement on the Commission's recommendation for the grand strategy on the back end of the fuel cycle, but as we said before, if creating a consolidated storage facility for the stranded spent fuel now at decommissioned sites like Wiscasset will not conflict with any disposition strategy, it would make good sense to set in motion now a plan to consolidate that material for the reasons stated in this paper. Even this seemingly simple plan will face difficulty in implementation, so it would be better to get started sooner rather than later.

Notes and Tables

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[i] *Report to Congress on the Demonstration of the Interim Storage of Spent Nuclear Fuel from Decommissioned Nuclear Power Reactor Sites*, December 2008, DOE/RW-0596

[ii] Section 131, NWPA

[iii] *Interim Storage of Spent Nuclear Fuel*, Harvard University Project on Managing the Atom and University of Tokyo Project on Sociotechnics of Nuclear Energy, 2001

[iv] *The Federal Government's Responsibilities and Liabilities under the Nuclear Waste Policy Act,* Congressional Budget Office Statement House Budget Committee July 27, 2010

[v] United States Nuclear Fuel Management Corporation Establishment Act of 2010, S. 3322 (proposed)

[vi] *Spent Nuclear Fuel- Options Exist to Further Enhance Security*, Government Accountability Office, GAO 03-426, 2003 and *Safety and Security of Commercial Spent Nuclear Fuel Storage*, Board on Radioactive Waste Management, National Research Council, 2006

Table 1 and 3 that follow are from the DOE Report to Congress cited in note i above.

Table 1. Status of Decommissioned Commercial Nuclear Power Reactor Sites in the U.S.

Plant	State	MTHM Stored at Site	MTHM in Pool Storage	MTHM in Dry Storage	Number of Casks	DOE Estimated Casks	Total Casks (Actual Plus Estimated)	Average MTHM/Cask
Big Rock Point	Michigan	58	0	58	7	—	7	8.3
Haddam Neck	Connecticut	412	0	412	41	—	41	10.1
Humboldt Bay[a]	California	29	0	29	5	—	5	5.8
LaCrosse[b]	Wisconsin	38	38	0	5	—	5	7.6
Maine Yankee	Maine	542	0	542	60	—	60	9.0
Rancho Seco	California	228	0	228	21	—	21	10.9
Trojan	Oregon	359	0	359	34	—	34	10.6
Yankee Rowe	Massachusetts	127	0	127	15	—	15	8.5
Zion 1 & 2[c]	Illinois	1,019	1,019	0	—	106	106	9.6
TOTALS		2,813*	1,057	1,756*	188	106	294	—

NOTE: [a]Dry storage underway in 2008. Holtec canister has capacity of 80 assemblies (five canisters for the 390 assemblies).

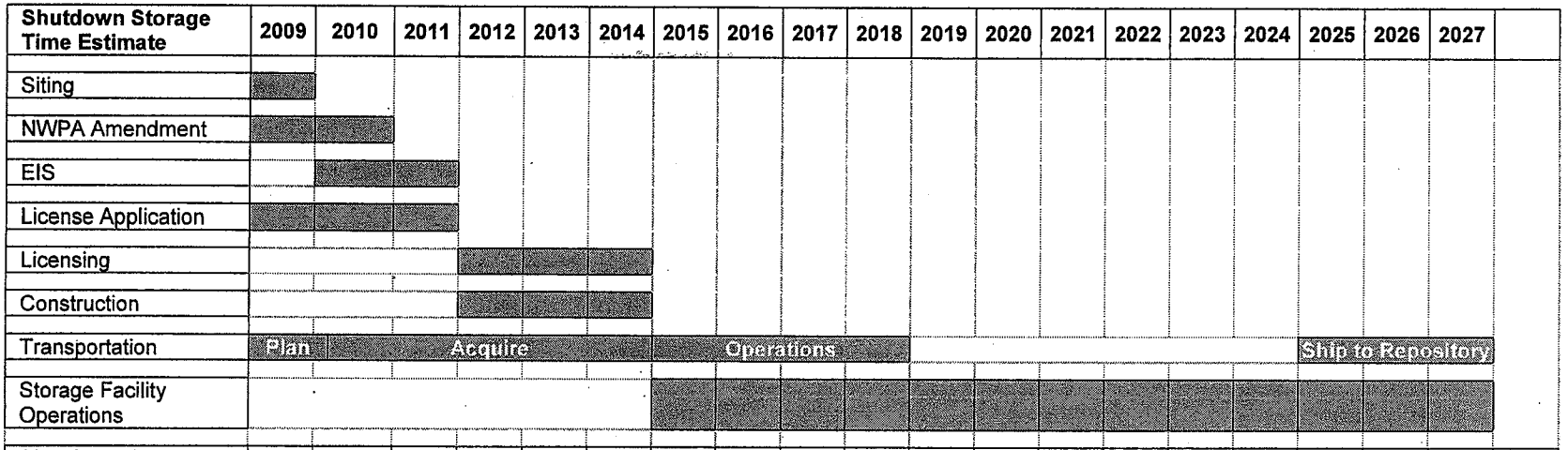
[b]Dry storage contract entered with NAC for five NAC-MPC canisters. Dry storage schedule indicates target completion by the end of 2010.

[c]Decommissioning contract entered with EnergySolutions. Canisters estimated using FuelSolutions W21 capacity. Target schedule for completion is 2013.

DOE = U.S. Department of Energy; MPC = multipurpose canister; NAC = Nuclear Assurance Corporation.

*Totals might differ from sums of values due to rounding.

Table 3. Estimated Cost and Schedule for Interim Storage of SNF from Decommissioned Nuclear Power Reactors Sites



Shutdown Storage Cost Estimate	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Total
Siting	$10																			$10
EIS/LA/ Licensing		$4	$6	$4	$4	$2	$0													$20
Storage Facility Construction				$4	$6	$10														$20
Storage Overpacks						$12	$19	$25	$32											$88
Transportation Equipment						$72	$72													$144
Transportation Operations							$12	$19	$25	$32							$29	$29	$29	$176
Storage Facility Operations							$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$130
Site Benefits NWPA Sec.171		$5	$5	$5	$5	$5	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$10	$155
Total	$10	$9	$11	$13	$15	$101	$123	$64	$77	$52	$20	$20	$20	$20	$20	$20	$49	$49	$49	$743

NOTE: The waste acceptance schedule does not consider technical attributes, such as the condition of the commercial SNF, that could affect the order and timing in which the Department could accept it for disposal. This estimate also assumes enactment of all necessary legislation, optimal project funding, the issuance of all necessary authorizations and permits, and the absence of litigation-related delays.

EIS = environmental impact statement; LA = license application; NWPA = Nuclear Waste Policy Act of 1982, as amended; SNF = spent nuclear fuel.