Radioactive Waste Storage/Disposal Policy: A Paradigm for Homeland Security and Energy Security

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The inability of U.S. policymakers to come to grips with the problem of what to do with the growing stockpiles of highly radioactive waste has both homeland security and energy security overtones. This paper presents a theoretical framework for assessing homeland security and energy security concerns associated with spent nuclear fuel and high-level waste by categorizing the risks related to the current on-site storage regime, centralized interim storage, and long-term disposal. At the same time, the political ramifications for each storage/disposal regime is assessed. While homeland security and energy security concerns should govern highly radioactive waste policymaking, in reality, political considerations are the primary driving force behind policy decisions.

The problem of highly radioactive waste storage/disposal has become one of the most controversial aspects of nuclear technology. Because the issue has become so contentious and politicized, it has been difficult for U.S. policymakers to develop a broad consensus on how best to cope with the ever-increasing amounts of radioactive waste being generated. As a result, radioactive waste storage/disposal policy initiatives have been slow to develop, forcing the operators of commercial nuclear reactors and DOE facilities to store both spent nuclear fuel and high-level radioactive waste on-site at numerous plants and facilities across the country.[1]

The inability of U.S. policymakers to come to grips with the problem of what to do with the continued generation of radioactive waste has both homeland security and energy security implications. Clearly, the events of 9/11 have focused attention on the potential for a terrorist attack on nuclear facilities. While much of this concern has been directed towards an attack on the reactors themselves, the radioactive waste stored on-site – especially the waste stored outdoors above ground in dry casks – is more problematic since it is far more vulnerable to any terrorist assault. Thus, the

[1] Radioactive waste for the purposes of this paper is defined as follows: "spent nuclear fuel" refers to the highly radioactive waste generated as a by-product of nuclear electrical power generation; "high-level waste" refers to the highly radioactive waste generated by DOE as a result of nuclear weapons and research and development programs; and the term "highly radioactive waste" is used to describe waste generated from either, or both, commercial nuclear power plants and DOE facilities.

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major terrorist threat to nuclear power facilities is not to the reactors, but the radioactive waste that they generate. At the same time, the lack of sufficient on-site storage space for spent nuclear fuel threatens the continued electric power generation capacity at a number of commercial nuclear power facilities. If alternative storage/disposal options are not found in the near future, some reactors could be forced to shut down prematurely due to insufficient on-site storage capability. Since nuclear power energy production accounts for about one-fifth of the total U.S. electric power production, any forced premature closure of nuclear power facilities will have a significant negative impact on energy security by increasing U.S. reliance on foreign sources of energy. Thus, the problem of continued highly radioactive waste generation, coupled with the inability to come to grips with this issue, has both homeland security and energy security overtones.

This paper is a qualitative analysis that presents a theoretical framework for assessing homeland security and energy security concerns associated with spent nuclear fuel and high-level waste. Basically, there are three options in dealing with highly radioactive waste: (1) continue the current on-site storage regime; (2) find an acceptable centralized interim storage solution; or (3) find an acceptable long-term disposal solution. The homeland security and energy security risks associated with each option are assessed; and the political ramifications associated with each policy are discussed. The thesis of this paper is that while homeland security and energy security concerns should govern highly radioactive waste policy, in reality, political considerations have been the driving force behind radioactive waste policy decisions.

Determining risk can be a difficult undertaking due to the number of variables that can exist simultaneously; which, in turn, can complicate the analytical process. However, subjective evaluations of potential security and political risks associated with highly radioactive waste storage/disposal options can be made. And, ultimately, employing risk analysis can be used to assist policy makers in choosing the best policy option for coping with highly radioactive waste.

Risk assessment has gained widespread use in both the government and private sectors as a means to maximize benefits and minimize consequences. Today, a number of U.S. government agencies are now employing a variety of risk analysis strategies for coping with radioactive waste. For example, the Department of Energy (DOE) has commissioned a study to develop technically sound “risk-based” approaches for the disposition of transuranic and high-level radioactive waste (see NAS 2005). The Environmental Protection Agency (EPA) uses the “Superfund Risk Assessment Model” to determine the ecological and health risks posed by a particular hazardous waste site (e.g., nuclear waste) (see EPA 2005). The Department of Homeland Security uses a variety of models and simulations to evaluate risks associated with particular critical infrastructure vulnerabilities (e.g., nuclear power plants) in order to make more informed protection decisions (see DHS 2003). The Nuclear Regulatory Commission (NRC) began to focus more on

probabilistic risk assessment in the 1990s as the NRC moved toward "risk-informed regulation" related to nuclear safety issues (see Jackson 1998).

For the purposes of this paper, "risk" is defined as the potential for a possible event to occur, coupled with the possible consequence of that event. Risk analysis can use either a quantitative approach (e.g., probabilistic modeling such as Monte Carlo analysis) or a qualitative approach (e.g., subjective analysis). A qualitative approach is used in this study by subjectively assessing the potential homeland security and energy security risks associated with the current highly radioactive waste storage/disposal options (on-site storage, centralized interim storage, or long-term disposal). In addition, the political risks associated with each storage/disposal option are evaluated. Clearly, homeland security and energy security concerns should determine policy. But, in reality, political considerations have had a major impact on highly radioactive waste policy decisions.

The "security risk" assessment models use a qualitative analysis of the homeland security and energy security concerns associated with a particular radioactive waste storage/disposal option. The following definitions are being used in the security risk assessment models: *poor*, *fair*, *good* and *excellent*. The designation *poor* means that the storage/disposal option does not adequately address potential homeland security or energy security risks. The designation *fair* partially addresses the security risk under consideration (e.g., may only be a partial or temporary fix). The designation *good* means that the security risk is generally addressed but with some reservations (e.g., there still may be some homeland or energy security concerns that will occur in the long-term). The designation *excellent* addresses the security risk for the long-term. These risk analysis models have been devised for their simplicity and fit with the homeland security and energy security concerns associated with the on-site storage, centralized interim storage, and long-term disposal methods of coping with highly radioactive waste.

The "political risk" assessment model also uses a qualitative analysis of the political conflict generated by a particular radioactive waste storage/disposal policy decision. The following definitions are being used in the political risk analysis model: *low*, *moderate* and *high*. *Low* political risk is defined as minimum conflict (e.g., only limited, generally localized conflict). *Moderate* political risk is defined as mid-level conflict (e.g., conflict is more evident, usually at the state level). *High* political risk is defined as significant political conflict (e.g. substantial conflict existing at the national level). This political risk model also has been devised for its simplicity and fit with level of political conflict associated with the on-site storage, centralized interim storage, and long-term disposal options for highly radioactive waste.

Homeland Security Concerns

Storing large quantities of highly radioactive waste at numerous locations across the country heightens anxiety over a possible terrorist attack with the potential for a significant release of radiation. In 2002, Secretary of Energy Spencer Abraham cited concerns over maintaining large amounts of highly radioactive waste at over 130 sites in 39 states within miles of millions of Americans as a threat to homeland security (Abraham, 2002a: 3).

Over the years, numerous threats have been directed at commercial nuclear power facilities. Concern over security has increased since the terrorist attacks on 9/11 – especially since nuclear power facilities have been singled out as a prime target for a future attack. Compounding this concern, in 2002, the Director of the U.S. Nuclear Regulatory Commission (NRC) acknowledged in a report to Congress that security "weaknesses" were identified in almost half of the mock security exercises conducted at nuclear power plants during the 1990s (Meserve, 2002a: 27). At the same time, the watchdog group Project on Government Oversight (POGO) asserted that post-9/11 interviews with security guards at several commercial nuclear power facilities revealed that the guards were undermanned, under-trained, under-equipped, and unsure how to respond to incidents requiring deadly force (POGO, 2002: 2-3). More recently, a Government Accountability Office (GAO) review of NRC efforts to improve post-9/11 security at commercial nuclear power facilities noted that while the NRC responded "quickly and decisively" after 9/11, the NRC still was not able to independently determine "that each plant has taken reasonable and appropriate steps" to protect against the perceived threats (GAO, 2004: i). While some of this concern over security has been directed towards the reactors themselves, they are less of a problem since they are housed within steel and concrete reinforced containment buildings. However, the highly radioactive waste stored on-site is more vulnerable since the spent nuclear fuel is stored either in cooling pools within non-reinforced buildings or stored in dry casks above ground. Thus, the spent fuel is more worrisome since it would be more vulnerable to any terrorist attack.

Clearly, steps have been taken recently to improve security at commercial nuclear power facilities. For example, according to the Nuclear Energy Institute (NEI) – the nuclear power industry's policy organization – over $370 million has been invested since 9/11 in enhancing security at nuclear power plants, and the commercial nuclear power industry has increased security forces by about one-third (8,000 officers) (NEI, 2004b: 1). At the same time, the federal government has taken steps to improve security such as establishing an Office of Nuclear Security and Incident Response to consolidate NRC safeguards and incident response (Meserve, 2002b: 2-3). In 2003, the NRC issued a new set of design based threat (DBT) guidelines requiring commercial nuclear power plants to implement new security plans by the end of 2004 that are capable of defending against potential threats to security. The new DBT guidelines reflect "the increased size of a potential terrorist

force, the more sophisticated weaponry, and the different methods of deployment demonstrated by the September 11 terrorist attacks" (GAO, 2004: 7).

On-site Storage. In spite of the steps to improve security, there still are a number of specific homeland security concerns associated with the highly radioactive waste stored on-site. First, there is the potential for a significant release of radiation if the highly radioactive waste on-site was attacked or sabotaged by a terrorist group. While the dry cask containers used to store spent nuclear fuel are robust and designed to take considerable punishment, concern has been voiced over whether they would be able to withstand an air attack using fully fueled jet airliners. This could be especially serious if the attack was near a major metropolitan center. Second, there is the potential for the theft and subsequent use – most likely as a "dirty bomb" – of the nuclear material by terrorists. Third, there is the potential for nuclear proliferation if stolen highly radioactive waste was transferred to a rogue state. As a result, the overall homeland security risk of the current on-site storage regime is assessed as *poor* since this option does not adequately address the problem.

Interim Storage. The construction of a centralized interim storage facility for spent nuclear fuel would address, at least for the mid-term, some of the homeland security concerns associated with the current on-site storage regime by reducing the number of sites (i.e., the signature) vulnerable to a terrorist attack (especially for those facilities located near large metropolitan centers). Moreover, security at a centralized facility likely would be more robust given the fact that significant quantities of highly radioactive waste would be stored there and the facility would be considered a high-value target. However, since a centralized facility would not have the capability to store all of the on-site highly radioactive waste, there would continue to be some spent nuclear fuel and high-level waste stored on-site in dry casks at a number of reactor sites across the country.[2] Moreover, any centralized option would require the transport of highly radioactive waste across great distances, sometimes near heavily populated centers (see Rogers and Kingsley 2004b). While DOE characterizes the nuclear transportation record as "impressive," there still is the potential for an accident or terrorist attack (DOE, 2002: 2). Thus, while the initial homeland security assessment for a centralized interim storage facility would appear to be good, the continued requirement for some on-site dry cask storage, as well as the transport of significant quantities of spent nuclear fuel, would lower the overall homeland security risk assessment to *fair* since this option would only partially address the problem.

Long-Term Disposal. Long-term disposal provides the greatest security. Since spent nuclear fuel and high-level waste would be stored below ground in a highly secured facility, there is little risk of a terrorist attack, sabotage, or theft of the nuclear material. Moreover, the most vulnerable waste (dry casks) could be removed

[2] For example, two proposed centralized interim storage initiatives (Skull Valley, UT; and Owl Creek, WY) envisioned storing up to 40,000 metric tons of spent nuclear fuel.

from all of the reactor sites. Thus, the homeland security risk initially would be assessed as excellent. However, the transport of the highly radioactive waste over long distances would pose some safety and security concerns. Thus, similar to transportation concerns associated with a centralized interim storage option, the overall assessment of a long-term disposal option is tempered somewhat. As a result, the overall homeland security risk for a national highly radioactive waste repository is assessed only as *good*, since it generally addresses the problem. See Figure 1 (Homeland Security Risk Analysis) for a graphic summary of the homeland security risk associated with on-site storage, centralized interim storage, and long-term disposal.

Figure 1. Homeland Security Risk Analysis

	Poor	*Fair*	*Good*	*Excellent*
On-site Storage	X			
Interim Storage		X		
Long-term disposal			X	

Energy Security Concerns

Concerns over adequate energy supplies first surfaced in the United States during the early 1970s with the Arab oil embargo. Oil shocks in subsequent years and the recent dramatic rise in oil prices have reinforced the perception of the need for the United States to reduce its dependency on foreign sources of energy. However, this can only be done if the United States does not lose any of its current domestic energy generation capacity and is able to keep pace with future energy demands. According to the U.S. Energy Information Administration (EIA), U.S. electricity generation is projected to increase by about 50 percent by 2025 (EIA, 2004: 145). In response to the anticipated demand for new energy sources, the Bush Administration has called for the expansion of nuclear generated electricity as part of its national energy policy (see White House 2001). In support of the new energy plan, DOE has developed the Nuclear Power 2010 program, which would facilitate the licensing process for building new nuclear power plants (DOE, 2004b: 1). At the same time, the commercial nuclear power industry has developed a plan (Vision 2020) to increase nuclear electricity generation by 50,000 megawatts from *new* nuclear power plant capacity by 2020 (NEI, 2004a: 1). In any case, whether nuclear power generation is increased to meet projected future energy demands, or if current production levels are maintained, the amount of spent nuclear fuel will continue to accumulate at commercial reactor sites across the country further straining on-site storage capabilities.

On-Site Storage. Currently, spent nuclear fuel is being stored on-site awaiting transfer to either an interim storage facility or a national repository. However, there is only limited on-site storage space available either in the cooling pools or in the dry casks. According to the nuclear power industry, by 2010, 78 (over 75 percent of the facilities) commercial nuclear power plants will not have any storage capacity left in

their cooling pools (NEI, 2004c: 1). While dry cask storage is now being used at a number of locations to supplement cooling pool capacity, some states "have moved to limit the development or expansion of these facilities" (NEI, 2004c: 2). Thus, a lack of sufficient on-site storage for the spent nuclear fuel could force the commercial nuclear power industry to shut down some of its reactors prematurely in order not to exceed the limited storage space. Energy Secretary Abraham expressed concern over the lack of sufficient on-site storage capacity and the potential for a premature shutdown of commercial nuclear reactors. Abraham stated that, "A repository is important to our energy security. We must ensure that nuclear power, which provides 20 percent of the nation's electric power, remains an important part of our domestic energy production. Without the stabilizing effects of nuclear power, energy markets will become increasingly more exposed to price spikes and supply uncertainties" (Abraham, 2002a: 2-3). Abraham noted in subsequent testimony before Congress that nuclear waste continues to pile up at commercial nuclear sites that are in his words, "running out of room for it." (Abraham, 2002b: 3) Abraham's remarks highlight a need to establish a secure pathway for spent nuclear fuel in order to ensure that current commercial nuclear power facilities are not forced to shut down their reactors prematurely. Thus, if U.S. commercial nuclear energy power production were curtailed due to a lack of sufficient on-site storage space, then the overall energy security risk of the current on-site storage regime would be assessed as *poor*.

Interim Storage. Energy security concerns involved with centralized interim storage of highly radioactive waste would be partially addressed, at least for the mid-term. Providing a temporary pathway for spent nuclear fuel would prevent commercial nuclear power facilities from potentially having to shut down their reactors prematurely due to a lack of sufficient on-site storage space. If the reactor site was in danger of reaching its storage capacity for spent nuclear fuel, then the highly radioactive waste could be transported to the centralized interim storage facility, freeing up additional on-site storage space. However, since a centralized interim storage facility would only be a partial fix for the mid-term and not for the long-term, the overall energy security risk for a centralized interim storage option is assessed only as *good*.

Long-Term Disposal. Energy security would be increased greatly since a national repository would provide a long-term pathway for spent nuclear fuel, preventing the potential for a premature shutdown of commercial nuclear reactors due to a lack of sufficient on-site storage space. Since large quantities of on-site spent nuclear fuel (especially dry cask storage) could be removed, the overall energy

Figure 2. Energy Security Risk Analysis

	Poor	*Fair*	*Good*	*Excellent*
On-site Storage	X			
Interim Storage			X	
Long-term disposal				X

security risk for a national highly radioactive waste repository is assessed as *excellent*. See Figure 2 (Energy Security Risk Analysis) for a graphic summary of the energy security risk associated with on-site storage, centralized interim storage, and long-term disposal.

Political Risk

Highly radioactive waste disposal has become one of the most controversial aspects of nuclear technology. The policy process has been quite contentious for a number of reasons. According to Katz, "It [radioactive waste disposal] is a complicated and distant threat, of little interest to the public or to most policymakers. It has few immediate payoffs and many immediate costs. It is controversial, and most of the solutions put forth for it are controversial, unlikely to appeal to a majority of interests" (Katz, 2001: 23). Paradoxically, as the need for action has become more acute, the conflict generated by the politicization of the issue has delayed progress on developing a viable long-term solution to the problem.

On-Site Storage. Conflict associated with the current on-site storage regime has been relatively muted. Thus, continuing a relatively non-controversial status quo policy (especially one that has been in place for a number of years) involves minimal short-term political risk. Policymakers generally prefer either to follow existing policy, or make only minor policy adjustments (i.e., incremental policymaking). However, that does not imply that there has not been conflict over the on-site storage of highly radioactive waste.

While there has been little general public opposition to the storing of spent nuclear fuel at commercial nuclear power facilities and DOE research and weapons facilities, there have been concerns voiced by some citizen groups over the safety and security of the on-site waste. For example, several safety incidents have been documented for some dry cask storage containers such as defective welds, cracked seals, and explosions (Macfarlane, 2001: 218). Moreover, POGO has released reports critical of on-site security at several commercial nuclear power facilities. In addition, the commercial nuclear power industry has brought legal action against the federal government for its failure to take title to the waste as mandated by the 1982 Nuclear Waste Policy Act (NWPA). At the same time, the Bush Administration's energy plan calls for, at a minimum, maintaining current nuclear power generation capacity. This would be difficult to achieve if some commercial nuclear energy facilities were forced to shut down reactors due to a lack of sufficient on-site storage space. Thus, while conflict currently is relatively muted, it would be reasonable to expect conflict to increase in the future as on-site storage capacity reaches it limit. In fact, the NRC has pointed out that some opposition to the dry cask storage method has made licensing operations more difficult in a number of states (NRC, 1996: 7). As a result, while the overall political risk associated with continuing temporary on-

site storage *currently* is assessed to be *low*, the lack of resolution of this issue ultimately will increase conflict and political risk.

Interim Storage. The concept of centralized interim highly radioactive waste storage has been controversial since opponents have voiced concern that any interim facility could become a de facto repository (see Rogers and Kingsley 2004a). Thus, any interim storage solution has been inextricably tied to progress on long-term disposal. While a centralized interim storage solution will address some of the more immediate problems associated with the continued on-site storage regime, it does not permanently solve the problem of what to do with the highly radioactive waste and offers only a temporary solution.

Although a centralized storage option was first proposed in the early 1970s, conflict and politicization of the issue have prevented the construction of any centralized facility. Initial efforts by local jurisdictions to consider hosting a centralized interim storage facility generally were blocked by the host state. Thus, while a centralized storage option for highly radioactive waste would partially address both homeland security and energy security concerns, the politicization of the issue has produced considerable conflict in the states that would possibly host such a facility. As a result, the overall political risk associated with constructing a centralized interim storage facility for spent nuclear fuel is assessed to be *moderate.*

Long-Term Disposal. The long-term disposal of highly radioactive waste has been the most politically contentious option primarily because the "not in my backyard" (NIMBY) reaction has generated opposition in states designated as a potential host for a nuclear waste repository. In accordance with the 1982 Nuclear Waste Policy Act, a site was first to be identified in the West with an additional site in the East to be designated later. The site selection process was slow and arduous due to opposition generated by the states that were initially identified as a potential host for the repository.[3] To circumvent this opposition, Congress passed the 1987 Nuclear Waste Policy Amendments Act, which singled out Yucca Mountain, Nevada, as the only site to be studied. Many observers have criticized the site selection process; and even the Director of DOE's Civilian Radioactive Waste Management Program at the time commented that Nevada was "slam dunked." (Suplee, 1995: A18) Clearly, Nevada with a small population and junior congressional delegation at the time did not have the political influence that the other potential host states such as Texas and Washington had. Thus, resentment over the perceived unfairness of the site selection process coupled with apprehension over the geologic suitability of the Yucca Mountain site has generated additional controversy.

[3] Six western states were identified (all with a prior nuclear history) as a possible host for a national repository: Louisiana, Mississippi, Nevada, Texas, Utah and Washington. Potential host states identified in the East were: Georgia, Maine, Minnesota, New Hampshire, North Carolina, Virginia and Wisconsin. (Kraft, 1996: 114-115)

In response, Nevada has attempted to block the initiatives at every turn, which has considerably slowed the pace of the project.[4] As a result, the attempt to construct a geologic repository has become intensely politicized; and thus, the political risk would be assessed as *high* (see Rogers and Rogers 1998). See Figure 3 (Political Risk Analysis for Highly Radioactive Waste) for a graphic summary of the political risk associated with on-site storage, centralized interim storage, and long-term disposal.

Figure 3. Political Risk Analysis for Highly Radioactive Waste

	Low	*Moderate*	*High*
On-site Storage	X		
Interim Storage		X	
Long-term disposal			X

* Denotes that increased political conflict is likely as storage space becomes more limited.

Summary

The continued on-site storage of highly radioactive waste at numerous locations around the country (some near large metropolitan centers) presents an unacceptable homeland security risk due to the potential for a terrorist attack, sabotage, or theft of the material. However, homeland security concerns could be mitigated somewhat by moving more vulnerable dry casks from above ground to a more protected area on-site until either a centralized interim storage facility or a permanent national repository is ready to accept highly radioactive waste. Even if the most vulnerable waste is moved to a shielded area, the current on-site storage regime still does not adequately address homeland security concerns and thus, is assessed as *poor*. In addition, the current on-site storage regime provides *poor* energy security due to the potential for having to shut down some commercial nuclear energy reactors at facilities where there is a lack of adequate on-site spent fuel storage space. The possible premature closing of commercial nuclear power facilities due to a shortage of adequate on-site spent nuclear fuel storage poses an unacceptable energy security risk during a time when the U.S. cannot afford to increase its dependency on foreign sources of energy.

Centralized interim storage would address some homeland security concerns. While some spent nuclear fuel would remain on-site, the most vulnerable on-site waste could be moved to a more secure centralized facility. However, significant quantities of spent nuclear fuel would have to be transported to any centralized interim storage facility. Thus, security concerns associated with the remaining on-site dry cask storage as well as transportation concerns would lower the overall

[4] The promotion of Senator Harry Reid (D, NV) to the position of majority leader in the Senate could further slow the Yucca Mountain project. Senator Reid has been quite successful in the past in reducing funding for the repository.

homeland security risk to *fair*. Energy security at a centralized interim storage facility would rate better since an interim storage facility would provide a *temporary* pathway for spent nuclear fuel, which would postpone the premature shutdown of reactors due to a lack of sufficient on-site storage space. However, since a centralized interim storage facility would only result in a partial fix for the mid-term (not the long-term) the overall energy security assessment for a centralized interim storage option only would be considered *good.*

A national repository for the long-term disposal of highly radioactive waste (e.g., Yucca Mountain) would provide excellent homeland security since the nuclear waste would be stored below ground in a highly secured facility where the risk of sabotage or a terrorist attack would be small. However, a national repository would require transporting large quantities of highly radioactive waste across the country. Thus, while a secured national repository would provide excellent protection against a terrorist attack, the overall homeland security risk is assessed only as *good* due to transportation security concerns. A national repository would provide a long-term pathway for spent nuclear fuel alleviating the need to shut down commercial nuclear power reactors prematurely due to a lack of sufficient on-site nuclear waste storage space. Thus, overall energy security would be assessed as *excellent.*

While the homeland security and energy security concerns *should* drive policy making, the reality is that political considerations have been a major determinant of highly radioactive waste storage/disposal policy. Opposition to constructing both a centralized interim storage facility and a permanent disposal facility has led to the policy of storing the waste on-site. The current on-site storage regime involves the least amount of conflict and is most acceptable politically since it follows a status quo policy; and thus, the political risk is assessed to be *low.* However, it is likely that conflict and the associated political risks will increase as adequate on-site storage space becomes more problematical. On the other hand, the centralized interim storage option has been controversial since opponents have voiced concern over the safety of the facility, as well as the fact that the interim facility could become a de facto repository if a national repository is not completed as planned. Moreover, opposition is intensified by the fact that any centralized option would require transporting significant amounts of highly radioactive waste to the facility. In addition, since an interim solution does not permanently solve the problem of what to do with the highly radioactive waste, opponents argue that policymakers should just keep nuclear waste on-site until a permanent option is found. As a result, the political risk is assessed to be *moderate*. The search for a geologic repository has been even more contentious and politicized. Opposition sparked by the perceived unfairness of the site selection process and scientific uncertainty over the geologic suitability of the Yucca Mountain facility has intensified the political conflict. As a result, the overall political risk is assessed to be *high.* The basic problem with the highly radioactive waste issue is that the best long-term solution to the problem (disposal) is the most contentious politically, while the least desirable long-term option (on-site storage) is the most palatable politically since it involves the least

political risk. See Figure 4 (Overall Homeland/Energy Security — Political Risk Analysis for Highly Radioactive Waste) for a summary of the overall risk analysis.

Figure 4. Overall Homeland/Energy Security• Political Risk Analysis For Highly Radioactive Waste

	Political Risk	
	Homeland Security	Energy Security
On-site Storage	*Poor — Low**	*Poor — Low**
Interim Storage	*Fair — Moderate*	*Good — Moderate*
Long-term Disposal	*Good — High*	*Excellent — High*

*Denotes increased political conflict likely in the future

Recommendations

Based on the above homeland security and energy security concerns, as well as factoring in the political risk associated with each option, there are several steps that could be taken in the near-term to address both homeland security and energy security concerns. First, all above-ground on-site dry cask storage should be placed in a protected area as soon as possible in order to address the most compelling homeland security concerns. It is the dry casks that present the major current threat to homeland security. While this clearly would enhance homeland security for the *short-term*, it would not address energy security concerns due to the limited on-site storage space.

Second, a centralized interim storage option should be approved in the near-term in order to provide at least a *mid-term* solution to both homeland security and energy security problems. If the centralized option were implemented, homeland security would be improved for the mid-term by eliminating the most significant threat. Energy security also would be improved since no reactors would have to be shut down in the near-term due to a lack of sufficient on-site storage space. While there is more conflict and political risk associated with a centralized option, it generally is limited to the state that would host the facility. Therefore, conflict is manageable with proper safeguards and a concerted public relations effort to convince the public that the risk of an incident is low. As the NRC points out, “Difficulties in achieving public support have been seriously underestimated in the past, and opportunities to increase public involvement and to gain public trust have been missed.” (NRC, 2001: 3)

Third, the long-term disposal option should continue to be pursued in a timely manner consistent with environmental and geologic concerns, since this is the only option that will address both homeland security and energy security concerns for the *long-term*. In spite of the fact that the Bush Administration already has signaled a

willingness to proceed with the Yucca Mountain initiative, there are some factors that weigh against moving forward on the permanent nuclear waste repository. First, it is not yet clear what impact the change in leadership in the Energy Department will have on overall policy. Former Energy Secretary Abraham was a forceful and articulate spokesman for the Administration's energy plan and the Yucca Mountain initiative. Only time will tell how successful his replacement (Samuel Bodman) will be. Second, it remains to be seen how effective the opposition in Congress will be. The elevation of Senator Harry Reid (D, NV) to majority leader status will put him in a better position to block any initiatives on Yucca Mountain. The White House will be forced to deal with Senator Reid on a number of issues and will have to trade support for Administration priorities. In the past, Reid has been successful in reducing funding for the Yucca Mountain initiative and future budget cuts for the project can be expected. Third, will other national security concerns (e.g., Iraq, Afghanistan, and the war on terrorism) and domestic priorities (e.g., Social Security reform, and tax reform) deflect the Administration's attention away from establishing a national repository for highly radioactive waste? There is only so much political capital a president has to spend and priorities many times trump other initiatives deemed less important. Finally, it will be difficult for a lame-duck president with low approval ratings to move forward on a contentious issue such as nuclear waste disposal.

So, in the final analysis, the near-term fate of the national repository lies in how aggressive the Bush Administration is willing to pursue the Yucca Mountain initiative. Will the White House lower its priority for the Yucca Mountain project in order to gain political support for other initiatives, or will it press forward aggressively to address security and energy concerns? The new political realities dictate that Yucca Mountain most likely will not be a priority during the remainder of the Bush Administration's second term. Thus, the fate of the project likely will depend on how aggressive the next administration will pursue the disposal option.

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