

Remaking the US Nuclear Waste Program: A Window of Opportunity for Change? – 15352

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ABSTRACT

John Kingdon's 1984 policy analytic approach is utilized to examine nuclear waste policy in the United States over the last three decades. Kingdon's premise concerning the merging of three process streams - the problem stream, the political stream, and the policy stream - to create a policy window, took place when major changes in U.S. management of high-level radioactive waste and spent nuclear fuel occurred in 1982 and 1987. These three streams have once again converged, with events beginning in 2006, creating an opportunity to move beyond the current Yucca Mountain stalemate by adopting the recommendations of the Blue Ribbon Commission (BRC) on America's Nuclear Future in 2012. Legislation introduced in the U.S. Senate in 2013 to redirect the waste program along the lines suggested by the BRC has been reintroduced as the Nuclear Waste Administration Act of 2015, S. 854. The authors examine key provisions of S. 854 and suggest amendments requiring written consent agreements with governors of all potential host states, including Nevada; the same requirements for commingled and separate defense waste facilities; and additional measures to enhance nuclear waste transportation safety, security, and public acceptance. The Nuclear Waste Informed Consent Act (S. 691, 2015; H.R. 1364, 2015) is also examined.

INTRODUCTION

The nation's efforts to consider and adopt new approaches to nuclear waste management have been gridlocked until recently. Since the passage of the Nuclear Waste Policy Amendments Act (NWPAA) in 1987, the efforts of the U.S. Department of Energy (DOE) to develop a geologic repository for spent nuclear fuel (SNF) and high-level radioactive waste (HLW) at Yucca Mountain have been adamantly and successfully opposed by the State of Nevada. The Yucca Mountain repository was already twelve years behind schedule, and was expected to open twenty years late, when DOE terminated the project in 2010.

Applying the policy process insights developed by political scientist John Kingdon, the authors of this paper have previously written [1] that the ascension of Senator Harry Reid of Nevada to U.S. Senate Majority Leader in 2007 and the election of President Barack Obama in 2008 not only shifted the balance of political power against Yucca Mountain, but also opened a policy window allowing an opportunity to redirect the nation's nuclear waste management program.¹ The possibility of a new direction was and is most visible in the recommendations of the Blue Ribbon Commission (BRC) on America's Nuclear Future Final Report issued in January 2012. [2] A consensus among the states, regional associations, and federal agencies had already emerged on many key issues prior to the BRC Report. [3] These concerns were heightened by the March 2011 Fukushima Daiichi nuclear accident. The U.S. Senate began consideration of the BRC recommendations in 2013 and 2014. The November 2014 congressional elections again altered the political environment in Washington, DC, creating uncertainties about the policy window, but new legislation to restructure the nuclear waste program has recently been introduced.

Utilizing John Kingdon's conceptual framework [4] to guide the analysis, the authors conclude that an opportunity for new policy direction has recently opened, enhanced by the Fukushima Daiichi nuclear accident, in Kingdon's terms a focusing event. Past nuclear waste management programs and policy

¹ The views expressed here are the personal opinions of the authors and do not represent the official position of the State of Nevada, any other State, the Western Governors' Association, or the Western Interstate Energy Board. This paper was revised April 2, 2015 to include legislative developments that occurred during March 2015.

changes have been preceded by merging process streams similar to those currently observed and accompanied by similar focusing events, resulting in what Kingdon calls policy windows - opportunities for major program changes.

THE CONCEPTUAL MODEL

Since it was first published in 1984, and re-issued in 1995, John Kingdon's seminal work on how policy is formulated and attains a place on the formal agenda of government has been utilized to better understand public policy development across a wide spectrum of policy types. The focus here is on how nuclear waste policy has attained a place on the agenda that in the past successfully resulted in policy development. Kingdon postulated that the entire federal government is organized anarchy "...in which preferences and technological solutions are problematic and participation is fluid." [4:86] Kingdon examines why some problems become the focus of government action and others do not. He does so by adapting Cohen-March and Olsen's garbage can model of organizational behavior. [5] Kingdon suggests that problems are most likely to become agenda items or issues when three process streams intersect or merge. These three streams are the problem stream, the policy stream and the political stream. In this discussion, Kingdon's work constitutes a conceptual framework of how problems become a part of the agenda and are acted upon. Importantly, Kingdon's conceptual framework can be used to describe the basic organization of the processes involved in agenda setting and policy formation across a wide number of different areas but still remain useful in distinguishing and organizing our thoughts and insights about a policy area. For this reason perhaps, Kingdon's basic conceptual framework has been used widely with some 1400 plus studies citing his work across a voluminous number of different specific policy areas. Yet, while the fundamental concept of streams that merge remains constant across these studies in understanding how items gain agenda status, the specifics of what each element of the conceptual model contains (specific variables) and how they specifically relate to each other, varies by what it is that is being studied. The conceptual model is often the focus of formative research endeavors facilitating the organization of material and information from a number of different sources, and it guides the research in an area as a model is developed that is often then used in summative research. [6] Kingdon's work is so widely used because it organizes, or allows the researchers to organize information in a particular area to make it more understandable in examining why or why not ideas become a part of the agenda of government. Once this information is organized using this conceptual framework, then more specific relationships may be specified among variables.

Kingdon suggests that the three problem, policy and political streams must merge or couple for an idea to become a policy. The problem stream entails identifying and elevating an issue as being important enough to gain the attention of policy makers. This problem identification element is critical. Without the attention of policy makers, the item will not be placed on the agenda of government. In this context, a variety of conditions are considered important characteristics of a problem if it is to gain this attention. For example, a problem must be viewed as being tractable – that is, solvable - to gain a place on the agenda because policy makers will not waste their time on problems that cannot be solved by their action. Yet, as Kingdon notes, "There is a difference between a condition and a problem," [4:109] and conditions become problems when there emerges the belief that something should be done about them. However, such belief is insufficient if the problem is viewed as intractable, or if there are other competing definitions of the problem. Many problems fade from view for a variety of reasons including the erroneous belief that legislation has adequately addressed them. Alternatively, problems can be assisted onto the agenda by focusing events including crises or disasters that simply overwhelm other factors because the implications of not acting are so dire.

The policy stream is composed of policy communities or attentive groups that produce alternatives and proposals for solving the issue/problem. These groups produce policy proposals for serious consideration and are often most successful when the proposal is technically feasible, compatible with the decision makers' values, reasonable in cost and appealing to the public. [7] Kingdon compares the policy

environment to “primeval soup” where many ideas and alternatives circulate around and are combined with other ideas while some fade completely. The policy community composed of the experts generating and considering these ideas is highly fragmented reflective of our policy system. Often advocates of specific proposals, or policy entrepreneurs invest their own resources for specific policy proposals. The study of such entrepreneurs is beyond the scope of this paper but sometimes such policy entrepreneurs play a critical role in advocating and obtaining a place on the agenda for a particular policy solution to a problem. Kingdon notes that in the policy stream the merit of ideas are supposed to provide the power to obtain agenda status. However, this is often not the case as sometimes an idea is counter to the prevailing ideology or wisdom of the day. [4:125] For example, the State of Nevada’s position on many facets of Yucca Mountain and the nation’s radioactive waste disposal plans can be viewed as going against the prevailing ideology or policy wisdom during the first two periods of time examined below. Indeed, Nevada’s efforts to prevent the siting of a repository at Yucca Mountain often focused on the technical infeasibility of elements of the policy and are often why ideas fail during implementation.

Finally, the political stream is composed of changes in public opinion, interest group receptivity, and/or administrative changes. Often such changes are reflected or manifested in changes of elected officials resulting in senior leadership changes in the administration. These political changes provide the possibility of a problem or issue rising in importance and gaining the attention of these officials, and others fading from sight until a later time. The Obama elections resulted in shelving some nuclear waste policies that had been the focus of U.S. efforts for over 50 years and charting new directions in this policy area as a result of these political changes (discussed below). With elections we also discover a new mood may emerge or new priorities that cause policy discontinuities in one area as a new consensus emerges in another. The political stream cuts across policies and problems and as Kingdon suggests is independent of these other streams.

Yet, sometimes because of timing, a focusing event or other factors, a policy window may open that results in these streams coupling with startling impacts on agendas. Often, Kingdon suggests, a problem may become a part of the agenda leading to new policy or new directions for policy, when a focusing event occurs. These focusing events are often crises or disasters. [4:94] While we demonstrate in this paper that nuclear waste management policy shifts have been closely associated with such crises and disasters, they are not always required nor are they sufficient by themselves. Indeed, as Kingdon notes: “Crisis, disasters, symbols and other focusing events only rarely carry a subject to policy agenda prominence by themselves. They need to be accompanied by something else. We have already made the point, first that they reinforce some preexisting perception of a problem, focus attention on a problem that was already ‘in the back of people’s minds’.” [4:98]

When these three streams converge, perhaps aided by a focusing event, the *opportunity* for a new agenda item and new policy direction exists. Policy advocates or policy entrepreneurs closely watch for these opportunities. As Kingdon suggests, at any one time there are multiple alternative problem solutions that are floating around and being discussed as potential solutions to a problem. Advocates of these various solutions monitor opportunities to attach their particular solution to a problem. Hence, when the opportunity presents itself (when a policy window opens) either with the occurrence of a focusing event or not, advocates/entrepreneurs must be prepared to attach their particular solution to a proposal for solving a problem. [4:88,165] Such opportunities for attaching an advocate’s particular solution to a problem may be the change of an administration (a change in the political stream). However, such opportunities for action on given initiatives stay open for only short periods of time and then close. These policy windows open and close in areas depending on various events, such as the occurrence of a focusing event, change in public opinion concerning the salience of an issue and changes in administration. Importantly, Kingdon believes that despite the shortness of time associated with such opportunities, most major changes in public policy result from the occurrence of such policy windows. [4:166]

Policy windows and opportunities close for a number of potential reasons according to Kingdon. Importantly for our consideration, policy windows close because the focusing event may pass from the scene or become less salient. Additionally, the change in the administration and personnel that helped to create the policy opportunity may change again. Hence, the opportunity presented by the administration and the key administrative personnel dissipates over time as the administration disappoints some of its supporters and as key personnel leave an administration. [4:168-169] There are other conditions that also will result in the closure of a policy window. Participants in the policy process may feel they have addressed a problem by enacting some legislation or by some administrative procedure that has been adopted. In fact, such action may not have adequately addressed the problem but the action results in the closing of this particular opportunity. Alternatively, efforts to address the problem may simply fail to achieve success despite considerable investment of time and resources, so an administration's attention turns elsewhere. [4:169] When there is a failure to act after an opportunity presents itself, another opportunity may not occur for considerable time. The possibility that proponents of nuclear waste policy change currently have such an opportunity, but that the window is closing, is a compelling reason for this paper. While Kingdon's analytic framework has limitations such as the lack of an explanation of the agenda setting policy process in causal terms, it nonetheless does provide a conceptual overview for understanding past and current nuclear waste management policy.

The body of this paper applies Kingdon's terminology or framework to not only the past development of nuclear waste management policies, but also the near term future of policy in this area. In this context, we believe the publication of the BRC Final Report represented the convergence of these three streams and that, in 2012, the likelihood of breaking out of our currently deadlocked nuclear waste management policy seemed probable. As will be seen, there was a growing consensus that the problems surrounding nuclear waste management were tractable and important as evidenced first by the publication of the National Academy of Science Committee on Transportation of Radioactive Waste report in 2006, and six years later the BRC Report. While focusing events may not be required for policy change, we identify such events we believe are closely associated with past change in nuclear waste policy. Hence, by 2012 there was a new definition of the problem of managing spent nuclear fuel and high-level radioactive waste in a comprehensive program that did not exclusively focus on Yucca Mountain as the sole solution. Acceptance of the new problem definition, support for other emerging alternatives among key stakeholder groups and shifting political acceptance for these other alternatives among the administrative and political leaders all suggest a newly opened policy window of opportunity.

A NATIONAL COMPROMISE: THE NUCLEAR WASTE POLICY ACT OF 1982

The policy developments and events leading to passage of the Nuclear Waste Policy Act (NWPA) of 1982 are addressed in detail by Carter, [9] Walker, [10] Stewart and Stewart, [11] and Alley and Alley. [12] Some of the key events are listed below in Table 1.

Table 1. Nuclear Waste Disposal Timeline, 1957 - 1982

1957	NAS, The Disposal of Radioactive Waste on Land
1959	Atomic Energy Commission (AEC) Project Salt Vault and Lyons, Kansas
1972	AEC Abandons Lyons, Kansas project
1974	Energy Reorganization Act (AEC replaced by ERDA and NRC)
1976	Energy Research & Development Administration Studies Repository Sites in 36 States
1976	Federal Elections (Carter elected President)
1977	Department of Energy (DOE) Created

1979	Interagency Review Group (IRG) Report
1979	Three Mile Island Accident (March 28, 1979)
1980	President Carter's Policy Statement (Feb. 12, 1980)
1980	GEIS on Commercially Generated Radioactive Waste
1980	Federal Elections (Reagan elected President, Republican Senate)
1981	President Reagan's Policy Statement (Oct. 8, 1981)
1982	Nuclear Waste Policy Act (Passed Dec. 20, 1982; Signed Jan. 7, 1983)

The NWPA of 1982 was an extraordinary policy accomplishment more than twenty-five years in the making. Enactment was only possible because of compromises between anti-nuclear and pro-nuclear forces, Eastern and Western states and organizations of states, and proponents of strong Federal government action and proponents of states' rights. The NWPA also represented a compromise on nuclear waste management options, incorporating near-term action on spent nuclear fuel storage and longer term action on geologic disposal, while straddling the highly controversial issue of reprocessing spent nuclear fuel. [13, 14, 15, 16] Congressman Morris "Mo" Udall of Arizona, the Act's key legislative manager in the House of Representatives, called it "a delicate fabric of agreements." [12:190]

Regarding geologic repositories, the NWPA [17] established four key components of national nuclear waste policy. First, the Act established a definite schedule for "the siting, construction, and operation of repositories that will provide a reasonable assurance that the public and the environment will be adequately protected from the hazards posed by" SNF and HLW. [Sec. 111(b)(1)] The Act directed DOE to select three candidate sites for the first repository by January 1, 1985, and five candidate sites for the second repository by July 1, 1989. [Sec. 112(b)] From these sites, DOE was to recommend one site for the first repository by March 31, 1987 and another for the second repository by March 31, 1990. [Sec. 114(a)] The Act further set deadlines for DOE to submit a license application to the NRC, and for NRC to approve or disapprove DOE's license application. [Sec. 114(b)]

Second, the Act established "the Federal responsibility, and a definite Federal policy, for the disposal" of SNF and HLW. [Sec. 111(b)(2)] The Act directed DOE to enter into contracts with the nuclear utilities requiring DOE to "take title" to SNF and HLW, following commencement of repository operations, and to begin disposing of SNF and HLW "not later than January 31, 1998." [Sec. 302 (a)(5)]

Third, the Act defined "the relationship between the Federal Government and the State governments with respect to the disposal of" SNF and HLW. [Sec. 111(b)(3)] The Act provided a specified role for State governments in the DOE repository siting process, including a provision that would allow a State government to veto a DOE repository site recommendation by filing a "notice of disapproval." The state veto could be overturned by a vote in both houses of Congress approving a "resolution of repository siting approval." [Sec. 115]

Fourth, the Act established "a Nuclear Waste Fund, composed of payments made by the generators and owners of such waste and spent fuel that will ensure that the costs of carrying out activities relating to the disposal of such waste and spent fuel will be borne by the persons responsible for generating such waste and spent fuel." [Sec. 111(b)(4)]

Overall, the provisions of the NWPA set forth a detailed blueprint for managing the nation's high-level nuclear waste program. Additionally, the Act mandated accountability to Congress by including

numerous reporting and approval requirements. The Act required Senate approval of the Director of the new DOE Office of Civilian Radioactive Waste Management (OCRWM). The Act required the OCRWM Director to report to Congress annually, and at every significant milestone in program implementation. Most importantly, the OCRWM budget was to be included in the budget of the U.S. Department of Energy, and expenditures from the Waste Fund were subject to the congressional appropriations process.

“Congress put together a national compromise,” Eliot Marshall wrote. “All the states agreed to give up some autonomy to support a single comprehensive system for disposing of spent reactor fuel. ...the President was to choose one site in the West to hold 70,000 metric tons of waste. Several years later, he would choose a second site in the East. The two-site requirement was essential. Without it, westerners were not inclined to take any waste from the East, where most nuclear waste is generated.” [18]

When the NWPA was passed the concept of federal responsibility for geologic waste disposal had been debated for a quarter century. A policy window that closely fits the model described by Kingdon evolved beginning in the 1960s and the 1970s, with three streams (problem, political, and policy) converging between the mid-1970s and the early 1980s, culminating in the NWPA of 1982. The national policy compromise was assisted by the focusing event of the Three Mile Island reactor accident on March 28, 1979. [19] This accident, and the media attention it received, almost in itself required key actors in the political and policy streams to re-examine the problem definition and understanding of nuclear power and nuclear waste. Yet, as can be seen in Table 1, even prior to the focusing event, key actions were already underway, including a newly established U.S. Department of Energy as part of an effort to consolidate the policy and administrative mechanisms of government for dealing with nuclear issues. In short, all the elements of Kingdon’s analytic model were in play when the NWPA emerged as the national compromise for managing nuclear waste.

THE POLITICAL BURIAL OF THE NUCLEAR WASTE POLICY ACT

The policy developments and events leading to passage of the Nuclear Waste Policy Amendments Act (NWPAA) of 1987 are addressed in detail by Walker, [10] Stewart and Stewart, [11] and Alley and Alley. [12] One contemporary observer described these events as “the political burial” of the “national compromise” embodied in the NWPA. Some of the key events are listed in Table 2.

Table 2. Nuclear Waste Disposal Timeline, 1983 - 1987

1983	NRC Repository Technical Criteria 10 CFR 60
1983	DOE Draft Regional Reports for Crystalline Repository Project
1984	DOE Repository Siting Guidelines 10 CFR 960
1984	DOE Draft EAs for Potentially Acceptable Sites for First Repository
1985	DOE Proposes Oak Ridge TN MRS (April 25, 1985)
1985	DOE AMFM Panel and Defense Commingling Reports
1986	Draft Area Recommendation Report for Second Repository (Jan. 16, 1986)
1986	Space Shuttle Challenger Disaster (Jan. 28, 1986)
1986	DOE Public Meetings in Second Repository States (Feb. 1986)
1986	Chernobyl Reactor Accident (April 26, 1986)
1986	DOE Public Meetings in Second Repository States (Feb.-May 1986)
1986	DOE Selection of First Repository Sites - NV, TX, WA (May 28, 1986)

1986	DOE Suspension of Second Repository Program (May 28, 1986)
1986	Proposed Federal Legislation to Delay or Amend NHPA
1986	Federal and State Elections
1987	Nuclear Waste Policy Amendments Act (Signed Dec. 22, 1987)

DOE and NRC began implementing the NHPA in early 1983. By the end of 1984, DOE had tentatively identified three previously studied sites – Yucca Mountain in Nevada, Deaf Smith County in Texas, and Hanford in Washington – as potential candidate sites for the first repository, and identified study areas for the Crystalline Repository Project, to be evaluated for the second repository, in 17 states in the North Central, Northeastern, and Southeastern regions. DOE was also evaluating sites in Tennessee for an interim storage facility, called the Monitored Retrievable Storage (MRS) facility, but this effort was not publically announced until April 1985. In January 1986, DOE was preparing to designate three candidate sites for the first repository; identify twelve potentially acceptable sites for the second repository and eight back-up sites; and proceed with the Oak Ridge MRS.

Political opposition to DOE's siting efforts grew in intensity as the scheduled NHPA decision dates approached. Tennessee and other states filed lawsuits against DOE. The controversy was heightened by preparations for the upcoming November 1986 elections, with state and congressional races of national importance in a number of NHPA-affected states, and the beginning of campaign planning for the 1988 presidential elections. The space shuttle *Challenger* disaster on January 28, 1986, and the Chernobyl nuclear reactor accident in the Soviet Union on April 29, 1986, both became focusing events, widely reported in the media in ways which challenged public confidence in science and technology generally, and in nuclear technology specifically. Thousands of angry people attended DOE meetings in Maine, New Hampshire, North Carolina, and Wisconsin. Altogether more than 18,000 people attended DOE briefings and hearings in fifteen states between January and April 1986, and DOE received more than 60,000 mostly-negative comments on the second repository area recommendation reports. [14]

In New England opposition was particularly intense after DOE identified two potential sites in Maine and one in New Hampshire. "Logs obtained by [Massachusetts Congressman Ed] Markey show that DOE's nuclear waste officials had 32 meetings or phone conversations with distraught eastern senators, congressmen, governors, and their staffs between 15 January and 28 May 1986." An opposition group in Maine known as Citizens against Nuclear Trash (CANT), hired Cooper Brown, a Washington, DC attorney to assist the group in arranging access to Vice-President George Bush. According to Brown, if DOE had persisted with its plans for Maine and New Hampshire, "it would have been very difficult for any Republican candidate associated with this Administration [to win] in the upcoming presidential primaries. The Bush people saw the handwriting on the wall, and saw that something had to be done." Brown told a vice-presidential aide that it would difficult to spare only the two New England states, so it "would make more political sense if DOE would drop the whole second round [of eastern site selection]." Two weeks later the Secretary of Energy indefinitely postponed work on an eastern site. "Politics played no part in it, he told the House Interior Committee on 31 July. 'It was a managerial decision made in the Department,' Herrington said, aimed at saving money." [18]

Energy Secretary Herrington's May 28, 1986 announcement suspended the second repository effort and proceeded with consideration of sites in Nevada, Texas and Washington for the first repository. The selection of Hanford over two sites with higher technical rankings – Richton Dome in Mississippi and Davis Canyon, Utah – further fueled the perception that DOE's siting process was driven by political science rather than earth science. Over the next 18 months, there were a number of legislative proposals to restructure the program, including a bill supported by many Eastern and Midwestern congressmen that would have imposed a temporary moratorium on site-specific work to allow a blue ribbon commission to

assess the situation and recommend new legislation to fix the program. Unlike the congressional deliberations in 1982, there was no last minute national compromise. On December 21, 1987, Congress passed the Nuclear Waste Policy Amendments Act (NWPAA) as part of the budget reconciliation conference report (H.R. 3545), and the NWPAA was signed into law the next day. [17]

Science “hit political reality,” journalist Foster Church observed. “Faced with pressure from four Eastern states where U.S. Senate seats held by Republicans were threatened--they were Georgia, New Hampshire, North Carolina and Wisconsin--the Reagan administration postponed indefinitely the search for an Eastern site. One year later, in 1987, Congress scrapped the scientific processes of the 1982 law for the other site as well. It picked a Western site based on pure politics.” [20] The NWPAA directed DOE to characterize only one site, Yucca Mountain, for development as a geologic repository. All work on second repository sites was terminated, with DOE directed to report back in 20 years on the need for a second repository. DOE’s Oak Ridge MRS siting proposal was also nullified.

Congressman James Bilbray of Nevada told Church how a member of the Senate-House conference committee broke the news to him. “I hope you understand what is going on here. There are three sites under review--Texas, Nevada and Washington. And the speaker [of the House, Jim Wright] is a Texan and the majority leader [Tom Foley] is a Washingtonian. ... It is not going to Washington. And it is not going to Texas.” Bilbray told the journalist “Nevada was treated very shabbily, and our delegation was treated very shabbily. ... I resent it to this day.” Two decades later, former Congressman Bilbray retold the story at a University of Nevada Las Vegas roundtable discussion on Yucca Mountain. He related going into a room with Majority Leader Tom Foley and Speaker Jim Wright and being told Yucca Mountain was it. “I left the room and a friend asked me what happened. I told him that Nevada had just been screwed.” Thus the unofficial name of the NWPAA as the “Screw Nevada Bill” was born. [21]

The NWPAA shattered the national compromise of 1982, especially the regional equity understanding between Eastern and Western political forces. Applying Kingdon’s model, the problem stream – the need for a national solution to the nuclear waste problem – remained essentially unchanged and the problem definition was unaltered. But the political and policy streams now faced major new obstacles: intense resentment and irreconcilable opposition by Nevada political leaders; the loss of trust and credibility in DOE by many important stakeholders; permanent skepticism about the technical safety case for geologic disposal at Yucca Mountain; and widespread concerns about disproportionate adverse transportation impacts by Western States, Indian tribes, and nongovernmental organizations. The *Challenger* disaster and the Chernobyl accident, coinciding with key DOE decision dates in January-February and April-May 1986, served as focusing events, undermining public confidence in government and science at the very time that the public demanded technical policy solutions from political leaders.

PROGRESS TOWARDS GRIDLOCK

The policy developments and events following passage of the NWPAA, including legislation, litigation and the 2002 DOE site recommendation, Nevada veto and the congressional override vote, are addressed in detail by Stewart and Stewart. [11] Developments at the Yucca Mountain site, including construction of the Exploratory Studies Facility, DOE site characterization studies, and technical controversies over the DOE repository design and long-term performance assessment, are addressed in detail by Alley and Alley. [12] Space does not permit an in-depth discussion of how these key developments and events, listed in Table 3, contributed to the resulting political and policy deadlock.

Table 3. Nuclear Waste Disposal Timeline, 1988 - 2008

1989	DOE Site Characterization Plan for Yucca Mountain
1992	Energy Policy Act of 1992

1995	NAS Technical Basis for Yucca Mountain Standards
1996	Federal Legislative Efforts to Site Interim Storage Facility in Nevada
1999	DOE Draft EIS for Yucca Mountain
2001	EPA Radiation Protection Standard for Yucca Mountain (40 CFR 197)
2001	NRC Licensing Regulations for Yucca Mountain (10 CFR 63)
2001	DOE Suitability Criteria for Yucca Mountain (10 CFR 963)
2002	DOE Final EIS for Yucca Mountain and DOE Site Recommendation
2002	Presidential Site Recommendation, Nevada Veto, and Congressional Override Vote
2002	State of Nevada Lawsuits
2004	Federal Court (CADC) Vacates EPA Radiation Protection Standard
2006	Federal Elections (NV Senator Reid becomes Majority Leader)
2008	EPA Promulgates Revised Final Rule on Radiation Protection for Yucca Mountain
2008	DOE Submits Yucca Mountain License Application & EIS to NRC

DOE quickly reorganized the repository program to focus on one site only, as directed by Congress. The State of Nevada had already created a Commission on Nuclear Projects and an agency of the same name within the Governor's Office to represent the State's interests in 1985. [22] After passage of the NWPA, Nevada ramped up a "scorched earth battle plan" in opposition to Yucca, utilizing "litigation, denial of water access to block DOE efforts to study the site, commissioning of technical studies to question the suitability of the site, challenges to DOE's site characterization methods and procedures, and extensive public relations efforts." [11:210]

DOE released its site characterization plan in 1989. Nevada's actions, combined with DOE's difficulties, soon slowed the program's progress. Moreover, DOE ignored its own 1993 Secretary of Energy Advisory Board's recommendations on how to earn public trust and confidence, a requisite for managing the radioactive nuclear waste program. As it failed to build the stakeholder trust deemed necessary, resistance continued to grow. [3] A brief illusion of progress was bolstered by release in quick succession of the DOE Draft Environmental Impact Statement (EIS) for Yucca Mountain in 1999, the NRC repository licensing regulations in 2001, and the EPA radiation exposure standard for Yucca Mountain in 2001. These actions gave the appearance of coordinated federal agencies moving toward ultimate approval of the site. What did not disappear was the increasing resistance to forced siting within Nevada.

When President Bush and the Congress decided to override Nevada's veto of the Yucca Mountain site recommendation in 2002, Nevada pursued litigation along a number of fronts, and began extensive preparation to challenge DOE's license application before the NRC. Nevada won a key legal battle in 2004. The U.S. Court of Appeals for the District of Columbia Circuit (CADC) in *Nuclear Energy Institute v. EPA* required EPA to revise its site-specific radiation exposure standards to comply with a 1995 NAS committee report, and ordered NRC to revise its licensing requirements to reflect the new EPA standards. Four years later, first EPA and then NRC complied with the CADC order, requiring DOE to revise the license application it filed with NRC, and leading Nevada to file new lawsuits against both EPA and NRC. Those lawsuits remain in abeyance to the present day. Earlier, in December 2008, Nevada filed 229 contentions or challenges against the original DOE license application submitted to NRC in June 2008. [11, 23] Meanwhile, the November 2008 elections changed the national political scene in Nevada's favor.

GRIDLOCK AT YUCCA MOUNTAIN AND THE CURRENT POLICY WINDOW

At the 27th anniversary of the NWPPA, there was no repository at Yucca Mountain, there was no final repository design, there was no final waste package design, there was no license to construct a repository, and there was no rail line to transport SNF and HLW to the repository, should one be constructed. But after more than 20 years of nuclear waste policy gridlock, Kingdon's three process streams - problem, policy, and political – have again converged with political changes brought about by the 2008 elections. A policy window of opportunity opened. The question, in the aftermath of the 2014 elections, is what if anything happens next. Some of the key events contributing to this situation are listed in Table 4.

Table 4. Nuclear Waste Disposal Timeline, 2008 – 2015

2008	Federal Elections (Obama elected President, Reid remains Senate Majority Leader)
2009	NRC Construction Authorization Boards Order Admitting Parties and Contentions
2010	DOE Motion to Withdraw Yucca Mountain License Application
2010	Blue Ribbon Commission (BRC) on America's Nuclear Future Appointed
2010	Federal and State Elections (Reid Re-elected, Sandoval elected NV Governor)
2011	Continuing Resolution eliminates new appropriations for Yucca Mountain
2011	Fukushima Daiichi Reactor Accident in Japan
2011	NRC Suspends Yucca Mountain Licensing Proceeding
2011	Litigation to Restart Licensing Proceeding (Aiken County – 1)
2012	Final BRC Report
2012	Federal Elections (Obama re-elected, Reid remains Senate Majority Leader)
2013	S. 1240 Nuclear Waste Administration Act of 2013 Introduced
2013	Federal Court orders NRC to restart Yucca Mountain Licensing Proceeding
2013	NRC issues Order to restart Yucca Mountain Licensing Proceeding
2014	NRC issues Yucca Mountain SER Volume 3 (Post-closure Performance)
2014	DOE issues Disposal Options Report (Possible Separate DOE/DOD Repository)
2014	Federal Elections (Reid becomes Senate Minority Leader, Gov. Sandoval Re-elected)

The current gridlock is essentially what the BRC found in January 2012: “The Obama Administration’s decision to halt work on a repository at Yucca Mountain in Nevada is but the latest indicator of a policy that has been troubled for decades and has now all but completely broken down. The approach laid out under the 1987 Amendments to the Nuclear Waste Policy Act (NWPA)—which tied the entire U.S. high level waste management program to the fate of the Yucca Mountain site—has not worked to produce a timely solution for dealing with the nation’s most hazardous radioactive materials. The United States has traveled nearly 25 years down the current path only to come to a point where continuing to rely on the same approach seems destined to bring further controversy, litigation, and protracted delay.” [2: vi]

Nevada’s opposition to Yucca Mountain continues. Shortly after publication of the BRC Final Report Governor Brian Sandoval advised the Secretary of Energy “that Nevada wholeheartedly supports the recommendations of the BRC and believes that the consent-based approach represents the best chance for ultimately solving the nation’s nuclear waste management problem. However, Nevada will not consent to an interim storage facility or repository being considered in the state.” [24]

Nevada's opposition to Yucca Mountain was strengthened when Senator Reid of Nevada became the U.S. Senate Majority Leader in 2007. After the election of President Obama in 2008, DOE began dismantling the Yucca Mountain program in 2010, and requested no new funding for the project after Fiscal Year 2011. Senator Reid made sure that Congress appropriated no additional funds for Yucca Mountain. DOE has not requested, nor has Congress appropriated, any additional funds for Yucca Mountain over the past four fiscal years.

Between Fiscal Years 1983 and 2007, DOE spent about \$14.5 billion (2008 dollars) on the Yucca Mountain repository project. DOE estimated that an additional \$82.5 billion (2008 dollars) would be required for construction and operation, for a total life-cycle cost of about \$97 billion (2008 dollars). The primary infrastructure currently existing at the site, about 5.1 miles of exploratory tunnels, cannot be used as is for waste storage or disposal. DOE would need to construct another 42 miles of tunnels and emplacement drifts, for a total of about 47 miles, to accommodate the proposed action, emplacement of 70,000 metric tons of SNF and HLW. Yet another 45-91 miles of tunnels and drifts would be needed if no second repository were to be constructed. [25, 26, 27, 28]

The NRC licensing process that began in 2008 was suspended in 2011 because of insufficient funding. Before suspension, the NRC licensing board had admitted 219 technical safety and environmental contentions filed by the State of Nevada in opposition to DOE's license application. [29] In August 2013, the U.S. Court of Appeals for the District of Columbia Circuit (CADC) ordered NRC to resume the Yucca Mountain licensing proceeding [Aiken County et al, Case #11-1271]. The 2-1 decision by the CADC acknowledged that NRC did not have sufficient funds to complete the legally-mandated proceeding, with Chief Judge Garland dissenting that the court was ordering NRC to do "a useless thing." [30] In November 2013, NRC issued an order directing NRC staff to restart the non-adjudicatory portion of the licensing proceeding, acknowledging the limited funds available. [31]

Even if the BRC recommendations were implemented, and NRC licensing sufficiently funded, a successful outcome for the Yucca Mountain project cannot be taken for granted. Thorne writes: "Based on what is now known of the conditions existing at Yucca Mountain and the large number of safety, environmental and legal issues that have been raised in relation to the DOE License Application, it is suggested that it would be imprudent to include Yucca Mountain in a list of candidate sites for future evaluation in a consent-based process for site selection. Even if there were a desire at the local, tribal and state levels to act as hosts for such a repository, there would be enormous difficulties in attempting to develop an adequate postclosure safety case for such a facility, and in showing why this unsaturated environment should be preferred over other geological contexts that exist in the USA and that are more akin to those being studied and developed in other countries." [32]

As of March 2015, NRC staff had completed the multi-volume Safety Evaluation Report (SER), and the publication of a required draft EIS supplement on groundwater impacts is expected in mid-2015. [33] Lack of funds may prevent NRC from resuming, let alone completing, the legally-mandated adjudicatory proceeding.² Lifting the suspension would require a vote by the Commission. If the adjudicatory proceeding with discovery and trial-like hearings were to resume, Nevada intends to fully prosecute the 219 admitted contentions and submit new contentions. DOE and NRC have estimated that the combined cost to the two agencies for the full legally-mandated proceeding could be about \$2 billion.³ Additionally, Nevada and other parties would likely resume lawsuits currently in abeyance regarding EPA radiation

² NRC had about \$14 million in prior-year Yucca Mountain appropriations when the restarted proceeding resumed. [33]

³ In a March 4, 2015, congressional hearing, NRC estimated about \$330 million would be required for the full proceeding. [42] In 2008, DOE estimated that it had spent about \$670 million (2007\$) on licensing between 2003 and 2006, and would require an additional \$1.66 billion (2007\$) for a successful licensing effort between 2008 and 2017. [27] DOE had about \$20 million in unobligated funds and about \$21.7 in obligated funds available for Yucca Mountain licensing at the end of 2014. [34]

protection standards, NRC licensing regulations, state water permits requested by DOE, and DOE selection of a preferred rail construction route (the Caliente rail alignment). Yet the window of opportunity for remaking the nuclear waste program remains open.

THE NUCLEAR WASTE ADMINISTRATION ACT OF 2015, S. 854

The reintroduction of legislation to implement the BRC recommendations is evidence that the current policy window is still open. In March 2015, Senator Lamar Alexander (R-TN), with co-sponsors Senators Lisa Murkowski (R-AK), Dianne Feinstein (D-CA), and Maria Cantwell (D-WA), introduced the Nuclear Waste Administration Act of 2015, S. 854. Except for year, S. 854 is identical to a bill of the same name introduced in 2013, S. 1240.⁴ Like its predecessor, S. 854 was referred to the Senate Committee on Energy and Natural Resources, where it awaits further consideration. [43]

Removing the Waste Program from DOE

At the heart of S. 854 is removal of the nuclear waste program from DOE. The BRC Final Report recommended legislative action to establish a new waste management organization: “Responsibility for implementing the nation’s program for managing spent nuclear fuel and high-level radioactive wastes is currently assigned to the U.S. Department of Energy. Legislation will be needed to (1) move this responsibility to a new, independent, government-chartered corporation focused solely on carrying out that program and (2) establish the appropriate oversight mechanisms.” [2: viii]

S. 854 would create a new executive-branch agency, the Nuclear Waste Administration (NWA), and transfer to it all of the responsibilities currently assigned to the DOE Office of Civilian Radioactive Waste Management (OCRWM). In this respect S. 854 differs sharply from the BRC report, which recommended creation of a government-chartered corporation, modeled after the Tennessee Valley Authority (TVA). The NWA would be headed by an Administrator and a Deputy Administrator, appointed to a six-year term by the President with the advice and consent of the Senate.

There is a strong case for removing the nuclear waste program from DOE. Because of the way it conducted siting for the first and second repositories and the Oak Ridge MRS proposal, DOE lost the confidence of those previously identified potential repository host states and Indian Tribes. DOE’s handling of the now-terminated Yucca Mountain project has damaged DOE’s credibility with the nuclear industry and with state public utility regulators. The recent contamination incident at the Waste Pilot Isolation Plant (WIPP) has damaged DOE’s long favorable credibility in New Mexico. DOE’s role in nuclear weapons stewardship, its role promoting civilian nuclear power, and its past record of environmental contamination at facilities around the country, combine to seriously undermine DOE’s credibility with influential segments of the public in many states. [1, 14]

The authors believe that the S. 854 provisions for transfer of functions from the OCRWM to the new NWA provide the minimum sufficient basis for implementation of the other BRC recommendations, but so would transfer to a government-chartered corporation as recommended by the BRC. The nuclear industry has long advocated transfer of authority to a government-chartered corporation. [36] The executive agency approach has not been endorsed by the nuclear industry and by state utility regulators,

⁴ S. 854, like S. 1240 (2013), has its origin in a bill introduced in August 2012, by the retiring U.S. Senator from New Mexico, Jeff Bingaman, with the goal of starting a discussion on the BRC report. Bingaman’s bill, S. 3469 (2012) died in committee. In April 2013, the Committee on Energy and Natural Resources issued a “discussion draft” of legislation “intended to implement the recommendations” of the BRC. Over the next month, the Committee received more than 2,500 public comments on the discussion draft bill. [1] In June 2013, S. 1240, was introduced and referred back to the Committee. [35] S. 1240 represented the collaborative work of the Committee’s Chairman (Ron Wyden, D-OR) and Ranking Member (Lisa Murkowski, R-AK) and the Chairman (Dianne Feinstein, D-CA) and Ranking Member (Lamar Alexander, R-TN) of the Senate Appropriations Subcommittee on Energy and Water Development. It was originally scheduled for amendments and debate in early 2014. In March 2014, work on the bill was tabled due to a change in committee chairmanship. [1]

and their support will be critical. Conversely, there is considerable congressional skepticism about transferring the nuclear waste program to a government-chartered organization based on the TVA model. Resolving differences over the new management option will likely be the single greatest challenge in moving forward with new legislation. The advice and consent provisions of Title II would require eight Senate confirmation proceedings in the first year of operation and, because of the staggered terms and term limits, one or more Senate confirmation proceedings would be required each year for the first six years of operation. Such a large number of confirmations could provide a significant challenge to implementation of the NWA.

Restructuring the Nuclear Waste Fund

The BRC Final Report recommended legislative action to ensure access to dedicated funding: “Current federal budget rules and laws make it impossible for the nuclear waste program to have assured access to the fees being collected from nuclear utilities and ratepayers to finance the commercial share of the waste program’s expenses. We have recommended a partial remedy that should be implemented promptly by the Administration, working with the relevant congressional committees and the Congressional Budget Office. A long-term remedy requires legislation to provide access to the Nuclear Waste Fund and fees independent of the annual appropriations process but subject to rigorous independent financial and managerial oversight.” [2: viii]

S. 854 would partially implement the BRC recommendation. Section 401 would create a new Working Capital Fund, comprised of annual utility fee payments under the existing standard contracts, which would be available to the NWA without congressional appropriations. The status of these fees is currently uncertain. A Federal court decision in 2014 ordered DOE to suspend collection of these fees. Utility payments totaled \$765 million in 2012 and were projected to average about \$730 million (in 2012\$) per year over the next decade (2013-2022). DOE has projected that future utility fee payments would total \$27.1 billion (\$20.5 billion in 2012\$) through the year 2095. [29] The Working Capital Fund also would receive congressional appropriations for defense waste expenditures and interest on the unexpended balance of this new fund.⁵

Section 402 would continue the current system under which the fees already collected and interest payments on the accrued fees would be made available to the NWA by congressional appropriation. The balance in the Waste Fund totaled about \$28.2 billion in August 2012 (2012\$). This amount, often referred to as the “corpus” of the Waste Fund, has grown significantly through interest earnings. Using the range of future interest rate estimates considered by DOE in its recent fee adequacy report, interest on the current balance would be expected to accrue at \$1 billion or more per year. [29] The authors believe that the new Working Capital Fund, which would not require congressional appropriations, would likely be sufficient to support all of the activities authorized under the NWPA and the NWAA, except for construction and operation of one or more geologic repositories.⁶ Resolving differences over congressional appropriation of funds will be another major challenge for new legislation.

⁵ According to the BRC, cumulative defense appropriations for the waste program totaled about \$3.8 billion through FY2010, about 35 percent of total appropriations from the Fund; defense costs projected forward are estimated to total about 20 percent of life-cycle program costs.

⁶ We estimate that siting, construction and operation of a 60,000 MTU capacity storage facility for 50 years could be about \$3.5-4.0 billion (\$2012), not including transportation costs. Our estimate is based on DOE estimates of costs derived from J. Kessler, Cost Estimate for an Away-From-Reactor Generic Interim Storage Facility (GISF) for Spent Nuclear Fuel, 1018722, Technical Update (May 2009.) DOE’s most recent total system life-cycle cost estimate for a waste program based around a repository at Yucca Mountain is about \$97 billion (2008\$), which includes about \$14.5 billion (2008\$) already spent between FY1983 and FY2007. Direct repository costs for Yucca Mountain are estimated at \$51.3 billion (2008\$), in addition to funds already spent on Yucca Mountain. Disposal in bedded salt or an open mode shale repository could be “about half the cost of the YM repository,” while other options (crystalline rock, enclosed shale) could be up to 80 percent higher. [29, pp.B-21 to B-23]

Consent-Based Siting

The BRC Final Report recommended legislative action to establish a new facility siting process: “The NWPA, as amended in 1987, now provides only for the evaluation and licensing of a single repository site at Yucca Mountain, Nevada. The Act should be amended to authorize a new consent-based process to be used for selecting and evaluating sites and licensing consolidated storage and disposal facilities in the future” [2: viii]

Title III of S. 854 would direct the NWA to assume responsibility for siting and operating a geologic repository for spent nuclear fuel and high-level radioactive waste and to site and operate a pilot spent fuel storage facility and one or more consolidated storage facilities. This title would create a consent-based site selection process for such new facilities, together with siting and licensing requirements. Separate subsections would govern the siting process for storage facilities (Section 305) and repositories (Section 306) and spell out specific requirements for written consent agreements with state, local, and tribal governments.

These provisions resolve one stakeholder criticism of the BRC recommendation for consent-based siting – the lack of a specified role for state Governors. S. 854 would require consultation with Governors of potential host states and public hearings would be required before selecting sites for development of storage facilities and for repository characterization. A written consent agreement with the Governor or authorized official of the State, in addition to local and tribal governments, would be required upon a final determination of site suitability but before submission of a license application to NRC. This provision is consistent with the Western Governors’ Association (WGA) policy resolution that no centralized interim storage facility “shall be located within the geographic boundaries of a Western state or U.S. flag island without the written consent of the governor, in whose state or territory the facility is to be located.”[37]

But S. 854 does not require prior approval of the Governor (only consultation) for sites recommended by local governments or tribal governments. The authors believe consent of the Governor must be obtained as early as possible in the siting process. Also, neither Section 305 nor 306 explicitly consider the need for consent agreements to address the potential impacts of nuclear waste facilities on neighboring local units of government and Native American lands. Adjacent and/or nearby counties, cities, and tribes could be heavily affected by transportation, socioeconomic, and environmental impacts. The authors believe the Administrator should be explicitly required to address such impacts.

While Section 306 (a) requires the Siting Guidelines to be consistent with NWPA 112(a), there is no requirement for consistency with EPA and NRC repository rules. Sections 306 (c), (d), (e) and (f) do not explicitly require the Administrator to prepare an Environmental Impact Statement (EIS) prior to submission of a license application to NRC.

The BRC Final Report side-stepped the future consideration of Yucca Mountain: “We have not: Rendered an opinion on the suitability of the Yucca Mountain site or on the request to withdraw the license application for Yucca Mountain. Instead, we focused on developing a sound strategy for future storage and disposal facilities and operations that we believe *can and should be implemented regardless of what happens with Yucca Mountain.*” [2; viii, italics in original]

Following the BRC approach, S. 854 mentions Yucca Mountain only in the findings section, which concludes “in 2009, the Secretary found the Yucca Mountain site to be unworkable and abandoned efforts to construct a repository.” [Sec. 101 (5)] However, three provisions would impact Yucca Mountain: (1) Section 506 (a) states “This Act shall not affect any proceeding or any application for any license or permit pending before the Commission on the date of enactment of this Act.” This provision would allow the Yucca Mountain licensing proceeding to continue, as ordered by CADR in August 2013, and restarted by NRC order in November 2013; (2) Section 301 transfers to the new Administrator all functions vested in the Secretary of Energy by the NWPA, including the construction and operation of a repository at

Yucca Mountain; and (3) Section 306(e) requires that the NWA Administrator enter into a written consent agreement with the Governor (or other authorized official) of the potential repository host state, before submitting a repository license application to NRC. Since the Yucca Mountain license application has already been submitted, this provision would not apply to Nevada.⁷

By these three provisions, S. 854 would continue the current deadlock over Yucca Mountain. It could also create uncertainty regarding the status of the proposed Private Fuel Storage (PFS) site on the Skull Valley Goshute Reservation in Utah. The PFS project, opposed by the State of Utah, received an NRC license for construction and operation in 2006 but has not obtained other necessary federal agency approvals. The NRC license is effective for a period of 20 years, raising the possibility that the new NWA might seek to move PFS forward as a federal storage project. The authors recommend that Section 306 be amended to require a consent agreement before construction of any repository or storage facility authorized under the new act or current law (the NWPA). Alternatively, a new provision could be added to Title IV prohibiting use of Nuclear Waste Fund monies for construction of any repository or storage facility without a written consent agreement as specified in Section 305 or 306. These changes would also be consistent with the WGA policy resolution on governors' consent for storage and disposal facilities.

S. 854 would require host governments to sign a binding agreement at or before the beginning of the licensing process, before NRC staff completion of the required SER, before completion of an EIS as required by the National Environmental Policy Act (NEPA), and prior to resolution of safety and environmental contentions by an NRC licensing board. An alternative approach, recommended by the authors, would allow for signing of a consent agreement at any time during or before the completion of the licensing process for a repository. In March 2015, Sen. Harry Reid (D-NV) and Sen. Dean Heller (R-NV) introduced the Nuclear Waste Informed Consent Act (S. 691). [44] Rep. Dina Titus (D-NV) and Rep. Joe Heck (R-NV) introduced an identical bill (H.R. 1364) in the House of Representatives. [45] S. 691 and H.R. 1364 would require a binding consent agreement with the host state governor, affected units of local government (including contiguous counties impacted by transportation), and any affected Indian tribe before the NRC authorized construction of any repository. This would allow the repository consent agreement to be informed by completion of the safety evaluations required by NRC regulations and by the environmental evaluations required under NEPA. This timing change for the required agreement would extend consent to Nevada regarding the proposed Yucca Mountain repository.

SNF and HLW Transportation

Building upon the 2006 National Academy of Sciences (NAS) transportation report, and a 2011 WGA resolution, the BRC Final Report recommended a number of legislative and administrative actions to enhance transportation safety and security and to address public perception of transportation risks. The NAS report found “no fundamental technical barriers to the safe transport” of SNF and HLW, but noted “a number of social and institutional challenges to the successful initial implementation” of large-scale shipping campaigns, and cautioned that “the challenges of sustained implementation should not be underestimated.” [8: 2-3] The NAS recommended 14 specific actions, some involving multiple steps, to be carried out before the beginning of shipments to a repository or centralized storage facility. [8:7-23] The WGA 2011 resolution⁸ on radioactive materials transportation endorsed all of the NAS

⁷ A related issue is that Section 509 would repeal the current 70,000 MTU capacity limitation for SNF and HLW emplacements in the first repository, included in the NWPA to assure geographic equity by requiring the construction of a second repository. That amount is one-half the projected total inventory of wastes requiring deep geologic disposal, assuming no new reactors.

⁸ When the WGA renewed its policy resolution in 2014, the Governors' also resolved: (1) “it is the responsibility of the generators of spent nuclear fuel and HLW and the federal government, not the states and tribes, to pay all costs associated with assuring safe transportation, responding effectively to accidents and emergencies that may occur, and otherwise assuring public health and safety. This includes costs associated with route evaluations and inspecting and escorting shipments;” and (2) that commercial SNF should stay at reactor sites until “DOE, the U.S. Department of Transportation and the nuclear utility companies have ensured and funded adequate state and local emergency and medical responder training and resources in case of an accident or terrorist attack while shipping this waste.” [39]

recommendations, plus additional measures demonstrated to enhance safety and public acceptance during the first 12 years of transuranic waste shipments to the Waste Isolation Pilot Plant (WIPP). [38]

The BRC endorsed amending the NWPA to give a new waste management organization “the broader authorities given to DOE in the WIPP Land Withdrawal Act that supported the successful large-scale transport of transuranic waste to WIPP (including a public information program, support for the acquisition of equipment to respond to transportation incidents, and broad assistance for other waste-related transportation safety programs).” [2: viii]

The BRC Final Report also endorsed adoption of the NAS 2006 transportation recommendations, including “full-scale cask testing, more systematic examination of social or societal risk and risk perception, making planned shipment routes publicly available, shipping stranded spent fuel from shutdown reactor sites first, and executing technical assistance and funding under NWPA, Section 180(c).” [2:81,150] The BRC noted stakeholder concerns that “DOE’s plans to use its own self-regulating authorities under the Atomic Energy Act” and recommended requiring full NRC and DOT regulation of future SNF and HLW shipments: “... a new waste management organization should be subject to independent regulation of its transport operations in the same way that any private enterprise performing similar functions would be – in other words, the new organization should not receive any special regulatory treatment. This will help assure regulatory clarity and transparency.” [2:83]

The NAS, WGA, and BRC transportation recommendations address widely-held stakeholder concerns about large-scale, decades-long, and nation-wide SNF and HLW shipping campaigns. Both routine shipments and transportation accidents and incidents would create the potential for radiation exposures to workers and members of the public. Large-scale shipping campaigns would heighten perceived risks despite actual radiation exposures likely to be far below regulatory concern. Once regular shipments of SNF and HLW to a centralized storage facility or repository begin, dozens of states and Indian tribes would be affected, along with hundreds of local government jurisdictions.⁹

The transportation provisions of S. 854 must be amended to fully incorporate the BRC transportation recommendations. It is particularly important to require the implementation of the transportation risk management measures (such as shipment of older fuel first, full-scale testing of shipping casks, cooperative identification of shipping routes, and creation of a social impact management program) before commencement of large-scale shipping campaigns.¹⁰ The authors recommend the following changes: (1) all transportation of SNF and HLW conducted under the Act should be subject to licensing and regulation by NRC and by U.S. Department of Transportation (DOT) as provided under existing law; (2) the Administrator should be required to report to the President, within two years of enactment, on measures already taken, or to be taken, to implement the transportation recommendations of the NAS and

⁹ The “representative routes” identified by DOE for Yucca Mountain shipments would have traveled 22,000 miles of railways and 7,000 miles of highways, traversing 44 states, the District of Columbia, and more than 30 Indian nations. According to the 2010 Census, about 56 percent of the total US population, about 177 million people, lived in the 955 counties that would have been traversed by those routes. [40]

¹⁰ Under Section 309, the NWA would be responsible for all transportation to storage and disposal facilities constructed under the Act. The NWA would be directed to provide financial and technical assistance to affected States and Indian tribes, including conducting “a program to provide information to the public about the transportation of nuclear waste.” [Sec. 309(d)(1)] The NWA would be required to use transportation packages explicitly governed by some but not all NRC regulations. The NWA would be required to provide advance notification to affected States and Indian tribes, but is not explicitly subject to existing NRC regulations regarding notification. S.1240 fails to address regulatory gaps, for example the exemption of DOE shipments from the NRC transportation security and safeguards regulations (10 CFR 73.37), and creates a new regulatory gap by failing to mention NRC requirements for advance notification to affected States and Indian tribes (10 CFR 71.97). Moreover, the transportation assistance provisions do not require implementation through rulemaking, a key objective of most transportation-affected state regional groups (SRGs) for the past three decades.

the BRC before the commencement of any shipments under the Act; (3) the Administrator should be required to implement by administrative rulemaking the Transportation Assistance program described in Sec. 308 (d) before the commencement of any shipments under the Act; and (4) the NWAA should restate Section 9 of the NWPA: “Nothing in this Act shall be construed to affect Federal, State, or local laws pertaining to the transportation of spent nuclear fuel or high-level radioactive waste.”

Defense Waste Disposal Options

The BRC did not take a position on the merits of the 1985 waste commingling decision or on comments it received during its deliberations regarding the possibility of a separate repository for defense wastes requiring geologic disposal. The BRC Final Report did, however, urge the Administration “to launch an immediate review of the implications of leaving responsibility for disposal of defense waste and other DOE-owned waste with DOE versus moving it to a new waste management organization.” [2:65]

In October 2014 DOE issued a report on defense high-level waste disposal options. [41] Defense HLW and DOE-owned SNF are expected to account for about 10 percent of the total inventory of nuclear wastes requiring deep geologic disposal. DOE concludes that a separate repository for DOE-managed HLW and SNF not of commercial origin would be technically feasible, advantageous from a technical and institutional standpoint, and could be sited and developed by DOE under current law, although it would require a separate defense nuclear waste appropriation. Current law provides no mechanism whereby DOE could “re-purpose” the Yucca Mountain repository for disposal of HLW and SNF “resulting exclusively from atomic energy defense activities, research and development activities of the Secretary [of Energy], or both....” (Sec. 101) The NWPA would have to be amended by Congress to allow such a change in mission.

S. 854 includes a number of provisions designed to facilitate construction and operation of a separate defense waste disposal facility. Section 308(e) provides that not later than 1 year after enactment, the Secretary of Energy will notify the President and Congress of whether the previous (1985) decision by the President to commingle civilian and defense wastes will be reevaluated. If the Secretary finds separate storage or disposal facilities are “necessary or appropriate for the efficient management of defense wastes”, the Administrator may proceed, with the concurrence of the President, to site, construct and operate one or more separate facilities for the storage or disposal of defense wastes. The authors believe S. 854 should be amended to (1) require congressional approval before any decision is made to construct and operate separate defense waste facilities; (2) expand the basis of the Secretary’s decision to include “cost efficiency, health and safety, regulation, transportation, public acceptability, and national security,” as specified in the section 8 of NWPA of 1982; (3) clarify that siting, construction and operation of separate facilities for defense wastes must fully comply with all other provisions of Title III regarding siting, consent agreements, and licensing by the NRC; and (4) clarify the funding requirements for defense-only facilities.

CONCLUSIONS

John Kingdon’s conceptual approach for understanding the development of policy and the importance of policy windows provides a useful mechanism for analyzing the political environments in which Congress enacted the NWPA of 1982 and the NWPA of 1987, and for assessing the current political environment for potentially restructuring the U.S. nuclear waste program as recommended by the Blue Ribbon Commission (BRC) on America’s Nuclear Future in 2012. Kingdon’s model postulates that a policy window or opportunity can result from the merging of three process streams – the problem stream (pressing issues are identified and prioritized), the policy stream (feasible solutions are formulated and advocated by policy elites), and the political stream (changes in public opinion, interest group receptivity, and elected and appointed leadership). When these three streams converge, perhaps aided by a focusing event (such as a crisis or disaster), the *opportunity* for a new policy direction exists.

The current policy window grows out of a problem stream 27 years in the making, gridlock over Yucca Mountain and a nuclear waste program that in the words of the BRC “has been troubled for decades and has now all but completely broken down.” The current policy stream emerged from two decades of DOE advisory groups and NAS study groups, then formulated by the BRC into a new and comprehensive approach to program management. The political stream grows out of election results since 2006 that dramatically altered power relationships in Congress, and the Obama Administration taking Yucca Mountain off the table. Focusing events are the 2011 Fukushima Daiichi nuclear reactor accident in Japan, and the precipitous reversal of the recent “nuclear renaissance” due to changing energy economics, resulting in reactor shutdowns and cancellation of new nuclear projects. The central focus of the current policy discussion has been legislation currently under consideration by the U.S. Senate Committee on Energy and Natural Resources. The Nuclear Waste Administration Act of 2015 (S. 854) would implement key recommendations of the BRC and create a promising new environment for solving the nuclear waste dilemma five decades after the National Academy of Sciences first endorsed geologic disposal.

The policy situation in 2015 will be marked by major uncertainties: (1) funding for, and schedule and scope of, the restarted NRC Yucca Mountain licensing proceeding and the role of DOE as an unwilling applicant; (2) likely resumption of State of Nevada legal challenges against DOE, NRC, and EPA; (3) the recent DOE assessment of separate disposal options for defense high-level radioactive waste and DOE-owned spent fuel; (4) implications of the recent NRC final rule governing continued storage rule of spent fuel at reactor sites; and (5) the yet unknown legislative priorities of the 114th Congress and of the new chairpersons of the congressional committees of jurisdiction.

The 114th Congress inherits a policy window of opportunity that has evolved over eight years. The recent congressional elections in which the Republican Party has attained majorities in both the House and the Senate will alter the political stream. The gridlock characterizing the waste program may continue, and vitriolic political partisan conflict may heighten as the 2016 Presidential election nears. If such intense political conflict encompasses the nuclear waste issue, the policy window we have discussed may close. Yet perhaps the nuclear industry, other stakeholders, and political leaders (especially the new congressional committee chairs) may be able to come to an agreement to move the program forward.

We believe it is essential to resume legislative deliberations with a well-vetted policy option rather than trying to develop a totally new one or attempting to revert back to an option that has been stalled for 27 years with the accompanying law suits and mistrust among the key stakeholder groups. While considerable distrust exists between the nuclear industry and the out-going majority Democratic Party in the Senate, those political leaders will no longer be directing policy options in the 114th Congress. As such, the opening continues to exist for new policy direction if the shifting political stream supports action. Failure to act now may squander an opportunity to resolve conflicts that prevent the development of a coherent and successful program. S. 854, with the needed modifications, could provide the basis for remaking the U.S. nuclear waste program by adopting a voluntary approach to site selection, by removing the program from the DOE, and by focusing on consolidated interim storage of spent nuclear fuel in the next decade. The results of the 2014 midterm elections will weigh significantly on the opportunity to utilize the opened policy window. Such opportunities, as John Kingdon has reminded us, may quickly fade. Whether the policy window remains open should become clear in the next few months.

REFERENCES

1. A. MUSHKATEL, R. HALSTEAD, K. THOMAS, “Restructuring the U.S. Nuclear Waste Management Program: An Environmental Opportunity for Change?” Paper presented at the Western Social Science Association 56th Annual Conference, Albuquerque, NM (April 3, 2014), <http://www.state.nv.us/nucwaste/news2014/pdf/wssa56.pdf>
2. BRC, *Report to the Secretary of Energy* (January 2012), brc.gov/sites/default/files/documents/brc_finalreport_jan2012.pdf

3. A. MUSHKATEL, "Review of Transportation Recommendations and Related Assumptions," Report Prepared for the State of Nevada, Agency for Nuclear Projects, <http://www.state.nv.us/nucwaste/news2014/pdf/mushkatel2013may.pdf>
4. J. KINGDON, *Agendas, Alternatives, and Public Policies* [Second edition], Boston, MA: Little Brown and Company (1995). [First edition published 1984]
5. M. COHEN, J. MARCH, J. OLSEN, "A Garbage Can Model of Organizational Choice," *Administrative Science Quarterly* 17:1-25
6. T. HEDRICK, L. BICKMAN, D. ROG, *Applied Research Design: A Practical Guide, Applied Social Research Methods Series*, V. 32. Sage Publications Inc., Newbury Park, CA (1993)
7. J. COFFMAN, Coffman, "Evaluation Based on Theories of Policy Process," *The Evaluation Exchange*, 13, 1&2 (Spring 2007). Retrieved November 6, 2013, from <http://www.hfrp.org/evaluation/the-evaluation-exchange/issue-archive/advocacy-and-policy-change/evaluation-based-on-theories-of-the-policy-process>
8. NAS COMMITTEE ON TRANSPORTATION OF NUCLEAR WASTE, *Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States*, Washington, DC: The National Academies Press (2006)
9. L. CARTER, *Nuclear Imperatives and Public Trust: Dealing With Radioactive Waste*, Washington, DC: Resources for the Future (1987)
10. J.S. WALKER, *The Road to Yucca Mountain: The Development of Radioactive Waste Policy in the United States*, Berkeley and Los Angeles, CA: University of California Press (2009)
11. R.B. and J.B. STEWART, *Fuel Cycle to Nowhere: U.S. Law and Policy on Nuclear Waste*, Nashville, TN: Vanderbilt University Press (2011)
12. W.M. and R. ALLEY, *Too Hot to Touch: The Problem of High-Level Nuclear Waste*, New York: Cambridge University Press (2013)
13. M.R. FITZGERALD, A.S. MCCABE, *The U.S. Department of Energy's Attempt to Site the Monitored Retrievable Storage Facility (MRS) in Tennessee, 1985-1987*, NWPO-SE-014-88, Report Prepared for the State of Nevada, Agency for Nuclear Projects (May 1988)
14. R.J. HALSTEAD, T.J. EVANS, M. WISE, "Rethinking the Nuclear Waste Program: Lessons from the Crystalline Repository Project," *Proceedings, Waste Management* 88, Vol. 2, Pp. 901-914, Tucson, AZ (1988)
15. T. COTTON, "Nuclear Waste Story: Setting the Stage," Pages 31-44, in A.M. MACFARLANE, R.C. EWING, eds., *Uncertainty Underground: Yucca Mountain and the Nation's High-Level Nuclear Waste*, Cambridge, MA: The MIT Press (2006)
16. L. CARTER, "The Path to Yucca Mountain and Beyond," Pages 381-391, in A.M. MACFARLANE, R.C. EWING, eds., *Uncertainty Underground: Yucca Mountain and the Nation's High-Level Nuclear Waste*, Cambridge, MA: The MIT Press (2006)
17. DOE, *Reprints from Public Laws: P.L. 97-425, January 7, 1983; Title V of P.L. 100-203, December 22, 1987; (1988)*
18. E. MARSHALL, "Nuclear Waste Program Faces Political Burial," *Science*, Vol.233, 835-836 (22 August 1986)
19. S.M. FRIEDMAN, "Three Mile Island, Chernobyl, and Fukushima: An Analysis of Traditional and New Media Coverage of Nuclear Accidents and Radiation," *Bulletin of the Atomic Scientists*, Vol.67 (5), 55-65 (2011)
20. F. CHURCH, "Federal Report: Nuclear Waste – Can Nevada Keep America's Sizzling Nuclear Waste Out of Its Backyard," *Governing* (April 1990)
21. F.C. DILGER, J.D. BALLARD, R.J. HALSTEAD, "Gimme Three Steps: The Changing Political Landscape of High-Level Nuclear Waste Disposal," Presentation at Southwestern Social Science Association, Annual Meeting, Las Vegas, NV (March 2008) [The Yucca Mountain Roundtable was on January 16, 2008.]
22. NEVADA REVISED STATUTES, Nuclear Projects, NRS 459.009-459.0098, <https://www.leg.state.nv.us/NRS/NRS-459.html#NRS459Sec0091>

23. NEVADA COMMISSION ON NUCLEAR PROJECTS, *Report and Recommendations Presented to the Governor and Legislature of the State of Nevada* (December 2014), <http://www.state.nv.us/nucwaste/news2014/pdf/nv2014commrep2.pdf>
24. STATE OF NEVADA, Letter from Governor Brian Sandoval to Dr. Steven Chu, March 12, 2012.
25. DOE, *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*, DOE/EIS-0250F-S1 (June 2008)
26. GAO, *Yucca Mountain: Information on Alternative Uses of the Site and Related Challenges*, GAO-11-487 (September 2011)
27. DOE, *Analysis of the Total System Life Cycle Cost of the Civilian Radioactive Waste Management Program, Fiscal Year 2007*, DOE/RW-0591, Washington, DC (July 2008).
28. DOE, *Nuclear Waste Fund Fee Adequacy Assessment Report* (January 2013)
29. NRC, Atomic Safety and Licensing Boards, Memorandum and Order Identifying Participants and Admitted Contentions, Docket NO. 63-001-HLW (May 11, 2009)
30. US COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT, On Petition for Writ of Mandamus, In Re: Aiken County, et al., Case No. 11-1271 (August 13, 2013)
31. NRC, In the Matter of U.S. Department of Energy (High-Level Waste Repository), Docket No. 63-001, Memorandum and Order (November 18, 2013)
32. M.C. THORNE, "Is Yucca Mountain a Long-Term Solution for Disposing of US Spent Nuclear Fuel and High-Level Radioactive Waste?" *Journal of Radiological Protection*, **32**, 175-180 (2012)
33. NRC, Monthly Status Report, Activities Related to the Yucca Mountain Licensing Action, Report for January 2015 (S.G. Burns to J. Imhofe, February 27, 2015)
34. DOE, P.B. Lyons to J.M. Shimkus, Letter providing update of activities and expenditures associated with the Yucca Mountain licensing proceeding (October 17, 2014)
35. S. 1240, Nuclear Waste Administration Act of 2013; Current information on the status of S.1240 is available at <https://www.govtrack.us/congress/bills/113/s1240>
36. NEI, "A Federal Corporation Should Be Developed to Manage Used Nuclear Fuel," (September 2010), <http://nei.org/resourcesandstats/documentlibrary/nuclearwastedisposal/policybrief/fedcorp>
37. WGA, Policy Resolution 2014-06, The Storage and Disposal of Radioactive Waste and Spent Nuclear Fuel, Denver, CO. www.westgov.org/policies/doc_download/1771-2014-066
38. WGA, Policy Resolution 11-5, Transportation of Radioactive Waste, Radioactive Materials, and Spent Nuclear Fuel, Denver, CO. www.westgov.org/component/joomdoc/doc_download/1437-11-55
39. WGA, Policy Resolution 2014-05, Transportation of Radioactive Waste and Radioactive Materials, Denver, CO. www.westgov.org/policies/doc_download/1771-2014-055
40. R.J. HALSTEAD, F.C. DILGER, "Repository Transportation Planning, Risk Management, and Public Acceptance: Lessons Learned," *Proc. IHLRWMC*, Albuquerque, NM, Pp. 408-415 (2011)
41. DOE, *Assessment of Disposal Options for DOE-Managed High-Level Radioactive Waste and Spent Nuclear Fuel* (October 2014)
42. ENERGY & WATER DEVELOPMENT SUBCOMMITTEE, U.S. SENATE COMMITTEE ON APPROPRIATIONS, "FY 16 Nuclear Regulatory Commission Budget Hearing," March 4, 2015. <http://www.appropriations.senate.gov/hearings-and-testimony/energy-water-development-subcommittee.fy16-nuclear-regulatory-commission>
43. S. 854, Nuclear Waste Administration Act of 2015; Current information on the status of S. 854 is available at <https://www.congress.gov/bill/114th-congress/senate-bill/854>
44. S. 691, Nuclear Waste Informed Consent Act (2015); Current information on the status of S. 691 is available at <https://www.govtrack.us/congress/bills/114/s691>
45. H.R. 1364, Nuclear Waste Informed Consent Act (2015); Current information on the status of H.R. 1364 is available at <https://www.govtrack.us/congress/bills/114/hr1364>