

WM2014 Conference, March 2-6, 2014, Phoenix, Arizona USA

**Toil and Trouble: Recommendations for the
Preparation of the DOE national Transportation Plan-14450**

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ABSTRACT

The [Department of Energy's](#) (DOE)'s Office of Nuclear Energy is currently preparing a national transportation plan for a prototype campaign for spent nuclear fuel (SNF) shipments from [decommissioned shut-down](#) reactor sites to a pilot interim storage facility. Two previous national transportation plans, prepared by the now defunct Office of Civilian Radioactive Waste Management (OCRWM) met with mixed reviews when released in 2007 and 2009. This paper recounts the recommendations of the 2006 National Academy of Sciences (NAS) report "Going the Distance," and demonstrates that implementation of those recommendations must be central to a successful national transportation plan in the future.

The paper also discusses how the NAS report, combined with the Final Report of the Blue Ribbon Commission on America's Nuclear Future (2012), provide insight into what specific objectives a national transportation plan should achieve.

This paper makes specific recommendations regarding: 1) Regulatory authority governing the shipments: [namely](#), it must be clear that the shipments will be governed by NRC rules the same as utility shipments; 2) [the new national plan must also a](#)Address the liability rules affecting

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these shipments: It must be clear when liability begins, who has the liability and what the coverage limits are and the process for redress; 3) the plan should address the BRC recommendations regarding damaged fuel: A substantial portion of the inventory of spent fuel is damaged and/or should reasonably be expected to be when shipments commence. The transportation plan must describe how it will characterize, inspect, package transport, and quality assure the spent fuel transported; 4) DOE should adopt the Western Interstate Energy Board (WIEB) “straw man” routing process for selecting routes. The WIEB straw man process remains the best available way to select routes with involvement by affected jurisdictions and stakeholders, one of the greatest remaining obstacles to progress in transportation planning; 5) The plan should present a process for effective interaction with States and tribes along shipment corridors: To date the DOE has engaged in a decision-making process that is best characterized as ~~was essentially~~ Decide Announce Defend.

The DOE Transportation Plan must address how it will make decisions in a way that will effectively engage States, localities, and Tribes; 6) lastly, the DOE needs to construct the plan to demonstrate compliance with the BRC and NAS recommendations: The BRC and NAS offer the most legitimate and authoritative standards for a successful transportation program. These reports offer the most specific recommendations for a successful program. In short, the new national transportation plan should demonstrate that DOE will implement all of the safety and security recommendations before any shipments are made. This paper recommends guidelines for a plan that will effect these ~~describes a recommended plan's~~ content specifications, address the various audiences the planning will impact and thus ensure the most reasonable and useful outcomes for the program.

INTRODUCTION

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This paper suggests the organization and possible contents of the National Transportation Plan (NTP) now being prepared by the ~~DOE~~ Department of Energy's (DOE)'s Office of Nuclear Energy (ONE). The paper suggests a possible organizational ~~schemata~~ and provides some description of ~~some of~~ the policy issues needing to be addressed by the document.

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An analogous ~~previous~~ effort to develop an NTP for the Yucca Mountain Project (YMP) was begun in 2006, and a pre-decisional draft for review was published in July 2007. [1,2,3] DOE published a second NTP for review and comment in January 2009. [4] Both plans were widely criticized by stakeholders, especially the state regional groups (SRGs) which met regularly with DOE on transportation matters. The purpose of this paper is to suggest methods to enable the DOE to avoid a repetition of these failed efforts.

A central public policy aspect of the NTP is that it must address the transportation recommendations made by the 2006 National Academy of Sciences (NAS) report "Going the Distance," [5] and the 2012 Final Report by Blue Ribbon Commission (BRC) on America's Nuclear Future. [6] Both are widely seen by the DOE's many stakeholders as setting the standard by which the new transportation plan will be judged. The NAS and the BRC reports contain specific recommendations that have long been sought by stakeholders. These recommendations also establish the basic conditions that will enable the DOE to develop a successful program, gain stakeholder buy in and ultimately avoid the issues that have plagued the agency handling of waste issues for decades.

The DOE's Office of Nuclear Energy is in an unenviable position. It must strive to rebuild a spent fuel management program following the end of the Yucca Mountain Program (YMP). As

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~~part of this, the DOE#~~ must ~~seek to also~~ accommodate the recommendations of the BRC. It must also attend to the priority problem indicated by the BRC-the waste at orphaned sites. As if that were not enough, the pace at which nuclear power plants are closing is accelerating.

At the beginning of 2013, there were ~~—13~~ closed reactor sites. By the end of the year an additional ~~—4~~ nuclear power plants were scheduled for closing [7]. ~~Altogether these orphaned sites and newly orphaned sites comprise _____ MTU or _____ of the total waste inventory (citation).~~

ORGANIZATION

The NTP will ultimately serve two purposes; First and foremost, it is a management document for use by the DOE. Second, it affords DOE a way to communicate to stakeholders that it understands the complexity and the difficulty of the task ahead. The document should be structured ~~so~~ as both a program management document and one a document that addresses ~~some~~ aspects of policy that are important to stakeholders.

To facilitate this dual purpose, the report can be organized into two parts.

The first part should attend to the substantial policy issues that must be addressed. The NAS and BRC identified many of these issues. The DOE's NTP should make clear statements of policy. As with the 2007 effort, this NTP can provide a solid framework on which other, more detailed plans, s can be developed. Like the 2007 plan, the authors recommend a report which is a comprehensive survey of the many complex issues and problems confronting the DOE as it tries to move forward.

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Secondly, aAlthough the NTP is a management document, it should be structured so that the report contains useful, significant information for the DOE. For example, the tTimeframe for tasks needing accomplishment: The DOE has a very challenging timeframe in order to make a disposal start date of _____.2021. This report should address the timeframes and the problems—highly integrated nature of the program. In addition to this task, the report has more important stakeholder issues to address and these are noted below in separate discussion.

SYSTEMS INTEGRATION

Equipment, procurement, stakeholder training and interactions, technology procurement, NEPA analysis and cost analysis are just some of the systems that must be brought together at just the right time for this program to be successful.

The NTP should show how the DOE will construct the system of systems to bring together all of the components of the program at the right time. The NTO needs to ~~It could~~ show how the DOE is planning to address issues associated with such integration and address how it will focus on the ~~There are~~ significant challenges to making the projects subsystems work together. There o assist in that the DOE should consider ~~are~~ additional issues related to systems integration that deserve mention in this document. For example:

- The NTP should describe how the DOE plans to incorporate improving technology on an ongoing basis. This is an important consideration for a program that is due to last more than a generation.
- A statement of the systems architecture for the program. A robust statement of the program components and their interrelationships.
- The NAS and BRC both made comments about the need to approach this problem in a systems manner.

SUGGESTED DESIGN OF THE DOCUMENT

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Given the dual purpose and multiple tasks this NTP needs to address, this paper will offer one possible system visualization.

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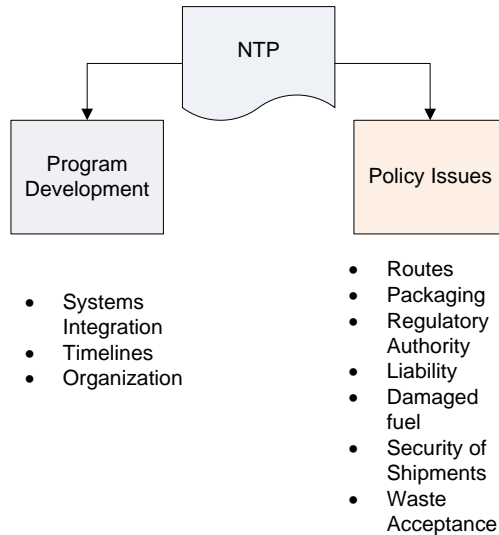


Figure 1 National Transportation Plan Organization

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ROUTE SELECTION

One particularly important issue to stakeholders will be the selection of routes for the shipments to follow. National route and mode selection was a problem that the YMP never solved. ~~It is part of the program that cannot be overlooked.~~ It can be addressed in the NTP as an unsolved problem. The NTP should make clear that the DOE understands the problem and has some means to address this issue. Some of the comments from the NAS and BRC may assist.

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BRC 8:

DOT should ensure that states that designate routes for shipment of spent nuclear fuel rigorously comply with its regulatory requirement that such designations be supported by sound risk assessments. P 16

DOE should make public its suite of preferred highway and rail routes for transporting spent fuel and high-level waste to a federal repository as soon as possible to support state, tribal, and local planning, especially for emergency response preparedness. P 18

BRC Recommendation #6: The federal government (and the new waste management organization when it is formed) should promptly initiate programs to prepare for the eventual large-scale transport of spent nuclear fuel and high-level waste to consolidated storage and disposal facilities, including implementing transportation-related recommendations issued by the National Academies in 2006, undertaking planning activities with potentially affected states and tribes to prepare local responders, and providing funding and technical assistance for related activities. P.9

Comment [FD1]:

The DOE NTP should describe how it will work with State, localities and tribes to identify, primary, and alternate routes from shipping sites to a final repository. The best process for resolving this problem to date may well be the Straw man process advocated by the Western Interstate Energy Board (WEIB). In 1988, WEIBthe Western Interstate Energy Board, expressing the desires of the Western Governors Association (WGA) proposed a recursive route selection methodology that would be suitable for spent nuclear fuel shipments. The method is illustrated below (WWEIBWestern Interstate Energy Board, 1988 [9]: p. 7)

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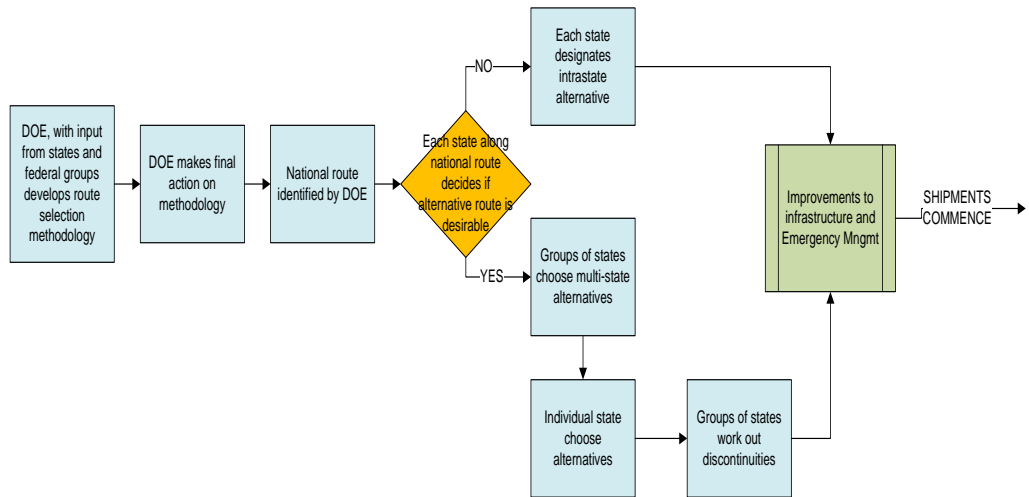


Figure 1 WIEB straw man process

The NAS explicitly, and the BRC implicitly, have also made efforts related to route designation selection (NAS BRC). The NAS recommended a similar process in its report. They said: “DOE

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should identify and make public its suite of preferred highway and rail routes for transporting spent fuel and high-level waste to a federal repository” (National Academy of Sciences, 2006). The issue of route selection was not resolved during the analysis performed for the Yucca Mountain project ~~and w- It remains one of the great unresolved issues.~~ Without a specific repository site, it is more difficult~~impossible~~ to select and communicate routes. However, the DOE should describe how it will do so when the time comes. The very tight time frame will make it difficult to produce a set of routes unless an effective process has been worked out first.

One of the most overlooked aspects of route and mode selection is the need to improve near-site transportation infrastructure. Many of the old and forthcoming decommissioned plants may no longer have access capable of transporting the spent fuel. This problem naturally affects the question of rail access, badge use and other transportation infrastructure related issues. For example the rail access will be a critical issue.

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If no rail access is available, the default route becomes truck-which creates additional problems (e.g. repackaging). The critical dimensions of near-site infrastructure are money, time, and environmental impacts. For example, if a decision is taken to provide rail access to Oyster Creek, it will be necessary to assess environmental impacts using the National Environmental Policy Act (NEPA). As part of that it may be will-necessary to negotiate funds to refit or replace existing rail. This will disrupt the operations of the current Class III rail operators. The utilities who will presumably be paying for the rail refit will not want to offer the current Class III rail operator a permanent subsidy and so will want some prorated discount on the track upgrades. All of these things will consume time and may disrupt the schedule for shipments. The Northeast

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Council of Governments performed an excellent study in conjunction with the FRA that highlighted these problems (CSG NE).~~)-~~

PUBLIC COMMUNICATION AND INTERACTION PLANNING

The legal and regulatory framework governing these shipments in the future will likely have two important characteristics: 1. It will enable more public scrutiny and 2. It will likely offer redress for affected parties. It is hard to envision a situation in which a law could be passed with different conditions and exempting all parties involved from issues related to risk communications. How the DOE plans to interact with its stakeholders (communication planning) will be a critical and perhaps deciding issue. The NAS saw clearly necessity of effective interactions:

“Transportation implementers should take early and proactive steps to establish formal mechanisms for gathering high-quality and diverse advice about social risks and their management on an on-going basis” (2006, p. 11).

“The DOE should continue to ensure the systematic, effective involvement of state, local, and tribal governments in its decisions involving routing and scheduling of foreign and DOE research reactor spent fuel shipments” (2006, p. 15).

In typical DOE planning efforts, the reasons for effective stakeholder outreach may not be clear. An effective program is necessary to create broad support for inevitable, tough decisions. It will enable the program to proceed more rapidly and hopefully with the widest possible support from the stakeholders and public. It will also make it possible to avoid lengthy legal disputes.

An effective program of public interaction will also make the program more resilient. It will accomplish this by providing a store of confidence in the management of the program. The best analogous example of this is the WIPP program. While the WIPP program is very different in

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terms of the [radiological](#) hazard, there are similarities in terms of the length of the shipments, the duration of the shipping campaign, and the difficulty of obtaining support. Effective outreach may be critical in ensuring that a severe mistake, ~~or~~ accident [or human initiated event like terrorism](#) does not do severe [and permanent](#) damage to the [credibility of the overall transportation](#) program.

[Given these potential challenges,](#) ~~t~~The NTP should present a process for effective interaction with States and tribes. [To date](#) the DOE has engaged in ~~a~~ decision-making processes that have ~~s~~ been criticized as Decide, Announce, ~~Defend~~ and ~~Defend~~. The ~~NTPDOE Transportation Plan~~ must address how it will make decisions in a way that will effectively engage states, localities, and tribes. The NTP should describe how it will engage its stakeholders in a way that will make it possible for decisions to be made and implemented [and it must overcome the perception that DOE fails to care what stakeholders think, feel and articulate as their concerns.](#)

PACKAGING

In the 2007 and 2009 DOE NTPs, the primary focus of packaging discussions was on fleet requirements, procurement timeframes, and hardware costs. The new NTP should provide a comprehensive overview of transportation packaging issues. These ~~issues~~ include [discussion on such issues as the](#) constraints on selection of shipping containers from available designs, development and certification of new designs, the multiplicity of dual purpose cask interface requirements, implications of higher-burn-up fuels, special handling for failed fuel assemblies, modal and intermodal transfer considerations, large campaign logistics and turn-around times (cask utilization factors), as well as procurement [difficulties](#) and costs.

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Special attention must be given to full-scale testing of shipping containers, which the authors believe is essential for public acceptance of large scale, long duration, and cross-country shipping campaigns. Full-scale testing is a critical aspect of public confidence in the ability of shipping packages to prevent the release of radioactive materials in the event of a severe accident.

Currently, full scale cask testing is not a requirement for NRC certification for spent fuel shipping casks. Of the currently licensed shipping casks operating in the United States, none have been tested full-scale. In place of full-scale testing, the NRC relies on scale model testing and computer simulation.

In 1999, NRC began the process of developing a cask testing demonstration study as part of the Package Performance Study (PPS). The NRC engaged the public and stakeholders with an innovative stakeholderpublic participation program. NRC held public meetings ~~in~~ throughout the country and invited a wide range of participants to engage in detailed discussions of technical and institutional issues. In 2005, the Commission approved a testing proposal developed by NRC staff, which calls for a demonstration test in which a cask mounted on a railcar is impacted by a speeding locomotive, and then subjected to a 30-minute fullyre engulfing fire.

A major finding of the 2006 NAS report regarded full-scale testing. The committee found: “the radiological risks associated with the transportation of spent fuel and high-level waste are well understood and are generally low, with the possible exception of risks from releases in extreme accidents involving very-long-duration, fully engulfing fires. While the likelihood of such

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extreme accidents appears to be very small, their occurrence cannot be ruled out based on historical accident data for other types of hazardous material shipments. However, the likelihood of occurrence and consequences can be further reduced through relatively simple operational controls and restrictions and route-specific analyses to identify and mitigate hazards that could lead to such accidents.”

The committee examined in detail previous accident consequence analyses, and previous full-scale cask testing programs, including the SNL testing program in the United States in the 1970s, and the “Operation Smash Hit” testing program. The committee directly addressed the issue of full-scale cask testing

“FINDING: The committee strongly endorses the use of full-scale testing to determine how packages will perform under both regulatory and credible extra-regulatory conditions. Package testing in the United States and many other countries is carried out using good engineering practices that combine state-of-the-art structural analyses and physical tests to demonstrate containment effectiveness. Full-scale testing is a very effective tool for both guiding and validating analytical engineering models of package performance and for demonstrating the compliance of package designs with performance requirements. However, deliberate full-scale testing of packages to destruction through the application of forces that substantially exceed credible accident conditions would be marginally informative and is not justified given the considerable costs for package acquisitions that such testing would require.

RECOMMENDATION: Full-scale package testing should continue to be used as part of integrated analytical, computer simulation, scale model, and testing programs to validate the performance of package performance. Deliberate full-scale testing of packages to destruction should not be carried out as part of this integrated analysis or for compliance demonstrations.” [10]

The NRC’s package performance study (PPS) was instrumental in collecting existing knowledge about the performance of waste packages in accident conditions [and the NAS study supported the addition of full scale testing of casks](#). This information can and should be used to inform

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route selection and emergency response planning. The DOE would [be](#) wise to include a desire to implement a full-scale cask-testing program.

REGULATORY AUTHORITY

The NTP must make it clear that the shipments will be governed by NRC rules the same as utility shipments. Under current Federal law, shipments of spent nuclear fuel (SNF) and high-level radioactive waste (HLW) to facilities constructed under the Nuclear Waste Policy Act (NWPA) as amended would not be regulated by NRC, except for use of NRC-certified casks and shipment notification to states, as specifically required by the NWPA.

Former NRC Chairman Richard Meserve explained: “If DOE takes custody of the spent fuel at the licensee’s site, DOE regulations would control the actual spent fuel shipment. Under such circumstances, the NRC’s primary role in transportation of spent fuel to a repository would be certification of the packages used for transport. ... However, if NRC licensees are responsible for shipping the spent fuel not only must the transport container be certified by the NRC, but also the shipment must comply with NRC regulations for the physical security of spent fuel in transit (10 CFR Part 73). NRC licensees are subject to inspection for compliance with the NRC’s transportation safety and security regulations. The NRC also issues Quality Assurance (QA) program approvals for radioactive material packages that apply to the design, fabrication, use and maintenance of these packages. Activities conducted under an NRC QA program are also subject to NRC inspection.”⁴

⁴ ~~R.A. MESERVE, RESPONSES TO QUESTIONS FROM SENATOR DURBIN (Letter dated March 22, 2002) NRC Durbin ML021060662.pdf (May 10, 2002).~~

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The BRC Final Report made the following recommendation in this regard: "...the BRC's Transportation and Storage Subcommittee heard testimony that DOE's plans to use its own self-regulating authorities under the Atomic Energy Act sharply undercut credibility in the proposed transportation program. The existing regulatory framework for commercial transportation – which features extensive oversight and involvement by the NRC, mode-specific administrations of the DOT, and state and tribal officials – is proven. Consistent with the recommendations articulated in Chapter 7 of this report, the Commission believes that 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 would help assure regulatory clarity and transparency." [p.83]

LIABILITY

The potential for confusion and delay is substantial in the inevitably complex response to a major accident involving spent nuclear fuel. The likelihood of problems following an accident involving SNF is borne out by past history [of large scale disasters](#). The difficult and protracted recovery from recent natural disasters does not inspire confidence (e.g. Hurricanes Katrina and Sandy). Federal management of the aftermath of the disasters has been slow, inefficient, and fraught with problems for the individuals and communities affected.

In the case of both Hurricanes Katrina and Sandy federal assistance for the recovery has been inadequate and left the communities [permanently and infrastructures therein](#) damaged. The example of these [and other two](#) episodes will make the public and stakeholders skeptical of Federal promises of redressing the harm done to communities. In the event of an incident

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involving the release of SNF from a waste cask, there will be strain on existing resources. There will be a need for extensive environmental assessments, legal support, evacuation and other kinds of support that will be extraordinary.

The NTP must address the liability rules affecting these shipments: It must be clear when liability begins, who has the liability and what the coverage limits are. The DOE should predefine the and the process for redress of wrongs. The Hurricane KatrinaSandy and Hurricane Sandy responses should be viewed as indicators of how NOT to respond to a severe radiological event. The serious nature of these materials and possibility for long-term severe contamination require that the process for redress be clearly understood and described. This is not a topic that should be completely examined by the NTP, but it must certainly be discussed.

WASTE ACCEPTANCE ORDER

The NAS and BRC have both indicated that the Standard Contracts are impediments to the efficient functioning of the waste program ~~(citations)~~^[1]. There is widespread agreement that the Standard Contracts now represent an impediment to the management of the nation's spent nuclear fuel. When the Standard Contracts were negotiated there were ~~====~~101 plant owners. Today's there are ~~====~~82 +17[17, 18]. The NTP should indicate how the DOE will proceed with removing waste from the abandoned sites with or without the standard contract. It should indicate whether or not the DOE intends to renegotiate the Standard Contracts.

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Additionally, the DOE should address where ~~specific the~~ DOE waste shipments will fit into this program. The BRC established abandoned nuclear sites as the priority. The NTP should indicate whether or not the DOE's new program will also incorporate shipments of DOE spent fuel.

CONCLUSION

The DOE's work on the NTP offers the agencyDOE an opportunity ~~for the DOE~~ to demonstrate that it understands the difficulty of the problem it faces. Unfortunately, the problem itself is increasing in size and urgency. The impending closure of ~~more~~ more reactors increases the problem. The legal decisions expressed in the Waste Confidence ~~case~~decision (New York v. NRC), reifies the widespread frustration over the Federal agencies and regulatory bodies systematic failure to find a storage solution. The NARUC decision shows that the money to pay for a solution will not be forthcoming unless credible progress is made.

Some stakeholders have patiently helped the DOE define critical policy areas and there now exists widespread agreement on important aspects of the problem (Dilger et al). The door is open for the DOE to make a significant step forward with the NTP and by having transparent processes to address stakeholder concerns~~is documents~~. Done right, this document can make real progress in certain policy areas and set the department on the path to meeting its goals.

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~~"Nuclear Energy Institute Knowledgebase." [Http://www.nei.org/KNOWLEDGE-CENTER/NUCLEAR-STATISTICS/US-NUCLEAR-POWER-PLANTS](http://www.nei.org/KNOWLEDGE-CENTER/NUCLEAR-STATISTICS/US-NUCLEAR-POWER-PLANTS). Nuclear Energy Institute, 01 Feb. 2014. Web. 13 Feb. 2014.~~

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