

Physical Protection of Spent Fuel Shipments: Resolution of Stakeholder Concerns Through Rulemaking - 12284

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ABSTRACT

In 1999, the State of Nevada brought its concerns about physical protection of current spent nuclear fuel (SNF) shipments, and future SNF shipments to a federal repository, before the NRC in a 1999 petition for rulemaking (PRM-73-10). In October 2010, the NRC published a rulemaking decision which would significantly strengthen physical protection of SNF in transit. The newest articulation of the rule (10 CFR 73.37) incorporates regulatory clarifications and security enhancements requested in Nevada's 1999 petition for rulemaking, codifies the findings of the Nuclear NRC and DOE consequence analyses into policy guidance documents and brings forward into regulations the agency and licensee experience gained since the terrorist attacks of September 11, 2001.

Although at present DOE SNF shipments would continue to be exempt from these NRC regulations, Nevada considers the rule to constitute a largely satisfactory resolution to stakeholder concerns raised in the original petition and in subsequent comments submitted to the NRC. This paper reviews the process of regulatory changes, assesses the specific improvements contained in the new rules and briefly describes the significance of the new rule in the context of a future national nuclear waste management program.

REGULATORY CHANGES

In June 1999, the State of Nevada Attorney General filed a petition for rulemaking with the NRC.[1] In the petition the State of Nevada requested that the NRC amend the current safeguards regulations in order to better deter, prevent and mitigate the consequences of any attempted radiological sabotage or human initiated event against shipments of SNF and high-level radioactive waste (HLW).[2] Nevada specifically requested that NRC conduct a comprehensive assessment of the consequences of terrorist attacks against transportation infrastructure used during nuclear waste shipments, attacks involving capture of nuclear waste shipments and use of high energy explosives against a cask or casks, and direct attacks upon a nuclear waste shipping cask or casks using antitank missiles or other advanced military weapons.[3]

The NRC initially issued interim physical protection requirements for spent fuel shipments in 1979, and adopted the current system of regulations (10CFR73.37) by rulemaking in 1980.[8] As noted, the NRC docketed the Nevada petition (PRM-73-10), published it in the *Federal Register* on September 13, 1999 (64 FR 49410), and accepted public comments through February 2000.[2, 4] The Western Governors Association, five states (LA, MI, OK, VA, and WV) and three Nevada counties (Nye, Clark and Eureka) endorsed all or part of the Nevada rulemaking petition.[9]

In addition to this stakeholder backing, the Nuclear Energy Institute supported comprehensive assessment of “credible threats of sabotage and terrorism on spent fuel in transit.” The DOE, the Department of the Navy Nuclear Propulsion Program, the Association of American Railroads, and five other organizations and individuals, opposed both Nevada’s request for rulemaking and the request for a comprehensive assessment [9].

In October 2010, the NRC published its then proposed rule.[6] The provisions of the final rulemaking, coupled with other NRC actions since 2001, and other changes in NRC regulations since 2007, would adopt most of the regulatory changes requested by Nevada. The new rule specifically extends armed guard requirements to routes through rural areas, requires enhanced pre-shipment planning and coordination, and enhanced communications during shipments. Three of Nevada’s requests which were rejected by the Commission - changes to the design basis threat, a comprehensive assessment of attack consequences, and mandatory use of dedicated train - have been largely satisfied by other developments.[7]

EXTRA-RULEMAKING ISSUES

From Nevada’s standpoint, the need for changes to the design basis threat have been largely granted by NRC in separate 2007 actions acknowledging the need to consider the “potential for attacks on spent fuel shipments by multiple coordinated teams of a large number of individuals” (72 FR 12712) and amending the definition of “radiological sabotage” (72 FR 12723-12724).

Likewise, Nevada’s concerns about the need for NRC to require mandatory use of dedicated trains has been eliminated by developments since 1999. Policies adopted by NEI in 2004 and by DOE in 2005, and Federal rail safety and security regulations adopted in 2008, virtually require use of dedicated trains for spent fuel shipments.

Lastly, from Nevada’s standpoint, the need for NRC to conduct a comprehensive assessment of attack consequences has also been largely satisfied by unclassified studies published since 1999. The DOE Supplemental Environmental Impact Statement (EIS), submitted to NRC as part of its Yucca Mountain license application in 2009, and analyses submitted by the State of Nevada, estimate that successful attack in an urban area could result in tens to thousands of latent cancer fatalities and billions to hundreds of billions of dollars in clean-up costs.

These issues will also be further examined if the Yucca Mountain NRC licensing proceeding resumes, since the NRC Construction Authorization Boards accepted six NEPA contentions filed by Nevada challenging the adequacy of the DOE SEIS transportation sabotage evaluations. (Order, 05-11-2009)

NEVADA ENDORSEMENT OF CHANGE

As noted earlier, the State of Nevada strongly endorses the rule proposed by the NRC (10 CFR 73.37). The changes in this rule were necessary because there have been significant changes in the threat environment, which affect both current and future SNF and HLW shipments. [8] Analyses prepared for the State of Nevada demonstrate that such attacks could result in hundreds to thousands of latent cancer fatalities, and tens of billions to hundreds of billions of dollars in economic losses. Nevada believes that the revised rule reflects more realistic assessments of changes in the threat environment since the terrorist attacks of September 11, 2001.

The NRC rule is necessary because of the greater understanding, achieved since 1999, of the potentially disastrous consequences of successful acts of terrorism or sabotage against spent nuclear fuel shipments.

The provisions of the rule, coupled with other NRC actions since 2001, and other changes in NRC regulations since 2007, would adopt most all of the regulatory changes requested by Nevada in its 1999 petition for rulemaking (PRM-73-10). Three of Nevada's requests which were rejected by the Commission - changes to the design basis threat, a comprehensive assessment of attack consequences, and mandatory use of dedicated train - have been largely satisfied by these non-rulemaking policy developments.

NRC CONSIDERATION OF THE NEVADA PETITION FOR RULEMAKING

The NRC invited stakeholder comments on its disposition of items 2 through 7 of PRM-73-10. This input was part of its consideration of this proposed rule.

General comments

In the 1999 petition, Nevada documented the vulnerability of shipping casks to high-energy explosive devices. Nevada also submitted evidence that shipments to a national repository would be dramatically different from past shipments in the United States and that these differences would create greater opportunities for terrorist attacks and sabotage. Between 1964 and 1998, Nevada was traversed by approximately 321 truck shipments and 16 rail shipments of civilian SNF to and from nuclear reactor sites, research facilities, and interim storage facilities. Studies prepared by Nevada contractors, DOE, and the NRC indicated the potential for 20,000 to 100,000 truck and rail shipment of SNF and HLW, over 30 to 40 years, to the proposed repository at Yucca Mountain. [1]

NRC Disposition of PRM-73-10, Item 2

While NRC "considers that the existing definition already encompasses actions of the type described by" the petition, the NRC rule was amended by adding the following language to the definition of "Radiological sabotage" in the supporting guidance document. For "purposes of SNF fuel transportation, the definition of radiological sabotage also considers deliberate acts that cause or are intended to cause economic damage or social disruption, regardless of the extent to which public health and safety are endangered by exposure to radiation." [9] The NRC clarification of the existing definition, and the additional language in NUREG/CR-0561, Rev. 2, fully address Nevada's concerns on these issues.

NRC Disposition of PRM-73-10, Item 3

The NRC rule has adopted an approach to routing that is different than that requested by Nevada, but Nevada believes that the NRC approach will achieve the primary objective sought by Nevada, “to minimize movement of spent nuclear fuel through heavily populated areas.” Nevada’s concerns about the security of rail shipments through urban areas are now also addressed by regulations enacted in 2008 by the U.S. Department of Homeland Security’s Transportation Security Administration (TSA) (49 CFR Parts 1520 and 1580, 73 FR 72130) and the U.S. Department of Transportation’s Pipeline and Hazardous Materials Safety Administration (PHMSA) (49 CFR Parts 172, 179, and 209, 73 FR 72182). The NRC proposed rule requires licensees to consider both the DOT and NRC routing requirements before submitting route approval requests to NRC.

NRC Disposition of PRM-73-10, Item 4

The NRC rule has adopted Nevada’s request that armed escorts be required along the entire road shipment route by eliminating the differential requirement based on population. The rule states: “The differentiation of security requirements based upon population causes potential areas of vulnerability along the shipment route for theft, diversion, or radiological sabotage.” The rule fully addresses Nevada’s concerns.

NRC Disposition of PRM-73-10, Item 5

The NRC rule has adopted Nevada’s request that armed escorts be required along the entire rail shipment route by eliminating the differential requirement based on population. “The proposed rule would require that the same security requirements for heavily populated areas apply along the entire route for road and rail shipments, and at any U.S. ports where vessels carrying spent fuel shipments are scheduled to stop.” The changes fully address Nevada’s concerns relative to this item.

NRC Disposition of PRM-73-10, Item 6

The NRC proposed rule has adopted the substance of Nevada’s request by requiring additional planning and scheduling requirements similar to those for shipments of formula quantities of special nuclear materials. The proposed rule requires licensee preplanning and coordination with corridor States to ensure minimal shipment delays, arrange state law enforcement escort arrangements, and coordinate safe haven locations. The proposed rule also require development of normal and contingency procedures (including responses to actual, attempted, or suspicious activities), and training all shipment personnel to be prepared to prevent theft, diversion, or radiological sabotage. The proposed rule fully addresses Nevada’s concerns.

NRC Disposition of PRM-73-10, Item 7

The NRC rule rejected Nevada’s request that 10 CFR 73.37(d) be amended to require that all rail shipments of spent nuclear fuel be made in dedicated trains. NRC believes the issue is resolved by requiring the same new strengthened security requirements for all rail shipments, whether shipped in dedicated trains or general freight service. “ Thus, this item is not addressed as part of the proposed rulemaking.”

From Nevada's standpoint, developments since 1999 have eliminated the need for an NRC requirement for mandatory use of dedicated trains. In 2004, the Nuclear Energy Institute issued a statement supporting use of dedicated trains for utility rail shipments of spent fuel. In 2005, DOE adopted a policy of using dedicated trains for "usual shipments." The DOE 2008 SEIS states that it is DOE policy "to use dedicated trains for most shipments" to a repository (SEIS, p.6-3). The TSA and PHMSA rail security regulations adopted in 2008 virtually require use of dedicated trains for spent fuel shipments. As of 2010, all rail shipments of SNF, except DOE shipments of naval reactor spent fuel, are expected to use dedicated trains exclusively, and rail carriers may decide to use dedicated trains for naval SNF shipments. In addition, Nevada believes that the new strengthened security requirements included in the NRC proposed rule will make general freight rail shipments of spent nuclear fuel impractical.

NEVADA DISAGREEMENTS WITH NRC RULEMAKING

The NRC did not agree with all of Nevada's contentions in the petition for rulemaking and offered rationales for these actions in the rule. [1] The sub-sections that follow articulate Nevada's positions on these denials and may suggest some future policy alterations if, or when, a new national transportation program is developed to address the nation's nuclear waste issues.

NRC Denial of PRM-73-10, Item 1

On December 7, 2009, the NRC published in the Federal Register a notice entitled "State of Nevada; Denial of Portions of Petition for Rulemaking, Consideration of the Remaining Portions in the Rulemaking Process" (74 FR 64012). This notice denied the Nevada request identified by NRC as "Item 1" in the rule.

In the 1999 petition, Nevada requested that the Commission reexamine the design basis threat used to design safeguards systems to protect shipments of SNF against acts of radiological sabotage. Nevada specifically requested the Commission clarify the meaning of "hand-carried equipment" regarding certain man-portable explosive devices (such as the U.S. Army M3A1 shaped charge and the TOW 2 antitank missile) which might be used against SNF shipments. Nevada further requested the Commission, as part of a comprehensive reassessment of the consequences of terrorist attacks, consider larger weapons and the use of military attack vehicles or military aircraft, because of the number and nature of military installations in Nevada and along the transportation corridors to Nevada.[1]

NRC stated that it denied Nevada's request because specific details of adversary's capabilities are contained in classified or safeguarded documents, which "must be withheld from public disclosure and made available on a need to know basis to those who are cleared for access." Further, the NRC made reference to its Final Rule Amending 10 CFR 73.1 Design Basis Threat issued in 2007 (72 FR 12705), and asserted that Nevada's request "would not be consistent with the Commission's recent revision to Section 73.1."

The state of Nevada supports the protection of classified and safeguarded information. However, the man-portable weapons specified in the 1999 petition have over the past

decade been evaluated in publically available, unclassified consequence assessments prepared for DOE and the State of Nevada. The debate over credible attack scenarios has shifted to other issues, such as the use of multiple weapons. For example, the NRC Construction Authorization Boards considering the DOE Yucca Mountain License Application accepted six NEPA contentions filed by Nevada challenging the adequacy of the DOE SEIS transportation sabotage evaluations (Order, 05-11-2009). The Nevada contentions and supporting documents evaluate attack scenarios using the same kind of large military demolition devices and man-portable antitank weapons systems described in Item 1 of PRM-73-10.

Nevada also believes that the request in Item 1 is not inconsistent with the NRC amended design basis threat. In fact, the amended design basis threat adopted by NRC in 2007 partially addresses Nevada's 1999 request, acknowledging the need to consider the "potential for attacks on spent fuel shipments by multiple coordinated teams of a large number of individuals" (72 FR 12712). The amended definition of "radiological sabotage" NRC adopted in 2007 includes expanded weapons capabilities and adversary attributes (72 FR 12723-12724) that partially accommodate Nevada's 1999 request.

NRC Denial of PRM-73-10, Item 8

The NRC denial notice published also denied Nevada's request that NRC conduct a comprehensive assessment of the consequences of terrorist attacks. Nevada requested a comprehensive reexamination of terrorism and sabotage consequences not only to determine the adequacy of the current physical protection regulations, but also to assist DOE and the affected stakeholders in the preparation of a legally sufficient environmental impact statement as part of the NRC licensing process for a geologic repository or an interim storage facility.

In the petition, Nevada suggested specific guidelines for assessing the impacts of an event resulting in release of radioactive materials, including: immediate and long-term implications for public health; environmental impacts, broadly defined; standard socioeconomic impacts, including cleanup and disposal costs and opportunity costs to affected individuals and business; and so-called special socioeconomic impacts, including individual and collective psychological trauma, and economic losses resulting from public perceptions of risk and stigma effects.[1]

Nevada further requested that the Commission's consequence assessment evaluate the advantages and disadvantages of increasing the escort requirements for SNF shipments to seven armed escorts, the same level of protection as for shipments of strategic special nuclear materials.[1]

NRC denied Nevada's request "because it does not involve (i.e., contain) a request to amend, create, or revise the NRC's existing regulations... Instead of requesting changes to the NRC's regulations (as it has specified for other topics elsewhere in its petition) the Petitioner has requested the NRC complete a comprehensive assessment. A comprehensive assessment is not a change to the language of the NRC's regulations." NRC noted that "relevant studies (which accomplish the objectives of the Petitioner) were performed at the request of the Commission following the September 11, 2001, terrorist attacks."

The NRC denial makes no claim that Nevada's request for a comprehensive assessment would create a conflict with the protection of classified or Safeguards Information. The NRC denial ignores Nevada's request that a comprehensive assessment should evaluate the advantages and disadvantage of a major change in the existing regulations, a very substantial increase in the number of armed escorts, from one or two armed escorts per shipment, to seven armed escorts per shipment.

At the time of the petition, no comprehensive assessment of sabotage consequences had been performed since 1984. Since 1999, assessments based on publically available, unclassified information have been prepared for DOE and the State of Nevada. The NRC denial notice makes no reference to these assessments. The denial notice also makes no reference to the May 2009 Order issued by the NRC Construction Authorization Boards considering the DOE Yucca Mountain License Application, which accepted six NEPA contentions filed by Nevada challenging the adequacy of DOE's evaluation of transportation sabotage.

The DOE acknowledged the vulnerability of shipping casks to terrorism and sabotage in the 2002 Final EIS for Yucca Mountain, and in the 2008 Supplemental EIS for Yucca Mountain, which was submitted to the NRC as part of the repository license application. The SEIS estimated that a single-weapon attack, penetrating one wall of the cask, could result in a 32,000-47,000 person-rem population dose and 19-28 latent cancer fatalities in an urban area, and cleanup costs similar to a severe transportation accident, in the range of \$300,000 to \$10 billion. A DOE-sponsored study estimated that a single-weapon attack that fully penetrated the cask, creating an exit hole, could increase the amount of radioactive material released as an aerosol by about 10 times, compared to the one-hole penetration. A Nevada-sponsored study estimated that a multiple weapon attack, which created an exit hole, would increase the release of radioactive cesium by 100 times or more. The resulting population dose was estimated to be 55-202 times greater than the SEIS estimate; the dose to the maximally exposed individual was estimated to be 555-1,615 times greater; and cleanup costs were estimated to be hundreds of billions of dollars(2008\$) in an urban area.

FUTURE ISSUES

Nevada remains concerned, however, about the exemption from NRC regulations of DOE SNF and HLW shipments to a geologic repository or storage facility constructed under the Nuclear Waste Policy Act (NWPA). In the future, this policy disjunction could create an incongruous situation in which the NRC physical protection regulations would apply to the expected 20 or so licensee shipments per year, while the projected 250-500 or more DOE shipments per year to NWPA facilities would not be regulated by NRC.

Route selection

NRC rejected Nevada's request that the current route selection security criteria for shipments through non-urban areas be made mandatory. However, Nevada believes that the new State preplanning involvement requirements in the NRC rule, combined with the requirements for State involvement under the new TSA and PHMSA rail security regulations, would allow affected States to address unique local conditions important for physical protection of shipments along rural routes.

DOE self-regulation versus NRC regulations

The discussion under Part III, Discussion Item P, substantially understates the differences between spent fuel shipments regulated by NRC and self-regulated DOE shipments, particularly large-scale shipping campaigns to a geologic repository or a centralized storage facility constructed under the NWPA. Shipments of SNF and HLW to the formerly proposed Yucca Mountain repository would not have been regulated by NRC, except for use of NRC-certified casks and shipment notification to states, as specifically required by the NWPA. As former NRC Chairman Richard Meserve explained in 2002, "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." [10]

Both DOE and NRC have long sought to assure stakeholders that DOE self-regulation would meet or exceed NRC physical protection requirements. But as the rule notes, DOE may exempt itself from NRC standards "if there is a determination that national security or another critical interest requires different action." Stakeholder concerns have been fueled by the DOE position that NWPA shipments would be in compliance as long as their physical protection requirements were "the equivalent" of 10 CFR 73.37. Stakeholders believe DOE self-regulation lacks a credible inspection and enforcement mechanism, and fails to ensure performance of the comprehensive system of critical security planning and operations tasks required under the rule.

The NRC physical protection route approval process is a particularly important example of the difference between NRC regulation and DOE self-regulation. "Once a spent nuclear fuel shipment route request is received, the NRC reviews it closely. The NRC conducts a detailed review, considering route length and minimizing transit time, local law enforcement and emergency response contact information, adequacy of safe haven locations, and communications capability along the route" [75 FR 62699]. NRC would also review the licensee's consideration of DOT routing requirements, and the licensee's interactions with the affected States. This is precisely the kind of comprehensive, independent regulatory guidance and oversight that DOE cannot provide for its own activities.

Preplanning for shipments

The new state preplanning involvement requirements in the NRC rule, combined with the requirements for State involvement under the new TSA and PHMSA rail security regulations, would allow affected States to address unique local conditions important for physical protection of shipments along rural routes.

Section 73.37(b) (1), 75 FR 62704 would add a new section entitled "Preplan and Coordinate Spent Nuclear Fuel Shipments." Nevada specifically endorses the provisions intended to ensure that the armed guards are knowledgeable of the Federal and State

statutes regarding the use of deadly force; the new accounting and control measures intended to ensure that only authorized individuals receive the shipment; and the requirements for licensees to preplan and coordinate spent nuclear fuel shipments with States. Nevada supports the intended goal of the rule's amendments, to ensure that States have early and substantial involvement in the management of spent nuclear fuel shipments by participating in the initial stages of the planning, coordination, and implementation of the shipments. Nevada specifically endorses the proposal to expand the requirements for licensee preplanning and ordination with NRC, including: identification of locations for safe havens along highway routes; obtaining the NRC route approval prior to the 10 day advance notice; provision of specific information to NRC; and the new requirements for documentation of licensee preplanning and ordination activities.

Physical protection program

Nevada also supports the related provisions under a new subsection entitled "Transportation Physical Protection Program." Nevada specifically endorses use of the term "movement control center" and the requirements for development and operation of movement control centers, including personnel training requirements, and revised requirements for periodic escort reporting, constant visual surveillance by at least one armed escort, and periodic reporting on shipment status. Nevada also endorses the requirement for continuous and active monitoring of the shipment by a telemetric position monitoring system or an alternative tracking system; requirement for an immediate investigation if a shipment is lost or unaccounted for after the designated no-later-than arrival time, in order to facilitate the location and recovery of shipments that may have come under control of unauthorized persons; and the new requirement that licensees notify NRC two hours before the commencement of the shipment, and notify NRC when the shipment arrives at its final destination.

CONCLUSION

Nevada's petition for rulemaking led to a generally satisfactory resolution of the State's concerns. The decade plus timeframe from petition to rulemaking conclusion saw a sea change in many aspects of the relevant issues – perhaps most importantly the attacks on 9/11 led to the recognition by regulatory bodies that a new threat environment exists wherein shipments of SNF and HLW pose a viable target for human initiated events.

The State of Nevada has always considered security a critical concern for the transport of these highly radioactive materials. This was one of the primary reasons for the original rulemaking petition and subsequent advocacy by Nevada on related issues. NRC decisions on the majority of the concerns expressed in the petition, additional developments by other regulatory bodies and the change in how the United States sees threats to the homeland – all of these produced a satisfactory resolution through the rulemaking process.

While not all of the concerns expressed by Nevada were addressed in the proposed rule and significant challenges face any programmatic shipment campaign in the future, the lesson learned on this occasion is that stakeholder concerns can be resolved through rulemaking. If DOE would engage with stakeholders on its role in transport of SNF and HLW under the NWPA, these concerns would be better addressed. Specifically the attempts by DOE to resist transportation and security regulations now considered

necessary by the NRC for the adequate protection of the shipments of highly radioactive materials, these DOE efforts seem ill advised. One clear lesson learned from this successful rulemaking petition process is that the system of stakeholder input can work to better the regulatory environment.

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