Questions for the Record for Mr. Michael Weber
U. S. Nuclear Regulatory Commission

Senate Committee on Commerce, Science, and Transportation
Hearing on the Safety and Security of Spent Nuclear Fuel Transportation
September 24, 2008

Questions from Senator Inouye, on behalf of Senator Reid

QUESTION 1 The U.S. Nuclear Regulatory Commission (NRC) has recorded at least four accidents involving spent nuclear fuel shipments over the past 30 years. Please tell the committee about those accidents and how the NRC responded.

ANSWER

The NRC is aware of four transportation accidents since 1971 that have involved loaded spent fuel casks in transit. These accidents are summarized in the table below. When accidents involving spent fuel shipments occur, State and local governments have the primary responsibility to respond. Therefore, these accidents were handled at the State and local level, with assistance from the carriers and shippers.

Transportation Accidents involving Commercial Spent Fuel Casks (1971 – Present)			
Mode	Date	Location	Description
Truck	December 8, 1971	Tennessee	Cask thrown free of trailer following head-on collision with automobile. Minor cask damage and no release. Driver killed.
Truck	February 2, 1978	Illinois	Trailer collapsed while crossing railroad tracks. No cask damage or release.
Truck	December 9, 1983	Indiana	Trailer separated from its axles. No cask damage or release.
Rail	March 24,1987	Missouri	Train-auto collision at grade crossing. Train carrying two casks of Three Mile Island core debris. No cask damage or release.

QUESTION 2 While the risk for a major accident involving a nuclear waste shipment is not great, it still exists and one major accident after thousands of successful shipments would mean this entire program is a failure. How is the NRC prepared to respond to a worst-case scenario situation, in which there is a major radioactive release on a railway or a highway?

ANSWER

The likelihood of highway or rail accident occurring that results in a major release of radioactive material is extremely low. This assessment is based on the outstanding safety record of spent fuel shipments during the past thirty years, numerous transportation shipment risk assessments completed by both the NRC and other Federal Agencies, an independent assessment of spent fuel transportation safety published by the National Academy of Sciences in 2006, and the technical knowledge gained from the actual physical testing of spent fuel casks conducted both within the United States and abroad.

In the event that an accident involving a spent fuel shipment occurs, State and local governments have the primary responsibility to respond. The NRC is prepared to respond by providing technical expertise if requested, to support State and local governments in their response. In an extremely unlikely accident scenario involving a major release of radioactive material on a railway or a highway, NRC would support a coordinated Federal response under the Nuclear/Radiological Incident Annex of the National Response Framework.

In accordance with the Nuclear/Radiological Incident Annex, the Federal Department or Agency responsible for the material involved in the accident would coordinate the response of other Federal Departments and Agencies, including the deployment of specialized equipment and personnel. The Department of Energy (DOE) is the coordinating agency for transportation incidents involving DOE materials. Therefore, if DOE takes custody of spent fuel prior to

shipment to Yucca Mountain, DOE would be the coordinating agency for transportation incidents. In this case, NRC is prepared to provide technical expertise. For shipments to sites other than Yucca Mountain, the NRC is prepared to act as the coordinating agency for transportation incidents that involve the shipment of radiological material by NRC or Agreement State licensees.

The NRC is also prepared to support the Department of Homeland Security in those circumstances under which they take a lead role in coordinating the Federal response under the National Response Framework.

QUESTION 3 The NRC reports prepared in the late 1970's estimated that sabotage of a spent fuel shipment in an urban area could cause hundreds of early fatalities, thousands of latent cancer fatalities and economic losses in the billions. In 1979, the NRC promulgated regulations to safeguard shipments from sabotage and terrorism. Has the NRC reconsidered these regulations or made any significant changes to them over the past 30 years?

ANSWER

Yes, the NRC continually evaluates its regulations based on new information.

With regard to the reports, the NRC published two reports in the mid-1970's: *Calculations of Radiological Consequences from Sabotage of Shipping Casks for Spent Fuel and High Level Waste,* NUREG-0194, February 1977, and *Final Environmental Statement on Transportation of Radioactive Material by Air and Other Modes,* NUREG-0170, December 1977, that estimated the health effects of a radiological release in a non-urban area and determined that the estimated risks were not considered substantive enough to warrant regulatory action. Sandia Laboratories also issued a study in 1977, *Transport of Radionuclides in Urban Environs : A Working Draft Assessment*, SAND 77-1927, suggesting that the sabotage of spent fuel shipments had the potential for producing serious radiologic consequences in areas of high population density. In response to the Sandia study, the NRC issued interim safeguard measures for spent fuel shipments in an interim rule published on June 15, 1979. The physical protection requirements were subsequently modified based on public comments in a final rule dated June 3, 1980.

The Sandia report (SAND 77-1927) contained estimates which were subject to large uncertainties due to lack of technical data. As a result, NRC and the Department of Energy

sponsored research programs to yield information about the potential for radiological releases from sabotage events. The research supported a conclusion that the potential releases from sabotage events were a tiny percentage of the values estimated in the Sandia report (e.g., no early fatalities and seven latent cancer fatalities). The interim safeguard measures were subsequently modified to reflect the research results and the modified measures were incorporated into NRC regulations by public rulemaking on June 8, 1984.

After the attacks of September 11, 2001, the NRC determined that additional security measures were necessary during the transport of spent nuclear fuel and that the existing regulations should be enhanced to further protect spent fuel during transport. The NRC began issuing orders to licensees shipping spent nuclear fuel in October 2002. Only those licensees currently shipping or expecting to ship spent fuel in the near future received the initial order. Since 2002, the staff issued additional orders to licensees transporting spent fuel when these licensees indicated their intention to ship. The orders imposing additional security measures during shipments of spent nuclear fuel are an interim solution, pending rulemaking, as described below.

The NRC initiated a rulemaking in September 2008 to enhance the in-transit security requirements of 10 CFR Part 73 consistent with the security measures imposed by the post 9/11 orders. These measures include: assuring consistent physical protection along the entire shipping route; pre-planning and coordination of a shipment with the States; communications among the transporters, escorts, local law enforcement agencies, and movement control centers; trustworthiness and reliability of individuals associated with the shipment; and normal and contingency procedures and training of individuals associated with the shipment. The proposed rule is expected to be published in late 2009 for public comment, with the final rule expected to be issued in late 2010-early 2011.

QUESTION 4 Since the attacks against America on September 11th, 2001, the NRC has studied the vulnerability of nuclear waste transportation containers. Why haven't the results of these studies been made available to the applicable state and local governments? If states and local governments are going to be involved in the transportation planning process, shouldn't they have more information about the risks involved? What can be done to involve state and local governments in the transportation planning process?

ANSWER

The Commission understands the importance of this information in enabling State and local governments to plan for the safety and security of spent fuel shipments, especially in their emergency response roles and responsibilities, and intends to ensure that they have the information they need to exercise these roles and responsibilities. In late 2006, the NRC began a dialogue with representatives of State Regional Transportation Groups aimed at sharing information from the NRC spent fuel transportation package security assessments with State and local governments to help them prepare more effectively for their emergency response and law enforcement responsibilities. This ongoing dialogue includes a discussion of what information (related to the spent fuel transportation package security assessments) is needed, how and by whom such information would be used, and how shared sensitive information would be protected. These groups include transportation safety task forces established through the Western States Energy Board, the Southern States Energy Board, and the Council of State Governments, Midwestern and Northeast States Divisions. Collectively, the state regional groups contain state representatives from all of the states that have potential transportation routes to Yucca Mountain.

QUESTION 5 In 2001, 11 train cars derailed while passing through the Howard Street Tunnel in Baltimore, Maryland, setting off a fire that lasted for days and was 1800 degrees Fahrenheit. Could the Department of Energy's (DOE) proposed multi-use transportation casks withstand such an accident?

ANSWER

The NRC staff has extensively evaluated the Baltimore Tunnel fire of 2001, along with other severe accidents as part of its efforts to ensure the safety of radioactive material transportation. In November 2006, NRC released a study that focused on how three representative spent fuel cask designs would have performed if they were involved in the Baltimore Tunnel fire (*Spent Fuel Transportation Package Response to the Baltimore Tunnel Fire Scenario*, NUREG/CR-6886, Rev.1., November 2006). The cask designs analyzed included the NAC-LWT truck cask, and the HOLTEC HI-STAR 100 and TN-68 rail casks. The study concluded that the fire, if it had involved spent fuel casks, would not have caused a release of radioactive material from the spent fuel for any of these three cask designs.

The Baltimore Tunnel fire study did not specifically consider DOE's proposed multi-use transportation casks, as the designs for these casks are still being finalized and have not yet been submitted to the NRC for review. Therefore, it would be premature to make a definitive judgment as to how DOE's proposed multi-use transportation cask designs would perform. However, we believe that DOE's proposed multi-use transportation rail cask designs would be similar in size, weight, and configuration to the rail casks we analyzed in our 2006 Baltimore Tunnel fire study.

Question from Senator Inouye

QUESTION 1 The National Academy of Sciences has recommended an independent examination of the security of spent nuclear fuel and high-level radioactive waste transportation prior to the commencement of large-quantity shipments to an interim or final repository. Has the NRC had difficulties working with the DOE to request this type of examination? Why hasn't the NRC requested an independent assessment of nuclear waste transportation security? What is the NRC currently doing to expand the knowledge base for the secure transportation of nuclear waste?

ANSWER

The DOE, the U. S. Department of Transportation (DOT) and NRC have a long history of working together cooperatively on transportation safety and security issues, including their joint sponsorship of the National Academy of Sciences' (NAS) recent study on the transportation of spent fuel. The principal finding of the NAS study was:

> The committee could identify no fundamental technical barriers to the safe transport of SNF and HLW in the United States. Transport by highway (for small-quantity shipments), and by rail (for large-quantity shipments) is, from a technical viewpoint, a low-radiological-risk activity, with manageable safety, health, and environmental consequences, when conducted with strict adherence to existing regulations.

The NRC takes this study's recommendations very seriously and addressed them in our program, including preparations for full-scale testing in the U. S. and additional analyses of long-duration, fully engulfing fires. The NAS study also recommended that, ". . . an independent examination of the security of spent fuel and high-level waste transportation should be carried out prior to the commencement of large-quantity shipments to a federal repository or to interim storage." At present, the NRC is not planning to conduct an independent security assessment with DOE that would cover both shipments to Yucca Mountain and to an interim storage facility

because NRC security assessments have shown that current security measures and standards put in place since September 11, 2001, are adequate for the protection of spent fuel and high level waste transportation even in the event of increased shipping campaigns. Specifically, in light of the elevated threat that the U.S. experienced following the terrorist attacks on September 11th, the NRC issued safeguards advisories and orders to enhance transportation security of spent nuclear fuel and other large quantities of radioactive material. The NRC issued these security enhancements in coordination with DOT, the Department of Homeland Security, State agencies, and other Federal agencies. The NRC security assessments of transportation, which were completed after the publication of the NAS report, evaluated a number of representative transportation package designs against a variety of credible land-based threats and a deliberate plane crash. The results of these security assessments, which we have shared with DOT, DOE, and other organizations that have a "need to know," demonstrate that the current requirements, combined with the security enhancements put in place after September 11th, provide adequate protection of public health and safety, and the environment, and common defense and security. These safeguards advisories and orders are only an interim solution and will not be relied on indefinitely. In late 2009, the NRC intends to issue a proposed rule for public comment that would revise the requirements for secure transport of spent nuclear fuel; the proposed rule would include additional measures to address the current threat environment.

Physical protection measures for future shipments must match the threat in place at the time of shipment. In addition, shipment tracking and monitoring technologies are constantly improving. The NRC would be responsible for overseeing the security requirements for commercial shipments to an interim storage facility and DOE would be responsible for implementing and overseeing the security requirements for Yucca Mountain shipments. Shipments to Yucca Mountain would not begin, at the earliest, until 2020, based on current DOE estimates. This

estimate is tentative, given that NRC staff continue to review the DOE license application to construct and operate the repository. Therefore, it would be more appropriate to consider whether an independent examination of shipment security is needed closer to the time of actual shipments.

To expand the knowledge base for the secure transportation of nuclear waste, the NRC has recently completed, through contract with Sandia National Laboratories, a number of security assessments on representative spent fuel transportation package designs. The NRC believes that these spent fuel transportation package assessments demonstrate that the stringent safety standards applied to the design of spent fuel packages provide substantial protection from security threats. NRC is considering the merits of releasing non-sensitive summaries of current spent fuel transportation package security assessments in partial response to the NAS study recommendation.

Questions from Senator Boxer

QUESTION 1 If the Department of Energy is responsible for shipments of waste to Yucca Mountain, what will be the role the Nuclear Regulatory Commission?

ANSWER

Because the Department of Energy (DOE) plans to take custody of the spent fuel at the licensee's site (i.e., at a nuclear power plant), the NRC's role in the transportation of spent fuel to a repository would be limited to certification of the designs for shipping casks used for transport and, in the event of a transportation incident, providing technical expertise, if requested. Section 180(a) of the Nuclear Waste Policy Act of 1982 prohibits the Secretary of Energy from transporting spent nuclear fuel or high level waste to a repository or monitored retrievable storage facility except in packages certified for such purpose by the NRC. Physical security and transportation safety for these shipments would be addressed under DOE and the Department of Transportation's requirements.

QUESTION 2 Is the NRC planning to do an independent security assessment with DOE that would cover both shipments to Yucca Mountain and to an interim storage facility?

ANSWER

At the current time, NRC is not planning to conduct an independent security assessment with DOE that would cover both shipments to Yucca Mountain and to an interim storage facility. Current security measures and standards put in place since September 11, 2001, are adequate for the protection of spent fuel and high-level waste transportation even in the event of increased shipping campaigns. Physical protection measures for future shipments must match the threat in place at the time of shipment. In addition, shipment tracking and monitoring technologies are constantly improving. Shipments to Yucca Mountain could not begin, at the earliest, until 2020, based on current DOE estimates. This estimate is tentative given that NRC staff continue to review the DOE license application to construct and operate the repository. Therefore, it would be more appropriate to consider whether an independent examination of shipment security is needed closer to the time of actual shipments.

QUESTION 3 Please explain the NRC's physical protection requirements for the transportation of spent nuclear fuel as they would relate to the transport of spent nuclear fuel to Yucca Mountain. What is the process for advance notification of State Governors prior to a shipment?

ANSWER

As DOE plans to take custody of the spent fuel at the NRC licensee's site, DOE requirements would control the physical security of spent fuel shipments. NRC's physical protection requirements would not apply.

However, Section180(b) of the Nuclear Waste Policy Act requires that the Secretary of Energy abide by the Commission's regulations regarding advanced notification of State and local governments prior to transportation of spent fuel or high-level waste to Yucca Mountain. NRC's advanced notification requirements in 10 CFR 73.37(f) require an NRC licensee to notify the governor or governor's designee at least four days prior to a spent fuel shipment within or through a state. Notifications delivered by mail must be postmarked at least 7 days prior to shipment.

QUESTION 4 You mention in your testimony that you are examining the MacArthur Maze accident in Oakland and the I-5/14 interchange tunnel fire in Northern Los Angeles County as part of your efforts to improve the security of commercial shipments of spent nuclear fuel. Will you share a copy of the results when your studies are completed?

ANSWER

Yes. The MacArthur Maze accident and I-5/14 interchange tunnel fire studies are focused on how spent fuel casks would perform under real world accident conditions involving severe fires. The studies are not specifically focused on security-related scenarios, although the studies could be used to inform the assessment of sabotage or security scenarios involving severe fires.

NRC is planning to publish the draft reports for the MacArthur Maze accident in Oakland and the I-5/14 interchange tunnel fire in Northern Los Angeles County for public comment. We anticipate that the draft reports on both accidents will be published in mid-calendar year 2009. The NRC's Office of Congressional Affairs will provide your office a copy of the draft reports as soon as they are published. The NRC will also notify the public of the reports' availability and seek public comments by *Federal Register* notice and by making the reports available on the NRC's public website. The final reports will be issued after public comments are considered. The NRC's Office of Congressional Affairs will provide your office a copy of the final reports