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From: Mahendra Shah - SFPO
To: Roger Kenneally - RES
Date: 8/28/02 4:28PM
Subject: Draft Q&As for the Spent Fuel storage and Transportation

Roger:

Attached please find the first draft of Q&As for the spent fuel storage and transportation areas. Based on the careful review here in SFPO, there may be changes/additions. Thanks.

Mahendra
>>> Roger Kenneally 08/28/02 03:20PM >>>
Based on comments received, I revised the responses to the questions. In preparation for the meeting tomorrow, I am attaching both the initial and revised responses.

SFPO { **CC:** Bernard White; Daniel Huang; Earl Easton; Jack Guttmann; Robert Shewmaker; Ron Parkhill; Syed Ali

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SPENT FUEL STORAGE AND TRANSPORTATION Q&As:
8/28/2002

Issue	Source	Question	Answer
		Q: Where is the NRC on its assessment of airborne attacks on spent fuel storage facilities and on spent fuel transportation by rail or truck?	A: In January 2002, the NRC completed an initial scoping assessment of vulnerabilities of spent fuel storage facilities and spent fuel transportation by rail or truck to aircraft attack. Although this assessment has considerably uncertainties, it provided insights in developing the interim compensatory measures for spent fuel storage facilities, and for transportation of spent fuel, and NRC's interactions with other Federal agencies. More detailed analyses will continue for the next year to support realistic decision making for the long term.
		Q: What are the findings from the NRC assessment?	A: NRC assessments of facility vulnerabilities are classified. Therefore, the agency will not discuss them publicly. Insights from the NRC scoping assessment are being factored into regulatory decisions and shared with other Federal agencies, as appropriate. If warranted by the ongoing detailed analyses, the NRC will consider changes to the ICMs for affected licensees to ensure the protection of the public health and safety.
		Q: Are the NRC findings similar to those reported by the NEI?	A: NRC assessments of facility vulnerabilities are classified. Therefore, the agency will not discuss them publicly.
		Q: How much longer will it take the NRC to complete its study?	A: The NRC's work in this area is continuing, with emphasis on resolving the uncertainties in our earlier work, and on addressing key aspects, such as fire and potential radiological consequences, in more detail. We expect the current analyses will be completed by the end of FY2003, with intermediate results being factored into our regulatory decisions and shared with other agencies, as appropriate.

		Q: It has been a year since the terrorist attacks, don't you have a sense of urgency, especially in light of your mission of protecting the public health and safety?	A: NRC's initial assessment was captured in January 2002, and the insights gained have informed regulatory decisions and have been shared with other Federal agencies, as appropriate. If warranted by the ongoing detailed analyses, the NRC will consider changes to the ICMs for affected licensees to ensure the protection of the public health and safety.
		Q: Was the NEI assessment peer reviewed?	A: The NRC has not seen the NEI study and is unable to comment on it.
		Q: Are the assumptions in the NEI assessment (speed of aircraft, angle of attack, etc.) realistic?	A: For security reasons, the NRC can not comment on the assumptions, methods, or conclusions of any vulnerability assessment.
		Q: Are the assumptions in the NEI assessment similar to those in the NRC assessment?	A: For security reasons, the NRC can not comment on the assumptions, methods, or conclusions of any vulnerability assessment.
		Q: When will the NRC assessment be completed?	A: We expect the current analyses will be completed by the end of FY2003, with intermediate results being factored into our regulatory decisions and shared with other agencies as appropriate.
		Q: Will an unclassified version of the NRC assessment be made public?	A: In the interest of national security, the NRC will not make public an unclassified version of its assessment. Intermediate results from the NRC assessment are being factored into regulatory decisions and shared with other Federal agencies as appropriate. If warranted by the ongoing detailed analyses, the NRC will consider changes to the requirements for affected licensees to ensure the protection of the public health and safety.

Spent Fuel and ISFSIs (General)	Meserve Senate testimony, 6/5/02	*Q: What would happen if a large commercial airliner was intentionally crashed into a spent fuel storage facility?*	Spent fuel casks are robust, typically constructed of a combination of concrete and steel that allow for air cooling of the spent fuel. Spent fuel stored at NRC-licensed facilities poses a lesser security challenge than an operating reactor because the risk to the public health and safety is diminished. NRC's comprehensive safeguards and security program re-evaluation includes the consideration of potential consequences of terrorist attacks using various explosives or other techniques on spent fuel pools and spent nuclear fuel dry casks at storage sites. The program also addresses the transportation of spent fuel and other significant quantities of radioactive material. The NRC is continuing a major engineering effort to evaluate the vulnerabilities and the potential effects of a large commercial aircraft impacting on a spent fuel storage facility. This effort will include careful consideration of additional mitigative measures, if needed.
		Q: What would happen if a large commercial airliner was intentionally crashed into a rail car or a truck transporting a spent fuel cask?	Spent fuel transportation casks are typically constructed of layers of steel and thus are robust in design to cope with a large aircraft impact during transportation. The NRC is continuing a major engineering effort to evaluate the vulnerabilities and the potential effects of a large commercial aircraft impacting on a spent fuel transportation cask. This effort will include careful consideration of additional mitigative measures, if needed..

Spent Fuel & ISFSIs - General	Meserve testimony, 4/11/02	*What is the NRC's current assessment of the wet storage and dry storage of spent fuel, and has your assessment of these methods of storage changed since September 11?*	Spent nuclear fuel is stored at reactor sites in spent fuel pools or in dry cask storage facilities. Spent fuel pools use water to cool the spent fuel and shield personnel from radiation. The pools are robust structures constructed of very thick concrete walls with stainless steel liners, and are designed to withstand earthquakes. Spent fuel casks are also robust, typically constructed of a combination of concrete and steel that allow for air cooling of the spent fuel. Spent fuel stored at licensed facilities poses a security challenge that is less than that of an operating reactor because the risk posed to the public health and safety is diminished. The comprehensive safeguards and security program re-evaluation being conducted by the NRC includes the consideration of potential consequences of terrorist attacks using various explosives or other techniques on spent fuel pools and spent nuclear fuel dry casks at storage sites. The Commission continues to evaluate the need for additional interim compensatory measures to augment the enhanced security put in place after September 11 through the advisory process.

Spent Fuel and ISFSIs (General)	Travers letter to N.C. General Assembly, 5/21/02	*What is the NRC's current assessment of the wet storage and dry storage of spent fuel, and has your assessment of these methods of storage changed since September 11?*	Spent nuclear fuel is stored at reactor sites in spent fuel pools or in dry cask storage facilities. Spent fuel pools use water to cool the spent fuel and shield personnel from radiation. The pools are robust structures constructed of very thick concrete walls with stainless steel liners, and are designed to withstand earthquakes. Spent fuel casks use air cooling and are also robust, typically constructed of a combination of concrete and steel. Both pools and casks can be used to store spent fuel safely and securely in accordance with NRC requirements. The comprehensive safeguards and security program reevaluation being conducted by the NRC includes consideration of potential consequences of terrorist attacks using various explosives or other techniques on spent fuel pools and spent nuclear fuel dry casks at storage sites. As part of this reevaluation, the NRC is also evaluating the need for additional interim compensatory measures to enhance security for spent fuel storage in the current threat environment.
Spent Fuel and ISFSIs (General)	Meserve Senate testimony, 6/5/02	*cont'd*	The Orders issued by the Commision on February 25, 2002, to operating reactors, and on May 2, 2002, to decommissioning reactors and the General Electric spent fuel storage facility, enhance the security measures for spent fuel stored in spent fuel pools. The specific security measures are understandably sensitive, but generally include requirements for increased patrols, augmented security forces and capabilities, additional security posts, vehicle stand-off distances, and enhanced coordination with law enforcement and military authorities. We will shortly issue a similar Order to independent spent fuel storage facilities using dry cask storage.

Spent Fuel Casks	Meserve letter to Markey, 3/4/02, Encl. 1	*Question 1: In your October 16 response, you stated that "the capacity of spent fuel dry storage casks to withstand a fire for extended time, such as 24 hours, has not been analyzed, given the very low probability that firefighting personnel would be unable to respond within 24 hours." Firefighters responded in far less than 24 hours to the fires that resulted at the Pentagon and World Trade Center, but they took far longer to extinguish these fires because of the amount of jet-fuel and other debris involved. If such a fire, fed by more than 20,000 gallons of jet-fuel, also involved the dispersal of highly radioactive materials, this could hinder firefighters' ability to immediately contain the fire. In fact, it took almost 200 firefighters 4.5 hours to extinguish the more than 30 fires started after the Chernobyl reactor exploded, except for the graphite core fire, which took more than 9 days to extinguish - after most of the radioactive materials had been released into the environment. [Given the risks involved and the record at the World Trade Center [and Chernobyl], don't you think you should perform a worst-case analysis involving a long-duration fire at a spent fuel storage cask facility, rather than just assuming that such a fire could never occur?*	The NRC does not believe that comparison of fires that could occur at spent fuel storage facilities, to the fires that occurred at the World Trade Center, the Pentagon, and Chernobyl, provides much meaningful information, because a spent fuel storage facility would not have the additional flammable material to fuel a long-duration fire, as did the other fires mentioned. As a result of the terrorist attacks of September 11, 2001, the Chairman directed the staff to thoroughly reevaluate the NRC's safeguards and physical security programs. This reevaluation will be a top-to-bottom analysis involving all aspects of the Agency's safeguards and physical security programs and will include a detailed analysis of the consequences resulting from a plane crashing into a spent fuel dry cask storage facility, including the potential and duration of fire.

Spent Fuel Casks	Meserve letter to Markey, 3/4/02, Encl. 1 (This item is repeated in Aircraft Impact)	*Question 2: Your October 16 response restates earlier NRC claims that a worst-case analysis of aircraft impact indicates that the jet-fuel would burn off in a matter of minutes. You conclude that therefore, "a spent fuel storage cask would not be expected to be appreciably affected by a fire." However, as I pointed out in my September 21 letter, this analysis was based on an assumption that there would only be 200 gallons of fuel involved, not more than 20,000 gallons as is typically contained in a 757 or 767. Please clarify you response. Exactly how much fuel did your worse-case analysis assume would be present in fire? If the amount is not typical of the amount carried by a fully-fueled large commercial aircraft, please redo your worst-case analysis and provide it to me, indicating as well whether the results will necessitate additional security measures at spent fuel storage facilities.*	The duration of a fire is highly dependent on the velocity and trajectory of a plane crash, as well as the amount of flammable materials at the crash site. The greater the velocity of the plane crash, the shorter the duration of the fire. This is due to the fuel spreading across a large area, rapidly atomizing and igniting. To estimate an upper bound for a potential fire duration, one can consider a plane traveling at very low velocity where the fuel would remain close to the crash target. On December 23, 1983, at the Anchorage International Airport, AK, while on takeoff, a DC10 collided with a parked aircraft. For this event, the amount of fuel was considerably greater than from one aircraft. The DC10 aircraft, alone, was fully loaded with approximately 36,600 gallons of fuel. The fire was extinguished within two and a half hours. The speed of impact was 168 feet per second. For a larger velocity impact, the fuel would have dispersed and burned significantly faster. To assess the impact of a dry cask under an engulfing jet fuel fire, the staff performed an analysis of a seven-hour fire duration. The results from the analysis did not lead to fuel failure nor cask failure.

Spent Fuel Casks	Meserve letter to Markey, 3/4/02, Encl. 1	*Question 3: In your October 16 response, you stated that "Even if a spent fuel cask were impacted and penetrated by a commercial aircraft, the resultant effects could never be equivalent to a Chernobyl-style accident because the amount of radioactive material contained within the cask is orders of magnitude less than in an operating reactor, and the mechanisms for dispersal are fewer than were present during the Chernobyl accident." However, a November 2, 2001 report in the New York Times cites a September 2000 NRC report, that "suggests that breaching a cask used to store spent fuel would create a lethal radiation dose in area many times larger than that caused by a 10-kiloton nuclear weapon." The New York Times report also states the "other experts note the spent fuel pools can contain 20 to 30 times as much radioactive material as the reactor core does....A draft study by the National Council on Radiation Protection and Measurements discussed the risk of shipping spent fuel and calculated that breaching a cask could produce a lethal radiation dose in an area of 2,700 square kilometers. In comparison the study said a 10-kiloton nuclear blast would produce those doses in 47 square kilometers.* *Question 3.a. Please explain the apparent discrepancy between your October 16, 2001 statement regarding the consequences of an aircraft impact on a spent fuel cask with those reportedly made in the September 2000 NRC report and the draft NCRP*	The staff reviewed the November 2, 2001 New York Times article that referenced a September 2000 report which "suggests that breaching a cask used to store spent fuel would create a lethal radiation dose in an area many times larger than caused by a 10 kiloton nuclear weapon." The staff contacted Matthew L. Wald, the author of that New York Times report, who indicated that the referenced information about radiation dose was from a draft National Council on Radiation Protection and Measurements (NCRP) document (not from an NRC report). The draft report has now been published as NCRP Report No. 138, "Management of Terrorist Events involving Radioactive Materials," issued October 24, 2001. The staff reviewed NCRP Report No. 138 and noted the quoted information from the draft report was not incorporated into the final report. The Commission believes that the calculations cited in the draft were incorrect.

Spent Fuel Casks	Meserve letter to Markey, 3/4/02, Encl. 1	*Question 3.c. Is the statement reportedly contained within the September 2000 NRC report that "suggests that breaching a cask used to store spent fuel would create a lethal radiation dose in an area many times larger than that caused by a 10-kiloton nuclear weapon" true? If so, how is this consistent with your statement in your October 16 response that the only consequence of such an event that you could not exclude is "localized impacts?" Would you consider a radiation release equivalent to that of a 10-kiloton nuclear bomb to be a "localized" event?*	Please see response to question 3. above.

Spent Fuel Casks	Meserve letter to Markey, 3/4/02, Encl. 1	*Question 1: Prior to September 11, 2001, were all spent fuel and dry cask storage areas protected by: a) permanent or temporary personal and vehicle barriers, and, b) armed guards? Are such areas currently so protected? If not, aren't they vulnerable to either attacks by terrorists on foot or by truck bombs?*	NRC regulations do not require dry cask storage areas be protected by armed guards or vehicle barriers. A watchman is required with the ability to contact and have the local law enforcement agencies respond immediately to an event. Spent fuel located at operating nuclear power plants is protected by armed guards and vehicle barriers. Prior to September 11, 2001, the requirement for vehicle barriers and armed responders varied for non-operating nuclear power plants. After September 11, 2001, the NRC issued an advisory to recommend vehicle barriers and armed responders at non-operating nuclear power plants. The NRC issued Confirmatory Actions Letters (CALs) to decommissioning reactors confirming that these licensees would take measures associated with four issues. Although the details are sensitive, the issues include 1) vehicle threat, 2) offsite communications, 3) offsite response commitments, and 4) onsite/offsite response force. As a result of the terrorist attacks of September 11, 2001, the Chairman directed the staff to thoroughly reevaluate the NRC's safeguards and physical security programs. This reevaluation will be a top-to-bottom analysis involving all aspects of the Agency's safeguards and physical security programs and will include the potential consequences of terrorist attacks at spent nuclear fuel storage sites.

Spent Fuel Casks	Meserve letter to Markey, 3/4/02, Encl. 1 (This item is repeated in Spent Fuel Pool)	*Question 2: Can either hand-placed or truck-delivered explosives penetrate either a pool or cask? What could happen if explosives or heat-producing material were placed next to the fuel in an emptied pool or in a breached dry cask?*	There is a possibility that, with enough explosives, both a spent fuel pool or spent fuel dry cask can be penetrated. The damage and possible material released is scenario dependent. Even if the pool or cask were penetrated, measures in place should provide adequate protection of public health and safety. As a result of the terrorist attacks of September 11, 2001, the Chairman directed the staff to thoroughly reevaluate the NRC's safeguards and physical security programs. This reevaluation is a top-to-bottom analysis involving all aspects of the Agency's safeguards and physical security programs and includes the potential consequences of terrorist attacks using various explosives or heat-producing devices on spent pools and spent nuclear fuel dry casks at spent nuclear fuel storage sites.
Spent Fuel Casks	Meserve letter to Markey, 10/16/01, Encl.	*Question 10(a): What would happen to spent fuel storage casks if they were subjected to a fire for a full day?*	The capacity of spent fuel dry storage casks to withstand a fire for extended time, such as 24 hours, has not been analyzed, given the very low probability that firefighting personnel would be unable to respond within 24 hours. However, previous studies have analyzed worst case impact conditions for aircraft accidents, and these studies have found that most of the aircraft fuel would be dispersed and will burn off in a matter of minutes. Thus, if impacted by a large commercial aircraft, a spent fuel storage cask would not be expected to be appreciably affected by a fire. However, if, as a result of the NRC's review of the terrorist events of September 11, 2001, the NRC determines that additional or revised safety or physical protection actions or requirements need to be taken at independent spent fuel storage installations, the NRC will take appropriate actions to implement those measures.

Spent Fuel Casks	Meserve letter to Markey, 10/16/01, Encl.	*Question 10(b): If the protective covering of the cask were burned away, what would happen to the fuel inside?*	The concrete and/or steel protective coverings are not readily flammable and will not be burned away. Therefore, the staff believes that a fire will not result in failure of the inner canister. As indicated above, if, as a result of the NRC's review of the terrorist events of September 11, 2001, the NRC determines that additional or revised safety or physical protection actions or requirements need to be taken at independent spent fuel storage installations, the NRC will take appropriate actions to implement those measures.
Spent Fuel Casks	Meserve letter to Markey, 10/16/01, Encl.	*Question 10(c): Could we have a Chernobyl-style accident, where the fire carried radioactive materials into the air [from a spent fuel storage cask]?*	No. Even if a spent fuel storage cask were impacted and penetrated by a commercial aircraft, the resultant effects could never be equivalent to a Chernobyl-type accident because the amount of radioactive material contained within the cask is orders of magnitude less than in an operating reactor, and the mechanisms for dispersal of the material are fewer than were present during the Chernobyl accident. In the event of a crash of a large commercial aircraft, and if the cask were breached, we could not exclude the possibility of localized impacts.
Spent Fuel Casks	Meserve letter to Markey, 10/16/01, Encl.	*Question 10(d) Will there be a redesign of spent fuel casks? Why or why not?*	As previously stated, if, as a result of the NRC's review of the terrorist events of September 11, 2001, the NRC determines that additional or revised safety or physical protection actions need to be taken or new requirements implemented at independent spent fuel storage installations, including the design requirements for spent fuel casks, the NRC will take appropriate actions to implement those measures.

Spent Fuel Casks	9/21/02 press release	*Q:What would happen if a large aircraft should crash into a spent fuel dry storage cask?* *(This is repeated in the aircraft impact - general - section.)*	A: The capacity of spent fuel dry storage casks to withstand a crash by a large commercial aircraft has not been analyzed. Nonetheless, storage casks are robust and must be capable of withstanding severe impacts, such as might occur during tornadoes, hurricanes or earthquakes. In the event that a cask were breached, any impacts would be localized. All spent fuel storage facilities have plans to respond to such an emergency, drawn up in consultation with local officials.
Spent Fuel Casks	9/21/02 press release	*Q: What if a large aircraft crashed into a spent fuel transportation cask in a heavily populated area?* *(This is repeated in the aircraft impact - general - section.)*	A: Again, the capacity of shipping casks to withstand such a crash has not been analyzed. However, they are designed to protect the public in severe transportation accidents. The cask must be able to withstand a 30-foot drop puncture test, exposure to a 30-minute fire at 1475 degrees Fahrenheit, and submersion under water for an extended period. Moreover, the location of loaded casks is not publicly disclosed and such a cask would present a small target to an aircraft . If an airliner crashed into a cask, there could be some localized impacts. Regulations require special accident response training of those involved in shipping, as well as coordination with state, local and tribal emergency response personnel. In addition, redundant communications must be maintained during shipment with the transporter vehicle; this would facilitate emergency response, if necessary.

Transportation	Meserve letter to Tauzin, 10/5/01		The [Markey] amendment's provisions also require armed guards on all spent fuel shipments. Armed guards are required today for transportation of materials of proliferation significance and for shipments of spent fuel through heavily populated areas. The NRC believes it needs to complete its ongoing physical security evaluations before a determination of whether further changes are necessary. This evaluation will include a review of threats, vulnerabilities and the risk of transportation sabotage. As the Committee is aware, the casks which are used to transport spent fuel are designed to withstand severe transportation accident conditions and, while the casks are not specifically designed against sabotage by terrorists, the designs do provide substantial protection against the effects of sabotage. A reasoned determination about whether and what additional protection or protective procedures are necessary will benefit from the completion of our ongoing studies and evaluations

Transportation	Meserve letter to Tauzin, 10/5/01		Representative Markey's Amendment No. 79 addresses the transportation of nuclear materials more generally. The amendment provides that all shipments of byproduct materials, source materials, special nuclear materials, and any materials and wastes contaminated by those materials be accompanied by manifests describing the type and amount of materials being transported. In addition, the drivers and those traveling with such a vehicle must have been subject to a Federal security background check, and the material being transported may go to no destination other than a facility licensed by the NRC or an Agreement State. The amendment would also require transporters to take material only to facilities licensed by the NRC or an Agreement State, or to a Federal facility. Most shipments of radioactive materials are shipments of radiopharmaceuticals. The U.S. manufactures radiopharmaceuticals that are used abroad. Because foreign recipients of U.S. manufactured radiopharmaceuticals are not licensed by the NRC or an Agreement State, the amendment would effectively halt the export of critical medical supplies. We are sure this was not intended. Many shipments regulated by the NRC currently satisfy the proposed statutory requirements relating to manifests because NRC transportation regulations require shippers to comply with Department of Transportation regulations. 10 C.F.R. § 71.5. Those regulations require that manifests describing the type and amount of materials being transported accompany each shipment. This would apply to, for example, shipments of spent fuel, fresh reactor fuel, radiopharmaceuticals, and radioactive sealed sources, and devices. Only "limited quantity shipments," such as shipments of smoke detectors and laboratory samples of radioactive material, are exempt from the manifest requirement.

Transportation	Meserve letter to Tauzin, 10/5/01	*(cont'd)*	The vast preponderance of shipments of radioactive materials involve shipments of radiopharmaceuticals, ores, waste with low activity, and consumer products utilizing radionuclides (e.g., watches, smoke detectors). These are accomplished by transporters that have not been subject to government background checks. However, most of the materials being transported are not attractive targets for diversion because diversion of the materials would not have significant public health and safety or nonproliferation consequences. Background checks are, however, performed for the infrequent transportation of strategic quantities of special nuclear material because of the nonproliferation significance of such shipments. Moreover, almost all of these shipments of strategic quantities of special nuclear material occur using DOE's secure transportation system. In light of the innocuous nature of most transportation of nuclear material, we do not believe that sweeping requirements for background checks are appropriate. We recognize that the September 11 attacks require a thorough examination of NRC policies, including those bearing on transportation. The Commission has commenced a comprehensive review of transportation requirements that will analyze those shipments presenting the greatest risks (e.g., spent fuel and irradiator components) and then analyze the benefits and costs of potential enhancements to our existing requirements. We will consider, in partnership with the Department of Transportation, whether Federal security background checks should be expanded to a larger class of transported materials. Although we believe there are flaws in Amendment No. 79 as drafted, we have attached for the Committee's consideration an amendment which would codify an approach to address the underlying concern that motivates the amendment (Enclosure 2). We understand it would require the Commission to prepare an initial report on transportation issues within 120 days after enactment of the legislation and a final report no later than 300 days after enactment.

Transportation	Meserve Senate testimony, 6/5/02		I would also like to address security during transportation. Our existing regulations currently contain significant safety and security requirements for the transport of radioactive material. After the September 11, 2001 event, we also issued advisories to increase security in transportation of specific types of radioactive material, including spent fuel shipments and shipments referred to as Highway Route Controlled Quantities of radioactive material. In order to codify the advisories, the Commission is currently in the process of issuing Orders to licensees shipping specific quantities of radioactive material and will be considering expedited rulemaking in this area as well. We will also review transportation requirements as part of our comprehensive review of the safeguards and security programs that I previously mentioned.