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FROM: Representative Edward J. Markey

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FINAL REPLY:

TO:

Chairman Meserve

FOR SIGNATURE OF : ** PRI **

CRC NO: 01-0613

Chairman

DESC:

Security of Spent Fuel and Decommissioning Nuclear Reactors Against a Terrorist Attack

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SPECIAL INSTRUCTIONS OR REMARKS:

Coordinate response with ERCT and NMSS.

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SUBJECT:	Questions regarding the security of spent nuclear fuel and decommissioned nuclear reactors against a terrorist attack		
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November 19, 2001

The Honorable Richard A. Meserve
Chairman
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Chairman:

I am writing to request your assistance in answering some questions regarding the security of spent nuclear fuel and decommissioned nuclear reactors against a terrorist attack. I am concerned that an attack on such a facility could lead – in the worst case – to a devastating release of radioactive materials, causing an increase in cancers to the surrounding population, leaving entire communities uninhabitable for decades and costing millions if not billions of dollars to remediate. Unfortunately, these facilities historically appear to have been held to lower security standards than operating reactors, leaving them even more vulnerable to attack.

While your October 16, 2001 letter to me appears to indicate that the Commission regards the consequences of an aircraft impact on spent nuclear fuel casks as minimal, I have directed my staff to review publicly-available NRC and other documents on this subject. These publications appear to have concluded that a successful terrorist attack on spent nuclear fuel could have the same impact as a 10-kiloton nuclear bomb, in terms of radioactive release. Moreover, I noted that the analysis included in your October 16, 2001 of the consequences of fire due to an aircraft impact on a spent fuel cask continues to be based on an assumption that an aircraft would only contain 200 gallons of fuel, and ignores my September 21, 2001 request that such an analysis consider the impact of a fire fed by more than 20,000 gallons of jet-fuel, an amount that is typically carried by Boeing 757s or 767s. I therefore require further clarification of the facts relating to this matter, so that I can fully understand the nature and adequacy of Commission and licensee actions in this area.

I am also concerned that the NRC does not appear to have adequately prepared for terrorist attacks at spent nuclear fuel storage sites or decommissioned reactors. For example, on June 4, 2001, NRC document SECY-01-0100 entitled "Policy Issues Related To Safeguards, Insurance, And Emergency Preparedness Regulations At Decommissioning Nuclear Power Plants Storing Fuel In Spent Fuel Pools" was published. The stated purpose of this document was to "present the Commission with policy issues and options related to regulatory decision-making in the areas of insurance, emergency preparedness (EP), and safeguards for decommissioning nuclear power plants and to request Commission approval of staff recommendations." However, while the NRC SECY document considers the possibility that radioactive

materials could be released from these facilities due to a zirconium fire and have "significant offsite radiological consequences", it explicitly chooses to ignore the possibility that such a fire could be started by a terrorist. The NRC SECY document did, however, inexplicably conclude that an earlier NRC decision to reduce certain insurance, emergency preparedness and safeguards requirements at decommissioned plants was acceptable, and recommends that offsite Emergency Preparedness be incrementally reduced and eventually eliminated after a reactor permanently shuts down. It seems to me that such conclusions need to be revised in the aftermath of the events of September 11th.

Another issue of concern is a proposal to create a spent nuclear fuel storage facility at Skull Valley, Utah. I understand that under this proposal the entire current United States inventory of commercial spent nuclear fuel, 40,000 metric tons, potentially will be concentrated in one location in dry storage casks that will be easily visible from the air and from a nearby road. The facility will also be located extremely close to military installations and commercial jetways. The State of Utah, which opposes the proposal, contends that the proposed operator of the facility, Private Fuel Storage LLC (PFS), failed to assess the impacts from suicide mission terrorism and sabotage that could occur at the facility (or in related activities) in its September, 2000 Safety Analysis Report (SAR), Environmental Report (ER), September 2000 Safety Evaluation Report (SER), and the NRC's draft Environmental Impact Statement (DEIS).

Given the serious risk to public health, safety and the environment that would be posed by a successful terrorist attack on a spent nuclear fuel storage cask or facility, and given that your October 16 response was incomplete in its discussion and analysis of these matters, I request your prompt assistance in responding to the following questions:

Questions on the Security of Spent Fuel Casks Related to the October 16, 2001 Response of the NRC

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? If not, why not?

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 your response. Exactly how much fuel did your worst-case analysis assume would be present in a 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.

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 an area many times larger than that caused by a 10- kiloton nuclear weapon." The New York Times report also states that "other experts note that 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."
   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 report. Please additionally provide a copy of the September 2000 NRC report.
   b) Is the statement that a spent fuel pool can contain 20 to 30 times as much radioactive material as an operating reactor true? Please provide a list of each operating reactor and each spent nuclear fuel pool, indicating for each how much radioactive material is contained within. Should this information be nonpublic, please advise your staff to make appropriate arrangements with my staff for transmittal and safekeeping of these documents.
   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 a10-kiloton nuclear bomb to be a "localized" event?

Questions Related to Emergency Preparedness Regulations At Decommissioning Nuclear Power Plants Storing Fuel In Spent Fuel Pools

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 attack by terrorists on foot or by truck bombs?

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?

On June 4, 2001, NRC document SECY-01-0100 entitled "Policy Issues Related To Safeguards, Insurance, And Emergency Preparedness Regulations At Decommissioning Nuclear Power Plants Storing Fuel In Spent Fuel Pools" was published. The stated purpose of the SECY document was to "present the Commission with policy issues and options related to regulatory decision-making in the areas of insurance, emergency preparedness (EP), and safeguards for decommissioning nuclear power plants and to request Commission approval of staff recommendations."

3) The SECY document states that revisions to the regulatory requirements for decommissioning nuclear power plants were initiated in the early 1990s because existing regulations "present a significant burden to decommissioning licensees without apparent commensurate safety benefits."
   a) Were the safety benefits of protecting decommissioning nuclear power plants from acts of radiological sabotage or theft explicitly considered when the decision was made to revise these regulations beginning in the early 1990s? Please provide copies of any analyses done on the impact of changing these regulations on the ability to protect decommissioning facilities against terrorist attacks.
   b) Were force-on-force exercises or other safety and security evaluations conducted at decommissioned facilities to verify that revising the regulations would pose no degradation in safety, compared to the old rules? If not, then on what basis was it determined that the pre-existing requirements did not provide commensurate safety benefits?

4) The SECY document states that "the only postulated scenario at a decommissioning plant that could result in a significant offsite radiological release is a beyond-design-basis event commonly referred to as a zirconium fire." Why were terrorist attacks at a decommissioning plant not "postulated scenarios?" Will the Commission revise its analysis of the scenarios in which a significant offsite radiological release could occur at a decommissioning plant in light of the events of September 11? If not, why not?

5) The document refers to a previous NRC publication, NUREG-1738, in which NRC staff "concluded that the risk from a spent fuel pool (SFP) zirconium fire at decommissioning plants is very low and well below the Commission's safety goals for operating reactors." The document describes the manner in which such a fire would take place as beginning with "a substantial loss of water from the spent fuel pool (SFP), uncovering the spent fuel. Uncovering the spent fuel could result in a heatup to the point where the fuel's zirconium cladding might begin to oxidize in a rapid, exothermic, self-sustaining reaction. The plume from such a zirconium fire could have significant offsite radiological consequences."
   a) Couldn't a terrorist start such a fire by draining the water from the spent fuel pool and then causing an explosion nearby? Why wasn't that considered?
   b) Will the NRC revise its estimation of the likelihood of such a fire in light of the events of September 11? If not, why not?

6) The document states that "the study concluded that the possibility of a zirconium fire cannot be dismissed even many years after final reactor shutdown."
   a) Do you agree that this conclusion means that security at decommissioned plants must remain high at least until all the spent fuel removed from the site? If not, why not?
   b) What steps has the NRC taken at decommissioned plants since September 11 to ensure that a terrorist attack on the spent fuel pool does not result in a fire and/or large release of radioactive materials? If no such steps have been taken, please justify.

7) A previous NRC ruling (SECY-93-127, "Financial Protection Required of Licensees of Large Nuclear Power Plants During Decommissioning," July 13, 1993) reduced certain insurance, emergency preparedness and safeguards requirements at decommissioned plants because the possibility of a zirconium fire resulting in a large release of radioactive materials had been ruled out. In light of the June, 2001 finding that such an event cannot be ruled out, as well as in light of the highlighted risk that a terrorist could cause such an event, will the NRC reverse its 1993 decision to reduce certain insurance, emergency preparedness and safeguards requirements at these plants? If not, why not?

8) The document found that the risk of a zirconium fire was dominated by the likelihood that a major earthquake would occur. However, the likelihood of sabotage was not even considered. Why would an analysis of any event that could result in a large release of radioactive material not even attempt to consider sabotage? Will the NRC redo this and other analyses of events that could result in a large release of radioactive materials in light of the events of September 11? If not, why not?

9) The document states that "regulatory changes for insurance or offsite emergency preparedness would be premised on the assumption that the level of safeguards maintained at a decommissioning plant would provide high assurance that the likelihood of a zirconium fire due to sabotage is very low." Was this assumption based on the results of Operational Safeguards and Response Evaluation exercises at decommissioned plants to determine whether a terrorist would be able to succeed

in starting a zirconium fire? If so, please list the number of decommissioned plants that have undergone such exercises, the name of the security company contracted to the licensee, the results of such exercises, as well as the number of decommissioned plants at which potential vulnerabilities were identified. If not, then on what possible basis was the assumption made?

10) The SECY document recommends that because of the severe consequences of a zirconium fire, the Commission's Safety Goal policy statement, which currently applies only to operating reactors, also apply to decommissioned plants until the spent fuel is removed from the spent fuel pools. Has this recommendation been adopted? If not, why not, especially in light of the events of September 11?

11) The report states that it would be difficult for the Commission to utilize probabilistic risk assessment techniques to evaluate the risk of a sabotage event, stating that Intelligence Agencies do not use these techniques either. Does this conclusion mean that the NRC will just ignore the risk of a zirconium fire being caused by sabotage entirely, as the document suggests?

12) The document recommends that a safeguards protection goal for decommissioning nuclear power plants that "consists of a design criterion of protecting against radiological sabotage by the design basis threat and a performance standard of preventing spent fuel sabotage that could cause radiation exposure to an individual at the nearest controlled area boundary from exceeding the dose specified in 10 CFR 72.106 (5 rem at a minimum of 100 meters)." Has the Commission adopted this recommendation? If so, will it be overseen through the use of Operational Safeguards Response Evaluation exercises, and if not, how will you know the safeguards protection goal is being achieved? If the Commission has not adopted this recommendation, why not?

13) The document recommends that "insurance requirements be substantially reduced shortly after a reactor permanently shuts down and enters into decommissioning. These licensees would not be required to participate in the secondary retrospective rating pool and primary insurance coverage would be reduced to about $100 million. In addition, onsite property damage insurance would not be required 60 days after permanent shutdown." This recommendation was made on the assumptions that a zirconium fire was not possible and that acts of sabotage would be prevented. Does NRC plan to reduce insurance at decommissioning plants now that it is clear that the possibility of a zirconium fire cannot ever be ruled out, and in light of the events of September 11? If so, please fully justify the decision.

14) Has the NRC ever conducted an analysis of how much a large scale release of radioactive materials due to a zirconium fire would cost, including the costs of decontamination and addressing health impacts of such an event on the surrounding community? If so, what is the cost of a worst-case scenario? If not, how can the Commission make an informed decision as to how much insurance coverage a decommissioned plant should have?

15) The document recommends that offsite Emergency Preparedness be incrementally reduced and eventually eliminated after a reactor permanently shuts down. Did this recommendation take into consideration the risk of a terrorist attack on the facility? Since the risk exists that a terrorist could start a zirconium fire by merely draining the spent fuel coolant, why would emergency preparedness be reduced before all the spent fuel was removed from the site? How does this recommendation make sense in light of the other recommendation that the Commission's Safety Goal policy statement, which currently applies only to operating reactors, also apply to decommissioned plants until the spent fuel is removed from the spent fuel pools?

16) The document concludes that back-fit exemptions from NRC requirements on decommissioned plants previously granted under the assumption that a zirconium fire was not possible do not "present an undue risk to the public health and safety."
   a) Does the NRC still agree with this statement?
   b) How is such a conclusion possible, given the document's conclusion that the risk of such a fire cannot be dismissed until the spent fuel is removed from the site, the failure of the analysis to account for the risk of zirconium fires due to sabotage or terrorism, as well as the recommendation that the Commission's Safety Goal policy statement (which currently applies only to operating reactors) also apply to decommissioned plants until the spent fuel is removed from the spent fuel pools?
   c) Will the NRC revoke its previously granted exemptions in light of the conclusion that the risk of a fire cannot be dismissed, as well as in light of the events of September 11? If not, why not?

17) The document assumes that "because of the long spent fuel decay times at currently decommissioning plants, a zirconium fire cannot occur for an extended period of time (at least 20 hours), if it could occur at all, even under the worst-case adiabatic heatup assumptions (no heat transfer of any kind from the fuel assemblies)." This statement seems to be premised on an accidental cause of the zirconium fire.
   a) Would it take 20 hours for a zirconium fire to occur if a terrorist simultaneously drained the coolant and set a fire or caused an explosion? If not, how long would it take in the worst case scenario?
   b) What is the shortest time a zirconium fire could occur if a large aircraft full of fuel crashed into the spent fuel storage facility?

Questions On The State Of Utah's Petition Related To Security At The Proposed Spent Nuclear Fuel Storage Facility At Skull Valley

As you know, the State of Utah is an intervenor in a licensing proceeding before the NRC for a spent nuclear fuel storage facility proposed for the Skull Valley Band of Goshute Indian Reservation. The State opposes the siting of the facility in Utah. Following the events of Sept. 11th, the State prepared and filed a new "contention" or concern it has with the proposed facility related to the threat of terrorism as well as a Petition to Suspend the Proceeding with the Commissioners.

The State of Utah contends that the proposed operator of the facility, Private Fuel Storage LLC (PFS), failed to assess the impacts from suicide mission terrorism and sabotage that could occur at the facility (or in related activities) in its September, 2000 Safety Analysis Report (SAR), Environmental Report (ER), September 2000 Safety Evaluation Report (SER), and the NRC's draft Environmental Impact Statement (DEIS).

According to the petition, under the PFS proposal, the entire current United States inventory of commercial SNF, 40,000 metric tons, potentially will be concentrated in one location in dry storage casks. Four thousand HI-STORM 100 casks will be stored out in the open on concrete pads over a 99-acre area. The casks are approximately twenty feet high and eleven feet in diameter (DEIS at Table 2.6), and the mass accumulation of these casks would be easily visible from the air, from Skull Valley Road, and from other unimproved roads near the site. No other nuclear facility currently amasses this enormous volume of SNF above ground in one location.

1) 10 CFR section 72.94 requires that a Safety Analysis Report (SAR) must identify and adequately address design basis external man-induced events such as suicide mission terrorism and sabotage "based on the current state of knowledge about such events." Given that the events of September 11 have forever altered our "state of knowledge" about the nature of such threats, do you plan to require PFS to amend its SAR to address the risk of suicide mission terrorism and sabotage? If not, why not?

2) The State of Utah also contends that PFS's Environmental Report (ER) and the NRC's Draft Environmental Impact Statement (DEIS) are too limited to comply with the National Environmental Policy Act and 10 CFR §§ 72.34, 51.45, 51.61 and 51.71, because they do not adequately identify and evaluate any adverse environmental effects which cannot be avoided from attacks by suicide mission terrorism or sabotage. The State of Utah filing states that "events of September 11th and their aftermath require a change in scope of the ER and DEIS to include an analysis "of Federal policy, including factors not related to environmental quality ... [that] are relevant to the consideration of environmental effects of the proposed action." 10 CFR § 51.71(d)." Do you plan to require PFS to amend its ER in light of the events of September 11? If not, why not? Do you plan to amend the DEIS in light of the events of September 11? If not, why not?

3) According to the State of Utah, the location of the proposed PFS facility, in the middle of Skull Valley, is surrounded by critical military installations vital to national security -- installations such as the Utah Test and Training Range, Dugway Proving Ground, Deseret Chemical Depot, and the Tooele Army Depot – and only 12 to 15 miles away from commercial jetways, and presents an opportune target for suicide mission terrorism. The transportation of spent nuclear fuel to the proposed facility

and casks stored at the Intermodal Transfer Facility (ITF, which is located right underneath a commercial jetway) also present exposed terrorist targets. The facility is about 45 miles from a large metropolitan area, 50 miles from Salt Lake City International Airport, and the ITF will be able to be seen from Interstate 80. What additional measures will NRC require PFS to take to ensure the safety of the spent nuclear fuel, as well as the safety of the surrounding sensitive facilities in the event of an accident or terrorist attack? If no additional measures will be required, please fully justify your decision.

4) According to the SAR, PFS plans to store spent nuclear fuel in Holtec International HI-STORM 100 Casks. The HI-STORM is designed to withstand an impact of a 1,800 kg (3,968 lb) car moving at a speed of 126 mph (SAR, Rev 17 § 8-2.2.2). . The HI-STORM 100 cask consists of 0.75 inch outside steel liner, 26.75 inches of 4,000 psi concrete, and a 2-inch thick inner steel liner for a total of 29.5 inches. The steel canister is 0.5 inches thick. According to the petition, a U.S. Department of Energy report determined that a Boeing 757 traveling between 422 and 500 miles per hour could penetrate between 28 to 33.6 inches of concrete and between 1.47 and 1.85 inches of steel. Clearly, a Boeing 757 commercial airliner, which on September 11 was traveling at 480 mph or greater, would be able to penetrate the HI-STORM casks and canisters. How will the NRC ensure that the storage casks are protected from an attack such as the one that occurred on September 11?

5) According to the SAR, PFS plans to transport spent nuclear fuel in a Holtec International HI-STAR 100 shipping cask. The HI-STAR 100 is required to withstand a 30 mph drop onto an unyielding surface (10 C.F.R. § 71(c)(1)), not to withstand a 255,000 pound Boeing 757 traveling 500 miles per hour. How will the NRC ensure that the shipping casks are protected from an attack such as the one that occurred on September 11?

6) According to the SAR, the Canister Transfer Building (CTB), where the transfer of PFS canisters from shipping casks to storage casks will occur, has two foot thick walls and an eight inch thick roof and is designed to withstand a 3,990 pound car moving at 91 mph. In addition, according to the ER, PFS's proposed Intermodal Transfer Facility (ITF), located 1.8 miles west of Rowley Junction, will consist of a pre-engineered metal shell to provide weather protection, but no additional protection against terrorist attacks. What measures will NRC require PFS to take to ensure that the CTB and ITF are better able to protect against terrorist attacks such as those of September 11? If no additional measures will be required, please fully explain the NRC decision.

7) According to the SAR, HI-STORM casks are required to withstand a 1,475 °F for 15 minutes, while HI-STAR shipping casks are required to withstand a fire of 1,475 °F for 30 minutes. According to a 1976 Sandia National Laboratories study, jet fuel

burns at an average temperature of 1,850 °F, and the fires that resulted at the World Trade Center and Pentagon burned for hours. What actions will NRC take to ensure that storage and shipping casks for spent nuclear fuel can withstand hotter fires of longer duration than 15 minutes? If no actions are planned, please fully explain why not.

8) The CTB, where the transfer of PFS canisters from shipping casks to storage casks will occur, is designed to withstand a 300 gallon diesel fuel fire for 16 minutes. What actions will NRC take to ensure that this facility can withstand a fire involving more than 20,000 gallons of fuel (the amount typically held in large aircraft)? If no actions are planned, please fully explain why not.

9) The State of Utah provided some expert calculations related to the amount of radionuclides that would be released into the environment in the event of a commercial airline crash into the proposed spent fuel storage facility. These calculations showed that the consequences of such an event would cause the release of radioactivity at levels far higher than NRC limits for distances of tens of miles. Has NRC verified these calculations? If so, what actions do you plan to take to ensure that such an event does not occur? If not, why not?

Thank you for your assistance and cooperation in providing responses to these questions. Should you have any questions about this inquiry, please have your staff contact Mr. Jeffrey S. Duncan or Dr. Michal I. Freedhoff of my staff at 202-225-2836.

Sincerely,

Edward J. Markey
Member of Congress