Mitigation Action Plan for the Implementation of a Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

I. Introduction

The U.S. Department of Energy (DOE) and the Department of State jointly issued the *Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (DOE/ EIS-218F) on February 23, 1996. The Record of Decision (ROD) establishing the policy was published in the Federal Register on May 17, 1996.[1] As specified in the ROD, approximately 19.2 metric tons of spent nuclear fuel and approximately 0.6 metric tons of target material are expected to be received and managed at DOE's Savannah River Site in South Carolina and the Idaho National Engineering Laboratory in Idaho. A maximum of approximately 150 to 300 shipments through the Charleston Naval Weapons Station in South Carolina and five shipments through the Concord Naval Weapons Station in California will be accepted. Most of the target material and some of the spent nuclear fuel will be received overland from Canada.

In compliance with 10 CFR 1021.331, this document sets forth a Mitigation Action Plan to reduce the likelihood of potential adverse environmental impacts associated with the policy established in the ROD in accordance with Section VIII.B of the ROD.

II. Objective

As shown in Chapter 4 of the EIS, incident-free radiation exposures to members of the ship's crew, port workers, and ground transportation personnel due to shipments of spent nuclear fuel from foreign research

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[1] *The Record of Decision was revised on July 22, 1996, and the revision was published in the Federal Register on July 25, 1996.*

reactors are expected to be below the radiation exposure limit of 100 mrem per year (above natural background levels) established to protect the general public (10 CFR Part 20).

However, port and transportation workers involved in the shipment of spent nuclear fuel from foreign research reactors could conceivably receive a cumulative radiation dose above that established for the general public if, for example, they are involved in multiple shipments within one year or if the radiation levels outside the casks are at the maximum allowable regulatory limit (10 mrem/hr at a distance of two meters from the surface of the cask). The purpose of this document is to provide a plan to minimize the likelihood that any individual involved in the transportation and handling of spent fuel from foreign research reactors receives a radiation dose in excess of the 100 mrem per year regulatory limit set in 10 CFR Part 20 for radiation exposure to a member of the general public. This Plan is not applicable to workers that are certified as radiation workers and are monitored during potential periods of exposure to spent nuclear fuel.

III. Mitigation Approach

Because some of the individuals involved in the transportation and port handling of spent fuel are not required to wear devices that measure radiation dose, estimates of radiation exposure for such individuals will be based on actual measurements of the radiation emitted from each transportation cask. Foreign research reactor operators provide measurement data to the shipping contractor prior to the movement of loaded transportation casks from the reactor sites as part of Department of Transportation requirements for transportation (49 CFR 172.403). These data will be available to DOE. Additional radiation surveys will also be conducted prior to the movement of the transportation casks from the U.S. port of entry on route to the DOE facility where the spent fuel will be managed. DOE will maintain a data base of the actual radiation survey data for each cask and each shipment. This data base will provide the basis for estimating individual worker exposures throughout these shipments.

Mitigation of Radiation Exposures for Ship's Crews

Certain assumptions were used in the EIS to estimate the maximum potential radiation exposures for members of the ship's crew (Appendix C, Section C.4.1 of the EIS) that tended to overestimate the potential exposure. Under these assumptions, individual members of the crew could receive from 5 mrem to 9 mrem for every two casks loaded or unloaded from a cargo compartment (hold). If one assumes the use of a chartered vessel transporting eight casks, with two casks per hold, all of which are emitting radiation at a rate equal to the regulatory limit, then individual members could receive 20 mrem to 36 mrem while loading and the same amount while unloading containers of spent nuclear fuel from foreign research reactors. In addition, crew

members could receive 9.2 mrem per daily inspection (again assuming eight casks with two casks per hold) during the voyage. These daily inspections could result in a 166 mrem cumulative individual exposure during an eighteen day voyage, and a cumulative total for the voyage of 238 mrem. However, although these assumptions were used in order to build conservatism into the EIS analyses, in practice the combination of all these assumptions would be highly unlikely. For instance, historical data based on the receipt of 44 research reactor spent fuel casks at the Savannah River Site (including the 1994 and 1995 "urgent-relief" shipments from Europe) and the Idaho National Engineering Laboratory indicate that the average measured dose rate in the vicinity of the cask has been approximately ten times less than the regulatory limit assumed in the analyses.

DOE is planning only one shipment to the Savannah River Site during calendar year 1996. The shipment will consist of two loaded spent fuel casks transported to the Charleston Naval Weapons Station on one vessel from South America, and six loaded casks transported to the Charleston Naval Weapons Station on another vessel from Europe. The eight casks from the two vessels are scheduled to arrive concurrently at the Charleston Naval Weapons Station, where they will be consolidated into a single overland rail shipment to the Savannah River Site. Preliminary information on the spent fuel already loaded on some of the casks, experience to date with previous foreign research reactor spent fuel shipments, and the fact that this will be the only shipment in calendar year 1996, indicate that shipment of these eight casks will not result in radiation exposures that would cause crew workers to exceed the 100 mrem per calendar year limit. If, in the unlikely case, additional measurements at the reactor sites of the casks scheduled for inclusion in the first shipment indicate the potential that any single individual among the ship's crew could exceed the 100 mrem limit during the trip, DOE will not issue the required "Authorization to Ship" until a mutually agreed upon plan (between DOE and the shipper of record) is in place that would minimize the likelihood of exposing an individual member of the crew to more than 100 mrem.

For subsequent shipments from reactors located in countries with other-than-high-income economies, DOE will contract directly with the shipper of record and will include appropriate clauses in the shipper's contract, consistent with this Plan (which will also apply to shipper subcontracts with ship owners), to ensure that the likelihood of any member of a ship's crew being exposed to more than 100 mrem during a single year is minimized. As part of DOE's oversight responsibility to ensure implementation of this Mitigation Action Plan, DOE will review on a periodic basis its shipping contractor(s)' implementation of these contractual requirements and their compliance with applicable federal and international regulatory requirements pertaining to radiation protection.

For subsequent shipments from reactors located in countries with high-income economies, DOE will consult with the foreign research reactor operators and their shipping contractor(s) to identify the most appropriate steps to ensure that commitments set forth in the Record of Decision regarding individual exposures will be met. The appropriate steps will be reflected in future contracts with the foreign research reactor operators.

Depending on the results of the consultations, DOE may propose appropriate modifications to contracts already entered into by DOE, if necessary.

Mitigation of Radiation Exposures for Ground Transportation Workers

For the one shipment planned for calendar year 1996, the measures outlined above with regard to ship's crew members will also ensure that the maximum potential exposure to a ground transportation worker will not exceed 100 mrem under the most conservative assumptions.

For shipments after 1996, for which DOE will contract directly with the shipper of record, DOE will include appropriate clauses in the shipper's contract, consistent with this Plan (which will also apply to shipper subcontracts with shipping companies), to ensure that the likelihood of any ground transportation worker being exposed to more than 100 mrem annually is minimized. For shipments after 1996 from reactors located in countries with high-income economies, DOE intends to work with the foreign research reactor operators as discussed above to identify the most appropriate steps to ensure that commitments set forth in the Record of Decision regarding cumulative exposures will be met.

Mitigation of Radiation Exposures for Port Workers at U.S. Ports

For the one shipment planned for calendar year 1996, the measures outlined above with regard to ship's crew members will also ensure that the maximum potential exposure to a port worker will not exceed 100 mrem under the most conservative assumptions.

For shipments in years after 1996, when the potential exists for multiple shipments during the same year, DOE will enter into interagency agreements with the Charleston and Concord Naval Weapons Stations that will include appropriate provisions to minimize the likelihood of any individual being exposed to more than 100 mrem annually.

Review of Mitigation Plan

The effectiveness of this Mitigation Action Plan will be reviewed prior to any shipments in calendar year 1997. The plan may be revised at any time as necessary to ensure that the commitments set forth in the ROD continue to be met and to reflect the applicability of any new regulatory requirements that bear on matters in the Plan.