[6450-01-P]

U.S. Department of Energy

Finding of No Significant Impact

for the

Urgent-Relief Acceptance of

Foreign Research Reactor Spent Nuclear Fuel

AGENCY: United States Department of Energy (DOE)

ACTION: Finding of No Significant Impact

SUMMARY: In compliance with the National Environmental Policy Act, 42 U.S.C. 4321 et seq., the Council on Environmental Quality's implementing regulations, 40 C.F.R. Parts 1500-1508, DOE's implementing procedures, 10 C.F.R. Part 1021, and Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, the DOE has prepared an Environmental Assessment (DOE/EA-0912, April 1994) to evaluate the potential environmental impacts of the proposed urgent-relief acceptance of foreign research reactor spent nuclear fuel.

The Environmental Assessment analyzed the potential environmental impacts under the proposed action of accepting up to 409 spent nuclear fuel elements from eight reactors in Europe for storage in an existing DOE wet storage facility to meet the urgent needs of certain foreign research reactor operators and to avoid failure of a key United States nuclear weapons nonproliferation objective of minimizing and eventually eliminating the use of highly enriched uranium in civil programs worldwide. Specifically, the Environmental Assessment analyzed the potential impacts of transporting the spent nuclear fuel elements by commercial or chartered vessel from eight reactors in Europe to any one of five ports of entry in the United States (Wilmington, North Carolina; the Army

Military Ocean Terminal at Sunny Point, North Carolina; Charleston, South Carolina; Savannah, Georgia; and Jacksonville, Florida), off-loading the spent fuel at the port of entry and transporting it by truck or rail to the Savannah River Site, near Aiken, South Carolina; and storing the spent fuel there until decisions are made regarding interim storage and ultimate disposition. The Nuclear Waste Policy Act authorizes ultimate disposal of the spent fuel in a geologic repository.

In October 1993, DOE provided a draft Environmental Assessment for comment to the States of Georgia and South Carolina, and the Commonwealth of Virginia, and interested individuals and organizations. In February 1994, DOE provided a revised draft Environmental Assessment to the States of Florida, Georgia, North Carolina, and South Carolina, the Commonwealth of Virginia, and to individuals and groups known to have an interest in the proposed action, and requested that comments on the draft Environmental Assessment be submitted by March 7, 1994. On February 10, 1994, Federal, State and local government representatives, citizen groups, individuals and members of the international community attended a meeting in Washington, DC, to present their views concerning the proposed action. DOE also held public meetings in communities potentially affected by the proposed acceptance of foreign research reactor spent fuel. On March 18, 1994, the comment period on the draft Environmental Assessment was extended until April 8, 1994, to provide an additional opportunity for stakeholders to provide comments. The Environmental Assessment has been revised, where appropriate, to reflect comments received during the comment period.

Based on an evaluation of the use of either commercial or chartered vessels, the proposed ports of entry and alternative modes of transporting the spent nuclear fuel (truck or train) from the port of entry to the Savannah River Site, DOE has concluded that no significant impact would result from receipt of the spent fuel at any of the five proposed ports and overland transport by rail or truck from the port of entry to the Savannah River Site. Therefore, based on the analysis in the Environmental Assessment and after careful consideration of all comments from Federal, State and local officials, members of the public and from the international community, DOE has determined that the acceptance of up to 409 spent nuclear fuel elements from eight foreign research reactors in Europe for storage at the Savannah River Site does not constitute a major Federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act. Accordingly, an Environmental Impact Statement is not required and the DOE is issuing this Finding of No Significant Impact.

However, upon further consideration, and in an effort to balance the domestic and international interests at stake, DOE has decided to implement the proposed action as follows. The spent fuel will be shipped either by commercial or chartered vessel from Europe to the Army's Military Ocean Terminal at Sunny Point, North Carolina to the maximum extent practicable (rather than allowing the shipper to select from among any one of the five proposed ports as described in the Environmental Assessment), and transported overland by rail (rather than truck). Should DOE determine that another port or mode of transport (from among those considered as the proposed action) is necessary, DOE will provide direct notice of the change to State and local government officials of the affected

States and will notify the public through local media and other means, as appropriate.

ADDRESSES AND FURTHER INFORMATION: Persons requesting additional information regarding this action or desiring a copy of the Environmental Assessment should contact:

Mr. David Huizenga
Office of Environmental Management
U.S. Department of Energy (Mail Stop EM-30)
1000 Independence Avenue, SW
Washington, DC 20585
(202) 586-9441

Copies of the Environmental Assessment are available for public review at the following DOE reading rooms and public libraries:

Aiken, South Carolina

DOE Public Reading Room
Gregg-Graniteville Library
171 University Parkway
Aiken, SC 29801
(803) 641-3465

Charleston, South Carolina

Charleston County Public Library
404 King Street
Charleston, SC 29403
(803) 723-1645

Savannah, Georgia

Chatham County Public Library
2002 Bull Street
Savannah, GA 31499-4301
(912) 234-5127

Jacksonville, Florida

Haydon Burns Public Library
Attn: Technical Services Dept.
122 N. Ocean Street
Jacksonville, FL 32202
(904) 630-2665

Wilmington, North Carolina

New Hanover County Public Library
Attn: Daniel Horn
201 Chestnut Street
Wilmington, NC 28401
(910) 341-4390

Brunswick County, North Carolina

Brunswick County Manager's Office
Attn: Joyce Johnson
P.O. Box 249
45 Courthouse Drive
Bolivia, NC 28422
(910) 253-4331

Washington, DC

DOE Freedom of Information
Reading Room
Forrestal Building, Room 1E-190
1000 Independence Avenue, SW
Washington, DC 20585
(202) 586-6020

For general information regarding DOE's National Environmental Policy Act process, please contact:

Ms. Carol M. Borgstrom
Office of National Environmental Policy Act Oversight
U.S. Department of Energy (Mail Stop EH-25)
1000 Independence Avenue, SW
Washington, DC 20585
(202) 586-4600 or (800) 472-2756

SUPPLEMENTARY INFORMATION: In the 1950's, as part of the "Atoms for Peace" program, the United States began providing assistance in the peaceful application of nuclear technologies to countries that agreed to forego the development of nuclear weapons. This assistance included the provision of highly enriched uranium for use in research reactors around the world. After irradiation in the reactor, the used (spent) fuel was transported to the United States, where it was reprocessed to extract the uranium still remaining in the spent fuel. In this way, the United States maintained control of the highly enriched uranium, which otherwise could be used to make nuclear weapons.

To reduce the danger of nuclear weapons proliferation, the United States began a program in 1978 aimed at minimizing and eventually eliminating the use of highly enriched uranium in civilian reactor programs worldwide. This effort (the Reduced Enrichment for Research and Test Reactors Program) was directed at replacing the highly enriched uranium used in research reactors with low

enriched uranium, a material that is not directly usable in nuclear weapons. Research reactors are of particular interest because the major civilian use of highly enriched uranium is as fuel in research reactors. If research reactors worldwide were to convert to low enriched uranium fuels, highly enriched uranium essentially would be eliminated from use in civil commerce.

For research reactors converting to low enriched uranium fuel, acceptance of spent fuel by the United States was viewed as essential to offset the substantial expenses and reduction in reactor efficiency and capability resulting from conversion. The United States accepted highly enriched uranium spent fuel for several decades, until the program was allowed to expire in 1988.

DOE decided in mid-1993 to prepare an Environmental Impact Statement on a new proposed policy to accept, over a 10-15 year period, up to 15,000 spent fuel elements containing uranium enriched in the United States.. The goal of the proposed long-term policy would be to recover highly enriched uranium exported from the United States, while giving foreign research reactor operators sufficient time to develop their own long-term solutions for storage and disposal of spent fuel. Although the Environmental Impact Statement is under preparation, DOE does not expect to complete the analysis and make a decision on whether to implement the policy until mid to late 1995.

Because DOE has not accepted any spent fuel containing uranium enriched in the United States for more than five years, several foreign research reactor operators are running out of storage capacity and facing safety and regulatory

issues associated with the presence of spent fuel at their sites. If the United States is unable to commit now to the near-term acceptance of a small amount of foreign research reactor spent fuel, several reactor operators soon will either shut down their reactors or ship their spent fuel offsite for reprocessing. Neither option would serve the nonproliferation interests of the United States. Thus, at the urging of the Department of State, DOE is proposing to accept a small number of highly enriched uranium spent fuel elements in the near term for storage in an existing federal facility in South Carolina.

DOE believes that preparation of the Environmental Assessment, which analyzes the potential environmental impacts of the proposed urgent-relief acceptance of a small number of spent fuel elements before the Environmental Impact Statement is completed, fully complies with the National Environmental Policy Act and its implementing regulations. The proposed near-term acceptance is justified independently of the decision on whether to establish a new policy on the proposed long-term acceptance of foreign research reactor spent fuel. Until the Environmental Impact Statement is completed and a decision made whether to implement the proposed long-term acceptance policy, the proposed acceptance of a small number of spent fuel elements is necessary to maintain the United States program of encouraging the conversion by research reactors to low enriched uranium fuel. Further, while there is an obvious relationship between the two proposals, a decision to accept such a small number of fuel elements does not foreclose or prejudice future decisions regarding establishment of a new spent fuel acceptance policy, or the decisions regarding interim storage or ultimate disposition of spent nuclear fuel. (In the Programmatic Spent Nuclear Fuel Management Environmental Impact Statement, due to be completed by June 1995, DOE

is considering where to manage all spent fuel within the DOE complex nationwide for the interim period prior to ultimate disposition.)

In October 1993, to ensure that countries currently possessing spent fuel continue to support the nonproliferation initiatives of the United States embodied in the Reduced Enrichment for Research and Test Reactor Program until the ongoing Environmental Impact Statement can be completed, DOE issued for comment a draft Environmental Assessment which evaluated the proposed urgent-relief acceptance of up to 700 elements of foreign research reactor spent nuclear fuel containing uranium enriched in the United States.
It was apparent from the comments that DOE received in response to the October 1993 draft that many people did not agree that there is a need for the United States to accept this spent fuel. Others expressed concerns regarding DOE's plans for implementing the proposed action. Subsequent to the release of the October 1993 draft Environmental Assessment and after consideration of comments received, teams of experts from the United States visited foreign research reactors in Europe and Australia to assess the near-term need for acceptance of foreign research reactor spent fuel elements before the Environmental Impact Statement on the proposed long-term acceptance policy is completed.

In February 1994, a revised draft Environmental Assessment, which included revisions made in response to comments received on the October 1993 draft Environmental Assessment, was prepared and issued for public review and comment. The proposed action evaluated in the February draft Environmental Assessment was to accept 448 highly enriched uranium spent fuel elements shipped by sea to any one of seven ports (Newport News, Norfolk, or Portsmouth, Virginia; Charleston,

South Carolina; Wilmington, North Carolina; Savannah, Georgia; and Jacksonville, Florida) and then by truck to DOE's Savannah River Site near Aiken, South Carolina, for storage. The comment period on the revised draft Environmental Assessment was scheduled to close on March 7, 1994.

On February 10, 1994, DOE and the Department of State co-hosted a meeting of stakeholders from State and local governments, Congress, environmental and non-proliferation public interest groups, other private sector interest groups, foreign research reactor operators and key affected communities. The purpose of that meeting was to involve stakeholders in a meaningful and constructive dialogue on the proposed urgent-relief acceptance of a small number of spent fuel elements from foreign research reactors. Subsequent to that meeting and based on concerns raised by local communities potentially affected by the proposed action, DOE extended the comment period on the February draft Environmental Assessment until April 8, 1994.

PROPOSED ACTION: The DOE proposes to accept up to 409 spent nuclear fuel elements containing highly enriched uranium of United States origin from eight research reactors in seven European countries (Austria, Denmark, Germany, Greece, Netherlands, Sweden and Switzerland). The spent fuel would be shipped across the ocean in up to 15 spent fuel transportation casks from the country of origin to one or more United States eastern seaboard ports. The casks are expected to be transported in the next several months either by commercial container ships or chartered ships. Several casks could be transported together on a single ship to any one of the five proposed ports of entry: Wilmington and the United States Army's Military Ocean Terminal at Sunny Point, North Carolina; Charleston, South Carolina; Savannah, Georgia; and Jacksonville, Florida.

After arriving in the United States, the casks would be transported to DOE's Savannah River Site near Aiken, South Carolina, where the fuel elements would be stored underwater in an existing storage facility (the Receiving Basin for Offsite Fuels).

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION:

Routine Operation: During routine (non-accident condition) ocean transport, there would be no impact to the marine environment. Radiation exposure from the very small radiation fields being emitted from the casks -- about 1 millirem per hour at 1 meter from the cask surface -- would be limited primarily to crew members who inspect the cargo on a daily basis to ensure secure stowage and structural safety of the vessel. Incident-free dose estimates to these crew members would be essentially the same regardless of the port of entry, largely because the exposure is proportional to the numbers of inspections over time. Distances and time of transit are similar from the European ports to the proposed United States ports of entry. Assuming that the ship makes three intermediate port stops and then unloads at the fourth stop, the incident-free dose to a ship cargo inspector is estimated to be 4.3 millirem for shipments into Sunny Point and Wilmington, North Carolina; 4.5 millirem for shipments into Charleston, South Carolina; and 4.6 millirem for shipments into Jacksonville, Florida and Savannah, Georgia. The likelihood of a single fatal cancer among the entire crew of all the ships used in the proposed action is approximately one in 450,000. If no intermediate port stops are assumed, the collective dose would be reduced by approximately 30 percent.

Because container cargo handling is relatively uniform throughout the world, exposure to port workers (handlers/inspectors) also would be essentially the same regardless of the port of entry. Using a conservative assumption, i.e., the same handler/inspector inspects all shipments, the maximally exposed port worker would receive a dose of approximately 5.2 millirem. The collective exposure (assuming the same crew of handlers/inspectors for all shipments) to the handlers/inspectors is estimated as 0.078 person-rem (0.0052 rem x 15 workers). The likelihood of a single individual port worker dying from cancer as a result of the proposed action is about 1 in 380,000. Dose to members of the general public during port operations would be extremely low because residences are separated from dock facilities by buffer spaces such as parking lots, warehouses and other port facilities.

During truck transport of the spent fuel from the port of entry to the Savannah River Site, the maximally exposed individual truck crew member (assuming the same person is involved in all truck shipments) would receive 2.4 millirem for shipments from Charleston, South Carolina; 2.7 millirem for shipments from Savannah, Georgia; 4.1 millirem for shipments from Wilmington, North Carolina; 4.5 millirem for shipments from Sunny Point, North Carolina; and 3.9 millirem for shipments from Jacksonville, Florida. The likelihood of a single crew member dying from cancer as a result of transporting spent fuel from Sunny Point to the Savannah River Site is about 1 in 440,000.

The maximum exposure to an individual not actively involved in shipping the spent fuel during routine transport was estimated for two cases: (1) a member of the public who lives beside the highway route (this individual was assumed to

be exposed to each of the 15 truck shipments at a distance of 30 meters); and (2) an individual located near a stopped truck, e.g., in a traffic jam. The maximum in-transit dose under the first instance was calculated to be 0.002 millirem for routine operations. A dose of 0.002 millirem would increase the risk of a latent cancer fatality by 1 in one billion. For the second case, an individual could receive doses higher than 0.002 millirem depending on the duration of the stop and the distance of the individual from the truck. For example, in the unlikely event that a person was standing outside a stopped truck for a period of 1/2 hour at a distance of two meters, the person could receive a dose of one millirem.

Since port workers, inspectors, and truck drivers are not considered radiation workers, as defined by the Nuclear Regulatory Commission (NRC), the maximum annual allowable exposure for these personnel would be 100 millirem, the same radiation dose limit established by the NRC to protect the individual members of the general public. As discussed above, during normal transport of the spent nuclear fuel, the maximum annual exposure to the public, port workers, inspectors, and truck drivers would be well below the 100 millirem dose limit, and no doses large enough to result in acute health effects are predicted among either the workers or general public for the proposed action. The cumulative annual incident-free dose from the proposed activity to all persons potentially exposed would range between 0.12 person-rem (Charleston and Savannah) and 0.16 person-rem (Sunny Point).

Currently, the average annual individual worker dose at the Receiving Basin for Off-Site Fuels (RBOF) for all operations (unloading, handling and storage of the

spent nuclear fuel elements) is approximately 150 millirem. Based on very conservative assumptions, i.e., all 409 spent fuel elements are received in a one-year period and the same individuals unload all 15 casks, the maximum annual increase in the average individual dose to a worker at RBOF is estimated to be 60 millirem. This dose would be well below both the DOE limit of 5,000 millirem per year for radiation workers and the DOE Administrative control level of 2,000 millirem per year per person, for all DOE activities. Once the spent fuel elements were stored under water in the RBOF, the increase in radiation exposure to facility personnel from the storage of the foreign spent fuel elements would not be detectable.

Only minor environmental impacts would be expected from the proposed action because the receipt and storage of up to 409 spent fuel elements represents only a small increase to existing site activity and involves no new construction. Approximately 15 cubic feet of laundry type waste and 5.5 cubic feet of solid waste would be generated per cask. The proposed action would add less than 4 percent to the average annual solid waste normally generated at RBOF. Receipt and storage of foreign research reactor spent nuclear fuel would have no effect on the types, quantities or utilization of hazardous compounds stored at RBOF, and no incremental risk to workers would be expected.

Accident Conditions: The Environmental Assessment evaluates the potential for accidents during ocean transport (port departure, ocean crossing, and port arrival), overland transport, and storage at RBOF.

In the extremely unlikely event of an accidental fire at sea in which a cask was sufficiently damaged by the fire to release its contents, members of the ship crew near the fire would be exposed to the released radioactive material. However, any crew member close enough to the fire to suffer a significant radiation dose likely would be more severely injured from the fire than the radiation dose. If crew members were to survive the fire, radiological impacts would be similar to those resulting from a severe accident in port, which would result in a maximum exposure to workers and the public of approximately 0.21 person-rem. This exposure would result in an approximately one in 9,500 chance of one additional cancer in the entire exposed population. If such an accident were to occur at sea, however, there would be essentially no exposure to members of the public, and all released activity would be deposited in the ocean. Assuming that the spent fuel cask lay on the ocean floor where it slowly released its radioactive inventory, the peak doses to biota residing on the ocean floor in or near the uppermost sediment layer are estimated to be 0.11 rad (radiation adsorbed dose) per year for fish, 0.17 rad per year for crustaceans and 7.3 rad per year for mollusks. The radioactive material would be expected to disperse and to be diluted due to the influence of ocean currents. Since deleterious effects of chronic irradiation have not been observed in natural populations at dose rates of less than 365 rad, no significant impacts would be expected. Further, uranium, the major constituent of the spent fuel, has not been found to bioaccumulate in fish and bioaccumulates only slightly in crustaceans and mollusks. No significant chemical hazard would be expected from the release of the contents of the spent fuel elements into the open ocean.

Spent fuel casks are designed to withstand at least a 15-meter immersion, and it has been demonstrated that the cask seals will remain intact at much greater depths. Further, damaged and undamaged casks can be recovered readily from water up to 200 meters deep. Recovery from depths of up to 2,000 meters may be possible, but would be costly.

In an extreme situation, where the accident occurs in coastal wasters, the spent fuel is not recovered, and both the spent fuel and cask are damaged, the peak dose to an individual is estimated to be 11 millirem per year. This individual is assumed to reside near the shore and to eat seafood (fish, mollusk, seaweed) harvested from the area in the immediate vicinity of the spent fuel cask.

In the event of the most severe port accident (major mechanical damage, fire, oxidation of 100 percent of the fuel, and release of radioactive material from a cask containing 33 spent fuel elements), the dose to a maximally exposed individual, i.e., an individual assumed to be standing outside approximately 100 feet away from the event and remaining there for 24 hours, would be 25 rem. At such close distance, it is highly probable that the individuals, if not evacuated, would be harmed more by the explosion and fire engulfing the cask than by the radiation dose. If the individual were inside a building approximately 100 feet away and remained there for 24 hours after the accident, the dose would be reduced to 0.22 rem. At a more likely distance, where an individual may be located outside for a period of 24 hours after the accident, the dose at 0.6 miles would be 0.21 rem. If the person were inside at the same distance, the dose would be 0.002 rem. When considered in conjunction with the unlikely probability of occurrence (approximately 1 chance in 7.7 million), the

accident has an extremely small risk. For example, the risk of developing a single fatal cancer for the most severe case, i.e., individual outside, 100 feet away for 24 hours receiving 25 rem, is about 1 chance in 600 million.

In the event of an overland accident, assuming the surrounding population remains there for a 24-hour period, the estimated population dose risk is 0.0000015 person-rem for transport from Savannah, 0.0000018 person-rem from Charleston, 0.0000028 person-rem from Wilmington, 0.0000024 person-rem from Jacksonville, and 0.0000035 person-rem from Sunny Point. While there would be slightly different risks among the different ports, no significant impacts would result.

Four hypothetical accidents at RBOF were evaluated that could potentially release radionuclides to the atmosphere. These accidents include: 1) a nuclear criticality incident; 2) a fire and explosion at RBOF; 3) accidental cutting of fuel element cores; and 4) rupture or failure of fuel elements during underwater storage. The maximum dose was attributed to the unlikely accident of 1000 foreign fuel elements rupturing during storage at RBOF. This event would result in an 8.3 millirem maximum dose to the individual at the site boundary and a 70 person-rem dose for the offsite population. The probability of such an accident occurring, however, would be less than one in 2000 years. When the probability is taken into account, there would be an additional 1 in 500 million chance that the individual at the site boundary would develop a fatal cancer, and a 1 in 55,000 chance that a single fatal cancer would occur in the exposed populations.

ENVIRONMENTAL IMPACTS OF ALTERNATIVES: Alternatives considered in the Environmental Assessment include no action, receipt of a greater or lesser number of spent fuel elements, alternate ports of entry, alternative modes of transport from the receiving port to the Savannah River Site, and reprocessing abroad and transport of low or highly enriched uranium to the United States.

No Action: Under the No Action Alternative, there would be no environmental impact in the United States. However, United States nonproliferation policy would be adversely affected. Foreign reactor operators will try to avoid shutting down their reactors. The operators of two reactors can elect to reprocess their spent fuel at an existing facility in Scotland, although one of the two would need United States authorization to do so. Reprocessing would allow the uranium to be extracted for reuse, and thus would increase the threat of nuclear proliferation. Reactor operators in Belgium and Germany resorted to reprocessing on four occasions in 1993 and 1994.

Six of the eight research reactors from which DOE proposes to accept spent fuel either do not have the option to reprocess their spent fuel or could not obtain regulatory authority to reprocess in time to avoid shutdown. Shutdown of these reactors would severely undermine the United States' credibility as a reliable partner in matters of nuclear cooperation. This, in turn, could influence other reactor operators to cease their conversion to low enriched fuel or to revert to the use of highly enriched fuel if they have already converted. In fact, several reactor operators have stated that, if the United States is unable to accept spent fuel, they will cancel or delay their reactor conversions to low enriched uranium fuel. Such actions would encourage development of a world

market for highly enriched uranium, thereby undermining a key aspect of the United States nonproliferation program.

Selection of the No Action Alternative would also adversely affect the upcoming 1995 international conference on the Treaty on the Non-Proliferation of Nuclear Weapons. The conference will consider the indefinite extension of the Treaty, which the United States strongly supports. Other Treaty parties will want assurance that the United States has fulfilled its obligations under the Treaty to share the benefits of peaceful nuclear cooperation. If several countries that are parties to the Treaty are compelled to shut down their research reactors, thereby foregoing the benefits from these reactors, the United States may be accused, fairly or unfairly, of not sharing the benefits of peaceful nuclear cooperation. Such an accusation, however ill-founded, could create or increase opposition to the indefinite extension of the Treaty, which is the foundation for the international nuclear weapons nonproliferation regime.

Greater or Lesser Number of Spent Fuel Elements Accepted: In addition to the proposed action (shipment of up to 409 spent nuclear fuel elements), the environmental impacts of shipping alternative numbers of spent fuel elements (i.e., 953, 359, 291, and 248 spent fuel elements) were also considered in the Environmental Assessment. The risks for the 953-element alternative are slightly more than double the risks for shipping 409 elements through the proposed ports. Conversely, the risks of shipping 359, 291 and 248 elements are less than the risks for shipping 409 elements. While there are differences in the risks depending upon the number of elements shipped, the impacts associated with the shipment of any alternative number of elements are extremely small.

Acceptance of up to 409 spent fuel elements would allow the foreign research reactors to ship full casks, and would not force the two reactors that can ship spent fuel to Scotland for reprocessing to do so. (Acceptance of 359 spent fuel elements, i.e., shipment in partially full casks, also would not force these two reactors to reprocess.) In proposing to accept full casks, DOE took note of the fact that there is no significant difference in the environmental impacts between shipping full and partially full casks. Further, shipping full casks is the customary shipping procedure, and more cost-effective. Accordingly, proposing to accept full casks appeared to be a prudent course to encourage the continued participation of foreign research reactors in the Reduced Enrichment for Research and Test Reactors Program.

Other Ports of Entry: The Environmental Assessment also evaluated the impacts of shipping 409 spent fuel elements through alternate commercial and military ports using two assumptions: (1) no intermediate port stops and eight casks per vessel; and (2) three intermediate port stops and one cask per vessel. Dose to handlers and port workers would be essentially the same from port to port. During ocean transport, dose to the ship's crew would be generally the same regardless of the port of entry. However, dose to the truck's crew showed some slight variation consistent with the distance of travel, i.e., slightly higher doses are associated with greater distances traveled. The dose to the ship's crew and the dose to the truck crew would be well below the 100 millirem limit for nonradiation workers.

None of the alternate ports appeared as advantageous for the proposed receipt of spent fuel as the five proposed ports based on the application of screening

criteria drawn from the National Defense Authorization Act for Fiscal Year 1994, and additional criteria recommended by a panel of maritime experts at a DOE-sponsored workshop on port selection criteria for shipments of spent fuel. While there are comparative advantages and disadvantages among the five proposed ports, all five of the proposed ports appear comparatively more advantageous than other United States seaports for the proposed action.

Other Modes of Overland Transport: The spent nuclear fuel could be transported by rail from the port of entry to the Savannah River Site. The incident-free dose to spent fuel cask handlers would depend on how the casks were handled in port. If two casks are shipped per rail car, the handler would continue to receive a small dose from the first loaded cask as the second cask is loaded. Dose would also be influenced by the number of cargo transfers required. For example, if the spent fuel cask cannot be off-loaded directly from the ship to a rail car, spent fuel cask handlers would receive an additional small dose during the transport by truck to the rail car and from the transfer of the cask from the truck to the rail car. In addition, rail cargo is inspected after loading and prior to off-loading. As a result, transport by rail would result in a slightly higher dose to port handlers/inspectors and rail crew than transport by truck. Dose to the public, however, would be generally lower, partly because rail stops would normally occur in rail yards (removed from the general population). For example, rail transport from Sunny Point to the Savannah River Site would result in an annual dose of 0.16 person-rem total to port handlers/inspectors, other port workers and rail crew, and in a dose of 0.0017 person-rem to members of the public. Truck transport of the spent fuel from Sunny Point to the Savannah River Site would result in an annual dose of 0.08

person-rem to port handlers/inspectors, other port workers and truck crew and a dose of 0.067 person-rem to members of the public. Neither mode of transport would result in a significant health effect.

Reprocessing Abroad and Transport of Low or Highly Enriched Uranium to the United States: The potential environmental impact of transporting low enriched uranium by ship to the United States after reprocessing the spent fuel abroad was analyzed in detail in two recently issued Environmental Assessments prepared by the United States Enrichment Corporation. Low enriched uranium was found to be a common commercial product that has been shipped safety around the world in large quantities by air, water, and land transport modes for over 30 years without significant impact. Consequently, if the spent nuclear fuel elements were reprocessed in Europe (i.e., at Dounreay, Scotland), blended down to low enriched uranium, and the low enriched uranium was returned to the United States, no significant impacts would be expected.

If the spent fuel were reprocessed in Scotland, but not blended down, then highly enriched uranium could be transported from Scotland to the United States for blending. The shipment of highly enriched uranium would require extensive security activities and would involve the use of military assets for protection and safety. The military has had considerable experience in shipment of highly enriched uranium and has safely transported such materials throughout the world without significant impact.

These options, however, would not serve the nonproliferation interests of the United States. As discussed above and in greater detail in the Environmental

Assessment, reprocessing would likely result in reactor operators postponing conversion from highly enriched uranium fuel, or reverting back to its use if conversion has already been completed. This is because the only current reprocessor of highly enriched uranium does not reprocess low enriched uranium fuel, and reactor operators have only limited capacity to store spent fuel generated as a result of operating. Thus, to continue operating, research reactors would have to continue to use highly enriched uranium fuels. In addition, for those reactors for which United States consent is not required for reprocessing to occur, there is no mechanism to implement or to enforce a blending requirement by the reactor operators or reprocessors. Consequently, reactor operators could elect to have their fuel reprocessed, but not blended. This would result in the continued use of highly enriched uranium fuel by research reactors, contrary to United States nonproliferation policy.

Enhanced Storage in Europe: DOE considered but rejected as unreasonable the alternative of assisting foreign research reactors to expand spent fuel storage capacity at the reactor sites or at other sites in Europe. By the time new facilities could be constructed and licensed, or existing facilities modified, the reactors from which DOE proposes to accept spent fuel would have been forced to send their spent fuel to Scotland for reprocessing, where that is an option, or to shut down. For the reasons discussed above and in greater detail in the Environmental Assessment, forcing research reactors to shut down or reprocess would undermine the gains already realized in converting to low enriched uranium fuels under the Reduced Enrichment for Research and Test Reactors Program. The governments in the countries where these reactors are located have stated that acceptance of spent fuel has become a measure of the United States' reliability

in worldwide nuclear cooperation. A perceived lack of reliability could complicate upcoming negotiations for renewal of important nonproliferation agreements.

CUMULATIVE IMPACT: In addition to the environmental impacts from the proposed action, the Environmental Assessment also considered the cumulative dose of transporting other shipments of spent fuel to the Savannah River Site and shipments of low-level radioactive materials to the Barnwell facility, east of the Savannah River Site. No significant cumulative effects were identified.

DETERMINATION: Based on the analyses in the Environmental Assessment, and after careful consideration of comments received, DOE has determined that the acceptance of up to 409 spent nuclear fuel elements from eight foreign research reactors in Europe for storage at the Savannah River Site does not constitute a major Federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act. Therefore, an Environmental Impact Statement is not required and DOE issues this Finding of No Significant Impact.

Based on an evaluation of the five proposed ports of entry (Jacksonville, Florida; Savannah, Georgia; the Army Military Ocean Terminal at Sunny Point, and Wilmington, North Carolina; and Charleston, South Carolina) and alternative modes of transporting the spent nuclear fuel from the port of entry to the Savannah River Site (truck or train), DOE has concluded that no significant impact would result from any combination of proposed port and mode of transport from the port of entry to the Savannah River Site.

However, upon further consideration, and in an effort to balance the domestic and international interests at stake, DOE has decided to implement the proposed action as follows. The spent nuclear fuel will be shipped by commercial or chartered vessel from Europe to the Army's Military Ocean Terminal at Sunny Point, North Carolina to the maximum extent practicable (rather than allowing the shipper to select from among any one of the five proposed ports as described in the Environmental Assessment) and transported overland by rail (rather than truck). Should DOE determine that another port or mode of transport (from among those considered as the proposed action) is necessary, DOE will provide direct notice of the change to State and local government officials of the affected states and will notify the public through local media and other means, as appropriate.

Issued at Washington, D.C., this 22 day of April, 1994.

Tara O'Toole, M.D., M.P.H.
Assistant Secretary
Environment, Safety and Health