
U.S. DEPARTMENT OF ENERGY

Office of Nonproliferation and National Security

FINDING OF NO SIGNIFICANT IMPACT

TRANSPORTATION OF FOREIGN-OWNED ENRICHED URANIUM FROM THE
REPUBLIC OF GEORGIA

"PROJECT PARTNERSHIP"

AGENCY: United States Department of Energy

ACTION: Finding of No Significant Impact (FONSI) for Project Partnership:

Transportation of Foreign-Owned Enriched Uranium from the Republic
of Georgia to the United Kingdom

SUMMARY: The Department of Energy (DOE) has prepared a classified environmental assessment (DOE/EA-1255, March 1998) to evaluate the potential environmental impact for the transportation of 5.26 kilograms of enriched uranium-235 in the form of nuclear fuel, from the Republic of Georgia to the United Kingdom. The nuclear fuel consists of primarily fresh fuel (fuel that has never been used in a reactor), but also consists of a small quantity (less than 1 kilogram) of partially-spent fuel (fuel that has been partially used, but not completely spent). Transportation of the enriched uranium fuel would occur via United States military aircraft. Actions taken in the sovereign nations of the Republic of Georgia and the United Kingdom are not subject to analysis in the environmental assessment. However, because the action would cross the global commons of the Black Sea and the North Sea, the potential impact to the human environment has been analyzed for actions occurring in and over the global commons.

Based on the analyses in the environmental assessment, the Department has determined that the transportation of approximately 5 kilograms of uranium-235 in the form of nuclear fuel via United States military aircraft from the Republic of Georgia to the United Kingdom 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 the Department is issuing this Finding of No Significant Impact.

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

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The Environmental Assessment and this Finding of No Significant Impact will be declassified and made available for public review as soon as possible at the public reading room at DOE headquarters:

U.S. Department of Energy
Freedom of Information Reading Room
Forrestal Building, Room 1E - 190
1000 Independence Avenue, SW
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SUPPLEMENTARY INFORMATION

Background: The United States supports a policy of nuclear nonproliferation. This policy goal is shared by other countries such as the Republic of Georgia and the United Kingdom. Accordingly, the leaders of three countries entered into a partnership to protect enriched uranium fuel at the now closed Institute of Nuclear Physics in Tbilisi, Georgia. The Tbilisi research facility has been permanently shut down since 1988, is in a poor state of repair, and is not capable of providing adequate physical security for the enriched uranium. In May 1996, DOE provided the Tbilisi facility with interim security upgrades to help better protect the enriched uranium fuel, but these measures were not designed for long-term protection. Therefore, in 1998, the President of the United States, the Prime Minister of the United Kingdom, and the President of the Republic of Georgia entered into a partnership to relocate the Georgian enriched uranium to the United Kingdom. DOE was tasked to oversee the repackaging of the material and to work with the Department of Defense (DoD) to transport the material to the United Kingdom. DOE has

therefore prepared this environmental assessment to evaluate the potential environmental impacts of this action on the global commons.

The analysis in the Project Partnership Environmental Assessment was based on a previous action taken by DOE in 1994, called Project Sapphire. Project Sapphire was a similar action which relocated a substantially larger quantity of enriched uranium fuel (566 kg) from the Republic of Kazakhstan to the United States for interim storage and processing to low enriched uranium for use as commercial nuclear fuel. Because of the similarities in the two actions, the Project Sapphire Environmental Assessment (DOE/EA-1006) was used as a basis for assessing the potential impacts of Project Partnership. However, because Project Partnership involves a small quantity of partially-spent fuel, additional analysis was conducted to assess the potential environmental impacts and to consider reasonable alternatives to the proposed action.

Proposed Action: The proposed action is the transportation of approximately 5 kg uranium via U.S. military aircraft from the Tbilisi, Republic of Georgia to Dounreay, Scotland in the United Kingdom for secure storage. The uranium-235 consists of less than 5 kg uranium-235 (²³⁵U) in the form of fresh fuel (fuel which has not been used or irradiated in the Tbilisi research reactor) and less than 1 kg of partially-spent fuel. Enriched uranium would be removed from the current storage location at the research reactor in Tbilisi, repackaged for safe and secure transport, and transported by military C-5 or C-17 aircraft to the United Kingdom in Scotland. DOE would oversee the repackaging and transportation of the material; however all actions would occur in and between foreign countries. None of the material would be returned to the United States and no physical project would be constructed in a foreign country. The United Kingdom would assume responsibility for the fuel once in their possession.

The enriched uranium to be relocated is in the form of small fuel rods and pins.

The Georgian enriched uranium would require repackaging prior to transport because the Georgian containers currently used to store the material do not meet requirements for international transport. Repackaging would ensure a nuclear criticality safe configuration for the enriched uranium fuel rods. The partially-spent fuel would be packaged in a separate cask approved by the US Nuclear Regulatory Commission and which would meet international shipping requirements. The repackaging operations would require approximately 20 DOE and contractor personnel. Actions that would occur on the ground in Georgia (such as repackaging and loading/unloading operations) would be conducted with the full cooperation and involvement of the governments of Georgia and the United Kingdom. These actions conducted in the sovereign nations are not subject to further analysis in this environmental assessment.

For the purposes of this environmental assessment, the proposed action begins in the air over the global commons at the boundary of the Republic of Georgia and the Black Sea and concludes with the entry into United Kingdom airspace over Scotland.

The enriched uranium would be transported from Tbilisi, Georgia to Scotland by one United States military C-17 aircraft under control of EUCOM and approximately 3 Department of Defense personnel. A second C-17 would transport material and equipment needed to support the repackaging and loading/unloading operations. EUCOM may wish to use one C-5 aircraft

instead of the two C-17s. Under this alternative, an additional C-141 may also be needed for support equipment. Use of either type of aircraft is considered in the environmental assessment along with a crew size that could vary from three to 30 personnel.

Because of the similarities in this action and Project Sapphire, the scope of the two projects was compared. The primary differences include the quantity of material and the storage destination. Project Partnership involves transport of less than 1% of the quantity of enriched uranium transported under Project Sapphire. Project Partnership involves no action inside the United States whereas Project Sapphire brought the enriched uranium back to the United States for interim storage (where it was eventually processed into low enriched uranium for use as a commercial nuclear fuel.) Both Projects Sapphire and Partnership involve nuclear fuel. However, one difference is the inclusion of a small quantity of partially spent fuel in Project Partnership. This quantity is less than 1/5 of the total amount of enriched uranium that would be transported. However, because Project Sapphire did not involve partially spent fuel, additional analysis was provided to assess the potential impacts to the crew and the global commons.

Environmental Impacts: The Project Partnership Environmental Assessment evaluated potential impacts to the human environment under both normal operations and a bounding accident scenario.

Normal Operations - Under normal operations, several alternatives could be selected by EUCOM including a long or short flight path (from 2,650 miles to 5,260 miles), and a varying crew size (from 3 to 30 personnel). The proposed action is the use of a small crew (three personnel) over the most direct (short) route. However, for the purposes of the environmental assessment, a range of alternatives was considered. Following is a summary of the potential environmental impacts. For impacts of normal operations, two sets of data are presented: the first data set is for the desired action (a small crew over the short route); and the second data set is for the bounding case action under normal operations (a large crew over a long route).

For the proposed action of the transport of 5 kg enriched uranium using a small crew over the most direct flight path, the collective dose to three crew members would be 0.012 person-rem. Using the dose-to-risk conversion factor of 4×10^{-4} latent cancer fatalities, the collective dose of 0.012 person-rem would result in a probability of 4.9×10^{-6} latent cancer fatalities. This means that the three crew members would face a collective risk of about five chances in one million of suffering a fatal cancer later in their life as a result of this action. Under a bounding case for normal operations using a larger crew and traversing a longer flight path, the collective dose to the 30-person crew would be 0.247 person-rem. Using the dose-to-risk conversion factor of 4×10^{-4} latent cancer fatalities, the collective dose of 0.247 person-rem would result in a probability of 9.89×10^{-5} latent cancer fatalities. This means that the thirty crew members would face a collective risk of about 10 chances in one hundred thousand (100,000) (or one chance in ten thousand) of suffering a fatal cancer later in their life as a result of this action. Because these probabilities are less than 1.0, it is likely that not even a single person would die from a latent cancer caused by this action.

In incident-free conditions, radiological exposure would only result to the crew on board the aircraft; there would be no radiological exposure to the public or the global commons.

For comparison, these risks are about one to two orders of magnitude less than that for Project Sapphire. The Finding of No Significant Impact for the Project Sapphire Environmental Assessment concluded that a collective dose of 0.34 person-rem to 30 crew (which would result in an associated latent cancer fatality probability of 1.4×10^{-4}) would not be significant since not a single crew member would be expected to die from a latent cancer induced by this small exposure.

Since the action under Project Partnership would result in an even smaller collective dose and smaller probability of a latent cancer fatality, the impact to the crew from this action is determined not significant.

Accident Conditions - Potential impacts to the global commons of the Black Sea and the North Sea were also assessed. Under incident-free conditions, non-radiological air emissions of criteria air pollutants from the aircraft operations would fall well below US Environmental Protection Agency (EPA) threshold levels and would not have a measurable effect on the global commons of the air. This determination is supported by the Finding of No Significant Impact for Project Sapphire which concluded negligible effects on the global commons from the operation of the C-5 aircraft flight over a flight distance of 8,000 miles. Since this action under Project Partnership would involve approximately one-third to two-thirds the flight distance of Project Sapphire, the impacts to the global commons would likewise not be significant.

Potential impacts for a bounding case accident scenario were also analyzed. A bounding case accident scenario would involve an in-flight crash of the military aircraft such that the containers of enriched uranium fuel would be breached and the enriched uranium released into the water of the global commons (the Black Sea or the North Sea). As documented in the Project Sapphire Environmental Assessment, in-flight accidents would have a higher probability of container breach than landing/stall accidents. Further, for the global commons, only in-flight accident probabilities are applicable because no landings would occur in the commons. Salvage techniques are assumed to allow for recovery of packages at depths of up to 200 meters. Should an unbreached package sink below 200 meters, long-term containment would be expected due to the low corrosion rates of the stainless-steel used in the package's construction. However, the bounding accident scenario assumes the containers would breach and the enriched uranium released. In the Black Sea the anoxic conditions below 200m would accelerate corrosion of the uranium. However, since there is no life in this zone of the Black Sea (due to the lack of oxygen), no effects to marine organisms would be expected. In the North Sea, which is more shallow and more turbulent than the Black sea, the volume of water and the well-mixed conditions in the shallow sea would disperse the uranium such that effects would be localized and short-term, although there may be some fatalities to marine species in the localized area of the accident. The small quantity of plutonium would be expected to preferentially bind with the bottom sediments.

In an accident scenario, only the crew and the global commons would be affected. There would be no exposure to the public.

The environmental assessment for Project Sapphire examines this bounding case accident scenario for a much larger quantity (566 kg) of enriched uranium. For Project Sapphire, the probability of the accident occurring in-flight was estimated to be 6.7×10^{-10} . This is a bounding conservative

probability (overestimation) based on a severe case accident where the impact forces exceed standards and fire engulfs the plane for more than 30 minutes causing 70% of the packages to fail.

Based on these assumptions for a bounding case accident scenario, the Project Sapphire Finding of No Significant Impact concludes there may be some loss of life to marine organisms directly exposed to the enriched uranium in this hypothetical bounding case scenario. However, as a result of the large volumes of water, the mixing mechanisms within it, the existing background concentrations of uranium, and the radiation-resistance of aquatic organisms, the radiological and toxicological impact of a very low probability accident would be localized and of short duration. The potential impacts of less than 5 kg enriched uranium from Project Partnership would be substantially less than Project Sapphire and are therefore determined to be not significant.

Summary Conclusions - In summary, use of a small crew (over a short or long flight path) would result in a collective radiological dose of about 95% less than that from Project Sapphire. Use of a large crew (over a short or long flight path) would result in a collective radiological dose ranging from 27% to 65% less than that of Project Sapphire. The risk probability of incurring a fatal cancer later in life as a result of these actions would be one to two orders of magnitude less than that for Project Sapphire. Not a single person would be expected to suffer a fatal cancer later in life as a result of this action. It is also unlikely that the global commons would be adversely affected.

ALTERNATIVES: Because of the decision of the President of the United States and the leaders of the United Kingdom and the Republic of Georgia to relocate the enriched uranium from Georgia to the United Kingdom, the only alternatives available for further consideration include the transport mode and route. Potential impacts from these alternatives were discussed above.

An alternative transportation route could involve traversing a longer flight path over the global commons of the Mediterranean Sea and the Atlantic Ocean. While this route would pass over fewer countries, the route would be about twice as long which would result in a doubling of the radiological doses received by the transport crew. This dose would still be less than that of Project Sapphire. Analysis of this alternative is provided in the environmental assessment.

The transportation mode could involve military transport by United States Navy ships over the global commons, however, this mode would require longer time than air transport. Because this increased time would further increase the radiological dose, and because the governments of the United Kingdom and the Republic of Georgia have expressed a need to relocate the enriched uranium as quickly as possible, naval transport was not considered as an alternative that would meet the purpose and need for action and was therefore not analyzed in detail.

Under the No Action alternative, the enriched uranium would be left in place at Tbilisi with no additional security measures. Because of the unreliable electrical supply, political unrest, and poor security conditions at the facility, this alternative could result in theft or unauthorized access to the enriched uranium.

DETERMINATION: Based on the analyses in this Environmental Assessment (DOE/EA-1255) for Project Partnership, and based on the previous Environmental Assessment (DOE/EA-1006) and Finding of No Significant Impact for Project Sapphire, the Department of Energy has determined that the transportation of about 5 kg of enriched uranium nuclear fuel from the Republic of Georgia to the United Kingdom does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an environmental impact statement is not required.

Issued at Washington, D.C., this _____ day of April, 1998.

/original signed by

Rose E. Grottemoller
Director
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