

**RERTR 2012 — 34th INTERNATIONAL MEETING ON
REDUCED ENRICHMENT FOR RESEARCH AND TEST REACTORS**

**October 14-17, 2012
Warsaw Marriott Hotel
Warsaw, Poland**

**The United States Foreign Research Reactor (FRR) Spent
Nuclear Fuel (SNF) Acceptance Program: 2012 Update**

C. E. Messick, J. J. Galan

Foreign Research Reactor Spent Nuclear Fuel Acceptance Program
U.S. Department of Energy, Washington, D.C. 20585—United States of America

ABSTRACT

The United States (U.S.) Department of Energy (DOE) Global Threat Reduction Initiative's (GTRI) U.S. Nuclear Remove Program, also known as the Foreign Research Reactor Spent Nuclear Fuel Acceptance Program (FRR SNF AP), was established by the U.S. Department of Energy in May 1996, and its mission to repatriate U.S. origin spent nuclear fuel and other weapon-grade nuclear material now extends to May 2019. This paper provides an update on recent program accomplishments, current program initiatives and future activities.

1. Introduction

The National Nuclear Security Administration (NNSA) Global Threat Reduction Initiative's (GTRI) U.S. Nuclear Remove Program, also known as the Foreign Research Reactor Spent Nuclear Fuel Acceptance Program (FRR SNF AP), supports permanent threat reduction by eliminating stockpiles of excess weapons-usable nuclear materials located at civilian sites throughout the world. GTRI has played a critical role in fulfilling commitments under the Joint Statement on Nuclear Security Cooperation agreed to by the U.S. and Russian presidents at Bratislava in 2005, and directly supports President Obama's commitment to secure all high priority nuclear materials worldwide within four years. To date, GTRI has repatriated 1,255 kilograms of highly enriched uranium (HEU) and a total of 9471 spent fuel assemblies to the United States. This paper outlines the program's history, various issues surrounding the program's execution, and lessons learned from recent shipments that may affect foreign research reactors' spent nuclear fuel projects. In addition, the paper describes current GTRI efforts to advance the goals of the Acceptance Program, highlighted by continued efforts to work with foreign research reactors to plan to ship eligible fuel as early as possible.

2. Acceptance Program History and Accomplishments

The Acceptance Program, now in its sixteenth year, has completed sixty-one (61) shipments to date safely and successfully. Thirty-one (31) countries have participated so far, returning a total of 9471 spent nuclear fuel elements to the United States for management at Department of Energy (DOE) sites in South Carolina, Tennessee and Idaho. Forty-nine (49) of the sixty-one (61) shipments contained aluminum-based spent nuclear fuel from research reactors and were placed into storage at the Savannah River Site in South Carolina. Nine shipments consisted of Training, Research, Isotope-General Atomics (TRIGA) type fuel and were placed into storage at the Idaho National Laboratory. The remaining four shipments were sent to the Y-12 National Security Complex, since the fuel was fresh or slightly irradiated and eligible for receipt at that facility, enabling more efficient disposition. The most recent shipment, from Canada was completed without incident, arriving at the Savannah River Site on September 11, 2012. During the remainder of calendar year 2012, the program is planning to receive one joint shipment of spent nuclear fuel from two participating countries.

3. Contractual Requirements

3.1 Contract Implementation

DOE enters into a contract with each of the customers who return spent nuclear fuel to the United States. If these reactor operators have not completed a contract extension or renewed their contract to allow shipments past 2009, the end of the original program period, a new contract will be required to continue shipments under this program. Reactor Operators who desire to ship under this program and do not have a modified contract should contact the Acceptance Program office to negotiate a new contract to authorize participation.

Please be aware that a Revised Fee Policy was published by DOE on January 31, 2012. Any contract modifications, renewals and all new contracts will be subject to the terms of the Revised Fee Policy. The Revised Fee Policy is further discussed below.

3.2 Public Disclosure of Shipment Information

Each research reactor that returns SNF to the United States through the Acceptance Program enters into a contract with DOE. It is very important that the contracting parties clearly understand all of the provisions in the contract. Contract requirements are usually described in detail prior to the first shipment. As time passes and personnel change, some understanding may be lost, so it is very important to review the contract and ask questions if there is any doubt about requirements. Compliance with all contract requirements must be maintained. Further discussions on contract requirements can always be addressed to the Acceptance Program office.

One very important article in the contracts which has been misunderstood in the past covers public disclosure of any shipping plans or shipment information, or the individual details comprising such plans or information. Any such disclosure must comply with limitations required by U.S. government regulations and IAEA Information Circulars, primarily the U.S. 10 CFR§73.22(a)(2)(ii), 10 CFR§73.21(b), and IAEA INFCIRC 225 Rev. 5. This means that information concerning dates and/or schedules, and any other information about the contents

of the shipment, cannot be published or publicly released until 10 days after the shipment has arrived at the material's final destination in the United States, unless permission is granted in writing. Before arrival, information must only be revealed to those who have a legitimate need to know in order to support shipment activities. Information on security measures to protect shipments should not be published. Compliance with this article is an important obligation to support security for any shipment activity. DOE believes premature release of this information would be an unwarranted violation of the contract which made the security of the shipment more vulnerable. Premature release of information would also violate the United States Nuclear Regulatory Commission regulations under which shipments are authorized. Further, The Convention on the Physical Protection of Nuclear Material, entered into by states which support the Acceptance Program, requires that each state protect the confidentiality of this information. Our ability to continue this program depends on our customers following the agreed process to protect all parties engaged in these shipments and ensuring that all persons who receive this information understand the need to protect confidentiality until the material arrives at its final destination.

Early or improper release of shipment information could affect DOE's decision to issue the "Authorization to Ship" which allows the shipment to depart the facility or reactor site. This could result in the delay or cancelation of a shipment based on any resulting or anticipated threat, as permitted under the excused performance section of the contract. A heightened security posture or other mitigating actions may result if the shipment is allowed to proceed.

3.3 Appendix A Data

The Appendix A to the contract provides a description of the fuel characteristics for the receiving facility to evaluate criticality safety as well as plan for interim storage and final disposition of the authorized material. The Authorization to Ship letter is based, in part, on this data. Because of this, it is important that the Appendix A data exactly represents the "as-shipped" condition of the fuel. After the Appendix A is accepted, the FRR should not perform any activity such as cropping or removal of fuel plates, which would change the fuel characteristics without consulting the program office and the receiving facility. Any unapproved changes may result in the inability of DOE to accept the material on the FRR's schedule if the required safety documents cannot be completed prior to the scheduled shipping date.

3.4 Revised Fee Policy

DOE is continuing to try to keep the reactor operator's cost to participate in the Acceptance Program low as possible, however, because of the increase in operational costs of receiving and managing SNF, on January 31, 2012 DOE issued the **Revised Fee Policy for Acceptance of Foreign Research Reactor Spent Nuclear Fuel From High-Income Economy Countries** (77 FR §4807). This is the first fee increase since the fee policy was established in 1996.

A synopsis of the revision:

- The first phase took effect January 31, 2012; and the fee for receipt of LEU fuel increased from no higher than \$3,750 per kg of total mass to \$5,625 USD per kg of total

mass. The fee for SNF shipments containing HEU remains at no higher than \$4,500 USD per kg of total mass.

- The second phase will be implemented automatically on January 1, 2014 and the fee for the receipt of LEU fuel will increase from \$5,625 USD per kg of total mass to \$7,500 USD per kg of total mass and for HEU fuel, the fee for the receipt of HEU fuel will increase from no higher than \$4,500 USD per kg of total mass to \$6,750 USD per kg of total mass.
- The third phase will be implemented automatically on January 1, 2016, and the fee for the receipt of HEU fuel will increase from \$6,750 per kg of total mass to \$9,000 USD per kg of total mass.
- DOE is also implementing a new minimum fee of \$200,000 USD per shipment of any type and amount of eligible SNF to reflect a minimum cost of providing acceptance services, this fee took effect January 31, 2012.
- The fee for return of TRIGA fuel will be the same as that of aluminum based fuel.

In the case where a reactor operator already has a signed and executed contract, DOE intends to negotiate an equitable adjustment to the fee in accordance with this revised fee policy.

Reactor operators and Acceptance Program participants should carefully review the Revised Fee Policy to determine the effects of this revision. If you have any questions, please contact the Acceptance Program office.

4. Focus on Advance Planning

GTRI focuses on the early planning and deliberate implementation of research reactor spent fuel shipments to the United States in support of worldwide nuclear nonproliferation efforts. Shipments involve many different logistical challenges, and early planning mitigates the risk of unanticipated problems delaying a shipment's schedule. The importance of communication and coordination with GTRI and the receiving site while planning for spent fuel shipments cannot be over-emphasized.

4.1 Shipment Scheduling

GTRI needs to understand clearly the intentions of all reactor operators so that shipment planning can be well integrated and supported to meet the reactor operator's needs. To ensure that shipments adhere to agreed-upon schedules, it is important to submit the required fuel data as early as possible to allow adequate time for the receiving site to perform necessary safety reviews and prepare for receipt and storage of the material. Early availability of this data is also important for use in verifying transport package license requirements or submitting a license amendment, when required. Budget limitations have been known to challenge implementation of shipping plans for our customers. Similarly, the DOE receiving facilities also face increasing challenges in providing resources to receive material, particularly when reactor operators' shipping plans are not well known. It is anticipated that these funding challenges will continue to threaten DOE's receipt capability and capacity. GTRI will be happy to answer questions about scheduling or clarify what type of information is needed to facilitate receipt of fuel.

At the request of many foreign research reactors, the program was extended to allow additional time for further development of LEU fuels and planning for back end solutions in the fuel cycle. The extension was granted for the benefit of foreign research reactors in justifiable need of relief. However, some foreign research reactors are now cancelling or rescheduling shipments to defer costs, which was not the intent of the extension. These delays negatively impact DOE's ability to maintain a regular schedule of operations and adequate resources for the receipt facility. Thus, GTRI strongly encourages foreign research reactors to continue shipping as early as possible and maintain original schedules where possible. Deferral of shipments when spent fuel is available for shipping could adversely affect DOE's ability to support the receipt of fuel on a schedule suitable to the customer. GTRI currently anticipates a large number of shipments near the end of the policy period. If too many shipments are deferred until the end of the policy period, DOE may be required to exercise its authority under the contracts to limit receipts to specific customers with the greatest need.

4.2 Cask License Review

GTRI enjoys a very good working relationship with Nuclear Regulatory Commission (NRC) and wishes to take every measure possible to respect this relationship by ensuring that cask license applications are timely and complete. GTRI has been meeting periodically with NRC to discuss planned shipments and to forecast support required to meet the needs of the Acceptance Program and our customers. Because there are limited NRC resources for review of cask licenses, customers need to ensure adequate time is available for the application preparation process, the NRC's review of the application, and final approval of cask licenses.

4.3 End –User Assurances

Some countries require the issuance of an End-Use or Dual-Use Undertaking in order to obtain an export license. In the past, DOE provided that document to the reactor operator when requested. DOE no longer provides that document because assurances are already provided through government agreements for cooperation in the peaceful uses of nuclear energy between each country and the United States when one exists or through other avenues. The U.S. Department of State can validate those assurances to the participating country as necessary. However, DOE does not require these agreements to be in place for the FRR to participate in this program. We recommend that these FRR export requirements be identified and resolved by the reactor operators as early as possible to ensure this political process is completed without shipment delays.

4.4 Insurance Issues

Insurance issues have been a recurring problem for reactor operators in high-income economy countries who participate in joint shipments. Nuclear liability insurance for ocean transport can greatly increase the total cost of shipping. Shippers are sometimes required to have overlapping insurance coverage and also may have different requirements for minimum coverage. It is important for reactor operators to plan early for the required coverage and determine how to provide coverage in the least expensive manner. Consideration should be given for reactor operators entering into a joint shipment to coordinate in obtaining their nuclear liability

insurance with the same pool or under a joint contract, where possible, in order to mitigate overlapping insurance costs. Recently, GTRI has experienced better results for some customers with aggressive coordination. It is also important to be conscious of this potential problem and budget for any added cost that cannot be mitigated.

4.5 Title Transfer Location

The Secretary of Energy has authorized the Department of Energy to consider, on a case-by-case basis, whether it is in the best interest of the United States to take title to certain spent nuclear fuel and target material from reactors located in countries with high-income economies before it reaches the port of entry into the United States. In order to be considered for title transfer at an earlier point, GTRI must provide supporting evidence that the title transfer is in the best interest of the United States and sufficient need exists to obtain formal approval to accept title. In these cases, the title transfer location would be specified in the contract with the affected reactor operator. In order to extend the United States' Price-Anderson Amendment Act nuclear liability indemnification, DOE is also required to control and manage the carrier of the United States titled material. The FRR and DOE must ensure this requirement is met to extend this coverage.

5. Efforts to Improve and Accelerate

GTRI and reactor operators need to work together to schedule shipments as soon as possible to optimize shipment efficiency over the remaining years of the program. Countries interested in participating in the Acceptance Program should express their interest as soon as possible so that fuel and facility assessments can be scheduled and shipments may be entered in the long-term shipment forecast. New and current Acceptance Program participants should also coordinate with GTRI approximately 18 - 24 months in advance to ensure GTRI can meet the reactor operator's plans and needs. Accelerated schedules are possible if there are no significant issues or changes from past shipments such as a change in fuel type or fuel condition. Decreasing resources and coordination requirements with other agencies such as the NRC and DOT could limit DOE's capability to support accelerated schedules, especially as we approach the program endpoint. Specifically, GTRI may not be able to accommodate a large number of requests at the end of the program, particularly from geographically isolated regions.

5.1 Coordination with Source Recovery Program

Several recent shipments of SNF have provided an opportunity for International Organization for Standardization (ISO) containers with radioactive sources from Chile, Germany and Switzerland to be transported to the United States on the same vessel used to ship SNF in support of GTRI's Radiological Remove Program. This is an excellent opportunity for organizations in the partner country or nearby countries to dispose of unwanted radioactive sealed sources, particularly sources that cannot be transported by air. These sources may include Americium-241, Plutonium, Cobalt-60, Cesium-137, Radium-226, and other sources. GTRI highly encourages partner countries and reactor operators to work with neighboring countries interested in disposing of sources to allow the Acceptance Program's dedicated vessel used in the spent fuel shipment to also transport these sources to the United States for disposition. The cost of shipping an ISO container with sources on the same ship is *de minimus* and allows for

disposition of these potential vulnerable items that would otherwise remain in unwanted or undesirable locations within the region. To learn more and register online, please visit <http://osrp.lanl.gov/>.

5.2. Gap Material SNF Acceptance

GAP MATERIALS PROGRAM

The Gap Materials Program facilitates the disposition of high risk, vulnerable nuclear material not covered by other removal efforts. GTRI's first priority in each case will be to find a viable commercial disposition pathway before considering sending them to the United States. The materials could include:-

- U.S.-origin spent or fresh nuclear fuel not covered by the existing U.S.-origin fuel return program,
- HEU material of non-U.S.-origin and non-Russian-origin,
- Separated plutonium.

The NNSA Administrator approved a revised Record of Decision (74 FR 4173, January 23, 2009) allowing GTRI to transport up to one metric ton of HEU SNF (Gap Material SNF) from foreign research reactor locations to the United States and safely store this Gap Material at a DOE site pending disposition. According to the revised Record of Decision, Gap spent fuel must meet the following criteria to be eligible for return to the United States:

- The material must pose a threat to national security;
- The material must be susceptible to use in an improvised nuclear device;
- The material must present a high risk of terrorist threat;
- The material must have no other reasonable pathway to assure security from theft or diversion;
- The material must meet Savannah River Site acceptance criteria; and
- There must be adequate storage capacity at the Savannah River Site.

Since the Gap program began in 2006, GTRI has removed approximately 323 Kg of nuclear material from Belgium, Sweden, Canada, Chile, Italy, and the Netherlands.

5.3. Material Disposition

The DOE Office of Environmental Management (DOE-EM), which previously managed the Acceptance Program, is currently reviewing final disposition options for repatriated spent nuclear fuel. As originally intended in the DOE Programmatic Spent Nuclear Fuel Environmental Impact Statement [1] and associated Record of Decision [2], GTRI currently transports all aluminum clad spent fuel to DOE's Savannah River Site for interim storage, while stainless steel fuel such as TRIGA fuel is transported to the Idaho National Laboratory.

5.4. Coordination With Other Programs

A primary goal of GTRI is to support worldwide nonproliferation efforts by facilitating the repatriation and disposition of research reactor HEU fuel, other HEU materials and separated plutonium. U.S. assistance in helping reactor operators convert their cores to low enriched

uranium (LEU) as LEU fuels become qualified and available is integral to achieving this goal. Thus, the Acceptance Program works closely with the Reduced Enrichment for Research and Test Reactors (RERTR) program to convert reactors to the use of LEU and the Enriched Uranium Operations group from DOE's Y-12 National Nuclear Security Complex in Oak Ridge, Tennessee to ensure a supply of enriched uranium for fuel fabrication. GTRI remains committed to working with staff in other program offices within DOE to assist in smooth transition of core enrichment level and a steady supply of fuel.

6. Conclusion

GTRI remains committed to supporting United States and international nonproliferation goals while assisting other countries to enjoy the benefits of safe nuclear technology that mitigates proliferation risks. To achieve these goals, GTRI aims to accept eligible fuel and other nuclear material as soon as possible and strongly encourages reactor operators to work closely with technical points-of-contact to ensure shipping schedules are accurate and achievable. GTRI continues to support research reactor operators' needs and would be happy to meet any interested parties to discuss the program.