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THE UNITED STATES FOREIGN RESEARCH REACTOR (FRR) SPENT NUCLEAR FUEL (SNF) ACCEPTANCE PROGRAM: 2009 UPDATE

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ABSTRACT

The United States (U.S.) Department of Energy (DOE) Global Threat Reduction Initiative's (GTRI) U.S.-origin fuel removal 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.-origin nuclear removal program, also known as the Foreign Research Reactor Spent Nuclear Fuel Acceptance Program (FRR SNF AP), supports permanent threat reduction by eliminating stockpiles of U.S.-origin 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 1,219 kilograms of highly enriched uranium (HEU) and a total of 8,864 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 thirteenth year, has completed forty-eight shipments to date safely and successfully. Twenty-seven countries have participated so far, returning a total of 8,864 spent nuclear fuel elements to the United States for management at Department of Energy (DOE) sites in South Carolina and Idaho. Since 1996, the program has removed all eligible U.S.-origin HEU from 18 countries. Thirty-eight of the forty-eight shipments contained aluminum-based spent nuclear fuel from research reactors and were placed into storage at the Savannah River Site in South Carolina. Eight shipments consisted of Training, Research, Isotope-General Atomics (TRIGA) type fuel and were placed into storage at the Idaho National Laboratory. The remaining two 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, a joint shipment from Indonesia and Taiwan, was completed without incident, arriving at the Savannah River Site on September 10, 2009. During the remainder of calendar year 2009, the program is planning to receive one shipment of spent nuclear fuel.

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. 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, contractual provisions and requirements are sometimes lost or forgotten. Compliance with contractual requirements is critical, so please address any questions or concerns regarding contract compliance to GTRI. GTRI's ability to continue this program depends on our customers following this critical and agreed-to process.

3.2 Public Disclosure of Shipment Information

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 10 CFR§73.22(a)(2)(ii), 10 CFR§73.21(b), and IAEA INFCIRC 225 Rev. 4 Section 8.1.3. 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. 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.

3.3 Contract Extensions

Some research reactors that have converted to low enriched uranium (LEU) fuel and have shipped their HEU or LEU prior to the end of the first program policy period, May 2009. Many of these contracts have expired. A contract extension or re-issuance of a new contract would be required to authorize shipments during the extended policy period, May 2019. Reactor Operators in this situation who desire to conduct at least one future shipment should contact GTRI to negotiate the extension of or a re-issuance of a contract between DOE and the research reactor to authorize continued Acceptance Program participation.

3.4 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. Because of this, it is important that the Appendix A data actually reflects the "as-shipped" condition of the fuel. After the authorized material 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.

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 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. 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 leave adequate time 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, these agreements are not required 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 at an earlier point in the shipment. In these cases, the title transfer location would be specified in the contract with the affected reactor operator.

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 Nuclear Regulatory Commission and Department of Transportation 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 Potential Fee Changes

NNSA continues to evaluate ways to accelerate repatriation activities. Therefore, fees may change in the future and/or other changes may be implemented, if DOE believes the changes will positively influence program goals. DOE is also continuing to try to keep the reactor operator's cost to participate in the Acceptance Program low as possible. Any suggestions of methods to accelerate repatriation of Highly Enriched Uranium (HEU), will be welcomed and given all due consideration. No fee changes are anticipated in the United States' Fiscal Year 2010.

5.2 Coordination with Source Recovery Program

The Acceptance Program has also begun to coordinate with GTRI's radiological source recovery program to include sources on Acceptance Program shipments. For example, the recent shipment of spent nuclear fuel from Australia included sources from Australia recovered by GTRI's U.S. radiological remove program. The shipment was completed successfully, and continues as a precedent for joint shipments of spent nuclear fuel and radiological sources. Such shipments will provide an excellent opportunity for a customer or other organizations in the customer's country or surrounding countries to dispose of unwanted radioactive sealed sources, particularly sources that cannot be transported by air.

5.3. Gap Material SNF Acceptance

A policy change has been approved and issued through a Federal Register Notice Vol. 74, No.14, January 23, 2009, pages 4173 – 4175. The change allows for the United States to accept up to 1 metric ton heavy metal of Gap Material SNF. Gap Material SNF is FRR SNF containing HEU that is either non-U.S. origin or is of U.S. origin but was not addressed previously in the FRR SNF EIS. With accepting Gap Material SNF, GTRI will facilitate the disposition of high risk, vulnerable nuclear material not covered by other removal efforts if the required conditions are met. DOE would only accept the material if it poses a threat to national security, is susceptible for use in an improved nuclear device, presents a high risk of terrorist threat, and has no other reasonable pathway to assure security from theft or diversion.

The first priority for Gap Material is to find a commercial disposition pathway. To date, approximately 100 kilograms of Gap Material has been sent to Areva for disposition.

5.4. 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.

5.5. Coordination With Other Programs

A primary goal of GTRI is to support worldwide nonproliferation efforts by facilitating the repatriation and disposition of U.S.-origin HEU. 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 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.