

Global Threat Reduction Initiative



Making It Happen: The Current Status of
Gap and U.S.-Origin Nuclear Fuel Removals in 2010

Technology Innovation and
International Partnership Workshop on
Used Nuclear Fuel Storage & Disposition

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GTRI Mission and Goals

DOE STRATEGIC GOAL 2.2

Prevent the acquisition of nuclear and radiological materials for use in weapons of mass destruction and other acts of terrorism

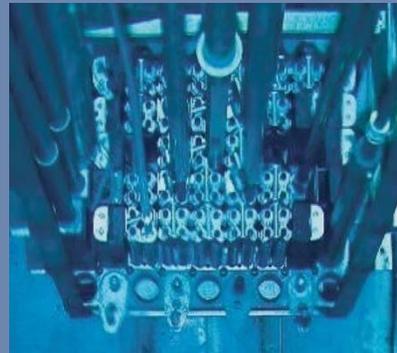
GTRI MISSION

Reduce and protect vulnerable nuclear and radiological material located at civilian sites worldwide.

GTRI is:

- A part of President Obama's comprehensive strategy to prevent nuclear terrorism; and
- The key organization responsible for implementing the U.S. HEU minimization policy.

Convert



Convert research reactors and isotope production facilities from the use of highly enriched uranium (HEU) to low enriched uranium (LEU)

These efforts result in permanent threat reduction by minimizing and, to the extent possible, eliminating the need for HEU in civilian applications – each reactor converted or shut down eliminates a source of bomb material.

Remove



Remove and dispose of excess nuclear and radiological materials; and

These efforts result in permanent threat reduction by eliminating bomb material at civilian sites – each kilogram or curie of this dangerous material that is removed reduces the risk of a terrorist bomb.

Protect

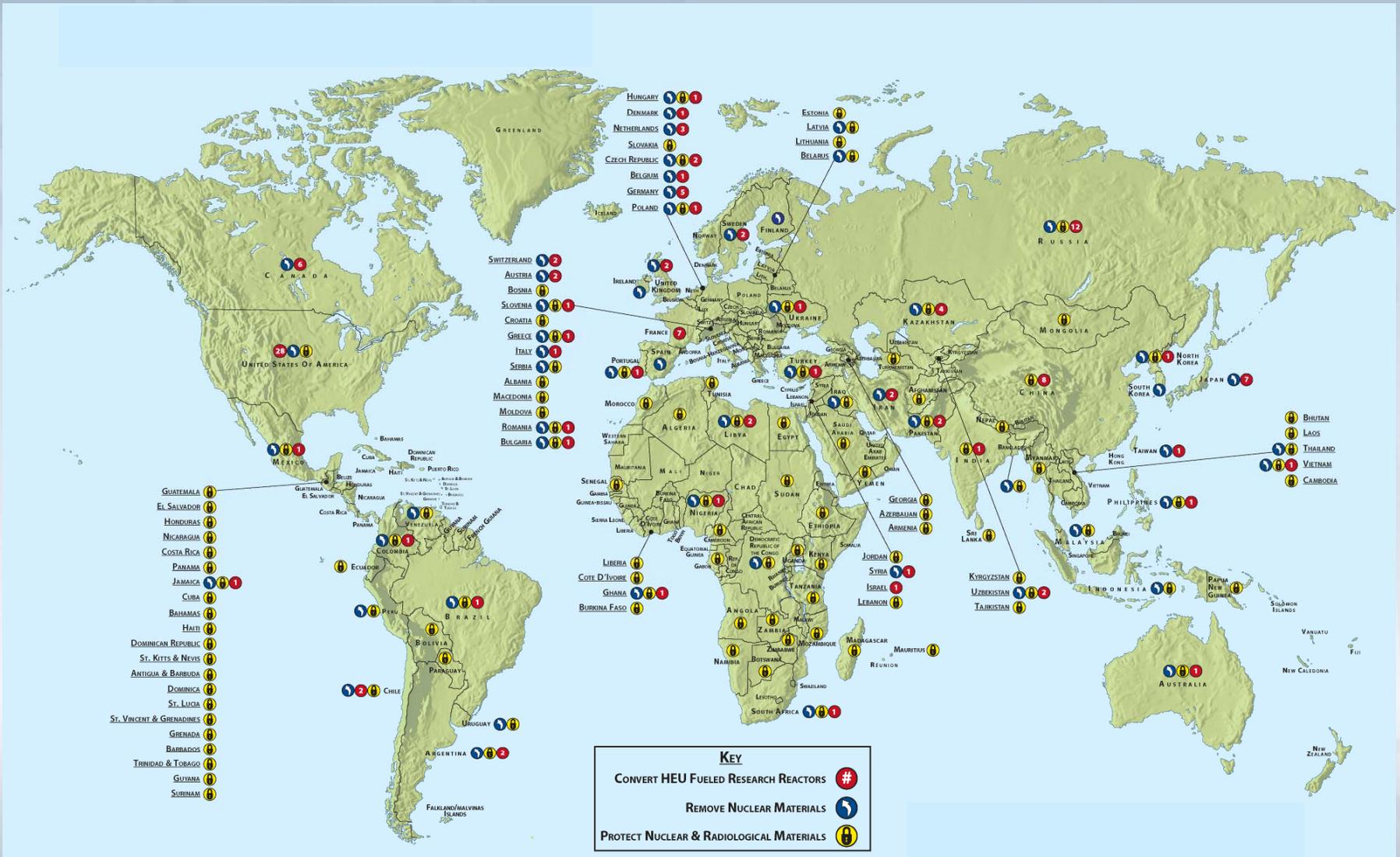


Protect high priority nuclear and radiological materials from theft and sabotage

These efforts result in threat reduction by improving security on the bomb material remaining at civilian sites – each vulnerable building that is protected reduces the risk until a permanent threat reduction solution can be implemented.



Global Scope



GTRI Addresses International Priorities

UN Security Council Resolution 1887 – September 24, 2009

“Gravely concerned about the threat of nuclear terrorism, and recognizing the need for all States to take effective measures to prevent nuclear material or technical assistance becoming available to terrorists.”

“Calls upon Member States to share best practices with a view to improved safety standards and nuclear security practices and raise standards of nuclear security to reduce the risk of nuclear terrorism, with the aim of securing all vulnerable nuclear material from such risks within four years.”

“Calls upon all States to manage responsibly and minimize to the greatest extent that is technically and economically feasible the use of highly enriched uranium for civilian purposes, including by working to convert research reactors and radioisotope production processes to the use of low enriched uranium fuels and targets;”



Removal Activities

Status: 4,604 kilograms to be removed by 2016;
2,800 completed (61%) (total program)

- Russian-origin: 2,351 kilograms by 2015; 1,351 completed (55%)
- US-origin: 1,362 kilograms by 2014; 1,242 completed (91%)
- Gap-material: 890 kilograms by 2016; 210 completed (24%)
- All HEU material has been removed from 18 countries
 - Brazil, Bulgaria, Chile, Colombia, Denmark, Greece, Latvia, Libya, Philippines, Portugal, Romania, Slovenia, South Korea, Spain, Sweden, Taiwan, Thailand, and Turkey
- Completed clean-out of HEU from of 5 of the 18 countries since June 2009 (Romania in June, Taiwan in September, Libya in December, Turkey in January, and Chile in March)**



Casks of HEU spent nuclear fuel being loaded for transportation from Latvia back to Russia, May 2008



Hungarian fuel coming off the trains at the port of Koper in Slovenia, September 2008

U.S.-Origin Nuclear Removal Objective

Goal: Remove or dispose of excess WMD-usable U.S.-origin nuclear materials located at civilian sites worldwide:

- Reduce and, to the extent possible, eliminate the use of HEU from civilian nuclear applications
- Disposition LEU spent fuel as an incentive for foreign reactor operators to convert from HEU to LEU fuel
- Allow time for countries with spent fuel (both HEU and LEU) containing uranium enriched in the United States to resolve their own disposition

These efforts result in permanent threat reduction because each kilogram of this dangerous material that is secured and disposed of removes it from possible diversion for malevolent purposes.

U.S.-Origin HEU Removal

Scope: Repatriate U.S.-origin HEU and LEU spent nuclear fuel

- Program Environmental Impact Statement permits return of TRIGA fuel and MTR fuel
 - Agreement to convert reactor to LEU fuel required for facility eligibility
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- **In 2004, DOE approved a ten-year extension of this program. Currently the United States will accept eligible spent fuel that is irradiated by May 2016 and returned to the United States by May 2019.**
 - **Responsibility for fuel return transferred to NNSA in 2004**
 - **EM retained responsibility for receipt, interim storage and packaging for disposition**



U.S.-Origin Fuel Removal from Japan

Gap Removal

- **Revised Record of Decision** approved by NNSA Administrator in January 2009 allows GTRI “to transport up to 1 metric ton of spent nuclear fuel (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, material must also meet the following 4 conditions:**
 - 1) Pose a threat to national security,
 - 2) Be susceptible to use in an improvised nuclear device,
 - 3) Present a high risk of terrorist threat, and
 - 4) Have no other reasonable pathway to assure security from theft or diversion
- **First priority is to find a commercial disposition pathway**
 - Approximately 100 kilograms have been sent to Areva for disposition, working on dispositioning additional plutonium and HEU materials

Gap Removal

Scope: Facilitate the disposition of high risk, vulnerable nuclear material not covered by other removal efforts if the required conditions are met. The materials could include:

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

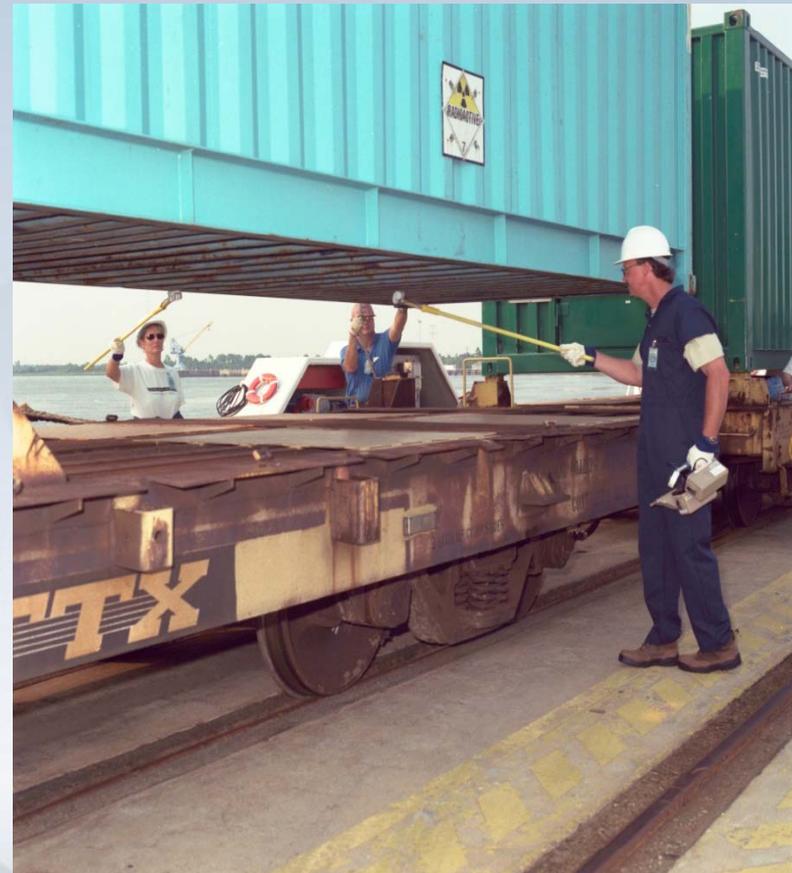
Accomplishments:

Since the program began in 2006, approximately 210 kilograms of HEU and plutonium have been removed from Belgium, Canada, Chile, Italy, and the Netherlands



U.S.-Origin and Gap Remove Program Shipments

- **53 shipments completed (3 Gap)**
- **43 via Ocean to East Coast**
- **9,175 spent fuel assemblies, from 29 countries**
- **8 cross-country shipments completed, one west coast shipment completed**
- **221 casks/7,757 assemblies to SRS**
19 casks/1,383 rods to INL
15 casks/37 assemblies to Y-12



Shipments to Date

3 Shipments to Y-12

1. Argentina
2. South Korea
3. Chile (Gap)

8 Shipments to INL

1. South Korea
2. Romania, Slovenia, Italy and Germany
3. United Kingdom
4. Germany
5. Japan
6. Indonesia
7. Japan
8. Romania

42 shipments to SRS

- | | | |
|--|---------------------------------------|-------------------------------|
| 1. Sweden, Switzerland, Germany, Colombia, and Chile | 15. Japan | 29. Australia |
| 2. Canada | 16. Chile and Argentina | 30. Japan |
| 3. Germany, Switzerland, Spain and Italy | 17. Austria, Germany, and Netherlands | 31. Sweden |
| 4. Japan, Sweden, Germany, and Spain | 18. Germany, Sweden, and Japan | 32. Argentina and Brazil |
| 5. Denmark, Italy, Germany, Sweden, and Greece | 19. Denmark | 33. Sweden, Germany and Japan |
| 6. Australia | 20. Denmark, Germany, and Sweden | 34. Portugal |
| 7. Venezuela, Uruguay, Japan, Sweden, and Spain | 21. Japan | 35. Germany and Japan |
| 8. Thailand, Philippines, Indonesia, and Taiwan | 22. Japan | 36. Canada |
| 9. Germany, Denmark, and Sweden | 23. Indonesia | 37. Australia |
| 10. Portugal and Denmark | 24. Germany | 38. Indonesia and Taiwan |
| 11. Japan (via Europe) | 25. Japan | 39. Japan |
| 12. Brazil and Venezuela | 26. Netherlands and Sweden | 40. Turkey and Israel |
| 13. Canada | 27. Austria & Greece | 41. Chile (Gap) |
| 14. Italy and Germany | 28. Netherlands and Germany | 42. Chile (Gap) |



Benefits of Participation

- Helps to alleviate the liability, costs, and security concerns involved with the long term storage and disposition of nuclear materials
- Opportunity for cooperation between multiple countries in shipping nuclear fuel and radiological sources
- Provides a great exercise in handling operations and project coordination for countries that may not have an extensive background in international transportation of nuclear materials



Recent Shipment

- All remaining HEU from Chile removed
- The shipment from Chile was the first shipment of non-U.S.-origin HEU spent fuel to the United States
- The Chilean shipment consisted of 18.3 Kg of HEU research reactor spent fuel and 433 U.S.-origin sources packaged by LANL's OSRP



Recent Shipment

- An 8.8 earthquake struck Chile after all of the fuel had been prepared and packaged for shipment
- The HEU, casks and, ISO containers were not damaged
- The transfer of the ISO containers to the port and loading onto the the ocean vessels were affected
- Slight delay in the departure to the U.S. due to change in route and port of embarkation
- EM participated in this shipment



Lessons Learned – Cropping Operations

- Beneficial to maintain an open line of communication with the Acceptance Program, Research Reactor and the cask vendor
- The cask vendor can provide useful insight to the reactor facility concerning cropping operations and techniques and can assist to ensure that the fuel is cropped in the appropriate and agreed upon locations as well
- It is also necessary to communicate any difficulties in cropping. Taking pictures of any unusual condition may be helpful to the unloading personnel
 - Bent plates
 - Changes in the final cask loading as previously planned to the Acceptance Program
- Maintaining the condition of the fuel elements allows for ease of fuel handling operations

Material Management and Disposition

- DOE Office of Environmental Management (DOE-EM) is currently reviewing final disposition options for repatriated spent nuclear fuel
- Currently, the U.S.-Origin Nuclear Remove Program (and Gap, with case-by-case approval) transports aluminum-clad spent fuel to the Savannah River Site and stainless steel clad (TRIGA) spent fuel to the Idaho National Laboratory for interim storage



Source Recovery

- Capability to transport sources jointly with U.S.-Origin or Gap Remove and Off-Site Source Recovery Program
 - Particularly PuBe sources which can not be transported by air
 - To learn more and/or register online, please visit:
<http://osrp.lanl.gov>
- GTRI highly encourages partner countries and reactor operators to work with neighbouring countries interested in disposing of sources to share the dedicated vessel to be used in the spent fuel shipment
 - Provides an opportunity for overall cost savings when compared to two separate shipments
 - Allows for international cooperation in securing nuclear and radiological materials



Conclusion

- **Recent years have been the busiest for GTRI removal programs**
- **GTRI's removal programs need the cooperation of our partners to complete the mission**