Status of Global Threat Reduction Initiative's Activities Underway to Address Major Domestic Radiological Security Challenges[1] - 12105

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ABSTRACT

During their service lives, radioactive sealed sources are used for a wide variety of essential purposes. However, each year, thousands of radioactive sealed sources that pose a potential risk to national security, health, and safety become disused and unwanted in the United States. Due to their concentrated activity and portability, these sources could be used in radiological dispersal devices ("dirty bombs.") For more than a decade, the National Nuclear Security Administration and the U.S. Department of Energy, through the Global Threat Reduction Initiative Offsite Source Recovery Project (GTRI/OSRP), have facilitated the removal and disposition of thousands of disused/unwanted sources worldwide. However, the ability of GTRI/OSRP to continue its work is critically dependent on the ability to transport and appropriately dispose of these sources. On that front, GTRI/OSRP progress includes development of two prototype Type B transport containers and significant efforts toward certification, increased commercial disposal access for risk-significant sealed sources at commercial sites, and cooperation through the International Atomic Energy Agency to increase source repatriation.

INTRODUCTION – SEALED SOURCES AND NATIONAL SECURITY

During their service lives, radioactive sealed sources serve numerous essential and beneficial medical, industrial, and research applications. They are used thousands of times per day and are uniquely suited for such purposes as cancer treatment, food safety, blood irradiation, and medical research. However, each year, thousands of radioactive sealed sources become disused and unwanted in the United States. Because of the lack of commercial disposal options for many of these sources, they are relegated to storage indefinitely. Some of these sources constitute a national security concern: due to their highly concentrated activity and portability, they could be used—either individually or in aggregate—in a radiological dispersal device (RDD), commonly referred to as "dirty bombs," or in radiation exposure devices (RED).[2] While secure storage of these sources is a temporary measure, the longer they remain disused or unwanted in storage, the greater the likelihood that they will become unsecured or abandoned.

The consequences of an accident involving a disused sealed source are well known. An inadvertent exposure that took place in Goiania, Brazil in 1987 indicates how serious the

[1] This paper represents the views of the authors, but does not necessarily reflect their respective agencies' or organizations' positions.
[2] As defined by the Radiation Source Protection and Security Task Force chaired by the Nuclear Regulatory Commission, an RDD is "the combination of radioactive material and the means (whether active or passive) to disperse that material with malicious intent without a nuclear explosion." An RED is "an object used to maliciously expose people, equipment, and/or the environment to ionizing radiation without dispersal of radioactive material." See Task Force Report at page 70. [1]

consequences of an RED attack could be. An abandoned medical therapy unit containing Cs-137 was looted by two people for scrap metal. In opening the unit and taking the source, they exposed themselves and the surrounding population to high levels of radiation. 112,800 people were examined for exposure, 249 found to be contaminated, 20 hospitalized, with four deaths resulting. The contamination area in Goiania exceeded 2,000 square meters, which had to be cleaned up at significant cost. In addition, studies carried out after the event suggested Goiania residents who were ultimately found to be uncontaminated, but who nonetheless were concerned about the effect the radiation may have had on them (i.e., the "worried well"), showed stress levels that approximated those levels found in persons who are in fact exposed to ionizing radiation.[3] While the impact of an RDD is fortunately undocumented and would ultimately depend on the type of sealed source or sources used, the type and amount of explosive employed, the location (i.e., urban or rural) of the attack, and other environmental factors, experts agree that the damages could be in the billions of dollars and have significant human health and psychological impacts. [2-6]

For more than a decade, GTRI/OSRP, has facilitated the removal and disposition thousands of excess, unwanted, abandoned, or orphaned radioactive sealed sources in the U.S. that pose a potential risk to national security, health, and safety.[4] With limited resources, OSRP prioritizes its sealed source recoveries according to security driven criteria. However, the ability of GTRI/OSRP to continue its work is critically dependent on the ability to transport and commercially dispose of these sources. Until recently, transport and disposal of recovered sources has been facilitated by nationwide commercial disposal access for many lower-activity sealed sources at the low-level radioactive waste (LLRW) disposal site in Barnwell, South Carolina, and the availability of certified Type B transport container designs. The 2008 decision by the State of South Carolina to discontinue acceptance of out-of-compact waste at the Barnwell facility has left 36 states without access to commercial sealed source disposal. Furthermore, since the expiration of U.S. Department of Transportation specification Type B containers such as the 6M and the 20 WC on October 1, 2008, the lack of affordable, timely transportation options for sealed sources has posed a significant challenge for many disused sealed source owners and for GTRI/OSRP efforts. These constraints have led to a significant backlog in GTRI/OSRP in the registry of disused sealed sources. See Figure 1 below.

The impact of these events on national security has been widely recognized. Two recent reports in particular demonstrate stakeholder perspective on the problem: the report of the Department of Homeland Security's (DHS) Removal and Disposition of Disused Sources (RDDS) Focus Group, and the *2010 Radiation Source Protection and Security Task Force Report* (Task Force Report). Furthermore, the Low-Level Waste Forum, an organization comprised of representatives from the low-level waste compacts, has convened a Disused Sources Working Group to consider the potential of both the front-end and back-end solutions to the problem of disused sealed sources. Front-end solutions may include financial assurance or other regulatory enhancements; back-end solutions may include increased opportunities to recycle or dispose of sealed sources. The working group is funded by NNSA, and will report back to the LLW Forum's Board of Directors and NNSA with its findings, including (but not limited to) potential action items and recommendations.

[3] Elizabeth Eraker, "Cleanup After a Radiological Attack: The U.S. Prepares Guidance," *The Non-Proliferation Review*, Fall/Winter 2004 at 179.

[4] GTRI, part of the National Nuclear Security Administration and the U.S. Department of Energy, is a vital part of the efforts to combat nuclear and radiological terrorism. GTRI's unique mission is to reduce and protect vulnerable nuclear and radiological material located at civilian sites worldwide. GTRI/OSRP) directly supports that mission.

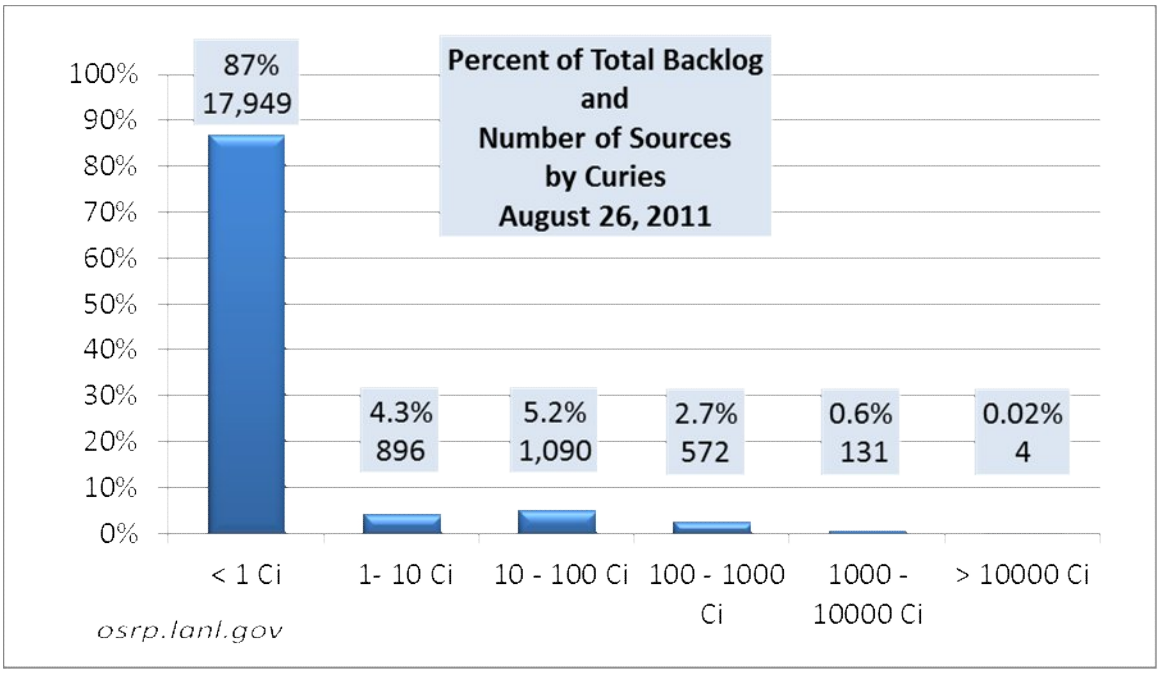

Fig. 1. GTRI/OSRP Registered Sealed Sources – Percent of Total Backlog by Curie Amount

HOMELAND INSECURITY: THE RDDS FOCUS GROUP

Following the implementation of the Barnwell restrictions in July 2008, both public and private sector concern for the security of disused and unwanted sealed sources increased substantially. While the security of disused sealed sources had long been a concern, the closure of Barnwell significantly exacerbate the problem. In September of 2008, the DHS Nuclear Sector and Government Coordinating Councils convened a public-private Sealed Source Security Workshop in Washington D.C. to address this and other sealed source security challenges.[5] During the Workshop proceedings, three stakeholder groups in particular expressed concern with regard to the lack of disposition options for sealed sources:

- Sealed source device manufacturers and users who no longer had a disposal option for lower-activity beta/gamma sources following the closure of Barnwell;
- State regulators who feared that desperate sealed source owners might increasingly abandon disused sources;

[5] Homeland Security Presidential Directive-7 (HSPD-7) and the National Infrastructure Protection Plan (NIPP) provide the basis for the National effort to protect the Nation's Critical Infrastructure and Key Resources (CIKR). This effort is carried out through an unprecedented partnership between the public and private sectors in each of the 18 CIKR Sectors. CIPAC provides a legal framework under which public and private sector organizations can share information and coordinate public and private sector efforts to maintain and improve CIKR security and preparedness. The Nuclear Reactors, Materials and Waste Sector partnership is led by the NSCC, which is comprised of representatives from private sector Nuclear Sector CIKR stakeholders, and the NGCC, which is comprised of representatives from public sector Nuclear CIKR stakeholders. The Nuclear Sector consists of a wide variety of assets, systems, networks, and functions, including the Nation's nuclear power plants, 32 research and test reactors, and radioactive materials used commercially in the United States.

- GTRI/OSRP representatives who noted that the backlog of disused sources voluntarily registered through their website (osrp.lanl.gov) had grown exponentially since the 2008 Barnwell closure.

The concerns presented at the Sealed Source Security Workshop led the NSCC and NGCC to form the RDDS Focus Group in February 2009.[6] Because this complex national security challenge involves stakeholders from all levels of government and the private sector, RDDS Focus Group membership was expanded beyond the membership of the NSCC and NGCC, to include sealed source manufacturers, distributors, users, storage and disposal companies, regulators, other Federal and State officials, and LLRW compact members (see Appendix A). During the workshop and in the course of Focus Group deliberations, three primary disposal-related challenges were identified:

- **Challenge 1** – Lack of disposal for high-activity beta/gamma sources (primarily Co-60, Cs-137, and Sr-90) in wide use primarily in medical and industrial irradiation and power generation applications. Commercial disposal facilities have activity limits below those found in many of these types of devices, even when the sources are not GTCC.
- **Challenge 2** - Lower-activity beta/gamma sealed sources in the 36 states without disposal access. These sources are used in a wide variety of medical and industrial applications. This challenge in particular has been exacerbated by the State of South Carolina decision to close the Barnwell disposal facility to out-of-compact LLRW.
- **Challenge 3** – Sealed sources using foreign-origin Am-241, Pu-238, and Pu-239. There is a significant increase in the amount of foreign-origin radioactive material incorporated into U.S. manufactured sources used by U.S. licensees because the U.S. no longer produces these radionuclides. U.S. manufactured sealed sources containing foreign-origin material that exceed the thresholds for Class C disposal do not currently have a disposal path in the U.S.

The RDDS Focus Group reported to the Nuclear SCC and Nuclear GCC in the form of two deliverables: *Sealed Source Disposal and National Security: Problem Statement and Solution Set* in December 2009 and *Sealed Source Disposal and National Security: Recommendations and Messaging Strategy* in June 2010.[7] During the course of its deliberations, the group considered an inclusive list of potential solutions to the identified sealed source disposal challenges prior to making its recommendations. Those recommendations, presented in the June 2010 deliverable in Table I below, are complementary rather than alternative. That is, only in combination do they address all three of the sealed source disposal challenges identified by the Focus Group. The table also indicates the advantages of each of the recommendations as identified by the group. While a breadth of criteria were considered in making its recommendations, two criteria emerged as particularly important: burden sharing and feasibility.

Table I. RDDS Focus Group Recommendations

[6] Abigail Cuthbertson, Olin T. Hale, and David W. Martin , *Public-Private Dialogue to Address the National Security Concerns Associated with Disused Radioactive Sealed Sources and the Current Sealed Source Disposition Landscape*, proceedings of the 2010 Waste Management Forum, Phoenix, AZ, March 7-11, 2010.

[7] Removal and Disposition of Disused Sources Focus Group, *Sealed Source Disposal and National Security: Problem Statement and Solution Set* (December 9, 2009); Removal and Disposition of Disused Sources Focus Group, *Sealed Source Disposal and National Security: Recommendations and Messaging Strategy* (June 30, 2010), available at http://osrp.lanl.gov/docs.shtml.

Recommendation	Advantages (as cited in the RDDS Part 2 Deliverable)
Recommendation A – Support ongoing DOE efforts to develop a disposal capability for GTCC LLRW	▪ Complete solution for Disposal Challenge 3 and most of Disposal Challenge 1 ▪ Provides a permanent disposition path for majority of the highest risk sources
Recommendation B – Concentration averaging of sealed sources for disposal at existing commercial facilities	▪ Partial Solution for Disposal Challenge 1 ▪ Can be done within existing legislative/regulatory framework ▪ Timely
Recommendation C – Case-by-case exemption by existing compacts for disposal of discrete numbers of high-risk sealed sources	▪ Partial Solution for Disposal Challenge 1and 2 ▪ Potential timely solution for addressing high-risk Class A, B, and C sources
Recommendation D – Physical destruction for disposal as Class A LLRW	▪ Partial Solution for Disposal Challenge 2 ▪ Can be done within existing legislative/regulatory frame ▪ Timely
Recommendation E – Co-Disposal of foreign-origin Am-241 sources with domestic sources	▪ Near-Term Solution for Disposal Challenge 3; ▪ Potential timely, near-term solution until a GTCC disposal facility is operational

FORCING THE ISSUE: THE 2010 INTERAGENCY TASK FORCE ON RADIATION SOURCE PROTECTION AND SECURITY

In August 2010, the Radiation Source Protection and Security Task Force ("Task Force") published the *2010 Radiation Source Protection and Security Task Force Report* ("Task Force Report"). The Task Force Report identified disposal of disused radioactive sources as the most pressing problem in radiation security. The Task Force was established by the Energy Policy Act of 2005 (EPAct /Public Law 109-58), and reports every four years to the President and Congress on ways to improve the security of domestic radioactive sources. It is comprised of 14 Federal agencies and two state organizations—the Conference of Radiation Control Program Directors and the Organization of Agreement States. The Task Force Report concludes that "[b]y far the most significant challenge identified is access to disposal for disused radioactive sources. . . . Continued coordinated effort is needed to make sure that comprehensive, sustainable disposal pathways for all disused sealed sources are developed in the interest of national security."[8] The Task Force Report also included the following recommendation:

> **2010 Recommendation 4**: The Task Force recommends that the U.S. Government, regional compacts, and States continue to evaluate disposal options for disused radioactive sources, including options for handling a potentially large number of disused

[8] Task Force Report at iii and fn.1 at iii.

> cesium chloride sources that may be replaced once viable alternatives are available. (37)

The Task Force continues to monitor progress in the achievement of the goal described in the report, and will next report to Congress and the President in 2014.

CONTAINING THE PROBLEM: THE SEALED SOURCE TRANSPORT CHALLENGE

The primary challenge to transportation of sealed sources and devices is the lack of a certified Type B container, both in the US and internationally. Many IAEA Category 1 and 2 sources must be transported in a Type B package. On October 1, 2008, a significant number of older design specification and performance-oriented Type B package certifications expired as the US Government harmonized with international transport regulations. While the US Government provided special permits and authorizations for continued use of decertified packages on an as-needed basis, the special use permit for the non-device specific 20WC container expired June 30, 2010.

The Radiation Source Protection and Security Task Force also addressed this challenge, noting that each year approximately 50 Cs-137 or Co-60 sources containing about 18,000 Ci are added to the list of unwanted sources needing recovery and that recovery of these sources requires the use of a certified Type B package. This is in addition to the 126 sources totaling 75,600 Ci already registered as disused. This means that between June 30, 2010, when the 20WC special permit expired, and 2014, when many new Type B packages are expected to be available, there could be roughly 240 sources totaling 93,000 Ci that will not be recovered unless other short-term options are identified.[9] The Task Force therefore offered the following recommendation:

> **2010 Recommendation 8**: The Task Force recommends that the U.S. Government enhance support of short-term and long-term research and development of certified Type B containers for use in domestic and international source recovery efforts.[10]

This challenge is even more notable in international source recovery efforts. Since the 1960s, in accordance with the “Atoms for Peace” program, radioactive sealed sources have been supplied to medical, industrial, and research institutions worldwide by the U.S. government. In addition, private U.S. companies have sold and donated radioactive sources and source-containing devices to foreign partners to promote peaceful uses of nuclear technology. In the U.S., once sources reach the end of their use-life, they are stored under regulatory control pending disposal. Disused sealed sources in some foreign countries are stored in facilities that are improperly maintained or poorly guarded, and very few foreign countries have permanent low-level waste disposal facilities or are undertaking the difficult and long process of developing such a facility. As a result, there are currently tens of thousands of locations worldwide storing radioactive sources, and such sources are occasionally abandoned in entirely insecure locations. Clearly, such sources have an even greater potential to be stolen and used for malicious purposes, and U.S. policy-makers consider repatriation of US-origin sources, as well as materials deriving from other major source-exporting countries, to be a priority. To date, the International Atomic Energy Agency has been a driving force in facilitating repatriation, not only of US-origin materials but of materials deriving from other major source-exporting countries as well. GTRI has joined with the IAEA and the U.S. Department of State to identify, condition, and

[9] Task Force Report at 39.
[10] Task Force Report at 38.

dispose of disused and unwanted sources. This activity is funded by the Nonproliferation and Disarmament Fund (NDF) at the State Department, as well as in-kind contributions from GTRI. Project implementation is coordinated with the IAEA Division of Nuclear Fuel Cycle and Waste Technology and the IAEA Office of Nuclear Security. Under this cooperative and novel framework, such bilateral and multilateral source repatriation operations have been highly effective in addressing high-risk situations, thus demonstrating the value and feasibility of even wider source repatriation involving even greater numbers of international stakeholders.[11]

PROGRESS TO DATE ON DISPOSAL: THE RDDS FRAMEWORK

Since the publication of the RDDS Focus Group deliverables and the 2010 Task Force Report, significant progress has been made on all of the sealed source disposal challenges identified by stakeholders. This progress is the result of the coordinated efforts across the sealed source stakeholder community.

Most importantly, disposal access will likely be available in 2012 for non-GTCC beta/gamma sealed sources in the 36 states without disposal access. This is the result of several important developments. First, Waste Control Specialists expects to begin receiving commercial waste at its new facility in Andrews County, Texas in early 2012. While the WCS facility is primarily intended to serve the Texas Compact states of Texas and Vermont, Texas has enacted legislation to allow import of non-compact waste to the facility, including Class A, B, and C sealed sources.[12] The change in rules will be codified through a license modification request to the Texas Commission on Environmental Quality by WCS. In late 2011 and early 2012, the Texas Compact Commission held stakeholder meetings to discuss issues related to non-compact imports to the facility. One of the issues discussed was the national security concerns posed by disused sealed sources and the importance of facilitating timely access for sources of concern.

In addition, EnergySolutions has submitted to the Utah Department of Environmental Quality a license variance request to accept Class A sealed sources for a period of one year at the EnergySolutions Clive, Utah facility. This request was submitted in consultation with GTRI, in order to facilitate disposal access for a large number of sealed sources that pose a national security concern. These sources have been without a disposal pathway and in storage since the closure of Barnwell in 2008. Shipments will be coordinated with The Conference of Radiation Control Program Directors' Source Collection and Threat Reduction (SCATR) Program. The period of acceptance will begin once the first shipment of sealed sources is received at the Clive facility.

Finally, NRC staff released in September 2011 an early draft of the revised *Branch Technical Position on Concentration Averaging and Encapsulation* (“CA BTP”) to stakeholders. In its current form, the revised CA BTP will increase the ability of sealed source generators, as well as GTRI to dispose of high-risk sealed sources that otherwise would remain in storage. The draft language increases the limit on Co-60 from 30 Ci to 140 Ci for Class A disposal (with no Class B limit), and increases the Cs-137 limit from 30 Ci to 130 Ci for Class C disposal. It also allows for shielding other than concrete and disposal containers other than the 55 gallon drum.

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[11] Ray Greenberg Jr., Julia Whitworth, Cristy Abeyta, Charles Streeper, Jan-Marie Potier, and Shelby Leonard, *Global Threat Reduction Source Recovery Efforts in Latin America* (2008), available at http://osrp.lanl.gov/Documents/LAURS_Documents%20Page/LAUR-08-04529.pdf

[12] Texas Senate Bill SB1504, available at http://tx.opengovernment.org/sessions/82/bills/sb-1504, signed into law on June 17, 2011, effective September 1, 2011.

There are also included alternate provisions that could facilitate the disposition of sources with higher activity levels than those stipulated and currently accepted under the current branch technical position on concentration averaging. Comments on the revisions were solicited from stakeholders at a public meeting held October 20, 2011 in Albuquerque, N.M. Those comments will be reflected in a revised draft expected for release in April 2012.
Table II below describes how these developments are significantly addressing the five RDDS recommendations. The table also reflects progress made on sealed source disposal options beyond the framework presented by the Focus Group.

Table II. RDDS Focus Group Recommendations – Progress to Date

Recommendation A – Disposal Challenge 1	Progress to Date
Support ongoing DOE efforts to develop a disposal capability for GTCC LLRW. (This recommendation will also address Disposal Challenge 3 – Disposal of Sources Using Foreign-Origin Am-241).	DOE expects to issue a Draft Environmental Impact Statement which evaluates disposal alternatives for GTCC LLRW, including sealed sources containing high concentrations of short-lived radionuclides (e.g., such Cs-137 high-activity beta gamma sources) and long-lived radionuclides (e.g., Am-241 sources). The draft EIS will support the development of a disposal capability for the most hazardous sources (i.e., International Atomic Energy Agency Category 1 and 2 sources), with the notable exception of Co-60 sources, which are classified as either Class A or B LLRW when sent for disposal and are therefore addressed under Recommendation C. The solution would have to be supplemented by a disposal option for Class A, B, and C sources (particularly for high-activity Co-60 sources) and interim storage. ▪ February 18, 2011 - Draft GTCC EIS released http://nepa.energy.gov/1653.htm ▪ June 27, 2011 - Comments the draft due to DOE ▪ 2013 - Final EIS expected to be released ▪ Congressional approval of recommended alternative(s) must be obtained ▪ Some alternatives may also require legislation or legislative changes
Recommendation B – Disposal Challenge 1	**Progress to Date**

Concentration averaging of sealed sources for disposal at existing commercial facilities. The Branch Technical Position (BTP) allows the concentration of a radionuclide to be averaged over the volume of the waste, or weight of the waste and not limited to 30 Ci per 55 gallon drum. This creates the potential for higher activity sealed sources to be disposed of at existing commercial disposal facilities.	On September 6, 2011 NRC released a *Draft Branch Technical Position on Concentration Averaging and Encapsulation* which will update and revise the current 1995 BTP on concentration averaging. The draft includes several changes that increase the potential for commercial sealed source disposal. ▪ Increases Co-60 limit from 30 Ci to 140 Ci for Class A disposal (with no Class B limit), and Cs-137 limit from 30 Ci to 130 Ci for Class C disposal. ▪ Allows for shielding other than concrete and disposal containers other than the 55 gallon drum. ▪ Makes alternate provisions more prescriptive and less burdensome and introduces alternate approaches so that in some cases, Co-60 and Cs-137 sources with even higher activity levels can be disposed of commercially. Comments on current draft BTP were due on November 14, 2011.
Recommendation C – Disposal Challenge 2	**Progress to Date**
Case by case exemption by existing compacts for disposal of discrete numbers of high-risk sealed sources. Regional Compacts that currently have disposal access have the right under the 1985 *Low-Level Radioactive Waste Policy Amendments Act* to exclude or allow non-compact waste. These compacts currently exclude non-compact waste, but may be able to allow a specific waste stream such as sealed sources. This option could address Class A, B, and C sealed sources up to the site curie limits established by the current compacts.	The Waste Control Specialists commercial LLW disposal facility is expected to begin receiving commercial waste in early 2012. ▪ Will serve the Texas Compact (Texas and Vermont), including sealed sources ▪ May accept imported waste, including sealed sources; ▪ The draft Waste Acceptance Criteria are consistent with the more expansive sealed source disposal limits identified in the draft CA BTP In addition, Energy Solutions has applied for a license variance to accept Class A sealed sources.
Recommendation D – Disposal Challenge 2	**Progress to Date**
Physical destruction of Class A sources for	There are currently vitrification options

disposal as Class A LLRW. Some licensees are already engaging in physical destruction of Class A sealed sources on a very limited basis for disposal as Class A LLRW. (The existing facility which accepts Class A LLRW from generators in all states does not currently accept sealed source waste.) Encouraging this practice could represent an immediate disposition solution for a large number of Class A sealed sources.	for some very low-activity beta/gamma sources on a small scale. In addition, there are instances of destruction of some lower-activity beta/gamma sources on a small scale Because of the disadvantages of sealed source destruction, progress on other options for disposal of Class A sealed source disposition will likely reduce the applicability of this recommendation.
Recommendation E – Disposal Challenge 3	**Progress to Date**
Recommendation: Co-disposal of foreign-origin Am-241, Pu-238 and Pu-239 sources with domestic sources. Federal and State Governments should provide long-term secured storage of sources recovered from U.S. owners that contain foreign-origin americium and plutonium radioactive material, pending availability of a disposal pathway so that these sources can be recovered now, and increase efforts to investigate options for disposal of these sources.	▪ Pierce Bill ▪ Defense Determination under consideration

PROGRESS TO DATE ON TRANSPORTATION: A TALE OF TWO CONTAINERS

To address the lack of Type B transport containers and to help facilitate both domestic disposal and international repatriation of sources, GTRI/OSRP is currently working with the Los Alamos National Laboratory (LANL) on developing two new Type B containers. The first, formerly referred to as Little B and now known as the 435B, is an unshielded container designed to be a light-weight alternative for shielded heads with design documentation and usable for field operations with the IAEA mobile hot cell and long term storage shield (LTSS). This will facilitate repatriation of US- and foreign-origin sources. Testing of the 435B was completed in December and the test report will be submitted in mid-January. The design package is expected to be submitted to the NRC in May 2012 and with anticipated certification in May 2013. The 435B will facilitate the recovery by OSRP of approximately 35% of the OSRP backlog.

The second container, referred to as Big B, is intended to serve as a flexible, heavily-shielded container for the recovery of highest-activity Cs-137 and Co-60 sources. An optimization analysis of various design parameters was completed and a decision was reached on the best configuration based on transportation needs and requirements. Big B will be able to transport a minimum of 15,000 Ci of Co-60 and 40,000 Ci of Cs-137, with a payload of 10,000 pounds and a gross vehicle weight of 110,000 pounds. Phase 2 of container development, which includes receipt of conceptual design documents, fabrication, and design package, is scheduled to begin in early 2012.

PROGRESS TO DATE ON REPATRIATION

GTRI has been working with foreign regulators to repatriate vulnerable us origin sources and encouraging others Nations to do the same. GTRI representatives have been participating in meetings with the State Department, the NRC, and representatives of other major source-

exporting countries to discuss circumstances under which the source exporting countries would consider repatriating exported sources or devices and what type of support might be provided. Based on these discussions, these countries are developing best practices guidelines for source repatriation. One example of this effort is GTRI's collaboration with the Department of Foreign Affairs and International Trade Canada (DFAIT). In accordance with the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, an initiative created by the G8 at the Kananaskis Summit in June 2002 (the "Global Partnership"), DFAIT and GTRI have partnered to identify, secure, remove, and dispose of vulnerable, high-risk nuclear and other radioactive materials internationally. The first of such efforts is an ongoing project focused on the recovery and disposal of radioisotopic thermoelectric generators (RTGs) used in the Russian Federation. These generators generally use a large amount of Sr-90, a highly risk-significant type of radionuclide. This partnership effort includes recovery, decommissioning, securing, disassembly, and safe and secure transportation of the devices prior to final disposal in the Russian Federation. The devices are also replaced with alternative power sources. The most recent initiatives undertaken by DFAIT and GTRI have centered on repatriation of Canadian-origin sources, primarily from South America, with plans to expand work into Africa. The partnership between Canada and the US is reflective of the urgency of efforts to help prevent the theft of and unauthorised access to high-risk radioactive materials, including sealed sources.

CONCLUSION

Disused sealed sources continue to pose a national security concern. The impact of a dirty bomb detonation could be costly both financially and to those exposed to the resulting radiation. However, significant progress has been made since 2008 on each of the challenges identified in the DHS Sealed Source Security Workshop. Not only will there be increased opportunity for commercial disposal of many sizes and types of sealed sources, but also stakeholders are studying front-end solutions to the problem of disused sealed sources, such as financial assurance and recycle. The lack of sealed source transport containers is also likely to be mitigated with the development and certification by NNSA of two new Type B models. Internationally, increased efforts at source repatriation will mitigate the threat posed by disused sealed sources abroad. Sealed sources provide irreplaceable benefits to those who use them or who benefit from their use; now stakeholders are rising to the challenge of ensuring that those benefits are safely and securely realized.

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Appendix A – Removal and Disposition of Disused Sources Focus Group Participant List

Name	Agency/Organization
Allard, David	Conference of Radiation Control Program Directors and Organization of Agreement States/Pennsylvania
Anderson, Curtis	National Nuclear Security Agency (NNSA)/MELE Associates, Inc.
Buzzell, Jennifer	Centers for Disease Control

Clarke, Devane	Texas Commission on Environmental Quality
Coggins, Terry	Mississippi St. University
Coleman, Norm	National Institutes of Health
Cuthbertson, Abigail	Department of Energy/NNSA
Cutler, Kirsten	Department of State
Dallman, Lee	Ohmart/Vega Corp
Devine, Terry	Conference of Radiation Control Program Directors
Dornsife, Bill	Waste Control Specialists
Elsen, Mike	Conference of Radiation Control Program Directors/Washington
Fairobent, Lynne	The American Association of Physicists in Medicine
Ferguson, Charles	Council on Foreign Relations/NNSA
Gallaghar, Bob	Conference of Radiation Control Program Directors-Organization of Agreement States/Massachusetts
Gallego, Rich	Thomas Gray and Associates, Inc
Hageman, John	Southwest Research Institute
Hansen, Annette	Philotechnics
Harness, Kyle	Ohmart/VEGA Corp
Haynes, Richard	Conference of Radiation Control Program Directors/South Carolina
House, William	Energy Solutions/Barnwell
Joyce, Jamie	Department of Energy/Environmental Management
Kroeger, Nathan	Rad Source Technologies, Inc.
Martin, David	Department of Homeland Security, Nuclear Sector-Specific Agency/Energetics Incorporated
McBurney, Ruth	Conference of Radiation Control Program Directors
Miller, John	International Isotopes, Inc.
Natarajan, Nitin	Department of Health and Human Services
Passetti, Bill	Conference of Radiation Control Program Directors-Organization of Agreement States/Florida
Plapp, Brendan	Department of State
Renquist, Cary	Eckert-Ziegler
Ribaudo, Catherine	National Institutes of Health/Radiation Safety
Rogers, Alice	Conference of Radiation Control Program Directors/Texas Department of State Health Services
Roughan, Kate	QSA Global
Schultheisz, Daniel	Environmental Protection Agency
Selig, Edward	Advocates for Responsible Disposal in Texas
Shaffner, James	Nuclear Regulatory Commission
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