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Office of Radiological Security: Global Cesium Security Initiative

January 2018

National Nuclear Security Administration

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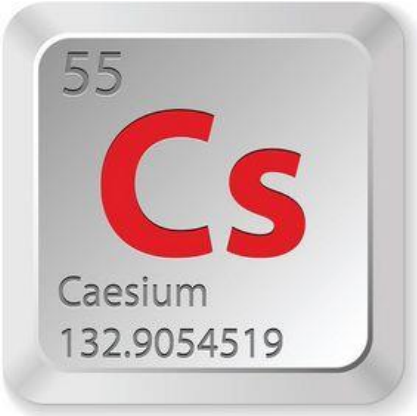
What is Cs-137?

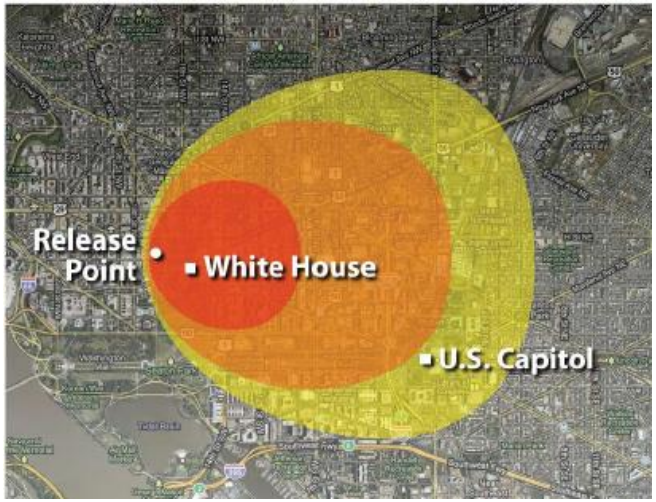


Stable cesium is a naturally occurring, soft, highly reactive metal

Cesium-137 is a man-made radioactive isotope

Cs-137 is extracted from spent nuclear fuel

Cs-137 usually takes the form of cesium chloride, which is soluble and easily dispersed



Potential depositional footprint associated with a 1,000 Ci Cs-137 RDD (Source: "Dirty Bombs": Technical Background, Attack, Prevention and Response, Issues for Congress, Congressional Research Service, June 24, 2011)

Industrial gauges (1 Ci)

Soil moisture / density gauges (10 mCi)

For commercial use, Cs-137 is packed into sealed sources

The NRC considers quantities > 27 curies (Ci) to be a security concern

Blood irradiators (>1,000 Ci)

Research irradiators (> 1,000 Ci)

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Only a few curies of radioactive materials, such as high-activity cesium-137, could result in a significant RDD. A salt shaker could hold several thousand curies of material.

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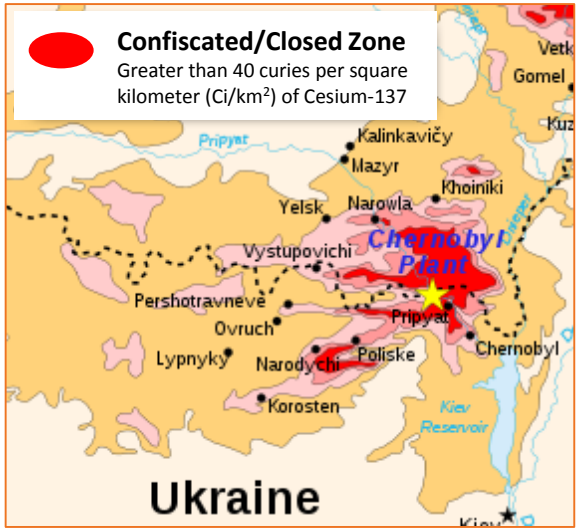
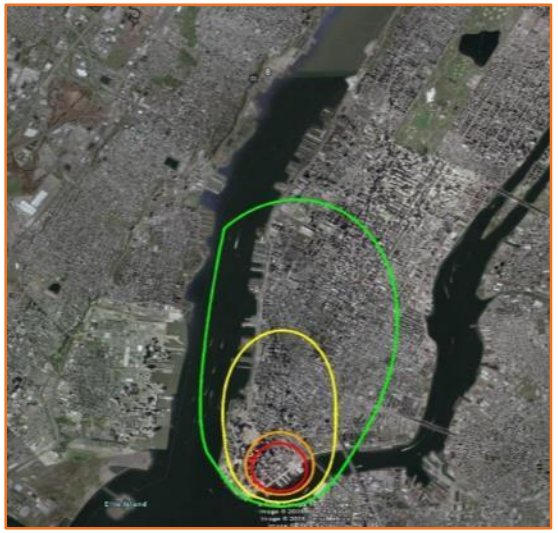
Dispersed Cs-137 has created large scale consequences around the world



Chernobyl exclusion zone (area near plant)

Goiania cleanup activities



NYC Dispersion Analysis

Chernobyl: *Uninhabited area - 30 km² (approximately half the area of Manhattan)*

Goiania: *40 tons of rad-waste from a 3.3 oz. source*

NYC RDD Analysis: *Relocation area 18 km²*

(approximately 30% the area of Manhattan or 2000 city blocks)

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A New Approach to a Complex Issue: Global Cesium Security Initiative (GCSI)

The GCSI partnership initiative aims to expand and accelerate efforts to enhance the security of Cs-137 devices worldwide

PROTECT

PROTECT cesium-137 sources used for vital medical, research, and commercial purposes

REMOVE

REMOVE and dispose of disused cesium-137 sources

REDUCE

REDUCE the global reliance on cesium-137 by promoting the adoption and development of non-radioisotopic alternative technologies

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GCSI Strategies

Strategic Mission: The GCSI aims to expand and accelerate global efforts to enhance the security of Cs-137 devices worldwide

1 **Site Security**	• Enhance security at Cs-137 buildings to achieve containment or permanent risk reduction ➢ Containment achieved with IDD and response integration ➢ Permanent risk reduction through Reduce/Remove
2 **Alternative Technologies**	• Promote permanent risk reduction of Cs-137 irradiators ➢ Reduce the number of Cs-137 devices through replacement with non-radioisotopic alternative technologies
3 **End-of-Life Management**	• Support removal, disposal, and consolidation of Cs-137 sources
4 **Sustainable Security**	• Collaborate on sustainable threat reduction ➢ National-level regulations, inspection programs, transportation security, response, and comprehensive inventory ➢ Site-level security plans, maintenance, procedures, response
5 **Stakeholder Collaboration**	• Conduct technical collaboration and outreach with a broad range of government and industry stakeholders to further the security of Cs-137 worldwide.

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GCSI Security Enhancements & Response Engagement

DETECT
Prompt Detection and Reliable Notification

Remote Monitoring System: *Fully networked, hardened, and encrypted security monitor*

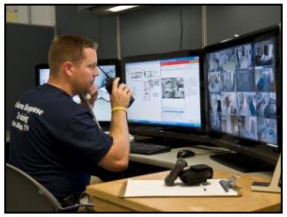
Multi-Factor Access Control: *Requires combination of card, pin, or biometric scan for entry*

DELAY
Extended Adversary Task Time

Hardened Doors

Facility Hardening

RESPOND
Timely, Aware, Equipped and Trained Response



Centralized Monitoring Stations

Response Planning

TRAIN
Security and Response Training

Alarm Response Training

Security Planning, Regulatory Development, Inspections Training

Containment Achieved with In-Device Delay and Response Integration

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GCSI Security By Design: In-Device Delay (IDD)

- Passive barrier
  - Attached directly to the shielding
  - Underneath the irradiator covers
  - Over likely point(s) of source removal
  - Cost < 5 % of device cost
- Barriers are typically comprised of:
  - Multiple steel plates
  - Concealed tamper resistant hardware
  - Penetration resistant materials (resists hand, power, and thermal tools)
- Regulatory approvals
  - United States Nuclear Regulatory Commission – Amended Sealed Source Device Registration Certificate for IDD upgrades
  - Canadian Nuclear Safety Commission – Amended Certificate for Radiation Device for IDD upgrades
- IDD kit certified to not affect device operation, maintenance, or safety
  - Over 550 installed in the United States
  - International installations are underway
  - Device manufacturer performs the installation

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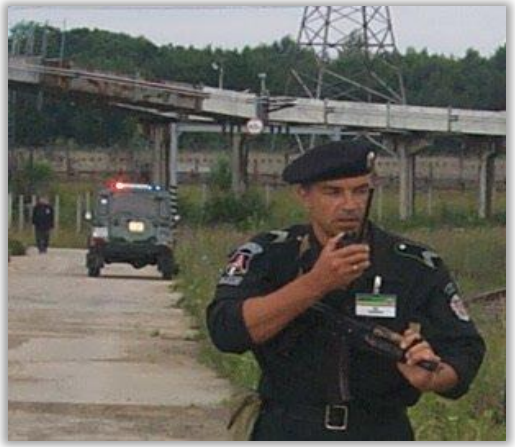
When and Why Install an IDD Kit?

When should an IDD kit be installed?

- When radiological device replacement by an alternate technology is not a near-term option AND
- the radiological device is planned for long-term use AND
- is not planned for removal/disposal in the near future.

Why should an IDD kit be installed?

- To provide 20+ minutes of additional access delay time after detection of an adversary to allow time for local law enforcement to respond.
- Mitigation of insider threat.



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GCSI Alternative Technology Engagement

ORS is working with partners to REDUCE the global reliance on cesium-137 by promoting the adoption and development of non-radioisotopic alternative technologies. Projects include:

Procurement of a new alternative technology device, e.g. X-ray irradiator

Support for the removal and consolidation of the existing Cs-137 irradiator

Installation and commissioning of the alternative technology device, to include limited equipment and/or room modifications necessary to operate the device

Technical exchanges and/or outreach to subject matter experts in the field

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GCSI End-of-Life Management Solutions

Reuse & Recycle

- ORS supports the concepts of reuse and recycle of radioactive sources as best practices in the IAEA's Code of Conduct on the Safety and Security of Radioactive Sources.

Consolidation

- ORS supports packaging, transportation, and emplacement of disused radioactive sources into secure storage/disposal in partner countries.

Repatriation

- ORS, on a case by case basis, repatriates US origin sources from international locations in agreement with political commitments to the IAEA's Code of Conduct on the Safety and Security of Radioactive Sources. These repatriated sources are consolidated then dispositioned at DOE disposal facilities.

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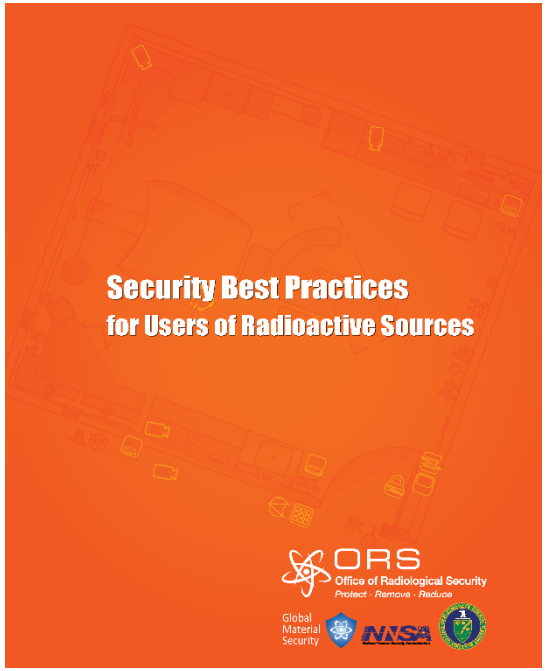
Sustainable Security

ORS Supported Sustainability Elements	
National Level	• Regulatory Development • Security Inspections Planning • Transportation Security • National Response Engagement • Comprehensive Inventory
Site Level	• Security Plan Development • Site/Responder Interaction • Training Job Knowledge • Maintenance & Testing • Budget/Lifecycle Planning



ORS has developed enabling tools and templates to support sustainability elements.

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Stakeholder Collaboration

- Collaborate with international partners to share lessons learned and promote best security practices.
- Explore the possibility of industry security standards.
- Work in partnership with industry to develop security-by-design solutions and address technology gaps for suitable replacement technologies.

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