

Module A

Physical Security for Radioactive Materials: Introduction



Workshop Sponsors/Hosts



- DOE/NNSA Global Threat Reduction Initiative (GTRI)



- Radiacinės Saugos Centras



- Sandia National Laboratories



Why Are You Here?

- Owner, user, protector, responder, or regulator of radioactive material.
- International concerns about malicious acts involving nuclear and radioactive materials.
 - Theft of radioactive material for RDD or RED
 - Sabotage of facility or transport
- Common understanding and basis.



Radioactive Source Material



- Used in a wide variety of industrial, medical, agricultural and research practices.

- Characteristics of radioactive sources include:

Radioisotope (Cobalt-60, Cesium-137, Strontium-90, Iridium-192)

Activity (# of disintegrations per second - Becquerel)

Form (sealed or encapsulated –vs- unsealed)

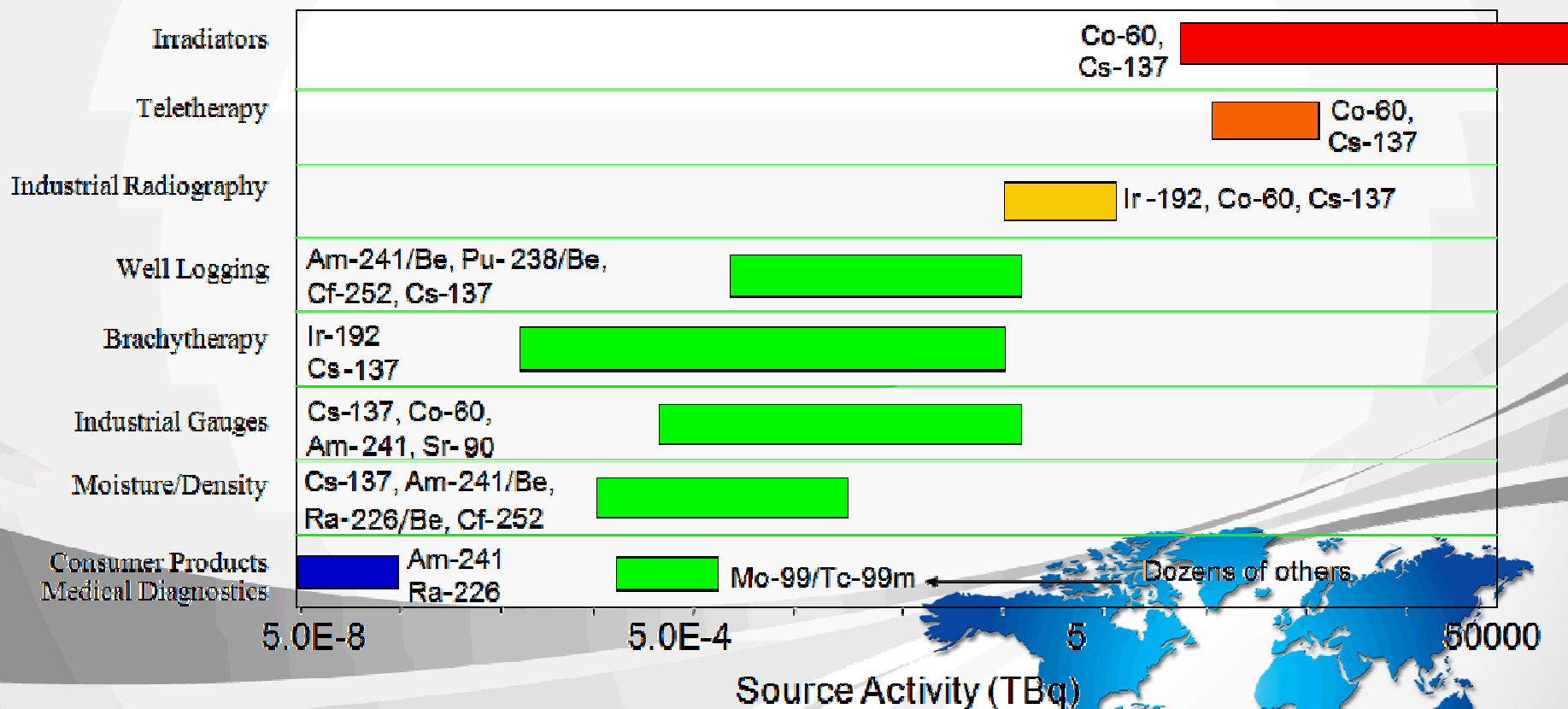
Chemical and physical properties

Device operation and design


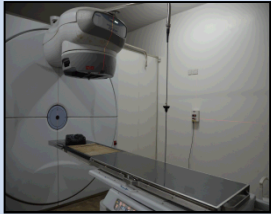


- May be used in fixed locations or may be mobile.



Uses of Radioactive Material



Beneficial Uses of Radioactive Sources

Device	Radionuclide	Use	Example
Irradiators	Co-60 56 to 110 TBq Cs-137 37 to 440 TBq	<ul style="list-style-type: none"> Sterilization (commercial products, food, medical devices, blood, etc.) Research applications (universities). Devices are fixed. 	
Teletherapy	Co-60 37 to 560 TBq Cs-137 19 to 56 TBq	<ul style="list-style-type: none"> Cancer treatment. Devices are fixed. 	
Industrial Radiography	Ir-192 0.19 to 7.4 TBq	<ul style="list-style-type: none"> Commercial materials integrity testing. Petrochemical operations. Devices are portable.. 	
Brachytherapy	Ir-192 0.37 to 0.74 TBq	<ul style="list-style-type: none"> Cancer treatment. Devices are portable. 	

Tomsk-7 Accident: Seversk, Russia



- Overpressure and a fire in a radioactive chemical processing building
- ~40 Ci of fission products released
- 89 km² of land contaminated
- 0.8 km² of land required decontamination



Goiania Brazil 1987



Used with Permission from Carlos de Oliveira-Noriega, IAEA



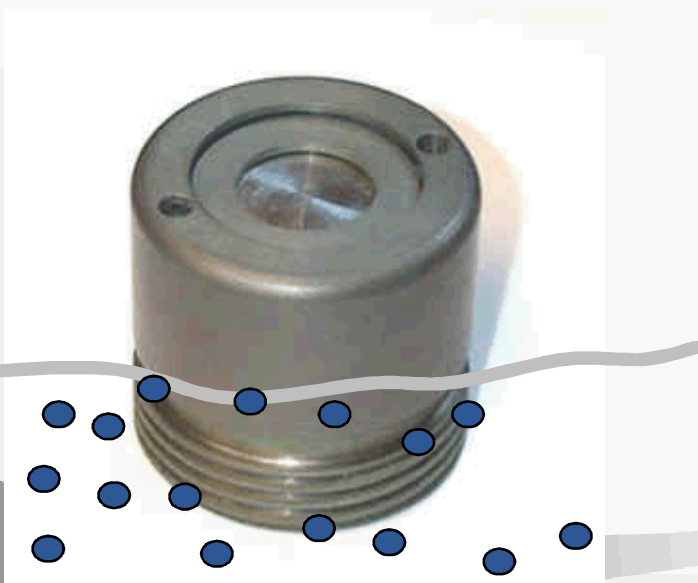
Goiania: The Facts

An unsecured ^{137}Cs source was abandoned in a building where a radiotherapy clinic used to function. The source activity was 50 TBq.



Goiania: The Facts

Ruptured sealed source capsule

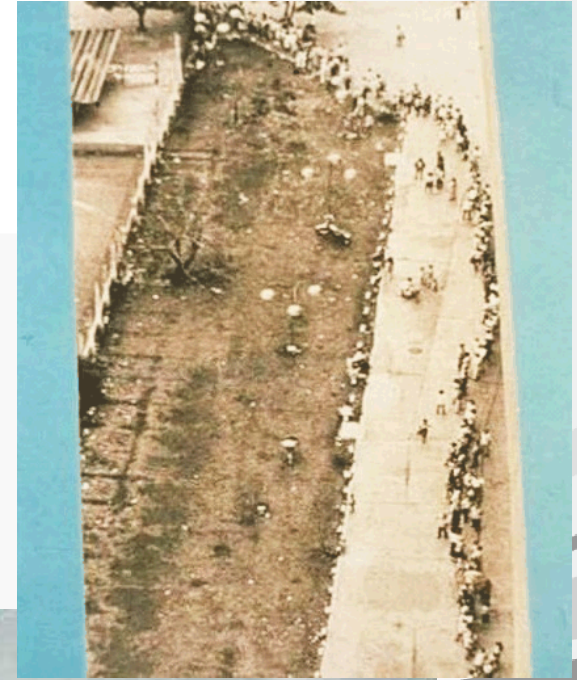


Sold to a junkyard



Impact to Local Population

- Persons monitored = 112,800
- Persons contaminated = 271
 - Clothes and shoes = 120
 - Skin & internally = 151
- Radiation injuries = 28
- Hospitalized = 20
 - Bone marrow depression = 14
 - Acute radiation syndrome = 8
 - Fatalities within 1 month = 4



Contaminated Sites & Surroundings

- 159 houses monitored, 101 houses contaminated
- 200 persons evacuated from 41 houses
- 42 houses decontaminated, 6 demolished, and 53 recuperated

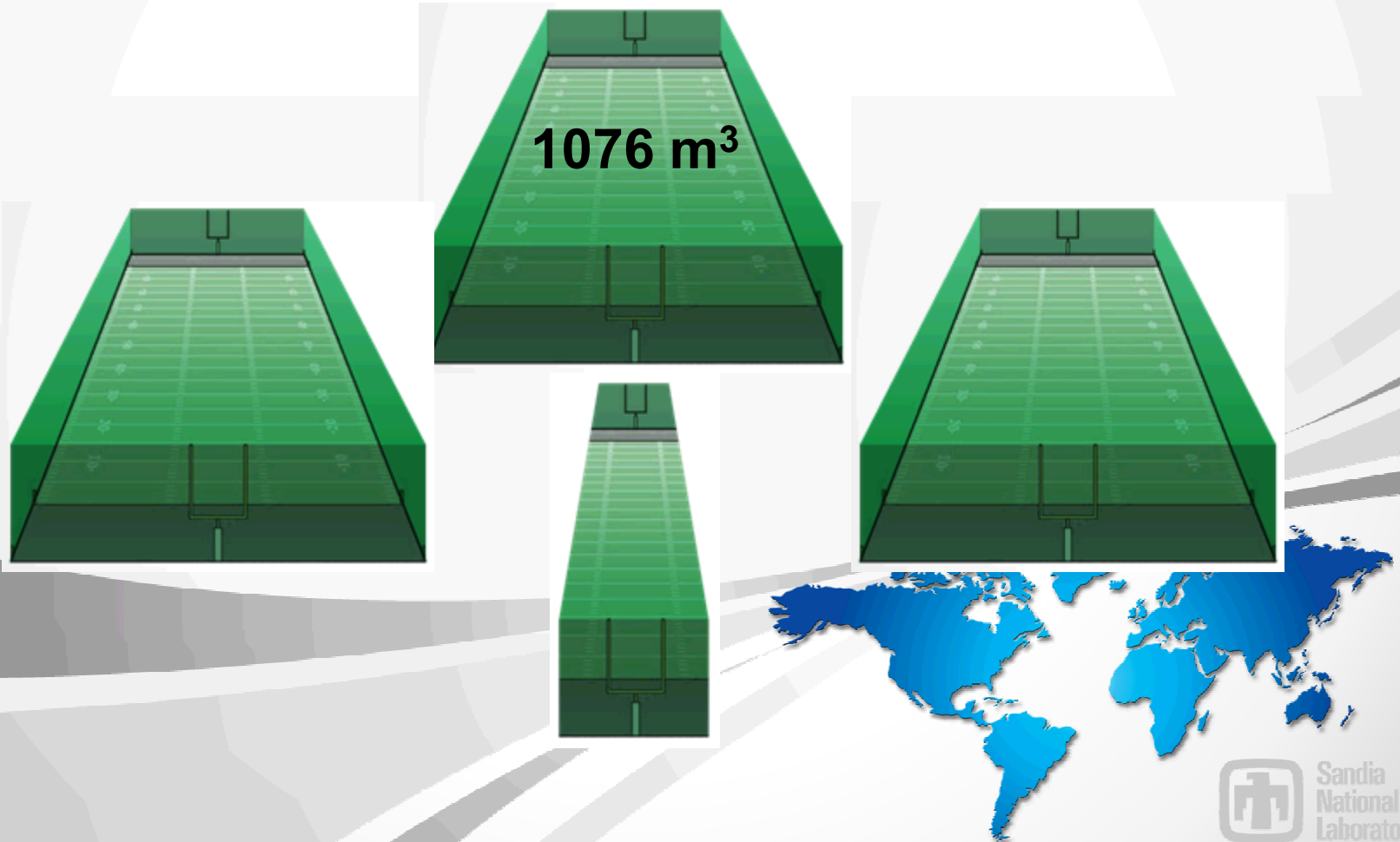


A: IGR clinic	G: Physicist W.F.'s house
B: Source first exposed	H: Olympic stadium
C: Junkyard I	J: General Hospital
D: Junkyard II	K, L: Other contamination points
E: Junkyard III	M: Initial CNEN command post
F: Vigilância Sanitária	N: Present CNEN office

FIG. 7. Plan of Goiânia showing the principal sites of contamination.



Amount of Waste Generated =
3500 cubic meters



Materials of Nuclear Security Concern

- Nuclear material (e.g., HEU, Pu)
- Radioactive sources
- Nuclear and radioactive waste
- Radioactively contaminated material



Categorizing Radioactive Sources

IAEA Safety Standards
for protecting people and the environment

Categorization of
Radioactive Sources

Safety Guide
No. RS-G-1.9



- IAEA Safety Guide: RS-G-1.9
- Currently used as international basis for security measures.



UN Security Council Resolution 1540

- Direct link to CPPNM and Code of Conduct
- Requires specific measures for protection of WMD (including nuclear weapons and related material)
 - Unauthorized activities prohibited
 - Criminal laws — punish offences
 - Account for and secure material
 - Effective physical protection
 - Effective border controls and law enforcement to detect, deter, prevent and combat illicit trafficking
 - Effective import/export regulations
- States to cooperate with IAEA

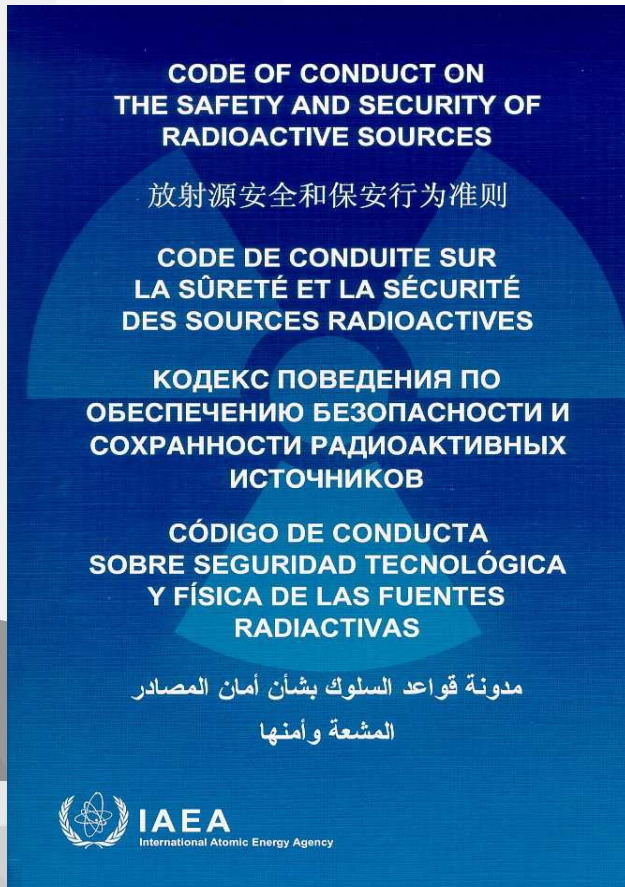


International Convention for the Suppression of Acts of Nuclear Terrorism

- In force since 7 July 2007
- Adopted by the UNGA on 13 April 2005
- Status: 120 signatories, 60+ ratifications
 - Details offences relating to unlawful and intentional possession and use.
 - Parties required to adopt measures as necessary to criminalize offences.
 - Parties “to make every effort... to ensure the protection of radioactive material, taking into account relevant recommendations and functions of the International Atomic Energy Agency.”



Code of Conduct on the Safety and Security of Radioactive Sources

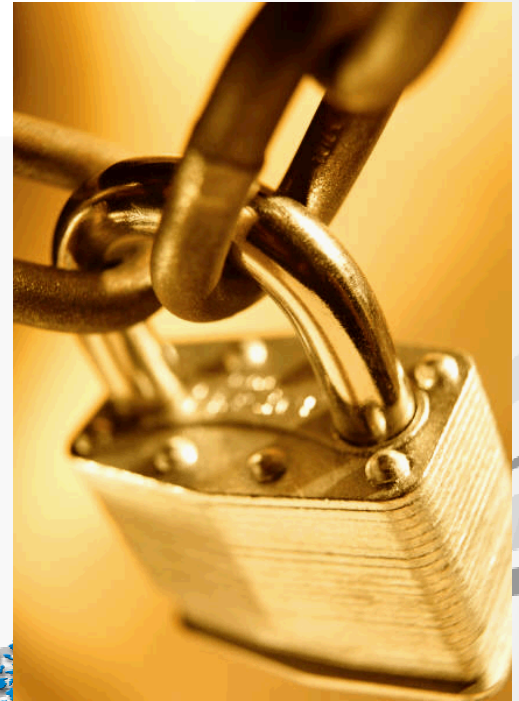


- International instrument for safety and security of radioactive sources
- Provides basis for international guidance on security

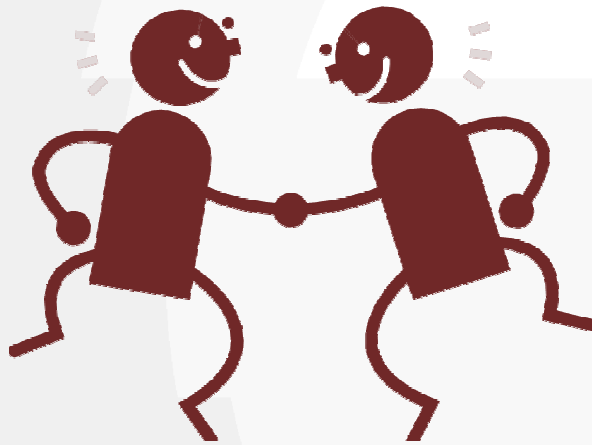


Workshop Learning Objectives

- Gain appreciation the importance of security of radioactive materials.
- Recognize elements of physical security and their roles in protection of radioactive materials.
- Develop better understanding your role in physical security.



Participant Introductions



- Name
- Organization/Responsibility
- Expectations for Workshop



Summary

- International concern about Nuclear Security
- Workshop tailored to Lithuania



Radiacinės
saugos
centras



Sandia
National
Laboratories