

The Office of Radiological Security Perspective on Alternative Technology



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Global
Material
Security



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- The risk of radiological terrorism
- The Office of Radiological Security (ORS)
- What are alternative technologies?
- ORS alternative technology strategies
 - Policy
 - Education & outreach
 - Federal incentives
 - Research, development, testing, & evaluation
- Areas of interest



Consequences of Radiological Terrorism

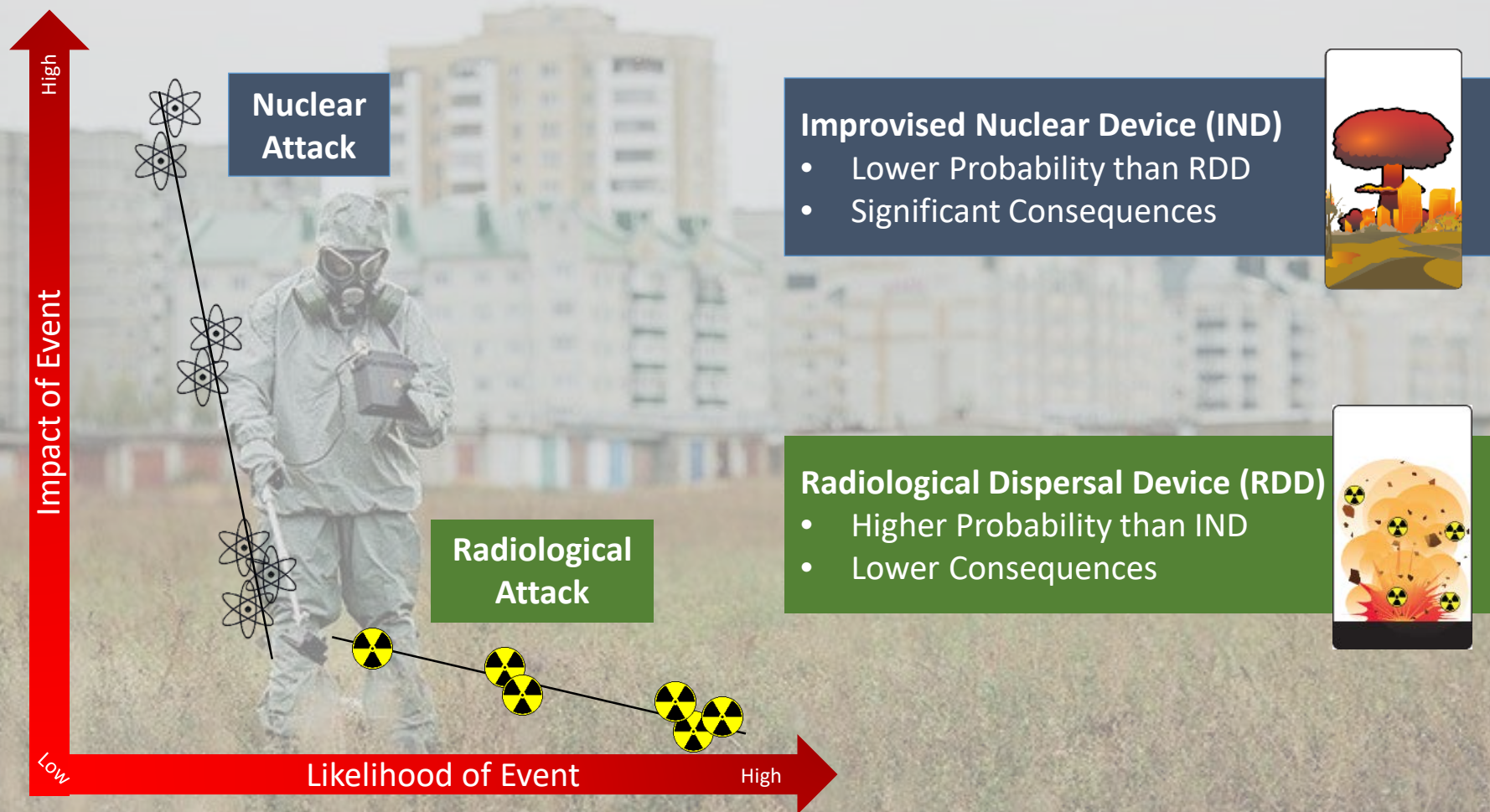


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Nuclear vs. Radiological Terrorism Risk



Enhance global security by preventing high-activity radioactive materials from being used in acts of terrorism.



High Activity Sources



Co-60 (Cobalt -60):

Teletherapy and Gamma Knife units (cancer treatment), self-shielded and panoramic irradiators (research and sterilization)

Radionuclide	Normal Device Activity (Ci)
^{60}Co	1,000 – 1,000,000+
^{241}Am	8 – 20
^{192}Ir	10 - 100
^{137}Cs	1,000 – 50,000

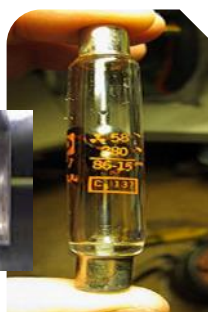
Cs-137 (Cesium-137):

Self-shielded irradiators (research and sterilization) and calibrators (dosimeter and detector calibration)



Ir-192 (Iridium-192):

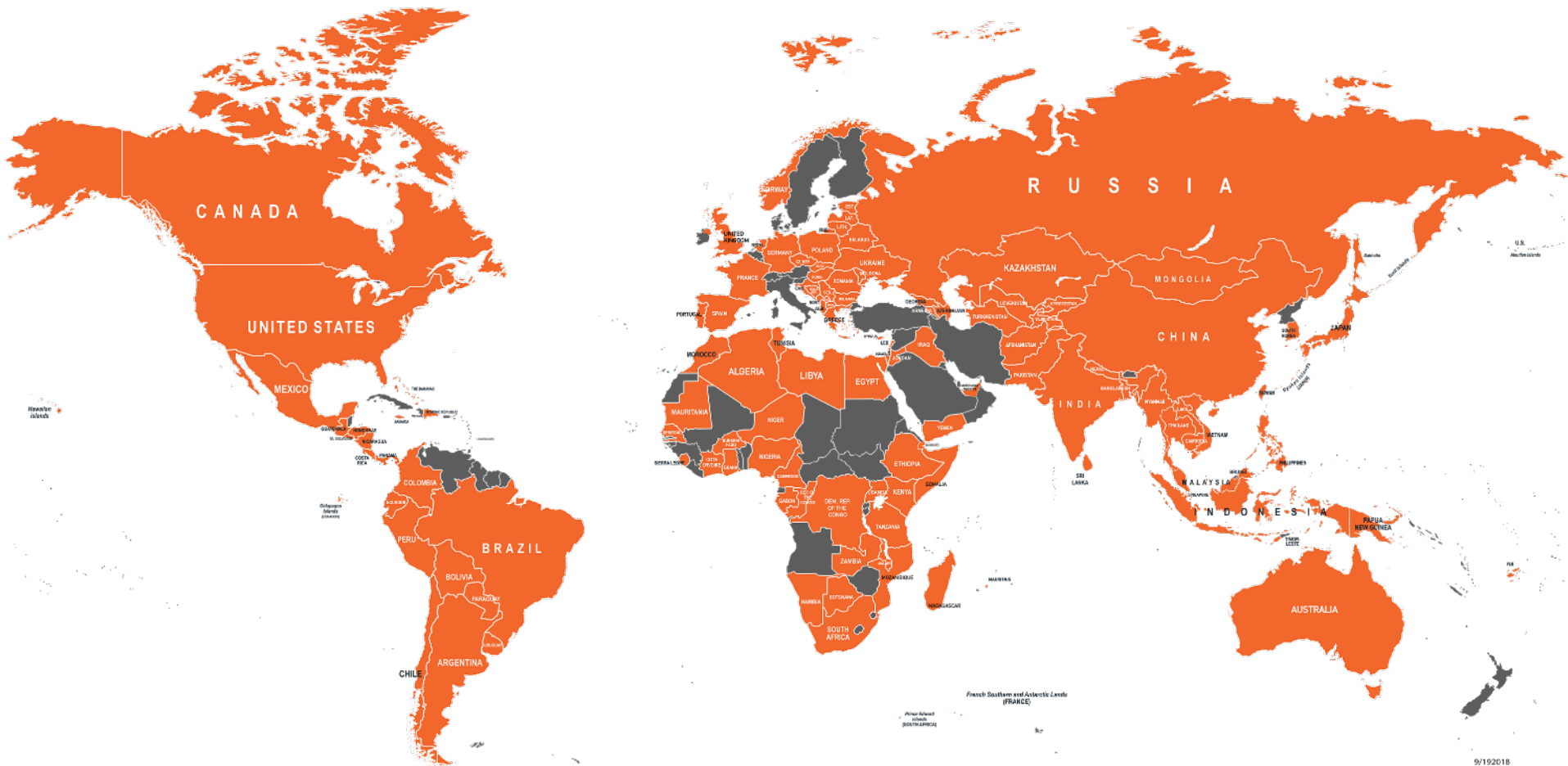
Radiography (industrial imaging)



Am-241 (Americium-241):

Oil well logging (industrial imaging)





9/19/2018



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MISSION: The Office of Radiological Security enhances global security by preventing high activity radioactive materials from use in acts of terrorism.

PROTECT

PROTECT radioactive sources used for vital medical, research, and commercial purposes



REMOVE

REMOVE and dispose of disused radioactive sources



REDUCE

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



What Are “Alternative Technologies”?

Technologies which do not contain radioactive materials that perform an equivalent (or better) function as a comparable device

Alternative technologies may emit ionizing radiation, like **X-ray irradiators**, or they may not, like **UV pathogen reduction systems**

Application Examples

- Blood Irradiation
- Research Irradiation
- Sterile Insect Technique
- Food/Phyosanitary Irradiation
- Radiotherapy
- Medical Device Sterilization
- Plastic polymerization

Alternative Technology Examples

- Self-shielded X-ray Irradiators (generators)
- Industrial E-Beam & X-ray Conversion
- Linear Accelerators (LINAC)
- UV Pathogen Reduction
- Neutron Generators

New applications & technologies yet to emerge...

Benefits of Alternative Technology

- Greatly reduced security procedures, requirements, costs
- Elimination of terrorism risk & potential liability
- Reprieve from complicated & costly end-of-life disposition
- Potential for expanded capabilities or technical performance
- Steady device throughput—no source decay!
- Opportunities to consider upgrades as technology advances

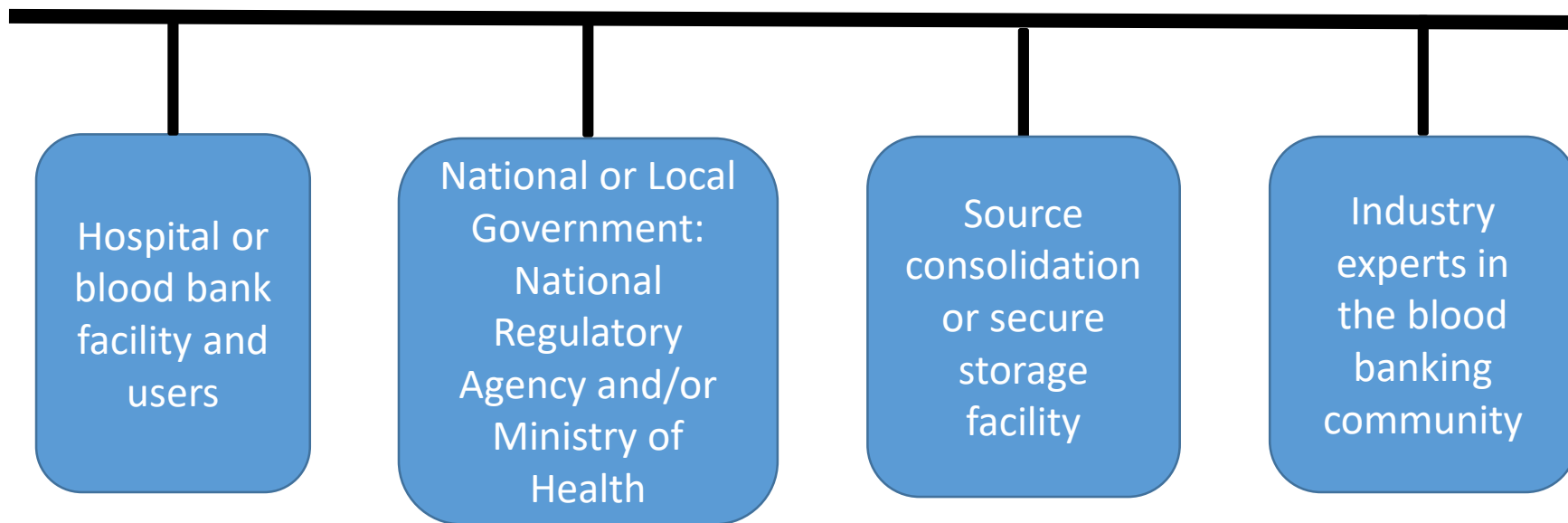


Should we consider an alternative technology for our facility?

- **Cost**
- **Facility & Maintenance Needs**
- **Device Preference & Training Needs**
- **Research or Clinical Standards**
- **Operational Protocols**
- **Technical Performance**
- **Schedule Requirements**
- **Government and Industry Approvals, Licensing, or Accreditations**

Partnership Approach

- It is necessary to assess the financial, clinical, and operational needs of the facility and its users before making the determination to switch technologies.
- Communication among multiple stakeholders ensures a successful initiative.



ORS Reduce Strategy

The ORS **REDUCE** Strategy:

- Supports the adoption and development of non-radioisotopic devices to achieve **permanent risk reduction** by reducing the footprint of risk-significant radiological materials
- Alternative technologies are commercially available for most applications of high-activity radioactive sources



Policy Engagement



Device Replacements



Outreach & Education



Research

ORS Reduce (Alternative Technology) Strategy

Outreach and Education



Organize targeted workshops to increase awareness of security concerns and technology options



Provide educational materials via websites, email, Twitter, handouts:

- Brochures and fact sheets
- Videos



Present papers or exhibit booths at industry conferences



Meet directly with source users to discuss source security and technology options, including source alternatives

ORS Device Replacements: U.S.

Cesium Irradiator Replacement Project

A voluntary initiative offering financial incentives to U.S. licensees who choose to replace Cs-137 self-shielded irradiators with alternative technologies.

Sites Receive:

- Removal of the Cs-137 device through the Off-Site Source Recovery Project (OSRP)
- A financial incentive toward the purchase price of an X-ray machine (typically 50%), paid as a reimbursement

Initiative	Irradiator Application	Irradiators to be Replaced
University of California	Blood & research	90%
New York City	Blood & Research	75%
Atlanta	Blood & Research	66%
Vitalant	Blood	100%

Progress to Date

- **135** irradiators replaced
- **30%** of the U.S. inventory currently being replaced

ORS Device Replacements

- Many countries **already using or transitioning** to non-radioactive source-based alternative technologies, although there are continued **complex challenges**
- Alternative technologies are part of a **comprehensive strategy** for **risk mitigation** in radiological security & promoted in different ways internationally via regulations, legislation, or commercial measures.

Ad hoc Working Group meeting – 5th annual meeting, over 60 participants from 26 countries!

ORS works with targeted international partners to develop alternative technology consideration via political engagement, outreach, implementation, or technical exchanges.

- **Collaboration with NNSA Office of Nonproliferation R&D**
 - Small Business Innovative Research (SBIR)
 - DOE Labs, universities
- **Technology research comparison studies**
 - Medical product materials sterilization
 - Biological research
 - Sterile Insect Technique
- **Policy & industry landscape studies**
 - Cost studies, Implementation feasibility
- **Technology demonstration Projects**
 - Flat panel X-ray source
 - Superconducting LINAC for industrial sterilization
 - Support for radiotherapy LINAC at the IAEA



Areas of Interest, Overall

- Awareness of technology options and their capabilities
- Understanding of technical or operational differences between technologies
- Availability of technologies deemed technically, operationally, and economically acceptable by relevant decision makers
- Infrastructure and resources necessary to sustainably maintain & operate devices with trained personnel in some environments
- Regulatory barriers for some applications
- Impact of information, resources, or policies supporting end-of-life management for disused radioactive sources (or the lack thereof)



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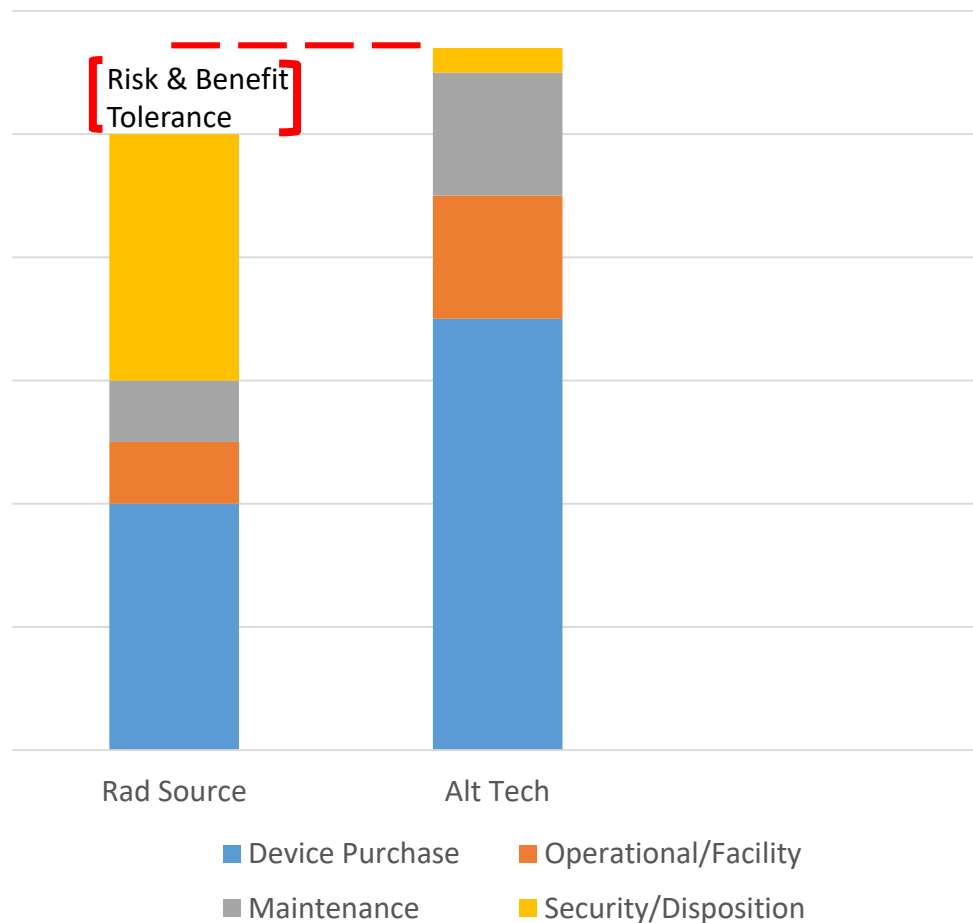


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Device Replacement Cost Comparisons

Example Costs



- Costs may not have an equal comparison.
- Cost sensitivity will depend on who is responsible for which portion of that budget. (Example: Security vs. Equipment)
- Need to consider Risk & Benefit tolerance for the operators and the organization – risk of RDD? Time or patient efficiency benefits?

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