

SOLUTIONS^{for} SECURE NUCLEAR FUTURE

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Finishing the Race: Eliminating and Minimizing Fissile Materials and High-Risk Radioactive Sources

Radioactive Sources
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Reducing Risks from Radioactive Sources: Some Useful References

- C. D. Ferguson, T. Kazi, J. Perera, Commercial Radioactive Sources: Surveying the Security Risks, Center for Nonproliferation Studies, Occasional Paper No. 11, January 2003.
- C. D. Ferguson and J. O. Lubenau, article in Issues in Science and Technology, Fall 2003. (raised issue of alternative technologies)
- Various Government Accountability Office reports since 2003
- U.S. National Academy of Sciences 2008 Report on Alternative Technologies.
- U.S. Government Interagency Task Force Reports from 2010 and 2014.
- G. M. Moore and M. A. Pomper, Permanent Risk Reduction: A Roadmap for Replacing High-Risk Radioactive Sources and Materials, CNS, Occasional Paper 23, July 2015.
- Other papers and articles by M. A. Pomper and colleagues at CNS and other NGOs.

What are Factors that Increase Riskiness of Radioactive Sources?

- Portability and mobility
- Easily dispersible
- Highly radioactive (value of half-life & specific activity)
- Extensively used
- Used in places without adequate security and ease of access
- Lax regulatory or other controls



High-Risk Radioactive Materials (not all inclusive)

Major radioisotopes of security concern:

Internal Health Hazards (Mainly):

- americium-241 (433 years)
- californium-252 (2.7 years)
- plutonium-238 (88 years)
- radium-226 (1600 years)

Internal and External Health Hazards:

- cesium-137 (30 years) [barium-137m, 2.6 minutes]
- cobalt-60 (5.3 years)
- iridium-192 (74 days) [yttrium-90, 64 hours]
- strontium-90 (primarily internal hazard) (29 years)

Other lists include up to 16 radioisotopes.

Risk Reduction Methods

- Reduce malevolent actors
- Increase security
- Increase regulatory controls
- Phase out high-activity radioactive sources with alternative technologies → permanent risk reduction



Risk

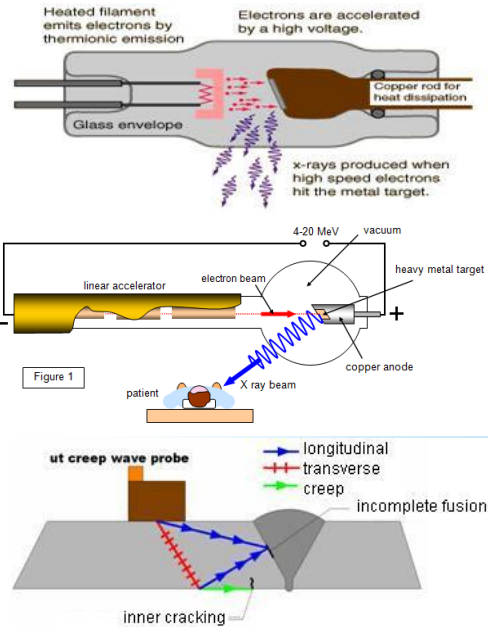
Principle of Justification

- Evaluate risks and benefits
- Users should opt for non-radioisotope or even non-radiation alternative if there is one that provides comparable benefits with less risk including factoring in waste management risk.



Progress is Being Made

- X-ray irradiation for blood irradiation
- Alpha particle accelerators for neutron sources in oil well logging
- LINAC for teletherapy cancer treatment
- Ultrasonics for radiography of welds
- Eddy currents and thermal imaging for neutron gauges in steel industry



Some Notable Countries That Have Made Significant Progress

- France
- Japan
- Norway
- Finland
- Italy
- Netherlands

Why?

- Public concern about use of radioactive materials
- Strong adherence to Principle of Justification
- Encourage domestic industries

Challenges to Further Adoption and Development of Alternatives

- Developing countries lacking reliable electricity
- Data standards—research irradiation and oil well logging
- Sunk costs in radioactive source devices
- Training technicians on new systems
- Some alternatives may have higher up-front costs but need to weigh against disposal costs for radioactive sources
- Comfort level with using radioactive sources
- Companies continuing to market radioactive sources

Disposal Facilities

- Lack of adequate number of facilities
- Restrictions on use
- High cost
- Transport and storage containers
- Orphaned sources



Notable Statements from 2014 NSS

- France: “minimizing use of high activity sealed sources where it is technically and economically feasible” – specifically mentioned use of X-ray method to replace CsCl for blood irradiation
- U.S. progress report: “intends to establish an international research effort on the feasibility of replacing high activity radioactive sources with non-isotopic replacement technologies with the goal of producing a global alternative by 2016.”

Recent U.S. Initiative

- National Science and Technology Council has recently announced creation of the Group on Alternatives to High-Activity Radioactive Sources (GARS)
- Focus on blood and research irradiators, medical device sterilization, and stereotactic radiosurgery
- Meeting to be convened on April 7 in Arlington, VA

