

Controlling and Minimizing Radioactive Sources
Solutions for a Secure Nuclear Future
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Introduction

Securing radioactive sources presents a unique and complex challenge due in large part to their diverse physical properties, applications and operating environments. Considerably more prevalent than nuclear materials, radioactive sources are used throughout the world for medical, industrial, agricultural, research and other purposes. Sources include radioactive materials that are encapsulated in solid form and can range from iodine seeds used for internal radiotherapy treatment, to industrial irradiators – weighing several tons, used for large-scale sterilization at fixed facilities. Sources can be found at both hospitals in city centers, through which thousands of people pass daily, and highly remote locations, where individuals or small teams use portable devices for a variety of industrial purposes.

Threats to radioactive sources are similarly diverse, with the historical record containing numerous incidents of sources stolen by insiders and external adversaries for reasons that include revenge, disgruntlement and financial gain. In February 2016 a strong radioactive source was stolen while in transport in San Juan del Rio, the third such incident to have occurred in Mexico within the past three years.¹ Sources have also been trafficked across international borders by criminal networks and others, with the IAEA's Incident Trafficking Database (ITDB) recording tens of incidents a year, where radioactive materials has been recovered from outside of regulatory control.² Certain terrorist groups have also actively sought radioactive sources due to their asymmetric properties, particularly when it comes to disruption. This threat is arguably increasing due to the growth of increasingly violent radical terrorist organizations – groups bent on killing and wreaking havoc on a massive scale – as evidenced by ever-more brutal attacks in the Middle East, in Europe and beyond.

In analyzing the potential consequences of the malicious use of radioactive sources there are thankfully relatively few incidences upon which to draw. However, these together with relevant safety-related cases have demonstrated that in the wrong hands these materials can be used to cause injuries and death, and have significant disruptive and psychological effects. This is vividly illustrated by the widely referenced examples of a cesium chloride sources that was scavenged from a disused hospital in Goiânia in 1987 and unintentionally spread throughout a local community.³ Resulting in deaths and injuries, this accident also had significant disruptive, economic and psychological with cost estimates putting these in the tens of millions of dollars.

¹ Mexico reports fresh theft of radioactive material', Reuters, <http://www.reuters.com/article/us-mexico-radioactive-idUSKCN0W224W>, 29th February 2016.

² Incident Trafficking Database, IAEA, <http://www-ns.iaea.org/security/itdb.asp>, accessed March 2016.

³ 'The Radiological Accident in Goiânia', IAEA www-pub.iaea.org/mtcd/publications/pdf/pub815_web.pdf (1988)

At the 2014 Nuclear Security Summit world leaders highlighted the importance of protecting radioactive materials, with 23 countries pledging in a joint statement to secure the strongest sources on their territories by 2016. This commitment to radiological security through the NSS process builds on broader IAEA and other efforts, which have been in place for more than a decade. However, despite these efforts to strengthen measures in this area there remain gaps and weaknesses in the radiological security regime. Outlined below is a short summary of some of the key challenges and opportunities for improving security through increased control and replacement, where appropriate, of radiological materials.

Current Challenges

There exist a number of unique challenges when it comes to securing radioactive sources, which are briefly summarized below:

- **Weak international regime for the security of radioactive materials** – There exists little in the way of international legal architecture when it comes to radiological materials. States have signed up to the IAEA’s Code of Conduct on the Safety and Security of Radioactive Sources (CoC), which while non-binding outlines key principles of radiological security. This suffers, however, from a lack of universal coverage and implementation, with only 130 of 168 IAEA Member States having signed up to the Code and not all of those have codified it into domestic laws.
- **Gaps in national legislation and regulation for radioactive materials** – In the absence of a formal international regime for radiological materials, countries have taken different legal and regulatory approaches to security. While there is no single solution to securing radioactive materials, in certain countries there are clear gaps, for example when it comes to transport, establishing national inventories and the disposal of sources.
- **Poorly secured and open facilities** – Radioactive material is widely stored and used by the public and private sectors in facilities such as hospitals or universities with open access and in some cases only minimal or no physical protection measures. These could be viewed as soft targets by potential adversaries, looking to steal materials or carry out sabotage attacks. In these environments increased security must be carefully balanced with safety and operational concerns.
- **Cradle-to-grave controls on radioactive materials remain weak** – Poor chain-of-custody procedures and insufficient or non-existent regulatory controls in many states have led to the loss of control over thousands of radiological sources. Even in states with regulatory controls in place, high disposal costs and a lack of depositories have led some end-users to abandon sources at the end of their life-cycle.
- **Complexity in tracking radioactive sources** - The use of radioactive sources is widespread and frequently involves transboundary movement of sources, making it

difficult for states to keep track of radioactive sources and leaving them vulnerable to theft.

Opportunities

While significant progress in this area has been made, there exist further opportunities for the international organizations, governments, the private sector and academia to work collectively to enhance radiological source security, through improving control and minimizing the use of these materials. Below is a list of key options for countries, industry and others to consider at the 2016 Nuclear Security Summit when making new commitments, strengthening existing initiatives and launching new activities.

- **Strengthening the international framework for radiological security** – Gaps with the CoC should be addressed through increased support (financial, technology, training and information exchanges) by the IAEA and the international community, to states that are yet to fully implement its provisions. Parallel efforts could also be made to develop a stronger governance framework, containing a harmonized set of standards and legally binding obligations for securing radioactive material. This would bridge an important gap within the set of existing international instruments aimed at preventing terrorists' use of chemical, biological, radiological, and nuclear weapons (CBRN). However, strengthening national regimes should be the primary focus of current efforts.
- **Comprehensive and robust national legal and regulatory frameworks** – States should consider establishing an independent and expert regulatory body, able to effectively oversee the implementation of appropriate national laws and regulations that cover radioactive sources across their entire lifecycle. For category I sources states should consider whether to require additional security measures may go beyond what is currently in place. Here States should implement this in close collaboration with the IAEA, with whom they should share information on incidences of radioactive material detected outside of regulatory control
- **Further outreach and support for the development and use of alternative technologies through international partnerships** – Alternative technologies (such as X-rays and linear accelerators) are replacing radioactive sources in certain countries, resulting in permanent risk reduction. While alternatives cannot currently fulfil the complete spectrum of radioactive source uses, for certain applications they represent a mature technology that can also offers operational and economic benefits. Global efforts to research, develop, promote and demonstrate these technologies within industry and to appropriate regulatory and government bodies must be continued. These activities should be done in partnership and tailored to the meet the unique needs of developing countries.

- **Greater focus on education and training in this area in order to grow security culture –** Given the open operating environment for many radioactive sources, the effectiveness of security measures will depend strongly on the behaviors of individuals working within these systems. Consequently, efforts to grow security culture within organizations using radiological sources through education and training should be supported. New education and training programmes in the specific area of radiological source security should be promoted, through relevant forums such as the IAEA, the International Nuclear Security Education Network (INSEN), WINS Academy and national and regional ‘Nuclear Security Centers of Excellence’. To date efforts in this area have been largely focused on supporting the development of security courses for nuclear materials and facilities.
- **Strengthen the role of the private sector –** As the first line of defense in preventing radioactive materials from falling into the hands of terrorists, the private sector has an important role to play in strengthening radiological security. This can be achieved by advocating for best practices across the industry in order to ensure corporate responsibility for radiological security. Training for key personnel and systems testing should be performed on a regular basis in order to help cultivate a culture of security. The private sector should also further promote international exchanges of experience through forums for sharing best practice such as the World Institute for Nuclear Security (WINS).