SAND2007-3666C

# Priorities for Technology Development and Policy to Reduce the Risk from Radioactive Materials

Ruth Duggan
Sandia National Laboratories[1]

## Abstract

The Standing Committee on International Security of Radioactive and Nuclear Materials in the Nonproliferation and Arms Control Division conducted a workshop in March 2007 entitled "Reducing the Risk from Radioactive and Nuclear Materials". This kickoff workshop examined issues and best practices in three panel discussions: Nuclear Trafficking Detection/Response, Transportation Security/Standards, and Tensions and Synergies Between Safety and Security for Nuclear and Radioactive Materials. Technology gaps, policy gaps, and prioritization for addressing the identified gaps were discussed. Participants included academia, policy makers, radioactive materials users, first responders to catastrophic events, physical security and safeguards specialists, and vendors of radioactive sources. This paper summarizes the results of this workshop.

## Introduction

In March 2006, sixty-three individuals representing the national laboratories, industry, academia, and government agencies participated in the Standing Committee on International Security of Radioactive and Nuclear Materials in the Nonproliferation and Arms Control Division workshop on reducing the risk from radioactive and nuclear materials. This workshop examined and proposed technologies and policies that could reduce the risk from radioactive and nuclear materials. The workshop focused on three aspects: nuclear trafficking, transportation security, and safety/security integration. Panelists highlighted existing efforts and identified current challenges. The second session of the workshop focused on identifying opportunities for technology, policy, and their integration to reduce the risks from these materials.

## Comprehensive Protection of Radioactive and Nuclear Materials

The security concern associated with radioactive and nuclear materials stems from their use in weapons of mass destruction or disruption in the form of radiological dispersal devices, improvised nuclear devices, and nuclear weapons. These materials not only need to be protected while in use, in transit, and in storage, but steps must also be taken to protect them from illicit trafficking, theft, and sabotage. In these circumstances, forensics is also a key element to ensure attribution and prosecution. Material must be identified and placed into a material accounting system and must be detected at perimeters and borders. Response must be capable of handling these materials in pre-detonation and post-detonation events. The consequences of events using these materials must be minimized. All of these must be combined into an effective system so as to make their attractiveness as a weapon of choice unappealing.

[1] Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Elements of a comprehensive system include:

- nonproliferation policies with monitoring and verification systems
- coordinated global detection system for tracking and interdiction
- a render secure program that includes disposition
- response and recovery to effectively address consequences
- mechanisms for attribution that include forensics and analysis
- public education system to decrease panic and empower people to be a part of the system.

## Best Practices and Current Challenges for Addressing Radioactive Material Trafficking Detection and Response

The best practices for addressing radioactive material trafficking include the installation of mechanisms to rapidly assess illicit nuclear trafficking and to communicate the nuclear threat, the use of efforts to make materials safe to ship, and the creations and application of forensics databases. Analysis of a country's policies, detection systems, law enforcement, border security, and disposition capabilities can provide insights about how to improve detection and response to radioactive material trafficking. It is important to remember that a vast majority of movements involving radioactive materials is not illicit and that legitimate activity must be facilitated to support the commercial applications of radioactive material. It is equally important to define and understand the kind of trafficking that could lead to adverse consequences – in other words, which materials are truly of interest from a terrorist perspective. One of the best opportunities to expand detection networks is to expand the training and use law enforcement and provide accessible expertise and resources for dealing with radioactive material events.

Detection approaches must be varied and include fixed, mobile, and re-locatable options that can provide continuous, or at least, periodic monitoring. Successful interdiction of illicit material depends heavily on the opportunity to encounter the material, the ability to detect and correctly identify material, and respond appropriately.

Opportunity exists to reduce the amount of radioactive material currently available. It is essential that every effort be made to locate, identify, dispose of or consolidate, and secure excess and unwanted radioactive materials in every country. It is the unknown and unsecured materials that pose the greatest risks. Additionally, as the potential for nuclear energy expansion increases, mechanisms for minimizing nuclear material and associated radioactive materials must be considered. Efforts are currently underway to examine industrial and commercial sources for modifications or replacement that can improve security and reduce attractiveness of the material for terrorist purposes.

The International Atomic Energy Agency (IAEA) collects trafficking event information, including dates, locations, and materials involved. The comprehensiveness of this information correlates with better trends analysis and security planning. Security planning is also better targeted when coupled with information about the interests of terrorists and financial trends. In particular, trafficking paths can be cooperatively monitored at borders and material analysis and disposition can be more timely.

## Best Practices and Current Challenges for Addressing Radioactive Material Transportation Security

Graded material categorization is a necessary basis for determining transportation security requirements. There are currently several different systems of categorization depending on whether the concern is radiation protection or security during transport. While there are some overlaps in the different categorization systems, each discipline, involved in the safety and security of these materials during transportation uses its own standard. The wide variety of radioactive materials application in industry and medical fields results in a fragmented and inconsistent standard of protection that depends upon whether the material is in use, in storage, or in transport. While there have been some attempts to harmonize safety and security, historically, these materials have not been given the same level of attention that nuclear material transportation security has seen.

The graded approach applied to nuclear material transportation security should have an equivalent standard for other radioactive materials. However, it should be noted that too much regulation hinders commerce and could outweigh the benefits of the material, especially in the medical field where it is most needed. Some regulations would actually increase the risk from these materials by making them exist longer in a transportation state versus a secured facility.

## Best Practices and Current Challenges in the Integration of Safety and Security of Radioactive Materials

For safety and security requirements, categorization of radioactive material is also key. Currently, the categorization basis for safety would differ from that for security, if a security categorization did exist. The internationally recognized safety categorization is based primarily on immediate, deterministic health effects. A security-based categorization could be based on such factors as long term health effects, economic consequences, and desirability for malicious use. For both, applying a layered defense is essential. A strategy of eliminating excess stocks of radioactive material, appropriately protecting existing material, and detecting illicit material must be exercised. Efforts are underway to work with manufacturers to better secure radioactive materials within equipment, to find ways to make materials used less effective for use as a weapon components, and to find less-threatening, yet effective alternatives for materials currently in use. These solutions to security would also need to be developed to ensure the safe uses of the radioactive materials continue to provide benefit.

A community of safety and security professionals should be brought together to identify the necessary integrated safety and security approaches as well as the public awareness and education needed to ensure better understanding of the role of radioactive materials, the difference between radioactive materials and nuclear materials, and the effects of a radiological event. Standards should be coordinated and made consistent to allow for safe and secure transport of materials, safe and secure use of radioactive materials, and disposition of materials when no longer needed.

## A National Strategy to Combat Terrorism

Fundamentally, a national strategy to combat terrorism would include the following:

- the ability to estimate or even determine terrorist intentions, capabilities, and plans to develop or acquire weapons of mass destruction (WMD)
- mechanisms to deny terrorists access to materials, technology, and expertise
- strategies to deter WMD deployment
- the capability to detect and disrupt attempted movement of WMDs
- a robust system to both prevent and respond to WMD attacks
- Forensics to define the nature and source of a terrorist-employed WMD

However, it should be noted that while terrorists, and particularly, transnational terrorists, seek to create catastrophic events and will use the path of least risk to achieve them, terrorists will weigh effectiveness of a weapon, its accessibility, and the needed expertise to determine risk. Planning and execution of a WMD attack can be too difficult and too revealing, but that does not mean it can be dismissed. Recent chemical attacks demonstrate long-standing interest and planning.

The US must increase the strength of existing bilateral and international partnerships and continue to develop new partnerships toward a global regime. We must seek to be a part of the detection system that recognizes and reports anomalies and must move beyond planning and actively pursue implementation. We must assist partners when possible and hold them accountable to the partnership. International standards and best practices for material security must be globally adopted and intelligence about terrorists must be shared with law enforcement.

## Recommendations

The second day of the workshop focused on identifying and prioritizing actions needed to enhance the security of radioactive and nuclear materials. In short, the group determined that the best value comes from integrating a security culture and safety culture around the use and disposition of these materials. Even reaching agreement and consistency on unified domestic security policy standards for management of these materials would be helpful. This includes better defining the risk that these materials pose (health and denial of use through contamination) and applying a graded approach to enhanced security. Building a community to specifically deal with nuclear trafficking integrating both the policy and technology perspectives can work to achieve faster results both in information sharing and technology development. Fundamentally, we must work to reduce the amount of material available to adversaries through programs such as the National Nuclear Security Agency's Global Threat Reduction Initiative. As the demand for nuclear energy increases, we must support standards that require material to be in transit for as little time as possible, and technologies and policies to better secure material, especially radioactive materials, while in transit.

The group also recommended that the Institute of Nuclear Materials Management continue to engage the community on this topic and seek to integrate other entities involved in reducing the risk from radioactive and nuclear materials. A second annual meeting is planned for next March and will include progress made since the first workshop and the priorities identified during the workshop: security policy, security

culture, nuclear trafficking, radioactive material threat definition, and transportation technology.

## Acknowledgements

The author wishes to acknowledge the following panel chairs and speaker contacts for their contributions and support without which this workshop would not have succeeded: Galya Balatsky and William Severe of Los Alamos National Laboratory, Mark Soo Hoo of Sandia National Laboratories, and Morris Hassler of the Y-12 National Security Complex. The author and workshop team would also like to thank the INMM Southwest Chapter for hosting this workshop and providing logistics support. The author and workshop team gratefully acknowledges the generous support of the workshop sponsors, including Los Alamos National Laboratory, Oak Ridge National Laboratory, Y-12 National Security Complex, Sandia National Laboratories, Canberra Albuquerque, Gregg Protection Services, Ortec, and Pacific Northwest National Laboratories.