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Challenges Associated with the Development of International Transport Security Regulations

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ABSTRACT

Following the events of September 11, 2001, a growing concern regarding the malicious use of radioactive materials and radioactive sources has led to the development of guidance and regulations pertaining to the physical protection of radioactive materials and radioactive sources while in use, in storage and during in transit. The International Atomic Energy Agency's (IAEA) *Code of Conduct on the Safety and Security of Radioactive Sources* (January 2004) urges Member States of the IAEA to adopt the guidance contained in the Code through political commitments to the Code. A key objective of the Code is to "… *serve as guidance to States for – inter alia – the development and harmonization of policies, laws and regulations on the safety and security of radioactive sources".* The IAEA's *Guidance on the Import and Export of Radioactive Sources* (March 2005, revised 2012) and IAEA Nuclear Security Series No. 9, *Security in the Transport of Radioactive Material*" (September 2008) provides additional guidance more specific to transportation security. While the radioactive source industry recognizes the need for the physical protection of radioactive sources and supports current transportation security regulations that have been implemented by various Member States, the global nature of the radioactive source business, necessitates some level of harmonization of physical protection requirements during transport. However, unlike the harmonization of transport safety standards, the dynamic nature of security threats poses unique challenges in regards to the harmonization of physical protection measures during transport. This paper highlights some of these challenges and introduces possible methods to develop a harmonized approach to a basic level of physical protection in transport.

Introduction

Radioisotope products are used in a wide range of applications that impinge upon health, safety, and security. Radioactive sources are a safe, secure, viable technology for use in a variety of important medical, industrial, and research applications. Cobalt-60 sealed sources, for example, are used for external beam radiation cancer treatment with more than 45,000 treatments per day provided in some 50 countries around the world; brachytherapy, which is another form of radiotherapy, involves other isotopes such as Iridium-192 in sealed sources placed inside or adjacent to the area or tumor requiring treatment, while Cesium-137 is utilized extensively in blood irradiation to prevent Transfusion-associated Graft versus Host Disease. In addition, Cobalt-60 is used to sterilize roughly 45% of all single use medical disposables such as sutures, catheters, syringes, heart valves, artificial joints and nearly 80% of all surgeons' gloves.

Radioactive sources are routinely used in industrial applications and in public safety for checking weld integrity, and in radiography and non-destructive testing for assessment of structural integrity of critical infrastructure and equipment including bridges, engines, castings and aircraft. In many industrial facilities, sealed sources are used in process control for such things as level, thickness or density gauging. Sealed sources are routinely used in the security industry for detecting explosives, drugs, toxic chemicals or gases. These sources may exist in a fixed setting in the factory or in mobile equipment transported to the point of use. In addition, tens of millions of homes and businesses around the world which incorporate smoke detectors as part of their safety and security programs are also beneficiaries of the sealed source industry.

The International Source Suppliers and Producers Association (ISSPA) is a trade organization comprised of 16 companies located in 9 countries who are international industry leaders in the manufacture, production and supply of sealed radioactive sources and/or equipment that contain sealed radioactive sources as an integral component of the radiation processing or treatment system, device, gauge or camera. ISSPA aims to ensure the ongoing and beneficial application of radioactive isotope sealed sources and promotes continuous improvements in the safe and secure use, transportation and end of life management of sealed sources.

ISSPA provides a global voice for the industry and is a recognized Non-Government Organization (NGO) of the IAEA. It actively participates as a member of many IAEA Technical Meetings, Consultancies, Working Groups, conferences, Standards Committees, Nuclear Security Guidance Committee (NSGC), and Steering Committees. This participation helps provide a practical and global approach to the development, implementation and application of international guidelines and ultimately national regulations with respect to the safety and security of radioactive sealed sources. In addition, ISSPA participates in other UN/international organizations (IMO, ICAO, IATA), national, as well as local meetings where issues impacting and impacted by sealed sources are in review.

Graded Approach

Industry supports a graded approach in regards to the physical protection of radioactive sources and materials during transport, taking into consideration the; isotope, activity and form.

This approach is very much akin to the approach taken when considering the safety aspect of Class 7 transportation requirements and is consistent with the basis of categorization for radioactive sources.

The Categorization of Radioactive Sources, IAEA Safety Standards Series No. RS-G-1.9 offers a risk-based ranking of radioactive sources and practices in five categories and promotes risk informed decision making in a graded approach with regards to safety and security of radioactive sources.

The IAEA’s Code of Conduct on the Safety and Security of Radioactive Sources and the supplemental Guidance on the Import and Export of Radioactive Sources apply to all radioactive sources that may pose a significant risk to individuals, society and the environment. Annex 1 of the Code is derived from the Categorization Table in RS-G-1.9. Identifying specific radionuclides and activities that correspond to Categories 1, 2 and 3.

An objective of the Code and supplemental guidance on import and export includes the development, harmonization and implementation of national policies, laws and regulations to:

- achieve and maintain a high level of safety and security;
- prevent unauthorized access, loss, theft or damage;
- prevent unauthorized transfer of radioactive sources;
- and to mitigate or minimize the radiological consequences of any accident or malicious act involving a radioactive source.

Basic principles relating to transportation include:

- Consent between importing and exporting governments prior to authorizing exports; conducted in a manner consistent with existing relevant international standards relating to the transport of radioactive materials.
- Transport of radioactive sources through the territory of a transit or transshipment state should be conducted in a manner consistent with existing relevant international standards relating to the transport of radioactive materials, in particular paying careful attention to maintaining continuity of control during international transport.

Guidance on general physical protections measures are provided in the IAEA's Nuclear Security Series No. 9, Security in the Transport of Radioactive Material. The objectives of this implementing guide is to facilitate a uniform and consistent approach to security and to provide States with guidance in implementing, maintaining or enhancing a security regime to protect radioactive materials, including sources, against theft, sabotage or other malicious acts during transport that could result in unacceptable radiological consequences. In determining the security measures to be implemented for radioactive material in transport the threat which the material should be protected against should be determined and well understood by all parties involved in designing the physical protection measures to be incorporated during transport. A graded system of security measures should be utilized taking into account the isotope, form and quantity of material and the resulting severity of consequences that could be achieved through the malicious use of the material being protected. NSS No. 9 provides suggested roles and responsibilities of States and Operators (e.g. consignors, carriers consignees), suggests basic security measures and enhanced security measures (when threshold is exceeded) and suggests activity threshold values for enhanced security level.

Activity threshold values for enhanced security level are defined as;

- For radioactive sources and other forms of radioactive material containing radionuclides covered by the Code of Conduct, 10 D (this includes Category 1 and Category 2 sources) per package; or
- For all other radionuclides, 3000 A2 per package.

Examples of Current Regulations

The Recommendations on the Transport of Dangerous Goods, Model Regulations, commonly referred to as the UN Orange Book, contain recommendations addressed to governments and international organizations concerned with the safety of the transport of dangerous goods.

Chapter 1.4 Security Provisions of the UN Orange book defines a high consequence dangerous goods as, "…those which have a potential for misuse in a terrorist event and which may, as a result, produce serious consequences such as mass casualties, mass destruction or, particularly for Class 7, mass socio-economic disruption. For radioactive materials a high consequence dangerous good includes Category 2 and above quantities of radioactive materials and greater than 3000 A2 in a single package for radioisotopes not assigned a Category 2 quantity. The UN Orange book is vague when describing security measures, using language such as; "shall consider security requirements" and "appropriately identified". The Orange Book does recommend the development and use of security plans for high consequence DGs. Additional security requirements are found in Chapter 7.2 Modal Provisions, Section 7.2.4 Security provisions for transport by road, rail and inland waterway includes the use of telemetry or other tracking method devices to monitor movement of high consequence dangerous goods, (caveat – when appropriate and already fitted).

The United States Nuclear Regulatory Commission (NRC) published a final rule, Title 10 Code of Federal Regulations Part 37 in March 2013, which includes Subpart D – Physical Protection in Transit that contains very specific physical protection measures. The scope of the NRC regulation is limited to category 1 and 2 quantities of radioactive material. Physical protection requirements during shipment applied to shipments by road and rail only.

The IAEA Regulations for the Safe Transport of Radioactive Material, SSR-6 references physical protection measures during transport in two paragraphs. Paragraph 108 states; "These Regulations do not specify controls such as routeing or physical protection that may be instituted for reasons other than radiological safety. Any such controls shall take into account radiological and non-radiological hazards, and shall not detract from the standards of safety that these Regulations are intended to provide". While paragraph 109 simple states, "Measures should be taken to ensure that *radioactive material* is kept secure in transport so as to prevent theft or damage and to ensure that control of the material is not relinquished inappropriately (see Annex I)".

Path to Harmonization

Given wide variety of applications that rely upon the use of radioactive sources and the global nature of the industry it is imperative to ensure that these products are transported in a safe and secure manner. The inability of a source supplier to transport radioactive sources in a reliable, efficient and cost effective method will have a deleterious effects, not only on the industry supplying the product, but even more importantly, on the industry or the public that uses and relies on these products. Efforts to harmonize the regulations pertaining to the safe transport of radioactive materials have been, by and large, successful. Industry's concern is that a myriad of security regulations could be adopted by States that contain varying levels of control that could result in denials and delays of shipments. In an effort to prevent future denials and delays in shipments and to maintain a continuous level of control during transport it is important to develop basic physical protection during transport regulations and to harmonize these regulations to the extent possible. The following aspects should be considered in the development of if security regulations:

- A graded approach is needed so that there are basic security requirements and enhanced security requirements
- Activity thresholds needed to define levels of physical protection

- An agreement on which modes of transport are affected
- An agreement on which materials are exempted

With the above considerations in mind the following questions need to be answered:

- How do you introduce a new concept such as Category 1 and Category 2 into the Regulations without confusing A1 & A2 or Type A & Type B?
- How do you identify a shipment is conducted with security provisions?
- How are variations disseminated?

It is the author's opinion that transport security regulations would best be promulgated in the IAEA Regulations for the Safe Transport of Radioactive Material, SSR-6. Assuming transport security regulations are developed and incorporated into SSR-6 the following suggestions should be considered:

- A new table added to Section IV to identify isotopes and quantities corresponding to Category 1 and 2 materials.
- New Paragraphs in Section IV under Classification of Material to include definitions for Category 1 and Category 2 material.
- A new marking could be developed and placed on the package to identify the package as containing Category 1 or 2 quantities of radioactive materials. However a downside here is that such a marking could aid an adversary in identifying a target.
- Identification on the Declaration of Dangerous Goods would be appropriate.
- A new training requirement in Section III of SSR-6 to incorporate UN Orange Book Section 1.4.2 Security Training.
- Identify a Security Plan requirement in Section III of SSR-6.
- Include notification requirements in Section V and Annex I of SSR-6

The suggestions provided above are similar to those provided in guidance and incorporated into some State regulations. Basic security awareness and training requirements should be agreeable to most. A government to government consent process already exists to support imports and exports of Category 1 quantities of radioactive materials, incorporating this requirement into the Section V and Annex I of SSR-6 should be straight forward.

Conclusion

This paper was intended to encourage discussion regarding the harmonization of transportation security regulations on the most basic level. It is clear that the physical protection of radioactive materials, specifically high activity sealed sources during transport is necessary. Given the global nature of the high activity sealed source business harmonization of physical protection requirements is needed. It is the author's opinion that the radioactive materials community will eventually be compelled to incorporate transportation security provisions in regulations on an international level and that a proactive approach in developing regulation is preferred. While the IAEA's Statute authorizes the Agency to establish or adopt standards of safety for protection of health and minimization of danger to life and property one could argue that physical protection measures are incorporated to that effect and could reside in a safety standard such as SSR-6.