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# TRANSPORTATION SECURITY RULEMAKING ACTIVITIES FOR CATEGORY 1 AND 2 MATERIALS IN THE UNITED STATES

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## ABSTRACT

Since the formation of the U.S. Nuclear Regulatory Commission (NRC), the agency's mission has been to license civilian, peaceful uses of radioactive material but to ensuring adequate protection of the public health and safety, and promoting the common defense and security, and protection of the environment. The events of September 11, 2001, heightened our concerns about the use of radioactive material by a terrorist. The theft or diversion of risk-significant radioactive material during transport could lead to their use in a malicious act. Following September 11th, the NRC evaluated its regulations, conducted security assessments, identified areas where security could be enhanced and, as an interim solution, issued Orders imposing additional security beyond the existing requirements found in Title 10 of the Code of Federal Regulations (CFR). In 2013, the NRC published a rule imposing additional in-transit security requirements and, once fully implemented, the rule will replace the post September 11, transportation security Orders. This paper will focus on the NRC efforts to improve in-transit security of IAEA Code of Conduct on the Safety and Security of Radioactive Sources Category 1 and 2 radioactive materials through requirements, guidance and technology. These enhanced in-transit security requirements will address areas such as licensee verification, preplanning and coordinating shipments, advance notification of shipments, control and monitoring of shipments that are underway, trustworthiness and reliability of personnel, and information security considerations.

## IDENTIFYING RADIOACTIVE MATERIALS THAT REQUIRE ENHANCED CONTROLS AND INCREASED SECURITY

The U.S. Nuclear Regulatory Commission (NRC) was created as an independent agency to ensure the safe and secure use of radioactive materials for beneficial civilian purposes. The mission of the NRC is to license and regulate the civilian use of radioactive materials protecting public health and safety, promoting the common defense and security, and protecting the environment. In the 1990s the NRC regulations for radioactive materials used in medical, academic and industrial applications focused on safe handling and prevention of inadvertent exposures to workers and the public during transport of radioactive material. These regulations also mandated a certain level of security during transport. As a result of past international incidents involving Orphan Sources and loss of control events such as melting sources in

smelters, in the late 1990s, the need to improve the control over risk-significant radioactive sources was recognized by radiation safety community. While it was known that these materials could be used for a malicious intent and the international regulatory community was taking responsible actions to address these issues of source control, there was no sense of urgency.

The events of September 11, 2001 changed the threat environment and resulted in a significant culture shift regarding the security of radioactive materials. The U.S. framework for security and control of radioactive material requires multi-jurisdictional coordination. Several U.S. government agencies have authorities relating to the security of radioactive material transport.

While the NRC's fundamental goals to protect public health and safety, and to protect the environment, remained unchanged, the NRC saw a need to increase its requirements for security of radioactive materials during transport. Immediately after September 11, the NRC worked internally, and with other Federal and State agencies, to identify priority actions for enhancing the security of risk significant radioactive materials and facilities. These initial actions resulted in the dissemination of a number of Security Advisories to licensees, which were used to recommend specific actions to enhance security, to address potential threats, and to communicate general threat information. Actions recommended by the NRC in the Security Advisories were voluntary and were not legally binding. However, the regulated community understood the change in the threat environment and the need for increased security. NRC reviews, although not formal inspections, largely confirmed that licensees had responded by implementing the requested actions.

With voluntary security measures in place, the NRC proceeded with several different activities, in parallel. The NRC provided experts that served on both domestic and international working groups to determine what radioactive material needed to be protected. The chemical, physical, and radiological characteristics of each radioactive material were evaluated and its effectiveness for use in either a radiological dispersal device or a radiological exposure device was considered. The NRC staff actively participated in these working groups. These efforts resulted in the list of sources found in the IAEA Code of Conduct on the Safety and Security of Radioactive Sources (IAEA Code of Conduct).

The IAEA Code of Conduct identifies 26 radionuclides as risk-significant radioactive material and encourages increased control of these materials within the international community. These materials could pose a serious threat to people and the environment if they were used maliciously. Of the 26 radionuclides identified, 16 are commonly used in the United States by NRC- licensees. The NRC categorizes these 16 radioactive materials as Category 1 and 2 (see Table 1 below).

**Table 1 – Category 1 and 2 Material**

| | Category 1 (TBq) | Category 2 (TBq) |
|---|---|---|
| Americium-241 | 60 | 0.6 |
| Americium-241/Beryllium | 60 | 0.6 |
| Californium-252 | 20 | 0.2 |

| | | |
|---|---|---|
| Curium-244 | 50 | 0.5 |
| Cobalt-60 | 30 | 0.3 |
| Cesium-137 | 100 | 1.0 |
| Gadolinium-153 | 1000 | 10.0 |
| Iridium-192 | 80 | 0.8 |
| Plutonium-238 | 60 | 0.6 |
| Plutonium-239/Beryllium | 60 | 0.6 |
| Promethium-147 | 40,000 | 400 |
| Radium-226 | 40 | 0.4 |
| Selenium-75 | 200 | 2.0 |
| Strontium-90 (Yttrium-90) | 1,000 | 10.0 |
| Thulium-170 | 20,000 | 200 |
| Ytterbium-169 | 300 | 3.0 |

**TRANSPORTATION SECURITY RULEMAKING ACTIVITIES**

With voluntary security measures in place and with the IAEA Code of Conduct development underway, additional security well underway, the NRC continued to meet with the Agreement State regulators[i] and the regulated community regarding the voluntary security actions issued immediately after September 11, 2001. Due to the sensitive nature of the discussions, for the most part, these meetings were closed to the public. The public was kept informed about the occurrence of these discussions, but they were not invited to observe or participate. As an independent regulator, the NRC sought to move away from voluntary security and move towards legally binding requirements which could be subject to inspection and enforcement. The NRC recognized the need to carefully integrate this increased security with the existing regulatory structure for safety of radioactive material.

Together with the law enforcement and intelligence communities, the NRC staff, conducted threat analyses. These threat analyses documented the credible motivations, intentions, and capabilities of potential adversaries. In parallel, the NRC conducted security assessments that evaluated the physical protection system effectiveness of different licensee types in a variety of event scenarios. The NRC developed countermeasures to improve the probabilities that adversaries will be detected, interrupted, and successfully neutralized. The NRC conducted security assessments to help determine the additional security and control measures needed to protect against the risk of sabotage and malevolent use of stolen, risk-significant material. Because of the diversity of radioactive material packages, the assessments were done on representative packages.

Once the NRC identified specific actions that licensees needed to take in order to enhance the security and control of risk significant radioactive materials and facilities, the NRC issued Orders which imposed legally binding requirements to individual licensees. It is important to note, it is the NRC policy to use a deliberative and transparent process for issuing new regulatory requirements that will impact the regulated community, also known as a rulemaking. Rulemaking is a process that often takes several years to complete. Issuing Orders is another method by which the NRC can issue requirements quickly without considering public or stakeholder comments during the decision making process. Due to the events of September 11, it was essential for the NRC to act quickly to remove any security gaps by using Orders, rather than the preferable process by rule.

As a practical matter, NRC could not issue Orders increasing security across all its programs at the same time. The NRC took a graded approach to issuing Orders that increased security. Spent fuel, source manufacturing and distribution, and large underwater and panoramic irradiators licensees received Orders associated with transportation activities in the 2002 to 2004 timeframe. Once these specific licensees received Orders, the NRC staff continued to develop Orders for licensees transporting Category 1 and 2 materials used in other academic, medical and industrial applications (e.g. self-shielded irradiators, gamma knifes, well logging, radiography, etc.). The U.S. government announced its support of the IAEA Code of Conduct at the 2004 G-8 Summit[ii] and the NRC moved forward with issuing the next sets of Orders to licensees transporting Category 1 and Category 2 materials in 2005. The Category 1 Order issued July, 2005 is not publicly available because it includes detailed, sensitive security requirements; the Category 2 Order issued later in 2005 is publicly available and is on the NRC's public website at http://www.nrc.gov/security/byproduct/orders.html#increased-controls. In 2007, the NRC issued the last large set of Orders to licensees and these Orders required fingerprinting and a criminal history background check on anyone with unescorted access to Category 1 and 2 material. These Orders are on the NRC's public website at http://www.nrc.gov/security/byproduct/orders.html#fingerprinting.

Since issuance of the Orders, the NRC continued inspecting licensees for compliance with security requirements and began the public process to establish security rules in the Federal regulations to replace seven sets of Orders and provide generally applicable requirements to a broad set of licensees. There were many insights gained over the years from inspections, self-assessments, and external audits. The challenge was to create a security rule that incorporated realistic approaches to enhancing security that would interface and integrate well with the existing safety rules. This new comprehensive security rule, 10 CFR Part 37, for Category 1 and 2 materials was effective May 20, 2013 and key requirements include:

- Background checks, including fingerprinting to help ensure that individuals with unescorted access to radioactive materials are trustworthy and reliable.
- Controlling personnel access to areas where risk-significant radioactive materials are stored and used. Access must be limited to individuals that require access to the area and are deemed trustworthy and reliable, based on a background and criminal history check.
- Documented security programs that are designed with defense in depth to detect, assess and respond to actual or attempted unauthorized access events.

- Coordination and response planning between the licensee and local law enforcement agencies for their jurisdiction.
- Coordination and tracking of radioactive materials shipments.
- Security barriers to discourage theft of portable devices that contain risk-significant radioactive materials.

For licensees that transport or prepare for transport, Category 2 quantities of material, the Part 37 rule imposes, in general, the following requirements:

- Prior to transferring materials, licensees must verify that transferee's license authorized the receipt, type, form and quantity of radioactive material to be transferred.
- Use of carriers that have established package tracking systems.
- Verify and document (a) the shipment "no-later-than" arrival time and (b) the actual shipment arrival with the receiving licensee.
- Initiate an investigation, with the receiving licensee, to determine the location of the licensed material if the shipment does not arrive by the "no-later-than" arrival time.
- If material is determined to be lost or stolen, the appropriate local law enforcement and then the NRC must be notified.
- Upon discovery of any actual or attempted theft or diversion of a shipment, or any suspicious activity related to a shipment, the NRC must be notified.
- For mobile devices, the licensee must:
  - Have two independent physical controls that form tangible barriers to secure the material from unauthorized removal when the device is not under the licensee's direct control and constant surveillance.
  - When devices are stored in or on a vehicle or trailer, use a method to disable the vehicle or trailer when not under the licensee's direct control and constant surveillance.

In general, for licensees that transport or prepare for transport, Category 1 quantities of material, the following requirements apply:

- Prior to transferring materials, licensees must verify that transferee's license authorized the receipt, type, form and quantity of radioactive material to be transferred.
- Use carriers that have established movement control centers that maintain periodic position information from a location remote from the transport activity of the transport vehicle or trailer. The control center will monitor shipments 24 hours a day, 7 days a week, and have the ability to immediately communicate an emergency to appropriate law enforcement agencies.
- Preplan and coordinate shipment information with the affected U.S. State.
- Preplan and coordinate shipment arrival and departure times with the consignee to ensure minimum delay in reporting the receipt of shipments and the notification of missing, lost, or stolen shipments.
- Provide advance notification of shipments, including a "no-later-than" final destination arrival time, to the NRC and to each affected U.S. State.

- For highway shipments, establish redundant communications allowing the transport to contact the escort vehicle (when used) and movement control center at all times.
- For highway shipments of long duration, provide an accompanying individual for the entire shipment.
- Ensure that rail shipments are monitored by a telemetric position monitoring system or an alternative tracking system reporting to the licensee, third-party, or railroad communications center.
- Require an immediate initiation of an investigation if the shipment does not arrive by the designated "no-later–than" time recorded on the advance notification.
- During stops, ensure that at least one individual is awake at all times and maintains constant visual surveillance of the shipment.
- Develop normal and contingency licensee procedures to cover notifications; communications protocols; loss of communications; and response to actual, attempted, or suspicious activities related to the theft or diversion of a shipment.
- Protect shipment information from disclosure to unauthorized individuals.
- As soon as possible upon discovery of any actual, attempted or suspicious activities related to the theft or diversion of a shipment, notify the designated local law enforcement agencies along the shipment route and the NRC.

## NATIONAL MATERIALS MANAGEMENT PROGRAM

As security Orders were being issued, the NRC also moved towards creating a national registry of Category 1 and 2 sources as recommended in the IAEA Code of Conduct. In 2006, the NRC published a final rule where certain licensees who possess Category 1 and 2 sources are required to report information on the manufacture, transfer, receipt, disassembly, and disposal of such sources to the NRC. However, at that time, another activity also shaped the development of the national program to manage and control Category 1 and 2 materials. In late 2006 and early 2007, the Government Accountability Office (GAO)[iii] conducted a test on the NRC's controls governing the issuance of licenses to possess certain types of radioactive materials and the enforcement of possession limits on the quantities of those materials[iv]. Subsequently, GAO reported that they were able to obtain radioactive materials licenses for two fabricated companies, modify the NRC licenses to raise the possession limits, and use the augmented licenses to receive quotes for purchasing radioactive materials from legitimate licensees. Following, GAO's report, the NRC evaluated its regulations, policies and practices and from this effort, identified areas where licensing of radioactive materials used in medical, academic and industrial settings could be improved. Many changes resulted from this effort; however, this discussion will focus on changes that affected transfers of Category 1 and 2 materials. The NRC focused on utilizing Information Technology (IT) to prevent fraudulent radioactive material license claims and alteration of possession limits. In an effort to better track transactions of radioactive materials, the NRC developed a portfolio of automated tools which consists of three significant IT applications, the National Source Tracking System (NSTS), the Web-Based Licensing System (WBL), and the License Verification System (LVS).

The NRC deployed the NSTS in December 2008. The NSTS allows State and Federal agencies to track transactions of Category 1 and 2 materials from origin (manufacture or import) through transfer to another licensee, to disposition (disassembly, disposal, export, or decay below the

level of tracked sources). The primary purpose of NSTS is to provide timely detection of either the theft or diversion of radioactive materials sufficient to constitute quantities which are of concern regarding the construction of a radiological dispersion device. The NSTS is consistent with one of the objectives of the Code of Conduct which is to prevent unauthorized access or damage to, and loss, theft or unauthorized transfer of, radioactive sources. The NSTS is in its fifth year and tracks over 80,000 Category 1 and 2 sources held by more than 1300 licensees across the United States and its territories.

The WBL system, deployed in August 2012, is an NRC and Agreement State material licensing system that manages the licensing information of businesses that use Category 1 and 2 materials. The WBL system allows the NRC and Agreement States to manage the licensing lifecycle from initial application to license issuance, amendment, reporting, and license termination.

Finally, the LVS is a "national verification system," deployed May 2013, that accesses NRC and Agreement State license information and provides assurance that only authorized licensees obtain radioactive materials in authorized amounts. The LVS is an integrated service that brokers information stored in WBL and NSTS to confirm that: a license is valid and accurate; a licensee is authorized to acquire specific quantities and types of radioactive materials; and the licensee's Category 1 or 2 inventories will not exceed its possession limits.

## CONCLUSION

The NRC's fundamental goals to protect public health and safety, and to protect the environment, have remained unchanged since the events of September 11, 2001. However, the NRC has focused signification attention on the potential for the theft or diversion of radioactive materials, in particular IAEA Code of Conduct Category 1 and 2 materials, during transport since this could lead to their use in a malicious act. The NRC evaluated its regulations, conducted security assessments, identified areas where security could be enhanced and, as an interim solution, issued Orders imposing additional security beyond the existing requirements. Since issuance of the Orders, the NRC has moved toward regulatory requirements and IT solutions to enhance the secure use and management of radioactive materials. The NRC's efforts in ensuring the security of radioactive materials cannot simply end with the publication of the new 10 CFR Part 37 rule, the NRC must continuously assesses its programs to ensure that new or emerging threats or vulnerabilities are appropriately addressed.

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[i] The safe and secure transport of radioactive material is under the authority of the federal government (NRC and Department of Transportation). However, the Atomic Energy Act of 1954, as amended, allows the NRC to relinquish its authority to a State for the licensing and oversight of certain radioactive materials, while in use or in storage. States that enter into such an agreement with NRC are known as "Agreement States". The NRC provides periodic reviews to ensure that Agreement State programs are adequate to protect public health and safety, and compatible with NRC's program.

[ii] In 2005, the NRC's first step towards this commitment was to revise the export and import requirements to incorporate Category 1 and 2 materials into the regulations.

[iii] The GAO is an independent government agency whose role, in general, is to evaluate the effectiveness of programs within the U.S. government.

[iv] The GAO at the same time conducted a test of the issuance licenses to possess radioactive materials by an Agreement State. The Agreement State questioned the GAO auditors and requested a pre-licensing site visit. When the State requested a pre-licensing site visit, the GAO dropped this request for a license.