

**United States
Nuclear Regulatory Commission
Radioactive Materials: Control,
Inspection, Enforcement**

WINS Workshop

**The Security of Radioactive Sources—The Road to
Sustainability and Resilience**

Stockholm, Sweden, 23-24 January 2018

Margaret Cervera

Source Management and Protection

Office of Nuclear Material Safety and Safeguards

Overview

- NRC mission
- Development of security regulatory structure
- Regulatory framework for safety and security
- Reported events
- Inspection
- Enforcement
- Resources

U.S. NRC Mission

- Regulate the Nation's civilian use of byproduct, source and special nuclear materials
 - Ensure adequate protection of the public health and safety
 - Promote the common defense and security
 - Protect the environment
 - Enable the safe and secure use of radioactive material for beneficial purposes





Regulatory Development

- Created new 10 CFR Part 37 for physical protection of byproduct material
 - IAEA Category 1 & 2 (aggregated)
 - Irradiated fuel (<100 grams)
- Conforming changes to other regulations
 - Safety, other security regulations
- Started in 2008 – into effect 2013
 - Public meetings
 - 148 comments received

Safety and Security Regulations

Radionuclide	IAEA Category 1, 2 and 3 Thresholds					
	NRC - 10 CFR Part 37 and Parts 20, 30-36, and 39, as appropriate				NRC - 10 CFR Part 20 and Parts 30-36, 39 as appropriate	
	Cat 1		Cat 2		Cat 3 (and lower, all isotopes)	
	TBq	Ci	TBq	Ci	TBq	Ci
Am-241 (Be)	60	1,600	0.6	16	0.0006	1.6
Cf-252	20	540	0.2	5.4	0.0002	0.5
Cm-244	50	1,400	0.5	14	0.0005	1.4
Co-60	30	810	0.3	8.1	0.0003	0.8
Cs-137	100	2,700	1	27	0.001	2.7
Gd-153	1,000	27,000	10	270	1.00	27
Ir-192	80	2,200	0.8	22	0.08	2.2
Pm-147	40,000	1,100,000	400	11,000	40.00	1,100
Pu-238	60	1,600	0.6	16	0.06	1.6
Pu-239 (Be)	60	1,600	0.6	16	0.06	1.6
Ra-226	40	1,100	0.4	11	0.04	1.1
Se-75	200	5,400	2	5.4	0.20	5.41
Sr-90 (Y-90)	1000	27,000	10	270	1.0	27
Tm-170	20,000	540,000	200	5,400	20.00	540
Yb-169	300	8,100	3	81	0.30	8.1

Category 1 and 2 Requirements: Administrative

Background Investigations

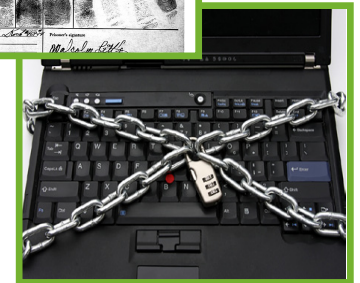
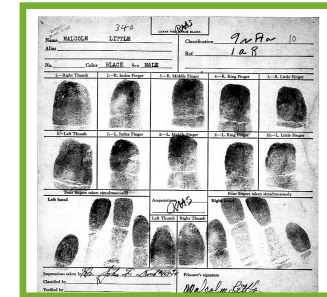
- Access limited, at all times, to approved individuals
- Trustworthiness and reliability

Documentation

- Security plans & implementing procedures
- Transportation records
- List of approved persons

Information Protection

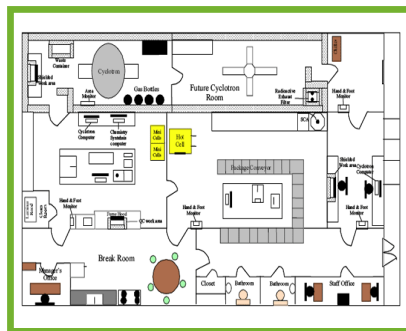
- Access limited to those with a “need to know”



Category 1 and 2 Requirements: Security During Use or Storage

Monitor, Detect, Assess and Respond

- Identify security zones
- Physical security program capable of immediate detection of unauthorized access to the security zone
- Assessment of detection method to determine appropriate response
- Immediate response to an actual or attempted theft, sabotage, or diversion
 - Coordination with law enforcement for armed response
 - Contact appropriate regulatory authority (NRC or Agreement States)



Category 1 and 2 Requirements: Transportation

	Cat 1	Cat 2
Coordinate Arrival Time and Confirm Receipt	✓	✓
Continuous and Active Monitoring of Shipment	✓ <input type="checkbox"/>	
Communication Center/Call-In, Backup Communication	✓ <input type="checkbox"/>	
Package Tracking Systems		✓ <input type="checkbox"/>
Capability to Summon En-Route Assistance	✓ <input type="checkbox"/>	✓ <input type="checkbox"/>
Plan and Coordinate Shipment with En-Route States	✓ <input type="checkbox"/>	
Advance Notification to NRC and En-Route States	✓ <input type="checkbox"/>	
Investigation of Past Due Shipments	✓ <input type="checkbox"/>	✓ <input type="checkbox"/>
Report Lost, Missing or Stolen Material	✓ <input type="checkbox"/>	✓ <input type="checkbox"/>
Notify Law Enforcement and NRC	✓ <input type="checkbox"/>	
Accompanying Individual/No Casual Stops/Surveillance	✓ <input type="checkbox"/>	
Training, Procedures and Instructions	✓ <input type="checkbox"/>	✓ <input type="checkbox"/>

Category 1- 5 Requirements

- All radioactive material – even very small activities - have security requirements embedded within the safety requirements

10 CFR Part 20 – Standards for Protection Against Radiation

§ 20.1801 Security of stored material:

“...secure from unauthorized removal or access...”

§ 20.1802 Control of material not in storage:

“...control and maintain constant surveillance...”

Category 1- 5 Requirements

- Specific uses (modalities) of radioactive material have additional requirements (10 CFR)
 - Part 30: General license requirements for byproduct radioactive material
 - Part 32: Manufacture and/or distribute radioactive material
 - Part 33: Broad scope users
 - Academic institutions; medical facilities
 - Part 34: Industrial radiography
 - Construction integrity; pipeline integrity
 - Part 35: Medical uses
 - Part 36: Panoramic irradiators
 - Medical equipment; cosmetics
 - Part 39: Well logging for oil and gas exploration

Reported Events Involving Radioactive Material

From October 2005 to March 2016

- No losses or thefts of Category 1 material
- 34 reported events involving Category 2 material
 - 33 events: material recovered intact
 - 1 event: material not recovered
 - radiography device stolen from a vehicle (a violation of security requirements)
- 37 reported events involving Category 3 material
 - 34 events: material recovered intact
 - 3 events: material not recovered
 - 2 events: source within cardiac pacemaker buried with deceased patient
 - 1 event: radiography device dropped from oil platform into Gulf of Mexico

Totals in the United States

- ~20,800 Category 1-5 licensees nationwide
- ~77,000 Category 1 and 2 sources
- ~7,500 – 10,000 transactions/month
- ~25,000 Category 3 sources
- ~2 million devices
- Over 20 million medical procedures/year

Inspection: Competence

Recruitment:

Inspectors come from a variety of backgrounds. For safety inspectors the NRC recruits from the engineering (nuclear, materials, chemical, civil, environmental, etc.) and scientist (chemist, health physics, physics, etc.) specialties. For security inspectors the NRC recruits personnel who have retired or completed service in the United States military, law enforcement, and industry.

Qualification:

Inspector candidates for either safety and security (or both) of radioactive materials, prior to having independent responsibilities for oversight, must complete a formal qualification program. This program is documented in NRC Inspection Manual Chapter (IMC) 1246, “Formal Qualification Programs in the Nuclear Material Safety and Safeguards Program Area” (ADAMS [ML112350733](#)), and IMC 1248, “Formal Qualifications Program for Federal and State Material and Environmental Management Programs” (ADAMS [ML12240A129](#)).

Maintaining Proficiency:

After the completion of the qualification, inspectors must maintain their proficiency through continuing inspection activities and annual refresher training. Annual refresher training consists of a minimum of 24 training hours on safety or physical protection topics. Training is coordinated with the inspector’s supervisor and, as needed, with the NRC’s dedicated human resources, training, and development staff.

Inspection

All licensees are inspected to verify compliance with applicable safety and security requirements

Inspections are:

- Unannounced (generally)
- Conducted according to priority given operational experience and hazard
- Increased in frequency if problems are identified
- Coordinated with other authorities (as applicable)

Reports are made public (if possible)

Inspection Experience

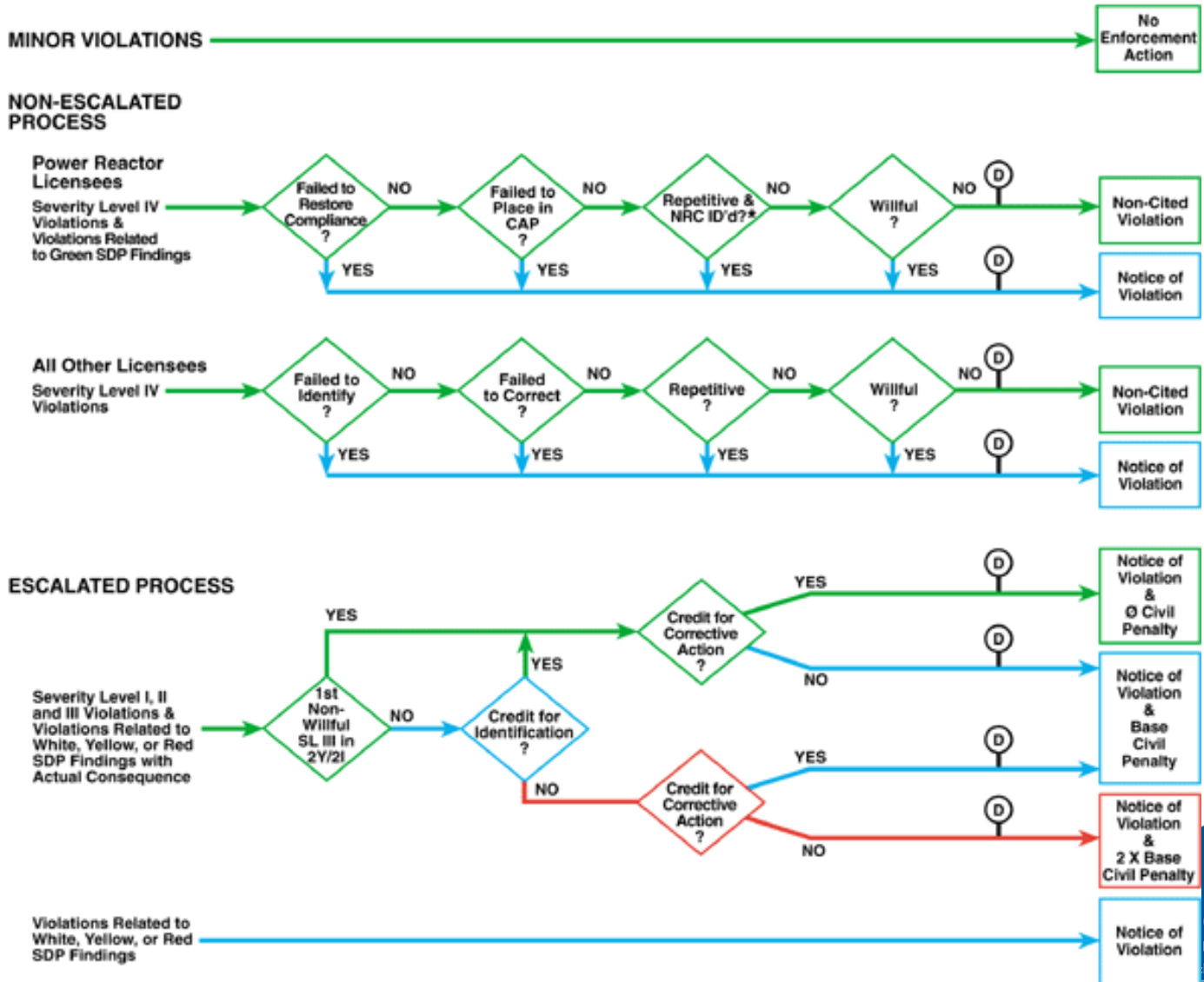
From March 2014 to March 2016

- 255 inspections conducted
 - accounts for 17% of total population of licensees who possess risk-significant quantities of radioactive material in the United States
 - 184 (74%) resulted in no violations
 - 71 inspections resulted in 189 specific violations issued to 61 licensees
 - >55% of violations due to lack of complete transition to the requirements of Part 37 rule from the previously-in-force Orders
- Significant number of violations resulted from a lack of:
 - understanding of Part 37 requirements
 - development of the program infrastructure (plans, procedures, annual reviews, etc.) that is required under Part 37 but had not been required under the Orders

Enforcement

NRC ENFORCEMENT PROCESS

<https://www.nrc.gov/about-nrc/regulatory/enforcement.html>



(D) Discretion

Enforcement – Civil Penalties

8.0 TABLE OF BASE CIVIL PENALTIES

TABLE A¹⁶

a.	Power reactors, gaseous diffusion uranium enrichment plants, and high-level waste repository	\$280,000
b.	Fuel fabricators authorized to possess Category I or II quantities of SNM and uranium conversion facilities	\$140,000
c.	All other fuel fabricators, including facilities under construction, authorized to possess Category III quantities of SNM, industrial processors, ¹⁷ independent spent fuel and monitored retrievable storage installations, mills, gas centrifuge and laser uranium enrichment facilities.....	\$70,000
d.	Test reactors, contractors, waste disposal licensees, industrial radiographers, and other large material users	\$28,000
e.	Research reactors, academic, medical, or other small material users ¹⁸	\$14,000
f.	Loss, abandonment, or improper transfer or disposal of regulated material, regardless of the use or type of licensee:	
	1. Sources or devices with a total activity greater than 3.7×10^4 MBq (1 Curie), excluding hydrogen-3 (tritium)	\$54,000
	2. Other sources or devices containing the materials and quantities listed in 10 CFR 31.5(c)(13)(i).....	\$17,000
	3. Sources and devices not otherwise described above	\$7,000
g.	Individuals who release safeguards information.....	\$7,000

Enforcement Actions

Home > About NRC > How We Regulate > Enforcement > Issued Significant Enforcement Actions

Issued Significant Enforcement Actions

These actions, referred to as "escalated," include Notices of Violation for Severity Level I, II, or III violations; Notices of Violation associated with inspection findings that the Significance Determination Process categorizes as White, Yellow, or Red; civil penalties; and orders.

For definitions of the various Severity Levels, see Section 2.2.2, "Traditional Enforcement," of the [Enforcement Policy](#). For definitions of the Significance Determination Process categories, see Section 0609-04 (04.02), "Definitions," of the [NRC Inspection Manual Chapter 0609](#).

Escalated enforcement actions issued to:

- Reactor: | [2017](#) | [2016](#) | [2015](#) | [2014](#) | [2013](#) |
- Materials: | [2017](#) | [2016](#) | [2015](#) | [2014](#) | [2013](#) |
- Individuals: | [2017](#) | [2016](#) | [2015](#) | [2014](#) | [2013](#) |
- Non-Licensees: | [2016](#) | [2015](#) | [2014](#) | [2013](#) | [2012](#) |
- Fuel Cycle Facilities: | [2017](#) | [2016](#) | [2015](#) | [2012](#) | [2011](#) |

Note: Reactor Facilities, in a Decommissioning status, are listed under Materials Licensees.

Significant enforcement actions, listed alphabetically and dating back to as early as 1994, can be found in the Enforcement Document Collection.

NRC National Materials Program

Available Resources

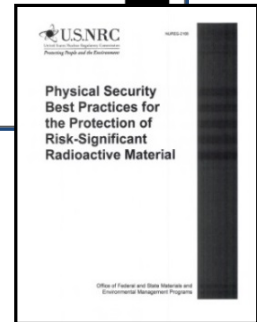
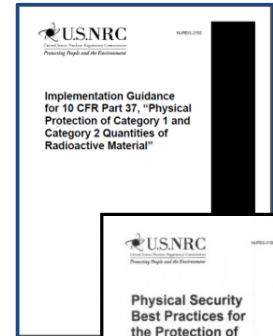
- NRC website <http://www.nrc.gov/>
- NRC Radioactive material security website <http://www.nrc.gov/security/byproduct.html>
- 10 CFR Part 37, “Physical Protection of Category 1 and 2 Quantities of Radioactive Material”
<http://www.nrc.gov/reading-rm/doc-collections/cfr/part037/>
- NRC video – 3 Minutes with Source Security published May 31, 2012,
<http://youtu.be/H6iKbZRB9Ek>



NRC National Materials Program

Part 37 Available Resources

- Limited access website which shares suspicious event information with licensees
- **NUREG-2155**, “Implementation Guidance for 10 CFR Part 37, Physical Protection of Category 1 and 2 Quantities of Radioactive Material” <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr2155/>
- **NUREG-2166**, “Physical Security Best Practices for the Protection of Risk-Significant Radioactive Material” <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr2166/>
- **Inspection Procedure 87137**, “10 CFR Part 37 Material Security Programs” <http://pbadupws.nrc.gov/docs/ML1403/ML14030A144.pdf>



**THANK YOU FOR
YOUR ATTENTION**