

**United States  
Nuclear Regulatory Commission  
Radioactive Materials: Physical  
Security and Source Management**

*5<sup>th</sup> Workshop on Isotope Federal Supply and Demand*  
**November 9, 2016**

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**Source Management and Protection**  
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# Overview

- NRC mission
- Development of security regulatory structure
- Regulatory framework for safety and security
- Integrated Source Management Portfolio
- Radiation Source Protection and Security Task Force
- Events
- 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



Dec – GAO Report to Congress on effectiveness of Part 37 due

Mar – 10 CFR Part 37 compatibility for Agreement States

Mar - Nuclear Security Summit 2016, Washington DC

Dec – Report to Congress on effectiveness of Part 37 due

Jan – NRC, DOT and DHS Transportation Security MOU

Apr – Commence 10 CFR Part 37 Program Review

Mar – 10 CFR Part 37 compliance for NRC licensees and Nuclear Security Summit, Hague, Netherlands

Apr – NRC Rescinds Orders against NRC licensees and Report to Congress

Jun– GAO issues Additional Actions Needed to Increase the Security of Industrial Radiological Sources

Aug – Third Task Force Report on Source Security Issued

Dec – FY15 Energy Water Appropriations Act

Mar – FRN 10 CFR Part 37 and Part 37 Implementation Guidance published

May – License Verification System deployed

Mar – Commission Approves Part 37 and Nuclear Security Summit, Seoul, South Korea

Aug – Web-Based Licensing deployed

Oct – GAO Additional Actions Needed to Improve Security of Sources at Medical Facilities

Nov – NRC Hosts International Regulators Conference

Jul - NRC Policy Statement for Security and use of cesium chloride sources

Apr – Nuclear Security Summit, Washington, DC

Jun – NRC Proposed Rule Part 37

Sep – NRC and NNSA Joint Report to Congress on Protecting Radioactive Sources

Aug – Report by Radiation Source Protection and Security Task Force

Jan – Licensee NSTS Reporting Begins

Jun – NSTS Expansion Rule – not approved

Dec – NRC Trustworthiness and Reliability Order for unescorted access to Category 1 and 2 for Service Providers

Feb – NAS Radiation Source Use and Replacement Study

Sep – NRC Pre-licensing guidance revised

Jul GAO Actions Taken by NRC to Strengthen licensing process for Radioactive Sources Not Effective

Dec – NRC and Agreement State Unescorted Access Fingerprinting Requirements

Aug Radiation and Source Protection and Radiation Task Force Report

Sep-Nov SGI Fingerprinting Orders

Nov Part 20 National Source Tracking

Jul Part 110 export and import rule, Category 1 and 2 NRC Transporters of Category 1 Orders

Aug Energy Policy Act of 2005

Nov NRC and Agreement State Increased Controls Requirements

Jan IAEA, Code of Conduct on the Safety and Security of Radioactive Sources

NRC Manufacturers and Distributors Order

Jun G-8 Summit, Sea Island, Georgia, USA

May NRC and DOE Report, Radiological Dispersal Devices

Jun NRC Irradiator Orders



# 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



# NRC Source Security Requirements

- Applied in a risk-informed manner
  - Enhanced security requirements apply to licensees of Category 1 and 2 quantities of material (10 CFR Part 37)
  - Security requirements for all categories of material are contained in safety requirements (10 CFR Part 20) and modality-specific regulations (10 CFR Parts 30-36 and 39, as applicable)



# 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

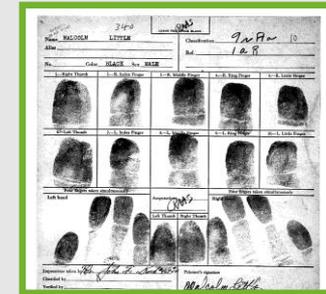
- Access limited, at all times, to approved individuals
- Trustworthiness and reliability

## Documentation

- Security plans
- Transportation records
- List of approved persons

## Information Protection

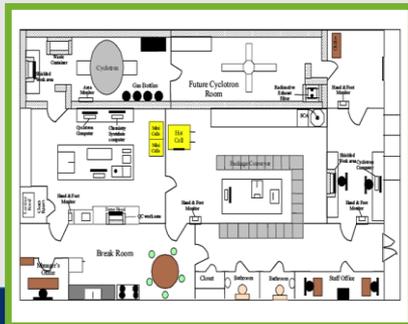
- Access limited to those with a “need to know”



# Category 1 and 2 Requirements: Security During Use or Storage

## Monitor, Detect, Assess and Respond

- Identify secure zones or radioactive material locations
- Physical security program capable of immediately detecting and assessing unauthorized access
- Immediate response to an actual or attempted theft, sabotage, or diversion
  - Pre-arranged plan with law enforcement for assistance and 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

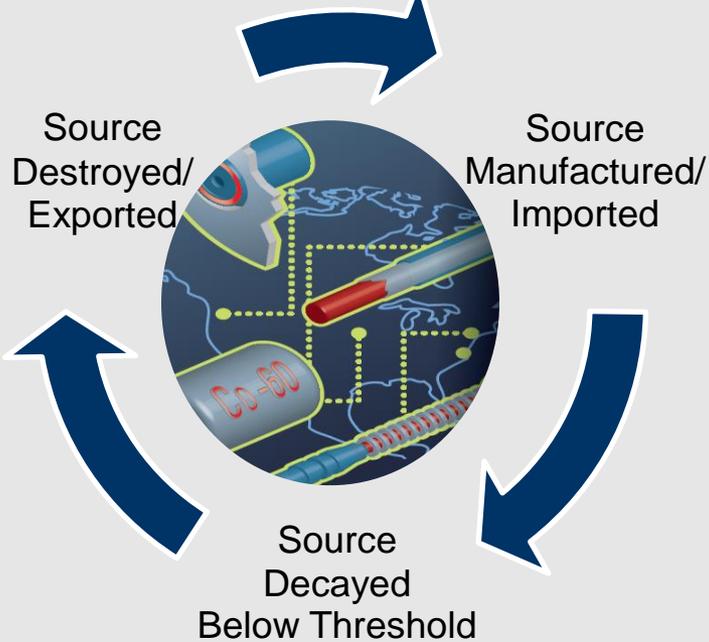
# Integrated Source Management Portfolio

- Regulations and security requirements are in place, but an information technology component is needed to ensure the safety and security of nation's radioactive materials
- ISMP comprised of three modules
  - National Source Tracking System (NSTS)
  - License Verification System (LVS)
  - Web-Based Licensing (WBL)
- Provides a web-based solution to:
  - enable accounting of the most risk-significant radioactive sources in the nation
  - authenticate license validity
  - modernize materials licensing





### Source Life Cycle



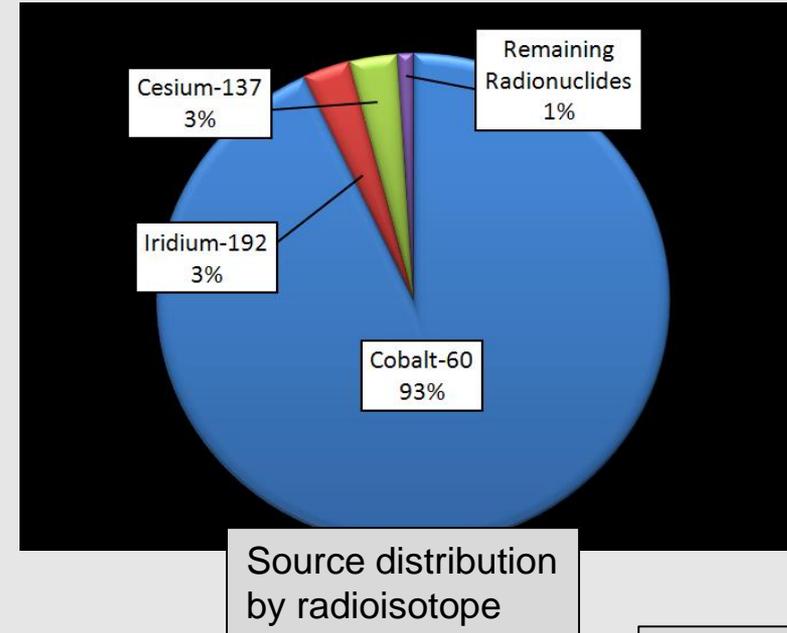
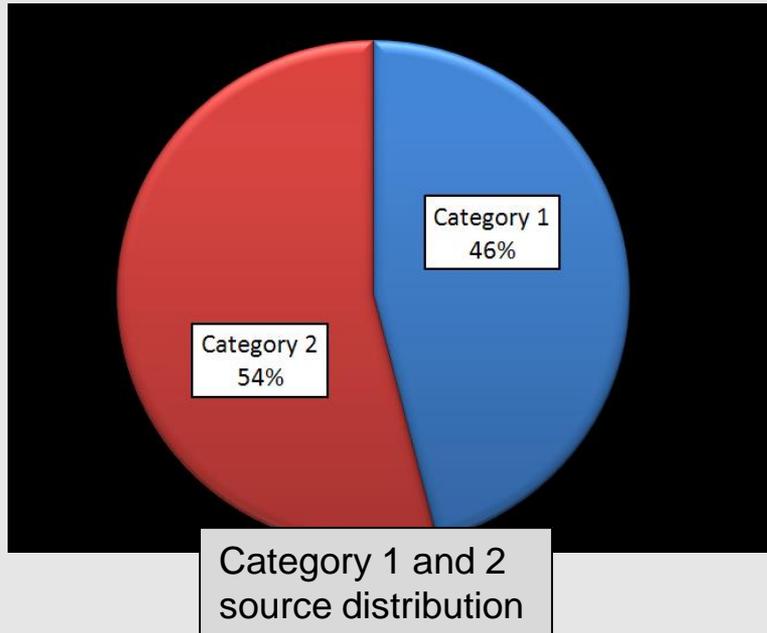
**Transaction Reporting**  
Transfer, Receipt, Import,  
Export



**Annual Inventory  
Reconciliation**

10 CFR 20.2207 states that each licensee who manufactures, transfers, receives, disassembles, or disposes of a nationally tracked source must complete and submit a National Source Tracking Transaction Report.

# Nationally Tracked Sources



Nationally Tracked Sources are

- Category 1 and 2 sources
- Actinium-227, Thorium-228 & Thorium-229 sources >20 TBq (540 Ci)
- Polonium-210 sources > 60 TBq (1,600Ci)

National Source Tracking System (NSTS)

- > 1000 transactions every week
- 97% of transactions involve 3% of the sources, Ir-192, Co-60 & Cs-137

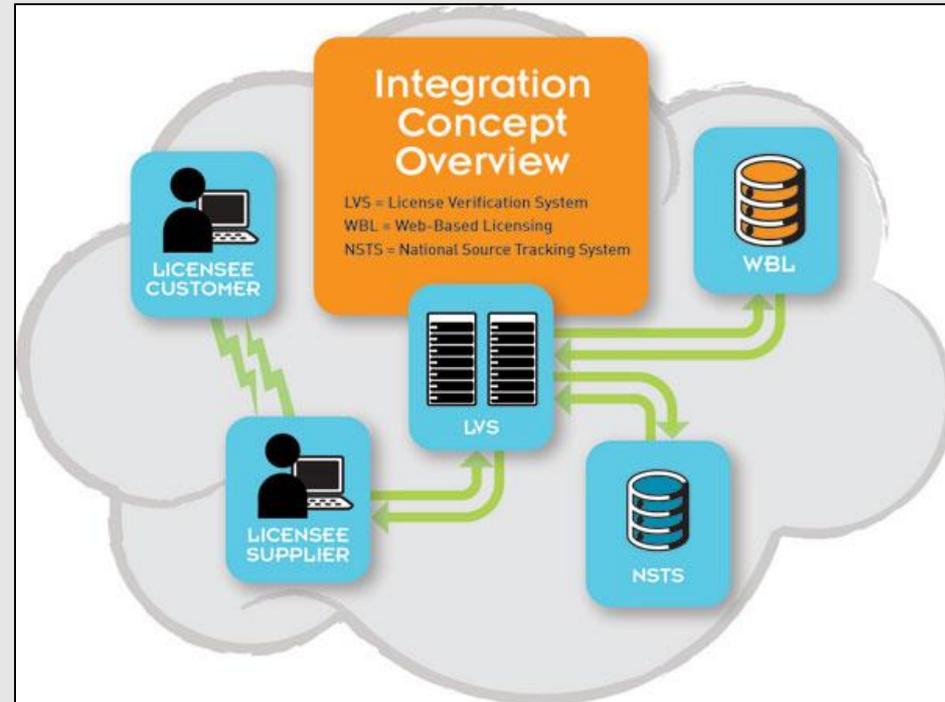




- Provides a license maintenance system
- Contains an up-to-date repository of all risk-significant (Category 1 and 2) licenses nationwide
- Contains all licenses for NRC and certain Agreement States that have chosen to adopt the system for use or submit licenses voluntarily
- Tracks all licensing actions, inspections, enforcement history



- Enables the validation and accuracy of Category 1 and Category 2 materials licenses
- Verification before unauthorized parties purchase radioactive materials
- Enables verification that Category 1 and Category 2 possession limits are not exceeded



# Radiation Source Protection and Security Task Force

<http://www.nrc.gov/security/byproduct/task-force.html>

- 1) Radiation sources that should be secured
- 2) National system for recovery of lost or stolen radiation sources
- 3) Storage of radiation sources
- 4) National tracking system for radiation sources
- 5) National system for proper disposal of radiation sources
- 6) Export/Import controls on radiation sources
- 7) Security and control of radiation sources
- 8) Transportation security of radiation sources
- 9) Background checks for those with access to radiation sources
- 10) Alternative technologies

2006



2010



2014



# Evaluation of Reported Events Involving Radiological 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

# NRC National Materials Program

## - Available Resources

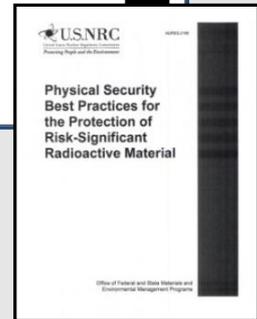
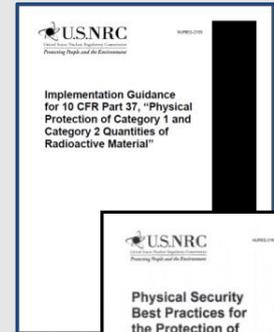
- NRC website <http://www.nrc.gov/>
- NRC Radioactive material security website <http://www.nrc.gov/security/byproduct.html>
- 10 CFR Part 37, “Physical Protection of Category 1 and 2 Quantities of Radioactive Material”  
<http://www.nrc.gov/reading-rm/doc-collections/cfr/part037/>
- NRC video – 3 Minutes 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**