

## NRC's Role in State Systems for Accounting and Control of Special Nuclear Material

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## **U.S. NRC Mission and Structure**

- Primary Functions:
  - Establish rules and regulations
  - Issue licenses
  - Provide oversight through inspection, enforcement, and evaluation of operational experience
  - Conduct research in support of regulatory decisions/actions
  - Respond to emergencies
- The U.S. NRC does not...
  - Regulate nuclear weapons, military reactors, or space vehicle reactors
  - Own or operate nuclear power plants
  - Promote nuclear power



## U.S. NRC Regulations Related to State System for Accounting and Control of Nuclear Material (SSAC)

- Title 10 Code of Federal Regulations (10 CFR)
- <u>Basis for U.S. NRC inspection</u> and oversight
  - 10 CFR PART 74
    - Material Control and Accounting of Special Nuclear Material
  - 10 CFR Part 75
    - Voluntary Offer, Additional Protocol
  - 10 CFR Part 110
    - Import/Export Licensing

For more information go to: http://www.nrc.gov/about-nrc.html





# 10 CFR Part 74 - Material Control and Accounting of Special Nuclear Material (Domestic Safeguards)

- Requirements for the control and accounting of special nuclear material (SNM) at fixed sites and for documenting the transfer of SNM
- Requirements enable detection in a timely manner of loss, theft, or diversion of SNM
- Subparts address general requirements and specific requirements based on the category of material possessed by the licensee
  - Subpart A General Provisions
  - Subpart B General Reporting & Recordkeeping Requirements
  - Subpart C Special Nuclear Material of Low Strategic Significance (Category III)
  - Subpart D Special Nuclear Material of Moderate Strategic Significance (Category II)
  - Subpart E Formula Quantities of Strategic Special Nuclear Material (Category I)
  - Subpart F Enforcement



## **Elements of Domestic MC&A Programs**

#### Management structure

- Ensure all quantities in the material accounting records are based on measured values
- · Key measurement systems are identified, monitored, and controlled

#### Measurements/measurement control

- Ensure measurement bias is estimated and significant biases are eliminated from inventory difference values of record
- Statistical methods are used to monitor and control measurement uncertainties

#### Physical inventory

- Periodic verification of all nuclear materials expected to be present at a given time
- Clearly written planning, coordination, and implementation procedures
- Calculation of inventory difference and associated measurement uncertainties
- Reporting of inventory results
- Reconciliation of book inventory
- Frequency: Category I 6 months, Category II 9 months, Category III 12 months



## **Elements of Domestic MC&A Programs**

#### Item control/Item monitoring

- Maintain current knowledge of location, identity, and quantity of all SNM contained in items.
- Items are stored, controlled, and handled to allow detection of, and provides protection against, unauthorized or unrecorded removals of SNM.
- Incidents involving missing or compromised items or falsified item records are investigated.
- Presence and integrity of SSNM items are verified on a periodic basis.
- Verification frequency is graded according to the item material type attractiveness, ease of diversion, and degree of surveillance and containment

#### Process monitoring

- Internal transfers, storage, and processing of SSNM will be monitored
- Production quality control program is used to monitor the status of material in process
- Detection and resolution of indicators
  - Resolve the nature and cause of any MC&A alarm (e.g., excessive inventory difference or item discrepancies, process control upset, compromised item, etc.) within approved time periods
  - Investigate and resolve significant shipper-receiver differences
  - Detect and investigate indications of unauthorized production or enrichment of uranium



## **Elements of Domestic MC&A Programs**

- Independent assessment
  - Review of capabilities and performance of MC&A system and its effectiveness at the required frequency.
  - Document results of the assessment and recommendations for corrective action, if any, and report to plant management.
  - Document management's action on recommendations.

#### • Recordkeeping

- Recordkeeping system that demonstrates meeting the regulatory requirements
- Document data for events such as material transfers, shipments, receipts, physical inventory
- Access controls that ensure accurate and reliable information
- Retention system is maintained for the required number of years
- Inventory Changes, and Material Balance Reports
- Reported to the U.S. Nuclear Material Management and Safeguards System (NMMSS)



## 10 CFR Part 75 - Safeguards on Nuclear Material-Implementation of US-IAEA Safeguards Agreement

Implements the requirements established by treaties between the United States and the International Atomic Energy Agency (IAEA)

#### • U.S./IAEA Safeguards Agreement (INFCIRC 288)

- Provide Design Information (DIQ/DIE/DIV)
- Application of containment and surveillance (seals and cameras)
- Physical inventories (Annual and interim)
- Records and Reports (Inventories and transactions)
- On-site Inspections
- U.S./IAEA Additional Protocol (INFCIRC 288, Add. 1)
  - Follows the Model Additional Protocol
  - Only difference is the inclusion of a National Security Exclusion
  - Requires reporting of: mining/ore processing, Nuclear-related equipment manufacturing, quarterly export reports, research and development not involving nuclear material, holding of source materials, building information for sites, and complementary access.



# Reports Under US. Domestic Safeguards (10 CFR 74) and the US/IAEA Agreement (10 CFR 75)

- Inventory Reports (Form 742 Material Status Report) Required by 10 CFR, Parts 74.13 and 75.32
- Inventory Change Report (Form 741 Material Transaction Reports and Form 740M Concise Note) Required by 10 CFR, Parts 74.15 and 75.34
- Physical Inventory Verification (Form 742C Physical Inventory Listing, and Form 740M Concise Note) Required by 10 CFR, Parts 74.13 and 75.35
- Special Reports to NRC Operations Center (material loss and unauthorized material removal) Required by 10 CFR, Parts 74.11 and 75.36



# Nuclear Materials Management and Safeguards System (NMMSS)

- Computer database in operations since mid 1960's
- Tracks uranium, plutonium and thorium handled by private industry
- Facilities report information to database mainly as a computer file, but a few paper forms are still received
- Used to prepare U.S. Government reports to the International Atomic Energy Agency and other countries as requited by various treaties and agreements
  - Inventory Change Reports
  - Material Status Report
  - Physical Inventory Data
  - All Exports and Imports of nuclear materials (Source and Special Fissionable Material)
  - Transit matching reconciliation



## **Reporting to NMMSS**

### Facilities required to report

- Imports & exports
- Physical inventory
- Inventory adjustments
- Shipments between facilities

#### • Reporting units

- 1 Kg for Natural Uranium, Natural Uranium or thorium
- 1 gram for Plutonium, U-233, or U-235 in enriched uranium



## U.S. Industry

- ~350 facilities report nuclear material to NMMSS each year
  - ~104 nuclear power reactors
  - ~25 research reactors
  - ~10 fuel cycle facilities
  - ~20 spent fuel storage locations
  - ~ 200 locations using mainly gram quantities of plutonium or enriched uranium



## References

- <u>www.nrc.gov/reading-rm/doc-</u> <u>collections/cfr/part074</u>, 10 CFR 74
- <u>www.nrc.gov/reading-rm/doc-</u> <u>collections/cfr/part075</u>, 10 CFR 75
- <u>http://nnsa.energy.gov/aboutus/ourprograms/nu</u> <u>clearsecurity/nmmsshome</u>, Nuclear Material Management Safeguards System