Accountability
Performance
Accuracy

The Nuclear Materials Management Safeguards System

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NRC Case Study- Material Found

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Overview

- Background
- NRC Involvement
- NRC & NMMSS Working Together
- Finding Resolution
- Possible Next Steps

Background

- A Radiation Safety Officer (RSO) arrives at new job and inspects the work area at a NRC-licensed site.
- The RSO discovers a box in a storage closet containing paperwork and several clear plastic containers.
  - Paperwork indicates that there is special nuclear material in the containers.
  - The containers appear to hold some pellets.
- The RSO checked site records and was unable to locate a record indicating that the site received this material in the past.
- The RSO scans the containers and confirms that there is radioactive material in the containers. The RSO contacts the NRC Regional staff and notes the findings, providing digital photographs by email.

NRC Involvement

- NRC receives and reviews the photographs
  - The items in the clear plastic containers are shaped like fuel pellets.
  - The paperwork does not include any NRC Form 741s, Nuclear Material Transaction Reports
- NRC contacts NMMSS who confirmed:
  - Licensee has a Reporting Identification Symbol (RIS) with NMMSS but the RIS is deactivated in NMMSS; and
  - NMMSS shows a zero inventory for the deactivated RIS

NRC and NMMSS Working Together

- Since the site has a deactivated RIS, NRC requested and received the following additional information from NMMSS:
  - The date that the RIS was established;
  - Copies of all of the reports documenting shipment to and from the RIS;
  - Confirmation that the RIS has a zero balance for all reportable materials;
  - The date that the RIS was deactivated; and
  - A copy of NRC's approval for deactivation of the RIS.
- The NMMSS reports showed that, over the years, several fuel fabrication plants had shipped about 200 grams of LEU, in the form of pellets, to the RIS.

NRC and NMMSS Working Together

- NRC contacts the site RSO
  - The RSO offers to send additional digital photographs of the containers.
  - The RSO asks for guidance in documenting the uranium.
- The additional photographs indicated a net uranium mass and net isotope mass on each container and number of items in each container.
- The net of the uranium and isotope mass are consistent with the uranium expected to be in the total number of pellets in each container.
  - NRC confirms the pellet information with the appropriate fuel fabricators who had shipped pellets to the licensee in the past.

Finding Resolution

- NRC telephones the RSO
  - NRC notes that the net of uranium and isotope listed on the containers are consistent with the expected mass for the pellets in each container.
  - NRC notes that NMMSS has been directed to reactivate the licensee's RIS
  - NRC notes that the site should report to NMMSS the mass of special nuclear material (enriched uranium) that was found at the licensee site
  - The RSO notes that their current license allows them to possess the enriched uranium that is present

Possible Next Steps

- What might the licensee do with the enriched uranium?
- Do you think that the licensee acted appropriately?
- What would you have done differently?

NRC Case Study – Incorrect Shipment

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Hypothetical Situation

A made-up case study for discussion:

- Company ABC, licensed by one of the 37 Agreement States, routinely purchases non-irradiated special nuclear material.
- ABC manufactures some niche market items which contain the special nuclear material.
- The manufactured items are sold to, and used by, the nuclear power industry and others.
- ABC periodically purchases the special nuclear material from a supplier, Company EFG.

A Big Order!

- One day ABC received a new contract for a large number of their manufactured devices.
- ABC did not have adequate special nuclear material at their plant so they placed a routine order for the special nuclear material, plus an extra amount to help with the new large contract.
- ABC purchased the special nuclear material from their normal supplier, EFG.
- When the nuclear material arrived, ABC accepted the package. A few days later, they opened the package to verify its contents and record the material transaction, per the requirements of 10 CFR 74.15.

Material Received

- ABC looked at the contents of the package and noticed:
  - The package was several times larger than what they usually received.
  - Normally they receive one metal can in the package, but this package contained three cans.
  - The shipping papers stated that more special nuclear material was shipped than what was ordered.
  - "This is not what we ordered!"
- ABC called the supplier, EFG, and expressed their confusion. ABC described what they received, the size of the package, the number of cans in the package and provided the information from the shipping paperwork.

Shipper's Investigation

- EFG management began to investigate the situation.
- EFG management contacted their shipping department to verify the records for the shipment to ABC.
- The shipping department manager looked at the records and noted that there appeared to be a problem.
- EFG staff met to review and verify the records.

Shipper's Investigation

- EFG called the ABC to confirm some additional items: shipping package number, size of the package received, number of containers in the package, and requested a copy of the shipping paperwork contained in the package.
- EFG staff has another meeting and reviews the records.
- EFG determines that they made an error.
  - ABC wanted a total of X grams of special nuclear material
  - EFG shipped Y grams of special nuclear material

Next Steps - Receiver

- Do we possess more nuclear material that allowed by license?
- Are we required by our license to notify anyone that we received more material than we requested?
- Can we keep the extra nuclear material?
- Do we need to talk to / inform our lawyer?
- What does the supply company want us to do?
- What do we report to NMMSS?
  - What we received or what the supply company reported as shipped?

Next Steps - Shipper

- Did we use the correct shipping container for the quantity of material we shipped?
- Do we need to notify anyone that we shipped too much material?
- Do we need to talk to / inform our lawyer?
- Did we report to NMMSS what we actually shipped or what we intended to ship?
- What does the receiving company want us to do?

Possible Issues- Receiver

- Receiver possesses more special nuclear material than authorized by the State-issued license
- Receiver possesses more special nuclear material than the State is authorized to license, now NRC licensing jurisdiction.
- A nuclear criticality or near criticality event occurred due to the quantity of special nuclear material received and present at the facility.
- An investigation could indicate that the receiver did not act quick enough to confirm what was actually received and take actions.
- Operations could be stopped during an investigation and the receiver could lose customers.

Possible Issues - Shipper

- The quantity of special nuclear material actually shipped exceeded the shipping container's licensed safety parameters, and the shipper is investigated by the Department of Transportation.
- The shipper could be shutdown for a period of time while an investigation of their operations is performed and any corrective actions are implemented.
- The shipper loses their license to operate.
- Personnel actions could be extensive.

What went right?

- The receiver noted that:
  - The package is several times larger than what they usually receive.
  - Normally one metal can is in the package. They questioned why three cans were in this package.
  - The shipping papers indicated that a lot more special nuclear material was shipped than what was ordered.
- The receiver contacted the shipper and shared its observations.

What went right?

- The shipper:
  - Documented receiver observations and passed information to management.
  - Promptly reviewed their records and double checked their records.
  - Called the receiver and confirmed some additional items: shipping package number, size of the package received, number of containers in the package, and asked for a copy of the shipping documents contained in the package.
  - Accepted that they made an error and notified the receiver.

Next Steps

- Actions taken to ensure that material was being safely handled/stored.
- Shipper and Receiver discussed what should happen with excess nuclear material.
- Internal and external investigations were performed .

What do you think?

- Do you think that the receiver acted appropriately?
- Do you think that the shipper acted appropriately upon learning of the error?
- What would you have done differently?

NRC Case Study – Reporting MT 81

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Overview

- Natural vs Normal
- DOE vs NRC requirements
- Example

Natural Uranium

- What is *natural uranium*?
- Uranium as it occurs “in nature”
- Has not been altered from its natural state
- Nominally contains:
  - 99.283 % U-238
  - 0.711 % U-235
  - 0.006 % U-234

Normal Uranium

- What is *normal uranium*?
  - DOE, NMMSS Users Guide:

	81	**Normal Uranium**	
		Total	
		0.710 to < 0.712% U-235	kg

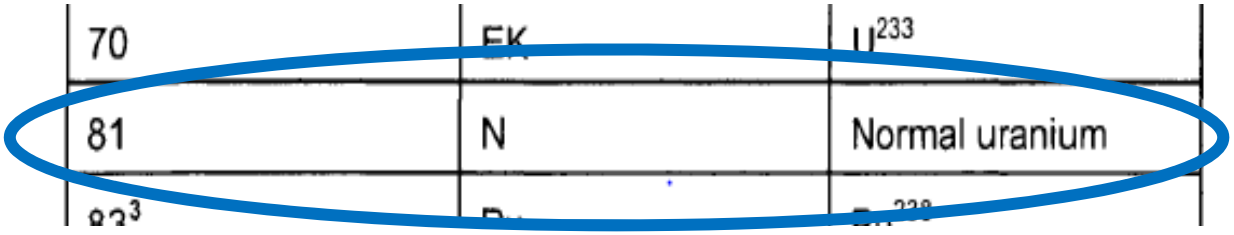
  - NRC, NUREG/BR-0096 (NRC Form 327s)

NORMAL URANIUM–Any uranium-bearing material with a uranium isotopic weight distribution that can be described as being (1) 0.700 to 0.724 percent in combined U-233 plus U-235; and (2) at least 99.200 percent in U-238.

[NOTE: All natural uranium with a U-235 isotopic concentration in the range of 0.700 to 0.724 percent is normal uranium, but not all normal uranium is natural uranium.]

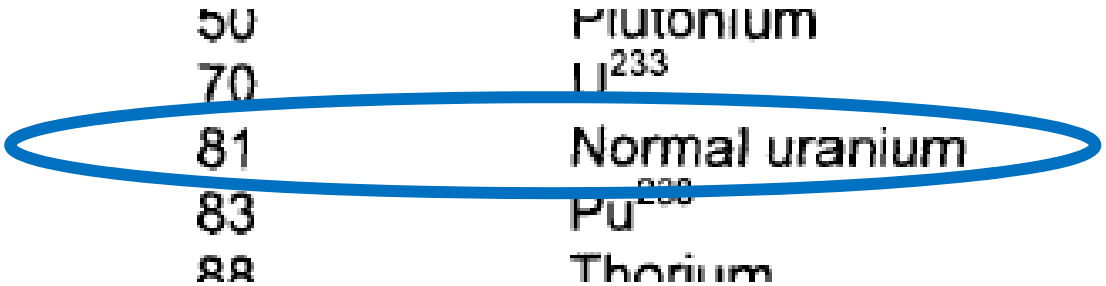
Normal Uranium

- NRC, NUREG/BR-0006 (Form 741s)



70	EK	U^{233}
81	N	Normal uranium
83^3	P	Pu^{238}

- NRC, NUREG/BR-0007 (Form 742s)



50	Plutonium
70	U^{233}
81	Normal uranium
83	Pu^{238}
88	Thorium

Reporting Example

- Government-owned nuclear material containing 0.716% U-235 is shipped from a DOE facility to a facility licensed by the NRC.
- The NRC facility will use this government-owned material in its process to create material used in the commercial nuclear fuel cycle.
- The Form 741 generated by the DOE facility indicates the material type as MT 20 (enriched uranium).

What does the NRC-licensed facility do when receiving the nuclear material?

Reporting Example

- In accordance with NRC guidance and facility procedures and processes, the NRC facility considers nuclear material containing 0.716% U-235 as MT 81.
- So….NRC facility documents receipt of the government-owned nuclear material as MT 20 (enriched) on Form 741 using its own measurements
- Then…NRC facility performs Miscellaneous Shipment & Miscellaneous Receipt pair of transactions on its books
  - Remove the nuclear material received as MT 20 (Misc Shipment)
  - Add the nuclear material as MT 81 (Misc Receipt)

Reporting Example

- One more thing…
- NRC facility also changes ownership code of G (government-owned) to J (not government-owned)
  - Miscellaneous Shipment of MT 20 in grams with G owner code
  - Miscellaneous Receipt of MT 81 in kilograms with J owner code

Summary

- Know the requirements
  - Regulatory
  - Facility-specific procedures, systems
- Communication is key
- Resources- Always!
  - DOE/NRC Program Managers
  - NMMSS Analysts