



Power Reactor Reporting NRC Inspector Observations

NMMSS Users Annual Training Meeting

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Background

Issue – Site 1

- Identified during review of records and thorough physical inventory conducted in preparation for dry storage and decommissioning
- Unable to match two rods listed in the records with items in the spent fuel pool (SFP)
- Conclusion of investigation: the two rods were most likely shipped to a low-level waste burial site
- No NMMSS transaction, no record of shipment



Background

Issue – Site 2

- Identified during conduct of an NRC temporary instruction for inspecting MC&A
- Records said two pieces of spent fuel listed in the inventory were in an open bucket in the SFP
- Had not visually verified pieces for several years
- Visual verification performed at request of NRC showed they were not in the bucket
- Search for the rod pieces took several months
- Pieces finally found in another container in the SFP
- No measures in place at the time would have prevented shipping the pieces to burial



Background

Issue – Site 3

- Identified during review of records and thorough physical inventory conducted in preparation for dry storage and decommissioning
- Three rod pieces listed in the records could not be matched with items in the SFP
- Three pieces removed from an assembly before it was shipped to West Valley for reprocessing
- Shipped on paper records as an intact assembly
- Many rod fragments found in the SFP, but match to these pieces not confirmed



Accounting in NMMSS for “Lost and Found” Material

To adjust the books for “found” pieces

- Line 34 on Form 742, Receipts – Misc
- “...nuclear material removed from inventory but now returned to inventory, if not accounted for elsewhere”
- Applicable to issue at Site 3
- Miscellaneous receipt on Form 741, accompanied by a **CONCISE NOTE**



Accounting in NMMSS for “Lost and Found” Material

To adjust the books for material known to be lost

- Line 75 on Form 742, Accidental Losses
- “...irretrievable and inadvertent loss of a known quantity of SNM ...by estimate on the basis of [prior] measurement”
- Applicable to issue at Site 1
- Accompanied by a CONCISE NOTE on Form 741



What Code/Line Should Reactors Not Use?

Line 77. Inventory Difference (ID, MF)

- *Unexplained* difference between physical inventory and book inventory after book has been adjusted for receipts and removals
- Reflects *measurement uncertainty*
- Reactors don't measure
- This code should NEVER be used by reactors



Definition of Inventory Difference

From the *IAEA Safeguards Glossary*, 2001 Edition

“For item MBAs, MUF [difference between book and physical inventory, ID in the U.S.] should be zero, and a non-zero MUF is an indication of a problem (e.g. accounting mistakes) which should be investigated. For bulk handling MBAs, a non-zero MUF is expected because of measurement uncertainty and the nature of processing.”



Common Reactor Transactions

- 21. Production
- 22. Change from another material
- 30. Receipt reported on Form 741
- 51. Shipment reported on Form 741
- 71. Degradation to another material
- 72. Nuclear decay
- 73. Fission and transmutation in the reactor
- 74. Normal operating losses/measured discards



Best Practice: Accounting for Rods and Pieces

- For site accounting only – not NMMSS
- Identify separated rods, rod fragments, and pieces
- Track them in the records and spent fuel pool map
- Assign SNM amounts to the rods and pieces
- Adjust SNM amounts assigned to the assembly to account for rods and pieces that have been separated or removed



Assigning SNM Amounts to Rods and Pieces

- Suggested approach
- For 1 rod removed from an assembly with 277 rods, assign the rod $1/277$ of the SNM value
- Reduce the assembly value by the same amount
- Amounts are merely estimates
- Apply subsequent reported adjustments to the assembly and to the separated pieces



Measures to Improve MC&A at Power Plants

- Revise/update ANSI N15.8, “Nuclear Material Control Systems for Nuclear Power Plants”
- Revise/update NRC regulatory guidance documents
 - *Internal Transfers of Special Nuclear Material*
 - *Nuclear Material Control Systems for Nuclear Power Plants*
- Reinstate program of periodic MC&A inspections