

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, D.C. 20555

November 8, 1999

NRC INFORMATION NOTICE NO. 99-30: FAILURE OF DOUBLE CONTINGENCY BASED
ON ADMINISTRATIVE CONTROLS INVOLVING
LABORATORY SAMPLING AND
SPECTROSCOPIC ANALYSIS OF WET URANIUM
WASTE

Addressees:

All fuel cycle licensees and certificants performing laboratory analysis to determine uranium content, in support of administrative criticality safety controls.

Purpose:

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to problems recently noted with the laboratory and spectroscopic analysis of uranium contaminated material. Under certain conditions, incomplete dissolution of samples may produce a nonconservative laboratory result and lead to violation of criticality safety limits. When the laboratory sampling is backed up by spectroscopic analysis, care must be taken to ensure a sufficiently precise result through proper qualification of the spectroscopic method. Recipients are expected to review this information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. Suggestions contained in this information notice are not NRC requirements. Therefore, no specific action nor written response is required.

Description of Circumstances:

On August 12, 1999, a fuel cycle licensee determined that a laboratory dissolution process was not completely dissolving the uranium in certain samples, which resulted in underestimating the amount of uranium in wet process waste. Subsequent licensee gamma spectroscopic analysis of the wet waste also failed to detect the problem, because of inadequate spectroscopic analysis conditions. Because of these simultaneous failures, excessive uranium was transferred into the wet process waste storage arrays. These deficiencies in sampling and spectroscopic analysis of process waste degraded the margin of safety to the extent that a criticality safety limit was violated.

ML993060157

PDR I&E

NOTICE 99-

D103/1

Discussion:

On July 30, 1999, a fuel cycle licensee discovered that a combustible waste bag containing laboratory filter paper had higher than expected radiation readings. A subsequent licensee investigation revealed that the acid leach dissolution process used to prepare samples for analysis of uranium content had not completely dissolved the uranium. When the samples were later filtered during the sample preparation process, some uranium was deposited on the filter paper with other solids.

The samples in question came from a uranium recovery process that produced wet solid waste that was collected into 5-gallon buckets and stored in a safe, single-layer array. The samples were used to determine uranium content before the material was further collected into 55-gallon drums. Once the waste was collected into the 55-gallon drums, the drums were examined by spectroscopic analysis before being stored in a safe, triple-layer array.

The licensee investigation revealed that the 55-gallon drum spectroscopic analysis was also assigning a low value to the uranium content of the drums. This was because the drum calibration standard did not adequately resemble the material being counted and the spectroscopic analysis did not account for self-shielding in the drum material.

The licensee had completed a criticality safety analysis (CSA) of the triple-layer drum storage array to establish safety parameters. The analysis made use of the surface density method to establish the maximum uranium content limit for individual drums. Double contingency for the storage array was maintained through sampling of the 5-gallon buckets and spectroscopic analysis of the 55-gallon drums. As a result of these independent and simultaneous failures, drums stored in the array exceeded the maximum allowed uranium content for single drums by up to 32%, thereby causing the failure of the double-contingency arrangement. This situation was safety significant in that no controls remained to limit the mass in the array, although the total mass involved was far less than what would be required for a criticality.

An important contributing factor in this event was the limited scope of the wet waste material process CSA, which stopped with the material being placed into 5-gallon buckets and did not overlap the CSA covering the 55-gallon drum storage. Including the transfer from 5-gallon buckets to 55-gallon drums in the wet waste material CSA should have resulted in more robust controls such as a requirement for dual sampling before permitting the transfer.


An additional important contributing factor in this event was that the sample processing procedures allowed a choice of dissolution methods under the assumption that either dissolution method would produce a substantially similar result. The procedure writers mistakenly assumed that the acid leach dissolution method of sample preparation would put all uranium into solution even if the entire sample was not dissolved.

Finally, the spectroscopic analysis procedures did not qualify waste streams for spectroscopic analysis, ensure optimal packaging for spectroscopic analysis, or require corrective action, when spectroscopic analysis results did not support laboratory analysis. Spectroscopic analysis

of the 55-gallon drums failed to detect the drums containing excess uranium due to these failures. ANSI N15.20-1975 "Guide to Calibrating Nondestructive Assay Systems" provides a more complete discussion of spectroscopic analysis sensitivities.

This event highlights the necessity for careful review of administrative controls, to ensure that the failure of such controls is actually unlikely. In addition, CSAs need to be broad enough that the analyst will clearly understand the safety significance of proposed controls. All procedures having an impact on the control need to be reviewed carefully to ensure that the control is actually implemented.

It is expected that addressees will evaluate the above information for applicability to licensed activities. This information notice requires no specific actions nor written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate regional office.


Elizabeth Q. Ten Eyck, Director
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Technical Contact: Dennis C. Morey, NMSS
301-415-6107
E-mail: dcm@nrc.gov

Attachments:

1. List of Recently Issued NMSS Information Notices
2. List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
 NMSS INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
99-29	Authorized Contents of Spent Fuel Casks	10/28/99	All power reactor licensees and spent fuel storage licensees and applicants
99-28	Recall of Star Brand Fire Protection Sprinkler Heads	9/30/99	All holders of licenses for nuclear power, research and test reactors, and fuel cycle facilities
99-27	Malfunction of Source Retraction Mechanism in Cobalt-60 Teletherapy Treatment Units	9/2/99	All medical licensees authorized to conduct teletherapy treatments
99-26	Safety and Economic Consequences of Misleading Marketing Information	8/24/99	All Distributors and/or Manufacturers of Generally Licensed Products
99-24	Broad-Scope Licensees' Responsibilities for Reviewing and Approving Unregistered Sealed Sources and Devices	7/12/99	All medical licensees' of broad-scope and master materials licensees
99-23	Safety Concerns Related To Repeated Control Unit Failures of the Nucletron Classic Model High-Dose-Rate Remote Afterloading Brachytherapy Devices	7/6/99	All U.S. NRC medical licensees authorized to use brachytherapy sources in Nucletron Classic Model high-dose-rate (HDR) remote afterloaders
99-22	10 CFR 34.43(a)(1): Effective Date for Radiographer Certification and Plans for Enforcement Discretion	6/25/99	Industrial Radiography Licensees
99-20	Contingency Planning for the Year 2000 Computer Problem	6/25/99	All material and fuel cycle licensees and certificate holders
99-18	Update on NRC's Year 2000 Activities for Materials Licensees and Fuel Cycle Licensees and Certificate Holders	6/14/99	All material and fuel cycle licensees and certificate holders
99-16	Federal Bureau of Investigation's Nuclear Site Security Program	5/28/99	All U.S. Nuclear Regulatory Commission fuel cycle, power reactor, and non-power reactor licensees

LIST OF RECENTLY ISSUED
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
99-29	Authorized Contents of Spent Fuel Casks	10/28/99	All power reactor licensees and spent fuel storage licensees and applicants
99-28	Recall of Star Brand Fire Protection Sprinkler Heads	9/30/99	All holders of licenses for nuclear power, research, and test reactors, and fuel cycle facilities
99-27	Malfunction of Source Retraction Mechanism in Cobalt-60 Teletherapy Treatment Units	9/2/99	All medical licensees authorized to conduct teletherapy treatments
99-26	Safety and Economic Consequences of Misleading Marketing Information	8/24/99	All Distributors and/or Manufacturers of Generally Licensed Products
99-25	Year 2000 Contingency Planning Activities	8/10/99	All holders of operating licenses for nuclear power plants and fuel cycle facilities
99-24	Broad-Scope Licensees' Responsibilities for Reviewing and Approving Unregistered Sealed Sources and Devices	7/12/99	All medical licensees of broad-scope and master materials licensees
99-23	Safety Concerns Related To Repeated Control Unit Failures of the Nucletron Classic Model High-Dose-Rate Remote Afterloading Brachytherapy Devices	7/6/99	All U.S. NRC medical licensees authorized to use brachytherapy sources in Nucletron Classic Model high-dose-rate (HDR) remote afterloaders
99-22	10 CFR 34.43(a)(1); Effective Date for Radiographer Certification and Plans for Enforcement Discretion	7/6/99	Industrial Radiography Licensees

OL = Operating License
 CP = Construction Permit

of the 55-gallon drums failed to detect the drums containing excess uranium due to these failures. ANSI N15.20-1975 "Guide to Calibrating Nondestructive Assay Systems" provides a more complete discussion of spectroscopic analysis sensitivities.

This event highlights the necessity for careful review of administrative controls, to ensure that the failure of such controls is actually unlikely. In addition, CSAs need to be broad enough that the analyst will clearly understand the safety significance of proposed controls. All procedures having an impact on the control need to be reviewed carefully to ensure that the control is actually implemented.

It is expected that addressees will evaluate the above information for applicability to licensed activities. This information notice requires no specific actions nor written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate regional office.

Elizabeth Q. Ten Eyck, Director
 Division of Fuel Cycle Safety
 and Safeguards
 Office of Nuclear Material Safety
 and Safeguards

Technical Contact: Dennis C. Morey, NMSS
 301-415-6107
 E-mail: dcm@nrc.gov

Attachments:

1. List of Recently Issued NMSS Information Notices
2. List of Recently Issued NRC Information Notices

FILE NAME: a:\99-30.in *See previous concurrences

OFC	TECH ED	FCOB	FCOB	FCOB	IMNS	FCSS
NAME	EKrauss*	DMorey*	WSchwink	PTing*	KRamsey*	ETenEyck*
DATE	9/16/99	9/16/99	/ / 99	10/13/99	10/18/99	10/15/99

C = COVER

E = COVER & ENCLOSURE
 OFFICIAL RECORD COPY

N = NO COPY

It is expected that addressees will evaluate the above information for applicability to licensed activities. This information notice requires no specific actions nor written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate regional office.

Elizabeth Q. Ten Eyck, Director
 Division of Fuel Cycle Safety
 and Safeguards
 Office of Nuclear Material Safety
 and Safeguards

Technical Contact: Dennis C. Morey, NMSS
 301-415-6107
 E-mail: dcm@nrc.gov

Attachments:

1. List of Recently Issued NMSS Information Notices
2. List of Recently Issued NRC Information Notices

FILE NAME: a:\INsiemen1.wpd

10/14/99

OFC	TECH ED	FCOB	E	FCOB	FCOB	E	IMNS	E	FCSS			
NAME	EKrauss	DMorey	WSchwink	PTing	KRamsey	ETenEyck						
DATE	1 /99	9/16/99	11 /99	10/13/99	10/18/99	10/15/99						

C = COVER

E = COVER & ENCLOSURE
 OFFICIAL RECORD COPY

N = NO COPY