UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

October 29, 1993

NRC INFORMATION NOTICE 93-86: IDENTIFICATION OF ISOTOPES IN THE PRODUCTION AND SHIPMENT OF BYPRODUCT MATERIAL AT NON-POWER REACTORS

Addressees

All holders of operating licenses or construction permits for test and research reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to a problem with the identification of isotopes in byproduct material produced and shipped at a non-power reactor. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

In response to NRC concerns regarding shipping errors at the University of Missouri-Columbia Research Reactor Facility (MURR), the licensee established a task force to review the shipping of byproduct material produced in the reactor. When the task force reviewed the information on target composition (isotopic enrichment, impurities, or encapsulation) and isotopes to be produced submitted by requesters of irradiation services, the task force found 17 target types that had been submitted with incomplete information. Because the licensee accepted the incomplete information from the requesters, some of the isotopes produced by irradiation of the targets in the reactor were not listed on the shipping papers. Apparently, the target composition information submitted by the requesters contained only the isotope(s) of interest to the requesters and did not contain other isotopes that would be produced in the target. The task force determined that less than 90 percent of the total sample activity was reported on the shipping papers for the 17 target types. The task force also found that the calculations of expected isotope activity levels submitted by requesters were accepted without independent licensee verification.

A particularly significant example in which activity levels were understated on the shipping papers concerned the irradiation of a sample of ytterbium (Yb). The isotope of interest to the requester was Yb-169 (half-life of 32.03 days) which was listed on the request for irradiation form. MURR accepted this information as listed on the request form and the sample was shipped as containing 592 MBq [16 millicuries] of Yb-169. However,

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conservative calculations (which ignored self shielding or flux perturbations) showed that up to 185,000 MBq [5 curies] of Yb-175 (half-life of 4.19 days) may have been in the target when it was shipped.

Another concern was found in the manner that facility personnel used the information prepared for irradiation of targets. For irradiation experiments, MURR prepares safety analyses called reactor utilization requests that contain comprehensive information on the isotopes that will be produced in irradiated targets. The technicians who prepare the targets for irradiation refer to summary sheets of pertinent data taken from the prepared reactor utilization requests. However, there was no administrative mechanism to ensure that the data on the summary sheets is updated if changes were made to the reactor utilization requests.

To correct the problems with preparation of shipping papers, MURR will measure directly the activity of samples for shipment if feasible. Where direct measurement is not feasible, MURR will calculate the activity produced in the target. The activity of samples of phosphorus-32 and sulfur-35 will be determined by reference to previously verified activities for identical targets with similar irradiation histories. To correct the problem with the use of summary sheets, MURR committed to develop a mechanism to ensure that the summary sheets are updated to reflect any pertinent changes to information on the reactor utilization requests.

Discussion

The circumstances described above demonstrate the importance of licensee verification of information on targets (isotopic enrichment, impurities, encapsulation, isotopes produced) for insertion into a non-power reactor. In accordance with technical specifications, licensees are responsible for ensuring that targets meet the requirements of an approved safety analysis. The calculations for these safety analyses evaluate the effects of irradiating the target material and assist in the determination of health physics and shipping requirements for isotopes produced by the irradiation. Identification of these isotopes is important for radiation protection of plant personnel and also for documenting the makeup of the irradiated target prior to shipment.

Title 10 of the Code of Federal Regulations, Part 71, Section 5(a)[10 CFR 71.5(a)] requires that licensee who transport licensed material outside the confines of their plants or deliver licensed material to a carrier for transport, shall comply with the applicable requirements of the regulations appropriate to the mode of transport of the Department of Transportation (DOT) IN 49 CFR 170-189. DOT regulation 49 CFR 172.203(d) requires that shipping papers specify, along with other information the activity contained in each package of the shipment in terms of curies, millicuries, or microcuries and the name of each radionuclide. Improper identification of isotopes in a sample could present a hazard to personnel who handle or package the samples for shipment, may result in incorrect shipping papers and package labeling

which could be misleading during shipping emergencies, and could cause unnecessary or incorrect exposure if the isotopes are used without verification by the end user.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contacts: A. Adams Jr, NRR
(301) 504-1127

C. Cox, RIII
(708) 790-5298

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List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-85	Problems with X-Relays in DB- and DHB-Type Circuit Breakers Manufactured by Westinghouse	10/20/93	All holders of OLs or CPs for nuclear power reactors
93-84	Determination of Westinghouse Reactor Coolant Pump Seal Failure	10/20/93	All holders of OLs or CPs for pressurized water reactors (PWRs).
93-83	Potential Loss of Spent Fuel Pool Cooling Following A Loss of Coolant Accident (LOCA)	10/07/93	All holders of OLs or CPs for boiling water reactors (BWRs).
93-82	Recent Fuel and Core Performance Problems in Operating Reactors	10/12/93	All holders of OLs or CPs for nuclear power reactors and all NRC-approved fuel suppliers.
93-81	Implementation of Engineering Expertise on Shift	10/12/93	All holders of OLs or CPs for nuclear power reactors.
93-80	Implementation of the Revised 10 CFR Part 20	10/08/93	All byproduct, source, and and special nuclear material licensees.
93-79	Core Shroud Cracking at Beltline Region Welds in Boiling-Water Reactors	09/30/93	All holders of operating licenses or construction permits for boiling-water reactors (BWRs).
93-78	Inoperable Safety Systems At A Non-Power Reactor	10/04/93	All holders of OLs or CPs for test and research reactors.
93-77	Human Errors that Result in Inadvertent Transfers of Special Nuclear Material at Fuel Cycle Facilities	10/04/93	All nuclear fuel cycle licensees.

OL = Operating License
CP = Construction Permit

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Original signed by
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*See previous concurrence

ONDD:LA:NRR*	ONDD:PM:NRR*	R-III*	C/ONDD:DORS:NRR*
EHylton	AAdams:dmj	CCox	SWeiss
07/30/93	07/30/93	08/03/93	08/03/93

TECHED:ADM*	OGCB:DORS:NRR*	C/OGCB:DORS:NRR*	D/DORS:NRR
MMejac	JLBirmingham	GHMarcus	BKGrimes
07/29/93	08/31/93	09/02/93	10/29/93

C/OSTB:IMNS:NMSS*
CJHaughney
08/31/93

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[SHIPMENT.JLB] (Adams #2-1b)
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MURR prepares safety analyses for experiments (called reactor utilization requests or RURs) that contain comprehensive information on the isotopes that will be produced in targets. However, the technicians preparing targets for irradiation referred to an RUR summary sheet and not the actual RUR to authorize irradiation of the target. The RUR summary sheets did not contain information on isotope production. The shipping paperwork was prepared from the irradiation request forms filled out by the requester and listed only the isotope(s) identified by the requester.

To correct this situation, MURR will measure directly the activity of samples for shipment when feasible. If not feasible, MURR will independently calculate the activity to be produced in the target. For samples of phosphorus-32 and sulfur-35, activity will be determined by reference to previously verified activities for identical targets with similar irradiation histories.

Discussion

This problem emphasizes the importance of independent licensee verification of information on targets to be inserted into an NPR. Licensees should verify that targets meet the requirements of an approved safety analysis that includes all isotopes to be produced. This is especially critical for those targets that are prepared for irradiation outside the control of the licensee. It is the responsibility of the licensee to ensure that outside parties who prepare targets for irradiation are familiar with the requirements of the target safety analysis and that the requirements of the safety analysis are followed.

It is important to identify the isotopes that will be produced in a sample. Incorrect identification of isotopes could present a hazard to facility personnel who handle samples and package them for shipment and could result in incorrect shipping paperwork and package labeling, which could mislead responders to shipping emergencies. Incorrect shipping paperwork and package labeling also presents a hazard to receiving personnel.

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