



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report No.: 50-62/90-02

Licensee: University of Virginia
Charlottesville, VA 22901

Docket No.: 50-62

License No.: R-66

Facility Name: University of Virginia Reactor (UVAR)

Inspection Conducted: March 5 - 6, 1990

Inspectors: C Bassett
C. H. Bassett

4/2/90
Date Signed

Approved by: E. J. McAlpine
E. J. McAlpine, Chief
Radiation Safety Projects Section
Nuclear Material Safety and
Safeguards Branch
Division of Radiation Safety and
Safeguards

4/2/90
Date Signed

SUMMARY

Scope:

This routine, unannounced inspection involved onsite review of licensee actions regarding previously identified issues and NRC Information Notices and also allegation follow up.

Results:

Within the areas inspected and reviewed, no violations were identified. However, a weakness was noted in the area of correlating proper emergency actions in response to a simulated emergency situation.

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REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *P. Benneche, Reactor Supervisor/Services
- *J. Farrar, Reactor Administrator
- B. Hosticka, Reserach Scientist
- *R. Mulder, Director, University of Virginia Reactor (UVAR) Facility
- *T. Williamson, Chairman, Department of Nuclear Engineering and Engineering Physics

Other Organizations

- *J. Gilchrist, Acting Radiation Safety Officer, University of Virginia (UVA) Environmental Health and Safety (EHS) Department
- *A. Jackson, Reactor Health Physicist, UVA EHS Department
- *D. Steva, Reactor Health Physicist, UVA EHS Department

*Attended Exit Interview

2. Action on Previous Inspection Findings (92701, 92702)

- a. (Closed) Violation (VIO) 50-62/88-02-05: Failure to Update Letters of Agreement In Accordance with Emergency Plan Requirements.

The inspector reviewed the licensee's response dated October 13, 1988, and verified that the corrective actions outlined therein had been taken. This issue had been reviewed during a previous inspection in November 1989. During that inspection it was determined that letters soliciting updated Letters of Agreement (LOAs) were sent out November 8, 1989, but not to the Virginia Department of Emergency Services nor to Oak Ridge/ Department of Energy as specified in the Emergency Plan. During this inspection, the inspector verified that Letters of Agreement had been requested and received from the aforementioned organizations. The letter from the local Virginia Department of Emergency Services (in Charlottesville) had been received December 19, 1989 and the letter from the State (in Richmond) had been received December 14, 1989. The Oak Ridge Operations/Department of Energy (DOE) LOA had been received January 25, 1990. In addition to the LOA, DOE furnished the reactor facility with a copy of a new version of the Assistance Guide "Guide for Requesting Radiological Assistance," based on the Federal Radiological Emergency Response Plan.

- b. (Closed) Inspector Follow-up Item 50-62/89-IN-27: Limitations on the Use of Waste Forms and High Integrity Containers for the Disposal of Low-Level Radioactive Waste.

The inspector verified that the licensee had received the Information Notice (IN-89-27) and that the appropriate personnel had reviewed the material contained therein for applicability.

- c. (Closed) URI 50-62/89-01-01: Possible Failure to Report Neutron Exposure as Whole Body Dose in Exposure Records.

During a previous inspection, the licensee's exposure records, as supplied by a vendor, were reviewed. The doses reported as whole body doses did not appear to reflect the neutron exposure that some individuals had apparently received. After further review by the licensee and discussions with the dosimetry vendor, it was determined that the doses reported did account for the neutron exposure. The inspector reviewed this data and concluded that the neutron exposure was being recorded on the exposure records as required.

3. Follow-up on Information Notices (92717)

The inspector determined that the following NRC Information Notices (INs) had been received by the licensee, reviewed for applicability, and distributed to appropriate personnel.

- IN 89-04: Potential Problems From the Use of Space Heaters, dated January 17, 1989.
- IN 89-09: Credit for Control Rods Without Scram Capability in the Calculation of the Shutdown Margin, dated January 26, 1989.
- IN 89-25: Unauthorized Transfer of Ownership or Control of Licensed Activities, dated March 7, 1989.
- IN 89-27: Limitations on the Use of Waste Forms and High Integrity Containers for the Disposal of Low-Level Radioactive Waste, dated March 8, 1989.
- IN 89-35: Loss and Theft of Unsecured Licensed Material, dated March 30, 1989.
- IN 89-37: Proposed Amendments to 40 CFR Part 61, Air Emission Standards for Radionuclides, dated April 4, 1989.
- IN 89-46: Confidentiality of Exercise Scenarios, dated May 11, 1989.
- IN 89-47: Potential Problems with Worn or Distorted Hose Clamps on Self-Contained Breathing Apparatus, dated May 18, 1989.
- IN 89-68: Evaluation of Instrument Setpoints During Modifications, dated September 25, 1989.
- IN 89-70: Possible Indications of Misrepresented Vendor Products, dated October 11, 1989.
- IN 89-76: Biofouling Agent: Zebra Mussel, dated November 21, 1989.
- IN 89-81: Inadequate Control of Temporary Modifications to Safety-Related Systems, dated December 6, 1989.
- IN 90-01: Importance of Proper Response to Self-identified Violations by Licenses, dated January 12, 1990.

4. Allegation Follow-up (99014)

a. Allegation No. RII-89-A-0095 - Statement of Concern

It was alleged that, during a drill which was conducted to test emergency response actions of licensee personnel to an accident with serious radiological implications, improper reactions by one individual actually worsened the situation instead of alleviating the problem. Also, management failed to recognize the problems and take corrective actions.

b. Discussion

The inspector discussed the concerns that were raised by the alleged with licensee representatives, including the primary participants in the drill. The inspector determined that the following sequence of events occurred:

A biennial emergency drill was held at the UVAR facility on January 17, 1989. The facility Director and one principal staff member had developed the drill scenario which was to include participation by all staff members present.

The drill scenario was set up such that the reactor staff was supposedly in the process of transferring fuel elements to an outside tank. A fuel element was supposedly loaded into a shielded transfer cask in the reactor pool and the cask was being lifted out of the pool by the overhead crane. Just as the cask was crossing over the pool wall, a cable clamp failed causing the cask to fall and making the crane inoperative. According to the scenario, as the cask fell it struck the pool wall and tipped over, causing the fuel element loaded inside to slide out and become lodged between the cask opening and some other equipment in the area. During the fall, the cask also struck a staff member, knocking her to the floor and trapping her under the cask. The extent of the injuries were such that the victim was unconscious and her leg was apparently crushed and bleeding profusely. Due to the exposed element in the immediate area, the dose rate where the victim was located was projected to be about 50 Roentgens per hour (R/hr).

Just prior to commencement of the drill, the participants were briefed as to the nature of the work that was supposedly in progress and positioned where they might actually be deployed during a fuel transfer operation. The drill was then officially initiated at approximately 10:30 a.m.

Immediately upon initiation of the drill, a Senior Reactor Operator (SRO) took charge of the situation and directed unnecessary personnel out of the immediate area.

- (1) It was alleged that the SRO actually began screaming at people and shoved them out of the area.

Then the person in charge and another SRO found a pry bar and used it to move the cask sufficiently to free the stuck fuel element. At that point, non-staff personnel were requested to evacuate the building and a general evacuation alarm was sounded in the facility. During this same time period, the SRO in charge made an unsuccessful attempt to lift the element from the floor with a long handled tool with a hook on the end.

Because this could not be done quickly, the SRO then simulated picking up the element by hand and throwing it in the reactor pool.

- (2) It was alleged that this reaction would have produced needless exposure and that the SRO's "hysterical performance" made him the most serious injury in the scenario (due to his handling the fuel element). Further, because the general area dose rate near the victim was approximately 50 R/hr and thus not immediately threatening to the life of the victim, there was some time for thought and discussion before such a reaction. The "forceful" action of picking up the element by hand left no opportunity for input from the staff.

At that point the drill had only been in progress for about 2 - 3 minutes. With the high radiation problem apparently taken care of, attention was then turned to caring for the injured staff member, making health physics assessments, and contacting necessary off-site support and regulatory agencies.

- (3) It was alleged that following the drill, these deficiencies were discussed with management and memoranda were written concerning the problems of the individual's apparent improper actions including failure to consult with others prior to taking action.

Through discussions with the following individuals, the inspector determined:

- (1) The SRO who initially took charge indicated that:
 - (a) It is difficult to determine how a person would react during a real emergency and he probably over played his role during the drill. His "hysteria" was overdone due to the circumstances of the drill.
 - (b) He was well aware of the dose rates of spent fuel elements because he had helped take radiation surveys on numerous elements during fuel relocation operations.

- (c) He had received training on the proper response to emergency situations both through his Navy training and through classes given at the UVAR facility.
 - (d) He based his response to this situation on his perception of ALARA. He felt that he could more easily and quickly "pick up" the fuel element with his hands and save the injured person needless exposure. He felt his actions were ALARA-oriented and that very short-term exposure to his hands was preferable to long-term exposure of the victim.
 - (e) He did not consult with anyone on the advisability or consequences of his actions before he reacted. He stated that his Navy training also prompted him to "take charge" and take action.
- (2) The UVAR facility management indicated that:
- (a) The individual's reaction was probably due more to play acting than to "hysteria".
 - (b) They are very confident that the individual who took charge of the situation was competent to do so and knew what needed to be done in the drill situation.
 - (c) They indicated that the situation demanded quick action due to the serious nature of the injuries of the victim.
 - (d) They are satisfied that the individual knew the relative radiation levels with which he was dealing and the ramifications of his actions.
 - (e) They also were of the opinion that the individual's actions were essentially ALARA based on the evaluation that was performed to assess the dose the individual would have received. The evaluation indicated that the individual would have been in an area with a dose rate of 60 Roentgen per hour (R/hr) for about 1 minute and in an area with a dose rate of 300 R/hr for about 5 seconds for a total whole body dose of 1.5R. Hand dose was estimated to be about 50R, having been "in" a dose rate of 40,000 R/hr (holding the fuel element) for approximately 5 seconds.
 - (f) The person who took charge would have incurred a whole body dose in excess of the regular quarterly limit of 1.25R but would not have exceeded the allowable limit of 3R because an NRC Form-4 was on file for the person. Also, the extremity dose would have exceeded the quarterly limit of 18.75R but not the 75R (whole body) limit allowed by the UVAR Emergency Plan for the purpose of saving a life.

- (g) Because of the quick actions of the person in charge, the victim would supposedly have received a dose of only 1R whole body.
 - (h) The Facility Director and the Head of the Nuclear Engineering Department were both of the opinion that the individual's actions were appropriate and were ALARA under the circumstances presented by the drill.
 - (i) Licensee management indicated that the apparent problems with this drill response were discussed and that memos concerning the problems were written. In a post-drill critique, the "accident" and responses to the event were discussed but everyone felt that the individual's actions were appropriate under the circumstances. Following the critique, the issues of the "hysteria" of the person who took charge and the failure to consult with others were discussed in memos distributed among the staff members. The items were again discussed with individual staff members and it was reiterated that nearly everyone felt that the actions taken were appropriate.
- (3) The Reactor Safety Committee reviewed the written review of the drill and were apparently satisfied with the results because no response or questions were raised concerning the actions taken.

c. Finding

Through discussions with licensee representatives and review of associated documentation, the inspector determined that the individual who took charge of the situation during the drill took forceful action and was "hyped-up" due to the circumstances. The person was aware of the problems and hazards associated with the presence of an exposed fuel element and took what he determined to be appropriate actions to reduce dose to the victim. He did not consult or coordinate with anyone else but "picked up" the fuel element and threw it in the reactor pool. Following the drill, these actions were discussed in a post-drill critique and in memoranda. Management and the majority of the staff members concluded that the action of throwing the fuel element in the pool was an appropriate action in this situation. The Reactor Safety Committee reviewed the drill scenario and staff actions and did not disagree with the emergency response actions or question them.

d. Conclusion

Although no violation of regulation occurred, it is the NRC's position that the individual's actions were not appropriate. Handling a fuel element with one's hands was not a proper response in this situation and was not ALARA. From all the data available, it would appear that a better response would have been to handle the

element remotely, as initially attempted. Eventhough this may have taken a few more minutes, the dose rates in the area of the victim were not critical and more conservative action was warranted.

Also, failure of the individual who took charge to consult with others was a problem. As noted above, the general area dose rate in which the victim was located was not immediately life threatening and a planned or coordinated course of action could have been developed. This coordination would not have required an inordinate amount of time and may have produced a more ALARA response. Management was deficient in not recognizing this problem and correcting the misperception that handling a fuel element is an appropriate action.

The allegation was substantiated in that the individual's handling of the fuel element was not an appropriate response in this situation. Also, management was deficient in not correcting this improper response and in not providing training to others to correct the misperception that handling a fuel element was ALARA.

5. Exit Interview

The inspection scope and results were summarized on March 6, 1990, with those persons indicated in Paragraph 1. The inspector described the areas inspected and discussed in detail the inspection findings. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspector. Licensee management was informed that the three items discussed in Paragraph 2 were considered closed.

On April 2, 1990, a telephone conference between the NRC and licensee management was held. During this conference the licensee was informed that the allegation regarding handling of a "dummy" spent fuel element during a drill was closed. NRC concerns related to this matter were discussed between W. E. Cline and the UVAR Facility Director. It is the NRC's understanding that this is not a normally acceptable method of handling spent fuel elements at the University of Virginia and that unique circumstances were present in this case.