

December 18, 1997

Dr. Peter Bond
[]
Brookhaven National Laboratory
P.O. Box 5000
Building 460
Upton, New York 11973-5000

EA 97-13

Subject: Preliminary Notice of Violation (NTS-CH-BH-BNL-BNL-1997-0002;
NTS-CH-BH-BNL-BMRR-1997-0001; NTS-CH-BH-BNL-HFBR-1997-0002)

Dear Dr. Bond:

This letter refers to the Department of Energy's (DOE's) evaluation of the facts and circumstances surrounding a number of radiological control deficiencies at the Brookhaven National Laboratory (BNL) identified in 1997. Specifically, on March 5, 1997, DOE found that a large number of BNL Radiological Control Technicians (RCTs) did not meet established qualifications yet were performing the same duties as qualified RCTs. Additionally, in May and June 1997 radiological events occurred at BNL involving unplanned personnel exposures, contaminations or loss of control of radioactive material. Enclosed is an Investigation Summary Report setting forth the results of DOE's review.

The Office of Enforcement and Investigation initiated an investigation of these occurrences in April 1997. Based on a review of relevant facility documentation and discussions with DOE personnel at BNL, DOE has concluded that violations of the Occupational Radiation Protection Rule (10 CFR 835) occurred. These violations are described in the enclosed Preliminary Notice of Violation (PNOV).

DOE is particularly concerned about these violations because they are not minor isolated noncompliances but rather reflect a trend of programmatic noncompliance with regulatory and BNL procedural requirements. Additionally, these noncompliances occurred at multiple facilities over a period of time. For example, the issue involving RCT qualification had been previously identified by a DOE audit conducted in 1993. In response to this finding, BNL committed to take corrective actions by October 31, 1993, to resolve the problem. However, actions to correct this problem were not fully implemented by BNL until after DOE raised the same issue in March of 1997. In

another example, supervisory staff at the High Flux Beam Reactor violated internal, BNL procedures on multiple occasions when transporting contaminated dummy fuel elements from a radiological area to a non-radiological area. These infractions led to personnel contaminations and the loss of control of radioactive material. In still a third example, personnel were contaminated and received unnecessary exposures due to failure to follow internal procedures for the review and irradiation of experimental samples at the Brookhaven Medical Research Reactor.

While the actual consequences of the BNL noncompliances were fortuitously minor, i.e., personnel exposures were low, the potential consequences to workers coupled with BNL's failure to take the corrective actions to which it had committed, is of significant regulatory concern. DOE has concluded that a PNOV describing these violations and requiring a response should be issued even though DOE's contract with Associated Universities, Inc., has been terminated in order to assure that the violations are properly corrected, and that the new contractor is cognizant of the problems.

In accordance with the "General Statement of Enforcement Policy," 10 CFR 820, Appendix A, these violations have each been classified as Severity Level II violations. A civil penalty in the amount of \$142,500 would normally have been issued for the four Severity Level II violations discussed in the enclosed PNOV. However, since the Price-Anderson Amendments Act of 1988 specifically exempts Associated Universities, Inc., activities at BNL from civil penalties, this civil penalty is automatically waived.

You are required to respond to this letter and you should follow the instructions specified in the enclosed PNOV when preparing your response. In your response you should document the specific actions taken and any additional actions you plan to prevent recurrence. After reviewing your response to this PNOV and the status of your corrective action plan, DOE will determine whether further action is necessary to ensure compliance with the applicable nuclear safety requirements.

Sincerely,



Peter N. Brush
Acting Assistant Secretary
Office of Environment, Safety and Health

Enclosures:
Preliminary Notice of Violation
Investigation Summary Report

PRELIMINARY NOTICE OF VIOLATION

Associated Universities, Inc.
Brookhaven National Laboratory
EA 97-13

As a result of a Department of Energy (DOE) evaluation of activities associated with the uncontrolled spread of contamination at the High Flux Beam Reactor (HFBR) between May 13, 1997, and June 9, 1997; personnel exposures associated with irradiated sample handling at the Brookhaven Medical Research Reactor (BMRR) on June 3, 1997; and training of radiological control technicians (RCTs) prior to independent work assignment on March 5, 1997; violations of DOE requirements were identified. These violations are described below in accordance with 10 CFR 820, Appendix A, "General Statement of Enforcement Policy."

I. Violations Associated with the Brookhaven Medical Research Reactor Facility

10 CFR 835.1003(a)(3) requires that during routine operations, the combination of design features and administrative control procedures shall provide that exposure levels are as low as reasonably achievable (ALARA).

Contrary to the above, during the conduct of reactor irradiations at the BMRR on June 3, 1997, the combination of design features and administrative control procedures were inadequate to provide that exposure levels were ALARA in that:

1. Procedure 1.3, *Control of Reactor Irradiations*, dated November 21, 1995, Section 7.1 required that the information in Boxes A, C, and D of Form 2310 (BNL Environment, Safety & Health Standards Manual, Section 3.7.0) be provided by the person requesting the reactor irradiation service. For the June 3, 1997, irradiation at the BMRR, Box C of Form 2310 was not completed in that flux, power and fluence were not specified as required. Additional data required by Form 2310 that was not provided by the requester included: sample weight; sample dimensions; encapsulation weight; encapsulation dimensions; maximum temperature permitted during

irradiation; and description of any known hazards associated with the material to be irradiated. Knowledge of these parameters, along with sample composition, permit estimations of radiation fields resulting from experiment irradiation. Potential radiation hazards to personnel were not identified.

2. Procedure 4.3, *Operation of the BMRR Pneumatic Tube Irradiation Facility*, Revision 3, May 23, 1990, Section 7.3 required that “if a sample is greater than [a specified dose rate] (closed window on RO-2A survey meter) and the experimenter does not need it immediately, shield the sample inside the hutch or place in Pneumatic tube with aluminum stop, if possible.” On June 3, 1997, although the dose rate from the irradiated [material exceeded this limit], and although the irradiation requester did not need the sample immediately after irradiation, it was not returned to a shielded configuration until several manual manipulations of the sample had been performed, resulting in needless exposure to BMRR technicians.

3. Procedure 4.5, *Review of BMRR Experiments*, Revision 1, May 11, 1995, Section 7.4 required that “all proposed irradiations of samples in the pneumatic tube thimble shall be reviewed by the RC Group Leader. This review should have independent verification.” The proposed sample irradiation for June 3, 1997, was reviewed by the RC Group Leader who was also the experiment requestor; however, an independent verification was not performed. Therefore, Procedure 4.5 was inadequate to ensure appropriate review of the proposed experiment in that it permitted independent verification of the proposed sample irradiation to be an optional requirement. Since a sample of [material] had not been irradiated at the BMRR previously, independent verification would have enhanced the potential for recognition of the radiological impact(s) of the experiment.

4. Procedure 4.5, *Review of BMRR Experiments*, Revision 1, May 11, 1995, Section 8.3.5 required that “the RC Group Leader shall review the requested irradiation sample for adequacy of encapsulation, the relative short half-life of their neutron activation products and their resistance to radiation damage.” Although considerations of reactor safety and experiment integrity were addressed by Procedure 4.5, it was inadequate in that similar considerations of managing the radiological protection for the workers involved in handling the irradiated experiment were not required. As a consequence, on June 3, 1997, [] gas was released to the BMRR facility and one RCG technician received [a specified value] of exposure due to unnecessary sample handling.

5. Procedure 4.5, *Review of BMRR Experiments*, Revision 1, May 11, 1995, Section 8.3.6 required that “proposed irradiation samples which are likely to become highly radioactive shall be reviewed for adequacy of shielding when discharged from the reactor. If required, samples may be allowed to decay by discharging them into the shield wall for an appropriate length of time before discharging into the shielded cave. Instructions for special shielding or in-facility decay time should be noted on Form 2310A.” Although the irradiated sample of [material] had a dose rate of [a specified value] after the June 3, 1997, irradiation, instructions for special shielding were not noted on the applicable Form 2310A. Further, the procedure did not delineate an upper dose rate limit at which samples should be immediately discharged into the shield wall regardless of other requirements.

6. Procedure 8.1, *Safety Instructions, Radiological Procedures and Radiological Work Permit*, Revision 2, June 15, 1994, Section 7.3.4 requires that Standing Radiological Permits may be written to cover routine work with predictable radiation and contamination levels. Although [material] had never been irradiated in the BMRR before June 3, 1997, and since the composition of the [material] was unknown, the result of the irradiation would not have had predictable radiation and contamination levels. Nevertheless, a Standing Radiological Work Permit (RWP) was used for the irradiation.

7. BMRR RWP #97-03 identified the following requirements: 1) that sample irradiation times not exceed 30 minutes; 2) that projected man-rem per irradiation not exceed 10 millirem; and that 3) “sample reading greater than [a specified dose] will be sent back into the wall to decay unless needed at that radiation level by the researcher.” However, for the June 3, 1997 irradiation, the irradiation time used for the [material] experiment was 60 minutes; the man-rem received by one worker from sample irradiation was approximately

[a specified value], and although the sample measured [a specified value], it was not immediately sent back to the shield wall even though the sample was not needed by the researcher. Instead, several manual manipulations of the irradiated sample by the technician under direction of the reactor shift supervisor led to a technician exposure of [a specified value].

Collectively these violations constitute a Severity Level II problem.
Civil Penalty - \$5,000 (Waived).

II. Violations Associated with the High Flux Beam Reactor Facility

- A. 10 CFR 835.404(c)(1) requires that any area in which contamination levels exceed the values specified in 10 CFR 835 Appendix D, i. e., removable beta/gamma activity of 1000 disintegrations per minute (dpm) per 100 square centimeters, shall be posted in accordance with 835.603.

10 CFR 835.603(e) requires that each access point to a Contamination Area shall be posted with the words, "Caution, Contamination Area" where contamination levels exceed values the values in Appendix D, 10 CFR 835, but are less than or equal to 100 times those values.

Contrary to the above, the access point to the High Flux Beam Reactor [room] was not posted "Caution, Contamination Area," nor was a "Contamination Area" sign posted warning of the radiological conditions during the time frame May 13, 1997, through June 9, 1997. Survey results showed that removable contamination was present in the [room] at levels exceeding [a multiple of] 10 CFR 835, Appendix D values, i. e., radioactivity up to [a specified amount].

- B. 10 CFR 835.404(b) requires that appropriate controls be maintained and verified which prevent the inadvertent transfer of removable contamination to locations outside of radiological areas under normal operating conditions.

10 CFR 835.501(b) requires that the degree of control for radiological areas be commensurate with existing and potential radiological hazards within the area.

Contrary to the above, controls commensurate with existing and potential radiological hazards in the HFBR [room] were not maintained and verified to prevent the inadvertent transfer of removable contamination to locations

outside radiological areas in that on June 4 and June 9, 1997, removable [radioactive material] ranging in activity from [specified amounts] were transferred from the HFBR [room], a radiologically contaminated area, to the maintenance shop, a non-radiological area.

- C. CFR 835.404(f) requires that appropriate monitoring to detect and prevent the spread of contamination be performed by individuals exiting radiological areas established to control removable contamination and/or airborne radioactivity.

Contrary to the above, appropriate monitoring to detect and prevent the spread of contamination by individuals exiting radiological areas was not performed at the HFBR in that on June 4, 1997, an operations supervisor exiting from a radiologically controlled area to an uncontrolled area caused a portal monitor to alarm on two successive tries as he passed through a portal monitor carrying dummy fuel elements. Further evaluation of the portal monitor alarms was not performed, resulting in the transfer of [radioactive material] contamination out of the radiological area to a non-radiological area, either on the body of the operations supervisor, on dummy fuel elements, or on both.

- D. 10 CFR 835.601(a) requires that radioactive items or containers of radioactive materials be individually labeled if adequate warning is not provided by control measures and required posting.

Contrary to the above, adequate warning was not provided by control measures and required posting in that on June 4 and June 9, 1997, unlabeled, radioactively contaminated dummy fuel elements were removed from the HFBR [room], an un-posted Contamination Area, to the maintenance shop, a non-radiological area, thus resulting in the dispersal of [radioactive material] contamination to personnel and to non-radiological areas of the HFBR.

- E. 10 CFR 835.1101(a)(1) states that in radiological areas established to control surface radioactive material, material and equipment shall be treated as radioactive material and shall not be released from radiological areas to controlled areas if measurements of accessible surfaces show that the total or removable contamination levels exceed the values identified in Appendix D of 10 CFR 835, i. e., for beta-gamma emitters, 1,000 disintegrations per minute (dpm)/100 square centimeters (cm²) removable activity, and/or 5,000 dpm/100 cm² total activity (fixed plus

removable radioactivity).

10 CFR 835.703(c) requires that the results of surveys for the release of material and equipment as required by 10 CFR 835.1101 be documented and maintained.

Contrary to the above, material and equipment within HFBR radiological areas established to control surface radioactive material were not treated as radioactive material in that on June 4, 1997, dummy fuel elements were removed from the [room], a radiologically controlled area, to the maintenance shop, a nonradiological area, without performing release surveys and without creating and maintaining release survey records as required. As a result, removable [radioactive material] with activity up to [a specified amount] were spread to both personnel and non-radiological facilities.

Collectively, these violations constitute a Severity Level II problem.
Civil Penalty - \$50,000 (Waived).

III. Violations Associated with the High Flux Beam Reactor Facility

10 CFR 835.1001(b) states that for specific activities where use of physical design features are demonstrated to be impractical, administrative controls and procedural requirements shall be used to maintain radiation exposures as low as reasonably achievable (ALARA).

Contrary to the above, adequate administrative controls and procedural requirements to maintain personnel radiation exposures ALARA at the HFBR were not developed or were not implemented in that:

1. Procedure FS-SOP-3010, Revision 2, *Labeling, Documentation, and Handling of Radioactive Material and Radioactive Sources*, Section 5.1 required that "all radioactive materials moving outside of Radiological Areas shall be appropriately packaged by the owner/user to prevent the spread of contamination and unnecessary exposure, and shall either be tagged or labeled with a Radioactive Material Tag or Label." However, on June 4 and June 9, 1997, dummy fuel elements contaminated with radioactive material were removed from the HFBR [room] without appropriate packaging thus resulting in the dispersal of [radioactive material] to the maintenance shop, a nonradiological area.

2. Procedure FS-SOP-3010, Revision 2, *Labeling, Documentation, and Handling of Radioactive Material and Radioactive Sources*, Section 6.2.2 required that “radioactive material shall be labeled at all times.”

Procedure FS-SOP-3010, Revision 2, *Labeling, Documentation, and Handling of Radioactive Material and Radioactive Sources*, Section 6.2.4 stated that Radioactive Materials in Radioactive Material Storage Areas are required to be labeled and appropriately packaged.

However, unlabeled, contaminated dummy fuel elements in the HFBR [room] were removed from the [room] because HFBR personnel believed the untagged elements were not contaminated.

3. Procedure FS-SOP-1001, Revision 1, *Contamination Survey Techniques*, Section 6.14.3 stated that “if radiological posting is not already done, post the area in accordance with Procedure FS-WOP-3000, *Radiological Posting Requirements*.” However, on May 13, 1997, although a pre-job survey indicated that removable contamination levels in the HFBR [room] measured [a specified amount], the area was not posted in accordance with Procedure FS-WOP-3000, *Radiological Posting Requirements*.”
4. Procedure 8.5, *RD Procedure for HFBR Portal Monitor Use*, Section 6.7 stated if contamination on either recount is identified, contact S&EP personnel or the HFBR Shift Supervisor by using the nearest telephone. **“Remain in the area and await assistance.”** However, on June 4, 1997, the HFBR day supervisor passed through a portal monitor on two successive occasions causing a radiation alarm to sound, and did not remain in the area to await assistance.
5. Procedure 8.5, *RD Procedure for HFBR Portal Monitor Use*, Section 2.5 required that persons wishing to bring non-personal items out from [building], the HFBR, must log the item with the HP group for release survey (“green tag”). The item will be surveyed in turn and removed from the building by the requestor. However, on June 4, 1997, the day supervisor removed eight dummy fuel elements from the HFBR on four successive trips without obtaining a release survey from Health Physics. As a result, [radioactive material] contamination was spread to nonradiological areas of the complex.
6. Radiological Work Permit #97-48, dated May 13, 1997, for the [room],

required continuous HP coverage for inspection and gauge work with the dummy fuel elements. However, at 1315 hours on May 13, 1997, under RWP #97-48, an operator and a Reactor Supervisor began inspection of dummy fuel elements in the absence of required HP coverage.

7. Procedure 8.1, *Safety Instructions, Radiological Procedures and Radiological Work Permits*, dated June 15, 1994, Section 2.3 states that Radiological Work Permits are required for entry into high radiation areas, very high radiation areas, high hazard radiation areas, airborne radioactivity areas, and contamination areas. However, a reactor supervisor and an operator entered the HFBR [room] to perform work without the use of a Radiation Work Permit when contamination had been found in the vault at levels up to [a specified value].

Collectively, these violations constitute a Severity Level II problem.
Civil Penalty - \$50,000 (Waived).

IV. Training Violations

10 CFR 835.903 states that training and retraining programs for radiological control technicians (RCTs) shall be established and shall either precede performance of tasks assigned to RCTs or be concurrent with such task assignments if the individual is accompanied by and under the direct supervision of a trained individual. The required level of knowledge of radiation safety possessed by RCTs shall be verified by examination to include demonstration prior to any unsupervised work assignment.

Contrary to the above, the training of BNL RCTs did not precede task assignments, nor was the training concurrent with assignment of radiological tasks under the direction supervision of a trained individual in that on March 5, 1997, seven out of 26, approximately 25 percent of BNL RCTs, were not qualified as required, and, further, the unqualified RCTs had been assigned to independently perform radiological tasks and were not accompanied by or under the direct supervision of a trained individual.

This is a Severity Level II violation.
Civil Penalty - \$37,500 (Waived).

Pursuant to the provisions of 10 CFR Part 820. 24, Associated Universities, Inc., Brookhaven National Laboratory, is hereby required within 30 days of the date of this Notice, to submit a written statement or explanation to the Director, Office of Enforcement and Investigation, U.S. Department of Energy, 19901 Germantown Road,

Germantown, MD 20874-1290, Attention: Office of the Docketing Clerk, EH-10, CXXI, with copies to Dean Helms, Acting Area Manager, Brookhaven Area Office, and to the Cognizant DOE Secretarial Office for the facility that is the subject of this Notice. This reply should be clearly marked as a "Reply to a Preliminary Notice of Violation" and should include for each violation: (1) admission or denial of the alleged violations; (2) the long term corrective steps that will be taken, and (3) the date when completion of corrective steps will be achieved.

A black rectangular box containing a white handwritten signature, likely of Peter N. Brush.

Peter N. Brush
Acting Assistant Secretary
Environment, Safety and Health

Dated at Washington, D.C.
this 18th day of December 1997