



**Department of Energy**  
Washington, DC 20585

November 18, 2003

Dr. Jeffrey Wadsworth  
[redacted]  
UT-Battelle  
P.O. Box 2008  
Oak Ridge, TN 37831-6255

EA 2003-10

Subject: Preliminary Notice of Violation and Proposed Imposition of Civil Penalty  
\$151,250

Dear Dr. Wadsworth:

This letter refers to the Department of Energy's Office of Price-Anderson Enforcement (OE) investigation of the facts and circumstances surrounding nuclear safety work control issues at the High Flux Isotope Reactor (HFIR) and the Radiochemical Engineering Development Center (REDC). Our office initiated this investigation in response to a manual reactor shutdown due to a control cylinder maintenance safety deficiency and operation of a radiological [redacted] without required containment, as well as additional broader work control issues.

Investigation activities included a full review of relevant documentation. In addition, discussions that involved the Department of Energy (DOE) Oak Ridge Operations Office (ORO) and University of Tennessee - Battelle (UT-B) personnel took place at the Oak Ridge National Laboratory (ORNL) site on August 5-7, 2003. Our findings were provided to you in an Investigation Summary Report dated September 16, 2003. An Enforcement Conference was held with you and members of your staff on October 1, 2003, to discuss these findings and to ascertain the UT-B response to the potential violations of DOE nuclear safety requirements discussed in the Investigation Summary Report. An Enforcement Conference Summary is enclosed.

Based on our evaluation of documents, information developed during the site visit, and the facts and information that you provided during the Enforcement Conference, DOE has concluded that violations of 10 CFR 830 Subpart A (Quality Assurance Requirements) occurred. These violations are described in the enclosed Preliminary Notice of Violation (PNOV).

The ORNL PNOV describes multiple violations of nuclear safety requirements related to your operation of HFIR and the REDC [redacted]. Although there were no immediate safety consequences to workers or the public, the events that occurred at

each of the one of only two operating DOE Hazard Category I facilities and had to undergo an unplanned manual shutdown due to a safety issue involving inadequate maintenance on a reactor control cylinder servomotor. At the REDC facility, operations occurred, over multiple shifts, which involved the processing of highly radioactive solutions without the required [ ] containment roof blocks.

In addition to the above significant issues, DOE is also concerned about the missed opportunities or failures of ORNL senior management to correct some of the HFIR programmatic maintenance work control deficiencies by way of (1) a more comprehensive and effective response to the ORNL August 2001, maintenance related readiness findings; (2) identification, analysis, and broader corrective actions for several precursor events; and (3) HFIR self-assessment and UT-B oversight processes.

Specifically, violations were identified by DOE in the areas of (1) work processes involving HFIR maintenance planning, implementation and post maintenance testing; (2) work processes involving REDC operations; (3) quality improvement and management assessment as mentioned in the preceding paragraph; and (4) management programs involving inadequate organizational structure and interfaces. In accordance with the General Statement of Enforcement Policy, 10 CFR 820, Appendix A, the violations described in the enclosed PNOV have been classified as five Severity Level II violations and two Severity Level III violations. In determining the Severity Level of these violations, DOE considered the actual and potential safety significance associated with the quality assurance noncompliances, as well as the recurring nature of the problems.

To emphasize the need to maintain a comprehensive quality program for nuclear activities, I am issuing the enclosed PNOV and Proposed Civil Penalty in the amount of \$151,250. After review of the information provided and your request made at the October Enforcement Conference, we have considered and applied substantial mitigation in determining the amount of the Civil Penalty. All but one of the Severity Level II violations were reduced by 50% in recognition of the comprehensive UT-B senior management response following the HFIR shutdown that included multiple post event investigations, detailed causal analyses, and extensive corrective actions. The quality improvement violation was mitigated by 25%, (the maximum typically considered for this type of violation) in recognition of UT-B's post event response to this longer standing issue. As part of this investigation, OE observed a willingness of UT-B senior management not only to discuss failures at the lower levels of the organization, but to reveal and correct failures in their own oversight and management responsibilities. No mitigation was provided for identification since all of the violations manifested themselves through self-disclosing events.

You are required to respond to this letter and follow the instructions specified in the enclosed PNOV when preparing your response. Your response should document any additional specific actions taken to date. Corrective actions will be tracked in the Noncompliance Tracking System (NTS). You should enter into the NTS (1) any actions

that have been or will be taken to prevent recurrence and (2) the target and completion dates of such actions.

After reviewing your response to the PNOV, including your proposed corrective actions, in addition to the results of future assessments or inspections, DOE will determine whether future enforcement action is necessary to ensure compliance with DOE nuclear safety requirements.

Sincerely,



For Stephen M. Sohinki  
Director  
Office of Price-Anderson Enforcement

CERTIFIED MAIL  
RETURN RECEIPT REQUESTED

Enclosures:

Preliminary Notice of Violation  
Enforcement Conference Summary  
List of Attendees

cc: G. Boyd, ORO  
G. Malosh, ORO  
B. Hawks, DOE-ORO PAAA Coordinator  
R. Orbach, SC-1  
R. Schwartz, SC PAAA Coordinator  
W. Magwood, NE-1  
O. Lowe, NE-40  
J. Boda, NE PAAA Coordinator  
B. Cook, EH-1  
A. Kindrick, EH-1  
R. Azzaro, DNFSB  
A. Acton, IG-33  
W. Madia, Battelle  
J. Smith, ORNL  
J. Preston, ORNL  
J. Yoder, ORNL PAAA Coordinator  
R. Day, OE  
P. Rodrik, OE  
Docket Clerk, OE

**Preliminary Notice of Violation  
and  
Proposed Imposition of Civil Penalty**

**University of Tennessee – Battelle (UT-B)  
Oak Ridge National Laboratory (ORNL)**

**EA-2003-10**

In August 2003, the Office of Price-Anderson Enforcement (OE) conducted an investigation into multiple maintenance work control events at the High Flux Isotope Reactor (HFIR) and a Technical Safety Requirement (TSR) noncompliance at the Radiochemical Engineering Development Center (REDC).

Following an Enforcement Conference held on October 1, 2003, DOE concluded that violations of DOE nuclear safety requirements have occurred. They are set forth below with the associated civil penalties. In accordance with 10 CFR 820, Appendix A, "General Statement of Enforcement Policy," DOE issues this Preliminary Notice of Violation (PNOV), with proposed civil penalty, pursuant to section 234a of the Atomic Energy Act of 1954, as amended, 42 USC 2282a, and 10 CFR 820.

**I. Violations Pertaining to Work Processes**

**A. HFIR Maintenance Work Control - Planning and Maintenance Work Package (MWP) Preparation Deficiencies**

10 CFR 830.122(e)(1) requires that work be performed consistent with technical standards, administrative controls, and other hazard controls adopted to meet regulatory or contract requirements by using approved instructions, procedures, or other appropriate means.

HFIR has developed work process procedure MWP-801, *Preparing and Processing a Maintenance Work Package (MWP)*, which contains requirements for the planning and preparation of MWPs. MWP-801 Sections 1-3 provides specific requirements for categorizing and preparation of nonsafety-related, safety-related and TSR-related MWP activities.

Contrary to the above requirements, between January 2003 and February 2003, the safety-related and TSR-related work activities listed below were performed with incorrectly categorized MWPs that were prepared using the less comprehensive set of MWP-801 requirements for nonsafety-related MWP activities. The failure to correctly categorize the MWP activity and use the correct set of requirements contributed to inadequacies with the MWPs and the performance of these activities as follows:

1. The Servomotor troubleshoot and repair MWP activity did not have a required engineering technical review of its content and post-maintenance test (PMT) due to its incorrect categorization as non safety-related. Such a review could have identified the need for more detailed instructions on labeling, motor polarity checks, wiring instructions, and component level PMTs. Such MWP instructions and elements would have been additional barriers to prevent the servomotor incorrect wiring and HFIR shutdown event.
2. The MWP governing the Reactor Beam Room equipment installation also was incorrectly categorized per MWP-801 requirements resulting in (a) inadequate reviews of the work scope and (b) an unauthorized modification and unanalyzed degradation of a safety component (Reactor Beam Room Wall).

In addition, 10 CFR 830.122(e)(3) requires that items be maintained to prevent their damage, loss or deterioration.

Contrary to the above requirement, between September 1989 and March 2003, the [ ] Door Closure Battery and Charger were not adequately maintained, most likely since its installation in 1989. The battery and charger were recently found (March 2003) in a deteriorated condition incapable of performing their tornado protection safety-related function. These [ ] Door components were not properly listed and categorized on the MWP-801 referenced *HFIR Safety-Related Equipment List*, HFIR engineering drawings, and HFIR maintenance tracking system, resulting in the lack of adequate preventative maintenance.

Collectively, these violations constitute a Severity II Level problem.

Civil Penalty – \$27,500

## **B. HFIR Maintenance Work Control – Work Package Implementation Deficiencies**

10 CFR 830.122(e)(1) requires that work be performed consistent with technical standards, administrative controls, and other hazard controls adopted to meet regulatory or contract requirements by using approved instructions, procedures, or other appropriate means.

HFIR procedure MWP-800, *Maintenance Work Control* Step 18, and MWP-801, *Preparing and Processing a Maintenance Work Package* Section 6, contain specific requirements for the performance of maintenance activities in accordance with MWP instructions as well as the implementation of the MWP change process for intent/non-intent scope changes.

Contrary to the above requirements, between August 2002 and January 2003, HFIR maintenance work activities were performed inconsistent with MWP supplied drawings, and on-the-job work scope changes were implemented without

processing these changes in accordance with the above HFIR work control requirements. Examples included the following:

1. The Servomotor MWP involved troubleshooting and repair of servomotor [ ] and its associated gearbox. When the final cause of the problem was linked to servomotor [ ] this original "Servomotor [ ] and Gearbox MWP" was inappropriately used to replace servomotor [ ] without processing this "intent" change in work scope per the HFIR MWP-801 requirements. In addition, maintenance craft personnel neither used nor wired servomotor [ ] consistent with an MWP supplied engineering drawing. Both deficiencies contributed to the failure to recognize Servomotor [ ] should have been wired opposite the other two motors.
2. During maintenance modifications with the HFIR pneumatic experiment rabbit tube assemblies [ ] and [ ], events also occurred in which the configurations and installation of the systems were not maintained in accordance with MWP supplied drawings and required design. In addition, craft personnel introduced the use of cleanliness stoppers in the [ ] installation, without appropriate accountability controls and without processing this "intent" change per the HFIR work process requirements. These deficiencies contributed to the inadequate installation of the PT systems with misconnected pneumatic control lines and a rabbit routing tube blocked by a stopper.

Collectively, these violations constitute a Severity II Level problem.  
Civil Penalty – \$27,500

### **C. HFIR Maintenance Work Control – Post Maintenance Testing Deficiencies**

10 CFR 830.122(e)(1) requires that work be performed consistent with technical standards, administrative controls, and other hazard controls adopted to meet regulatory or contract requirements by using approved instructions, procedures, or other appropriate means.

HFIR has developed work process procedures MWP-801, *Preparing and Processing a Maintenance Work Package*, and MWP-900, *Post Maintenance Testing*, that contain specific requirements for the development and performance of MWP post-maintenance testing (PMT) activities.

Contrary to the above requirements, between August 2002 and February 2003, MWP PMTs were either not developed or not effective in establishing the operability of systems or components following the specific maintenance work activities described below:

1. The servomotor MWP PMT was the Control Cylinder Standard Surveillance Test Procedure (STP). This test verifies only the final control cylinder withdrawal rate and function but does not verify the operation of the individual

servomotors. Consequently, the PMT (STP) as performed was incapable of verifying the correct installation of the replaced servomotor. The installation deficiencies were not detected until after reactor restart activities.

2. The [ ] MWP contained a functional rabbit insertion and withdrawal test. This test as implemented involved only limited cycling of the rabbit during installation, but the test was inadequately designed to detect the misconnected pneumatic control lines. The installation deficiencies were not detected until initial operation following reactor restart.
3. The [ ] MWP did not contain a specific PMT for functionally testing the rabbit and pneumatic control installations. The MWP was completed and closed without a PMT being performed and documented. A subsequent facility operational test detected the installation deficiencies.
4. The Safety Channel [ ] breaker preventative maintenance (PM) MWP did not contain a PMT that verified all equipment that would have been impacted was effectively returned to a normal state. Some of the PM induced anomalies were detected by random operator rounds subsequent to the PM closeout.

Collectively, these violations constitute a Severity III Level problem.  
No Civil Penalty Assessed

#### D. REDC Operational Work Control – TSR Implementation Deficiencies

10 CFR 830.122(e)(1) requires that work be performed consistent with technical standards, administrative controls, and other hazard controls adopted to meet regulatory or contract requirements by using approved instructions, procedures, or other appropriate means.

The REDC [ ] TSR defines various operational modes based on cell configurations and intended operations. Specifically, the TSR “limited operations” mode prohibits cell processing activities but allows for limited activities associated with cell maintenance work while the cell roof blocks are removed.

Contrary to the above, TSR mode requirements, on May 21 and May 22, 2003, precipitation and dissolution activities were conducted in [ ] while [ ] was in a “limited operations” mode with the cell roof blocks removed. In this configuration, the [ ] could not meet its containment design function if an operational or process accident occurred.

This violation constitutes a Severity II Level problem.  
Civil Penalty – \$27,500

## **II. Violations Pertaining to Quality Improvement**

### **HFIR Maintenance Quality Improvement Deficiencies**

10 CFR 830.122(c) requires that the laboratory (1) Establish and implement processes to detect and prevent quality problems; (2) Identify, control, and correct items, services, and processes, that do not meet established requirements; and (3) Identify the causes of problems and work to prevent recurrence as a part of correcting the problem.

Contrary to the above, between August 2001 and January 2003, ORNL did not effectively implement processes to identify causes and to correct quality problems as described in the following examples:

- A. No detailed HFIR investigation, causal analysis and corrective action process was applied following the [ , ], and servomotor events prior to the more reactive UT-B senior management reviews. Since these events all revealed similar programmatic maintenance work control issues, the HFIR servomotor reactor shutdown event may have been preventable if the underlying causes of the [ ] events had been identified and corrected in accordance with the ORNL Quality Management System.
  
- B. In August of 2001, ORNL submitted NTS Report NTS-ORO--ORNL-X10HFIR-2001-0008 describing multiple instances of failures to follow maintenance work control processes and MWP requirements including specific PMT requirements. The work control issues documented in this NTS report are some of the same issues leading to the events of this investigation. The NTS corrective actions were not effective in preventing their recurrence.

Collectively, these violations constitute a Severity II Level problem.  
Civil Penalty – \$41,250

### **III. Violations Pertaining to Management Assessments**

#### **HFIR Management and ORNL Independent Assessment Deficiencies**

10 CFR 830.122(i) requires that managers assess their management processes and identify and correct problems that hinder the organization from achieving its objectives.

10 CFR 830.122(j)(1) requires that the Laboratory plan and conduct independent assessments to measure item and service quality, to measure the adequacy of work performance, and to promote improvement.

Contrary to the above requirements, between August 2001 and January 2003, the HFIR Management and ORNL Independent Assessment processes were not effective in identifying and correcting precursor programmatic problems associated with the HFIR maintenance work control processes and their implementation.



Although management assessments of the HFIR maintenance program were conducted, the scope of these reviews were limited and did not fully assess the adequacy and implementation of HFIR MWP activities. In addition, management assessments were not effective in ensuring that previously identified program weaknesses associated with the August 2001 HFIR maintenance program readiness findings were adequately corrected. Similarly, ORNL independent assessments were conducted, but were not effective in ensuring the adequacy of HFIR management assessment processes.

Collectively, these violations constitute a Severity II Level problem.  
Civil Penalty – \$27,500

#### **IV. Violations Pertaining to Management Programs**

##### **HFIR Management Program Deficiencies**

10 CFR 830.122(a) requires that the Laboratory (1) establish an organizational structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing the work; and (2) establish management processes, including planning, scheduling, and providing resources for the work.

Contrary to the above requirements, between August 2002 and May of 2003, ORNL senior management did not establish the following: effective interfaces between the HFIR reactor and experiment groups; an adequate organizational structure; or sufficient resources as described below.

- A. Task leaders who organizationally were in the experiments group led the [ , ] Beam Room activities. These activities, however, involved and impacted HFIR equipment and systems. Consequently, the task leaders lacked familiarity, experience, and functional responsibility for HFIR systems and components, all of which contributed to the events.
- B. The REDC [ ] TSR violation occurred when reduction in facility staffing had required that the [ ] act also as the supervisor for the shift. This additional responsibility limited his ability to effectively oversee and manage all of the REDC cell activities including how the [ ] maintenance activities impacted ongoing cell operations.

Collectively, these violations constitute a Severity III Level problem.  
No Civil Penalty Assessed

Pursuant to the provisions of 10 CFR 820.24, UT-B is hereby required within 30 days of the date of the Preliminary Notice of Violation and Proposed Imposition of Civil Penalty, to submit a written statement or explanation to one of the following addresses:

(if sent by U.S. Postal Service):  
Director, Office of Price-Anderson Enforcement  
Attention: Office of the Docketing Clerk  
EH-6, 270 Corporate Square Building  
U.S. Department of Energy  
1000 Independence Avenue, SW  
Washington DC 20585-0270

(if sent by overnight carrier):  
Director, Office of Price-Anderson Enforcement  
Attention: Office of the Docketing Clerk  
EH-6, 270 Corporate Square Building  
U.S. Department of Energy  
19901 Germantown Road  
Germantown, MD 20874-1290

Copies should also be sent to the Manager, DOE Oak Ridge Operations Office. This reply should be clearly marked as a "Reply to a Preliminary Notice of Violation" and should include the following for each violation: (1) admission or denial of the alleged violations, (2) any facts set forth in this PNOV which you believe are not correct, and (3) the reasons for the violations if admitted, or if denied, the basis for denial. Corrective actions that have been or will be taken to avoid future violations should be delineated with target and completion dates in OE's Noncompliance Tracking System. In the event the violations set forth in the Preliminary Notice of Violation are admitted, this PNOV will constitute a Final Order in compliance with the requirements of 10 CFR 820.24.

Any request for remission or further mitigation of civil penalty must be accompanied by a substantive justification demonstrating extenuating circumstances or other reasons why the assessed penalty should not be paid in full. Within the 30 days after the issuance of the PNOV and proposed civil penalty, unless the violations are denied, or remission or additional mitigation is requested, UT-B shall pay the civil penalty of \$151,250 imposed under section 234a of the Atomic Energy Act by check, draft, or money order payable to the Treasurer of the United States (Account 891099) mailed to the Director, Office of Price-Anderson Enforcement Attention: Office of the Docketing Clerk, at one of the above addresses. If UT-B should fail to answer within the time specified, the contractor will be issued an order imposing the civil penalty. Should additional mitigation of the proposed civil penalty be requested, UT-B should address the adjustment factors described in section IX of 10 CFR 820, Appendix A.



For Stephen M. Sohinki  
Director  
Office of Price-Anderson Enforcement

Dated at Washington, DC  
this 18th day of November, 2003

#### **ENFORCEMENT CONFERENCE SUMMARY**

**Oak Ridge National Laboratory  
HFIR and REDC Investigation**

On October 1, 2003, Department of Energy (DOE) representatives from the Office of Price-Anderson Enforcement (OE), Office of Nuclear Energy (NE), Office of Science (SC), and Oak Ridge Operations Office (ORO) held an enforcement conference with representatives from the Oak Ridge National Laboratory (ORNL).

The purpose of this conference was to discuss potential noncompliances associated with work control issues at the High Flux Isotope Reactor (HFIR) and Radiochemical Engineering Development Center (REDC) described in the OE Investigation Summary Report dated September 16, 2003. A list of conference attendees is attached. Material provided by ORNL at the conference has been incorporated into the docket file.

Stephen Sohinki, OE Director, opened the proceedings with an overview of the conference's purpose and objectives as well as attendee introductions.

Dr. William Madia, [ ], Battelle and Dr. Jeffery Wadsworth, [ ], UT-B initiated ORNL presentations. Dr. Madia discussed Battelle's commitment to improving nuclear safety performance at the Laboratory by addressing longstanding cultural and operational discipline problems. Dr. Wadsworth emphasized these corporate goals as well and indicated they were not yet satisfied with the Laboratory's overall nuclear safety performance. Dr. Wadsworth also stated that they agreed with the findings of the OE Investigation Summary Report and were in the process of addressing the additional items OE highlighted in the report.

The ORNL presentation continued with discussions of work control deficiencies and their causes, the safety significance of the events, and ongoing corrective actions. Jeff Smith, Vice President (VP) Operations, Jim Roberto, VP for Physical Sciences, and Herb Debban, VP for Facilities and Operations, facilitated these discussions.

ORNL concluded their discussions with a request that OE consider a Consent Order remedy or substantial mitigation based on timely reporting, comprehensive corrective actions, a self-critical response, and open communication on these matters. Mr. Sohinki stated that the circumstances did not warrant a consent order and that OE would consider the information presented by ORNL in DOE's deliberation of an enforcement outcome.

October 1, 2003

**Oak Ridge National Laboratory  
Enforcement Conference List of Attendees**

**Office of Price-Anderson Enforcement**

Stephen M. Sohinki, Office Director  
Howard Wilchins, Office Counsel  
Peter D. Rodrik, Enforcement Officer  
Richard Day, Enforcement Officer

**Department of Energy/Oak Ridge Operations Office**

George Malosh, ORO  
Johnny Moore, ORO  
Brenda L. Hawks, ORO PAAA Coordinator

Dennis Miotla, NE-2.3  
Matthew Hutmaker, NE-40  
Edmond Tourigny, NE-40  
Joseph Boda, NE PAAA Coordinator  
Michael Worley, NE-70

Stanley Staten, SC-10  
Van Nguyen, SC-83  
Raymond Schwartz, SC PAAA Coordinator

Earl Carnes, EH-2  
Chuck Ramsey, EH-2

**Oak Ridge National Laboratory**

William Madia, Battelle  
Jeffery Wadsworth, UT-B  
Jeffery Smith, UT-B  
Jim Roberto, UT-B  
Steve Porter, UT-B  
Herb Debban, UT-B  
Crystal Schrof, UT-B