



**Department of Energy**  
**National Nuclear Security Administration**  
Washington, DC 20585

February 23, 2006

OFFICE OF THE ADMINISTRATOR

Dr. Michael R. Anastasio, Director  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-001  
Livermore, CA 94550

EA-2006-01

Subject: Preliminary Notice of Violation and Proposed Civil Penalty of \$588,500  
(Waived by Statute)

Dear Dr: Anastasio:

This letter refers to the Department of Energy (DOE) Office of Price-Anderson Enforcement's (OE) investigation of the August 2004 MOVER radiological uptakes and the April 2005 Phosphorous Spill Event, as well as longstanding Radiological Protection Program, Quality Assurance, and Safety Basis deficiencies. An Investigation Summary Report describing the results of that review was issued to you on August 30, 2005. An Enforcement Conference was held on October 5, 2005, in Germantown, Maryland, with you and members of your staff to discuss the findings in the investigation report. An Enforcement Conference Summary is enclosed.

Based upon our evaluation of these issues and information presented by you and your staff during the Enforcement Conference, the National Nuclear Security Administration (NNSA) has concluded that violations of DOE's nuclear safety rules, including Quality Assurance Requirements (10 CFR 830 Subpart A), Safety Basis Requirements (10 CFR 830 Subpart B), and Occupational Radiation Protection (10 CFR 835), have occurred. The violations are described in the enclosed Preliminary Notice of Violation (PNOV).

Section I of the PNOV describes three Severity Level (SL) II violations associated with the unplanned radiological uptake exposures resulting from MOVER operations at LLNL. Although the exposures were below regulatory limits, they were determined to be significant since they (1) occurred multiple times over a six-month period, (2) involved exposures to several individuals (five), (3) had the potential to be higher since the work place controls were not adequate for the observed radiological conditions and (4) there was a lack of an appropriate response to the more hazardous work place conditions that were observed during MOVER operations. Two of the violations were mitigated 25 percent for causal analysis and corrective actions.

Section II of the PNOV describes two SL II violations associated with the April 2005 phosphorous spill event. This event was also considered significant even though regulatory exposure limits were not exceeded because (1) it involved the unauthorized and uncontrolled removal of radioactive material from the site, (2) the level of contamination was not fully known at the time the material was removed, and (3) a room was left in an unknown and uncontrolled condition for several days due to an inadequate spill response. Each of these violations were mitigated 25 percent for causal analysis and corrective actions.

Section III of the PNOV describes one SL III and three SL II violations associated with significant Radiological, Configuration Management, and Unreviewed Safety Question (USQ) Program implementation deficiencies that were identified by various DOE/NNSA reviews or activities. Specific examples included (1) failures to complete adequate ALARA reviews, (2) Technical Safety Requirement (TSR) and design control/design documentation violations associated with Configuration Management deficiencies, and (3) repetitive implementation deficiencies associated with site USQ requirements. Two of the four violations were mitigated 25 percent for causal analysis and corrective actions.

Section IV of the PNOV describes a SL I quality improvement violation. Specifically, the violation is associated with longstanding and repetitive failures to (1) effectively track and correct Radiological Program deficiencies, (2) develop an effective process to capture and report radiological deficiencies during work activities such as MOVER operations, and (3) to implement an effective Configuration Management and USQ Program. The Enforcement Policy emphasizes that where there is repeated poor performance in an area of concern or a serious breakdown in management controls, "DOE intends to apply its full statutory enforcement authority." As you are aware, DOE's statutory authority permits the issuance of a civil penalty of \$110,000 per violation per day. In this case, given the acknowledged significant failure of management to properly oversee the correction of these repetitive problems that occurred for an extended period of time, and the breadth of the issues involved, I have determined that a SL I citation for two separate days is appropriate, thus resulting in a civil penalty of \$220,000.

I am concerned with those aspects of LLNL's nuclear safety performance that have resulted in issuance of this PNOV. The non-conservative decision making by technical experts and supervision that contributed to the MOVER and Phosphorous Spill Events, and the safety issues that led to LLNL's programmatic stand-down of operations in Building 332, demonstrate the need for significant improvement in LLNL's nuclear safety culture. Without improvement, NNSA can not have confidence that all critical elements of LLNL's safety programs are being effectively implemented.

I am also disappointed by the longstanding and recurring nature of many of the deficiencies associated with the violations. This recurring aspect casts significant doubt on the Laboratory's ability to effectively analyze and correct performance problems. If LLNL had effectively corrected the identified deficiencies, LLNL senior management would not have had to initiate a programmatic stand-down of Building 332 operations in

order to focus resources on developing an integrated corrective action plan. While the increase in LLNL and NNSA senior management attention required by this stand-down has resulted in the actions necessary to resume limited operations, LLNL needs to demonstrate the ability to sustain these improvements to ensure that these deficiencies do not recur. As already indicated, the institutional quality improvement violation was cited for two separate days at a Severity Level I to highlight this issue.

During the enforcement conference you described a number of initiatives to improve LLNL'S nuclear safety culture and performance. I am also aware of your plans for and ongoing improvements made in conjunction with the resumption of programmatic activities in Building 332. Representatives from both NNSA and OE were encouraged by those actions intended to demonstrate management commitment to and accountability for safety performance improvement, improve deficiency identification and correction, and resolve issues associated with insufficient rigor in implementation of Integrated Safety Management (ISM) and critical safety programs. These initiatives, properly implemented, will result in a positive step change in improving performance and the general safety culture at the laboratory. Your personal involvement in ensuring the implementation of these initiatives is critical if recurring issues raised in this PNOV are to be addressed in an effective fashion. I expect timely and effective action by LLNL on these measures, continued regular reporting to the Manager of the Livermore Site Office, and quarterly progress reports to NNSA headquarters on these actions and continuing improvement in nuclear safety performance.

While NNSA recognizes the fundamental changes you are attempting to make to address the deficient safety culture and improve implementation of critical safety programs, only limited mitigation was provided. Specifically, only six of the eleven violations received mitigation, and for those violations only partial mitigation was provided due to weaknesses in initial causal analysis and corrective action plans and yet to be demonstrated sustainability in performance improvement. None of the violations received mitigation for prompt identification since the underlying deficiencies were either disclosed by the events or through DOE/NNSA contract management and oversight activities.

In accordance with the General Statement of Enforcement Policy, 10 CFR 820, Appendix A, the violations described in the PNOV have been classified according to the Severity Levels described above with an aggregate civil penalty in the amount of \$588,500. This civil penalty, however, is waived by statute for LLNL. In determining these Severity Levels, DOE considered the actual and potential safety significance associated with each event or issue under consideration and the programmatic and recurring nature of the violations.

You are required to respond to this letter and to 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 NTS. You should enter into the Noncompliance Tracking System (1) any additional actions you plan to take to prevent recurrence and (2) the anticipated completion dates of such actions.

Sincerely,

A handwritten signature in black ink, appearing to read 'LFB', is positioned above the typed name.

Linton F. Brooks  
Administrator  
National Nuclear Security Administration

CERTIFIED MAIL  
RETURN RECEIPT REQUESTED

Enclosures:

Preliminary Notice of Violation  
Enforcement Conference Summary  
List of Attendees

cc: J. Shaw, EH-1

R. Shearer, EH-1

A. Patterson, EH-1

M. Zacchero, EH-1

A. Rankin, EH-1

L. Young, EH-1

S. Sohinki, EH-6

P. Rodrik, EH-6

Docket Clerk, EH-6

B. Loesch, EH-31

C. Lagdon, EH-31

F. Russo, NA-1

D. Jonas, NA-1

J. Paul, NA-1

A. Morrow, NA-1

D. Minnema, NA-1 PAAA Coordinator

T. D'Agostino, NA-10

D. Crandall, NA-11

M. Thompson, NA-117

C. Yaun-Soo Hoo, LSO

R. Kopenhaver, LSO PAAA Coordinator

J. Rispoli, EM-1

L. Vaughan, EM 3.2 PAAA Coordinator

G. Holman, LLNL PAAA Coordinator

J. Koonce, UC

H. Hatayama, UC

R. Azzaro, DNFSB

## Preliminary Notice of Violation

University of California  
Lawrence Livermore National Laboratory

EA-2006-01

As a result of the Office of Price-Anderson Enforcement's investigation of radiological and quality deficiencies associated with two events and multiple findings from DOE assessments, violations of DOE nuclear safety requirements were identified. The two events included the MOVER radiological uptakes that occurred from April to August 2004; and the Phosphorous-32 spread of contamination event that occurred on April 22, 2005. The DOE/NNSA assessments were issued in late 2004 and early 2005. In accordance with 10 CFR 820, Appendix A, "General Statement of Enforcement Policy," the violations are listed below. Citations specifically citing the quality assurance criteria of 10 CFR 830.122 represent a violation of 830.121(a), which requires compliance with those criteria.

### I. MOVER Uptake Event

#### A. As Low as is Reasonably Achievable Violations

10 CFR 835.1001 (a) *Design and Control* requires that measures shall be taken to maintain radiation exposure in controlled areas ALARA through physical design features and administrative control. The primary methods used shall be physical design features (e.g., confinement, ventilation, remote handling, and shielding) [ . . .].

The Lawrence Livermore National Laboratory's (LLNL) Integration Worksheet (IWS), IWS #11359, revision 12, established the following control to prevent inhalation of radioactive material: "Differential air pressure zones are maintained to ensure air is directed into the glovebox" [ . . .].

Document 20.2, LLNL Radiological Safety Protection Program for Radiation Materials, requires two barriers between the radioactive material and worker breathing zones for gloveboxes.

Contrary to the above, LLNL failed to establish effective physical and administrative controls to ensure that workers were not exposed to airborne radiation while performing work at the MOVER facility without respirators. LLNL's analysis of air sample and bioassay data determined that workers were exposed to airborne

radiation on three to five separate occasions between April 1 and August 19, 2004, without respirator protection. The failure to establish effective controls to govern the response to the identified chronic airborne radioactivity conditions allowed workers to remain in the potential airborne radioactivity environment solely at the discretion of the assigned Health and Safety Technician (H&ST). Specific deficiencies included the following:

1. LLNL developed a set of radiological controls for the MOVER operation as part of the Laboratory's radiological protection safety responsibilities outlined in the WTS/LLNL interface agreement. The set of LLNL radiological controls were based on the assumption that MOVER had an active confinement function, including the establishment of effective differential air pressure zones. However, the LLNL radiological controls were inadequate since they failed to establish effective limitations or boundaries for the controls such as to (1) require that WTS demonstrate that an effective MOVER confinement function was being maintained consistent with the limitations and assumptions of the LLNL controls, (2) require that WTS stop operations when confinement was degraded or lost so that the existing radiological controls could be reevaluated and/or modified, and (3) communicate to WTS the importance of the MOVER active confinement function relative to the LLNL controls and the above required additional actions. It should be noted that although differential air pressure zones were initially established by WTS, differential air pressure routinely degraded within the glovebox zone below the minimum allowed, as evidenced by routine low DP alarms during waste operations. Consequently, the confinement function on which LLNL based their controls did not always exist.
2. No limits or administrative controls were developed or implemented to ensure sufficient time for the zone 2 ventilation to clear the room air after contamination on the glovebox ports was discovered and before workers were allowed to remove their respirators.
3. No limits or administrative controls were established to provide hold points when airborne radioactive conditions were identified. Without data to indicate how long airborne radiation might remain in zone 2 once it occurred, there was no technical basis to determine when it was safe for workers to remove respirators.

Collectively these violations constitute a Severity Level II problem.  
Civil Penalty – \$55,000 (Waived by Statute)

#### B. Radiological Monitoring Violations

10 CFR 835.401(a) *General Requirements* requires that monitoring of individuals and areas shall be performed to [ . . . ] (3) detect changes in radiological condition; [ . . . ] (5) verify the effectiveness of engineering and process controls in maintaining radioactive material and reducing radiation exposure; and (6) identify and control potential sources of individual exposure to radiation and /or radioactive materials.

Contrary to the above, LLNL failed to adequately detect and investigate changes to radiological conditions for the purpose of verifying the effectiveness of engineering and process controls, and to identify and control sources of airborne radioactivity at the MOVER facility. Specific deficiencies include the following:

1. On May 19, 2004, a continuous air monitor (CAM) alarm occurred at the MOVER facility sometime after work ended on May 18 and before it started on May 19. The H&ST assumed the CAM alarm was due to radon and allowed work to continue on May 19. Approximately four days later after analysis of the air monitoring filters, a Health Physicist (HP) determined that the CAM alarm had been the result of transuranic airborne radiation and that chronic airborne levels had been occurring since the beginning of the project. The HP assumed the airborne condition occurred from contamination during bag-in and bag-out operations while workers were in respirators. The HP did not require any additional work space monitoring so as to verify his assumptions nor did he require any additional radiological controls to be formally implemented.
2. A CAM alarm was used by LLNL for identification by workers of airborne radiation. The CAM alarm was set at 120 percent of a derived air concentration (DAC). Following the second CAM alarm on August 19, 2004, the LLNL investigation concluded that the actual instantaneous airborne radioactivity was much higher than the CAM alarm set point (due to CAM monitoring limitations such as location, air weekly volume averaging, etc.) and may have been occurring for as long as one hour before evacuation of the workers.
3. Several informal attempts were made by the MOVER's H&ST to control the levels of contamination at the glovebox ports during the bag-in and bag-out operations. However, they were not effective in eliminating or substantially reducing the airborne radioactive contamination. Although the HP recognized that evidence of chronic airborne radiation was present by analyzing air monitoring filters, no further investigation of the source or cause of this airborne radiation was performed, nor was the area posted as an airborne radioactive area as required by 10 CFR 835 (Occupational Radiation Protection). Chronic airborne radiation levels were identified in May 2004 and continued through August 19, 2004, when the CAM alarmed a second time.
4. During the above period, the LLNL investigation identified that alarms indicating insufficient delta pressure conditions (a loss or partial loss of active confinement) in the glovebox occurred frequently during MOVER operations. LLNL, although crediting the active confinement function, had not established a process with WTS to limit operations if active confinement was not adequate.
5. As indicated above, the source of the elevated airborne levels was attributed to a routinely experienced condition involving contamination of the external surfaces of the drum port during drum change-out operations. However, no formal



surveys of the contaminated port were routinely taken to ensure that the IWS contamination suspension limits were not exceeded. The operators would routinely decontaminate the port by using “masslin” type wipes and would then request that these large surface area wipes be surveyed for contamination. However, this technique has the potential to underestimate the level of contamination (due to the size and fabric construction of the wipe) compared to more formal survey techniques used to officially document contamination levels. The failure to adequately monitor this known source of contamination potentially resulted in operations beyond those authorized by the IWS.

Collectively these violations constitute a Severity Level II problem.  
Civil Penalty – \$41,250 (Waived by Statute)

### C. Work Process Violations

10 CFR 830.122(e)(1) Criterion 5- *Performance/Work Processes* requires that contractors perform work consistent with technical standards, administrative controls, and other hazard controls adopted to meet regulatory or contract requirements, using approved instructions, procedures, or other appropriate means.

The Documented Safety Analysis (DSA) Section 6.3.4.2.1 states that, “The MOVER glovebox serves as the primary confinement structure to prevent the spread of contamination in the absence of ventilation. By providing a physical barrier from radioactive materials, occupational exposure is minimized.” LLNL TSR 5.6.5 required the following: “An initial testing, in-service inspection and test, configuration management, and maintenance program shall be established, implemented, and maintained to ensure the integrity of the design features.”

Contrary to the above, LLNL’s investigation found that initial testing at LLNL to ensure the integrity of the glovebox was not performed. The glovebox was shipped from Argonne National Laboratory-East after TRU operations and was contaminated. ALARA concerns prevented pressurization of the glovebox. However, alternative testing methods could have been used, such as a vacuum test under simulated operating conditions. The LLNL investigation identified that reliance on “complex-wide contractor established designs” and “good operating history” were used in lieu of the required initial testing at LLNL. The LLNL investigation identified that the glovebox seals and the bag material were a poor design that did not create a leak-proof seal. In addition, LLNL’s investigation concluded that radioactive contamination leakage around the seals, due to changes in pressure within the glovebox, contributed to the airborne conditions that resulted in unplanned radiological uptakes to the workers.

Collectively these violations constitute a Severity Level II problem.  
Civil Penalty – \$41,250 (Waived by Statute)

## II. Phosphorous-32 Spread of Contamination Event

### A. Control of Material and Equipment Violation

10 CFR 835.1101, *Control of Material and Equipment*, states that [. . .] material and equipment in contamination areas [. . .] shall not be released to a controlled area if: [. . .] (1) removable surface contamination levels on accessible surfaces exceed the removable surface contamination values specified in appendix D of this Part.

LLNL's Environment Safety & Health (ES&H) Manual 20.2 Sections 3.6, 3.8, and 3.9 contain requirements for releasing items from radioactive material areas (RMA), handling radioactive materials, and moving radioactive materials. These sections contain various requirements for release criteria, surveys, personnel authorized to perform surveys, and handling and labeling of radioactive material.

Contrary the above requirements, on April 22, 2005, a researcher, with his supervisor's authorization, took a known contaminated item (shoe) from the LLNL site in violation of these release criteria and other applicable controls. The shoe was subsequently determined to exceed 10 CFR 835 Appendix D criteria with a contamination level of 148,000 dpm/100 cm<sup>2</sup>.

Collectively, this violation constitute a Severity Level II problem.  
Civil Penalty – \$41,250 (Waived by Statute)

### B. Monitoring of Individuals and Areas Violation

10 CFR 835.401(a) *General Requirements* states that Monitoring of individuals and areas shall be performed to [. . .] (3) detect changes in radiological condition; [. . .] (5) verify the effectiveness of engineering and process controls in maintaining radioactive material and reducing radiation exposure; and [. . .] (6) identify and control potential sources of individual exposure to radiation and/or radioactive materials.

Contrary to the above, LLNL failed to adequately monitor and investigate changes to radiological conditions associated with a radiological spill that occurred on April 22, 2005. The spill consisted of approximately 10-15 milliliters of solution from a Kontes glass tube containing phosphorous-32 labeled DNA probes. The event occurred during a routine laboratory procedure in Building 361. The appropriate qualified LLNL personnel failed to respond to the spill after being notified on April 22 to ensure that the source of the spill was adequately controlled. Both the worker and laboratory contaminated areas were not surveyed in a timely manner by qualified individuals to adequately determine the extent of the contamination and to develop appropriate response and controls. This inadequate response resulted in inappropriate removal of radioactive material from the site and radiological

conditions that were in an unknown status for several days (from Friday, April 22 until the following Monday, April 25).

Collectively, this violation constitutes a Severity Level II problem.  
Civil Penalty – \$41,250 (Waived by Statute)

### **III. Radiological, Safety Basis, and Quality Program Violations identified in DOE Assessments**

#### **A. Radiological Program ALARA Violations**

10 CFR 835.1001, *Design and Control*, requires that measures shall be taken to maintain radiation exposure in controlled areas ALARA through physical design features and administrative control. The primary methods used shall be physical design features (e.g., confinement, ventilation, remote handling, and shielding).

LLNL's ES&H Manual, Document 20.4 requires a formal ALARA review to be performed and documented for any operations, authorized by a work document, for which individual whole-body doses are expected to exceed 100 mrem or for which collective dose is expected to exceed one rem.

Contrary to the above, the DOE OA assessment found that during October and November 2004, some operations that met the applicable dose thresholds in Building 332 did not have a documented ALARA review. Examples concerning authorized operations without required documented ALARA reviews are listed below:

1. No ALARA reviews were found for work conducted in rooms 1378, 1919, and 1353 during which some workers had accumulated external doses in excess of the Document 20.4 thresholds.
2. ALARA plans that had been completed were found to be less than adequate in that they did not contain all the information required by Document 20.4.
3. Specific controls identified in ALARA review were not always added to the work procedures.

Collectively, these violations constitute a Severity Level III problem.  
Civil Penalty – \$11,000 (Waived by Statute)

#### **B. Safety Basis Program Technical Safety Requirement Violations**

10 CFR 830.201, *Performance of Work*, requires that LLNL perform work in accordance with the safety basis for a hazard category 1, 2, or 3 DOE nuclear facility, and in particular, with the hazard controls that ensure adequate protection of workers, the public, and the environment.

Contrary to the above, LLNL failed to ensure that administrative programs necessary to maintain the safety system configuration were implemented, that safety systems met the functional requirements, and that required surveillances of safety systems were performed in accordance with the DOE approved safety basis documented in the Plutonium Facility – Building 332 Safety Analysis Report (SAR). Specific deficiencies are listed below.

1. The Building 332 TSR Administrative Controls Section 5.6.8, Configuration Management Control Program, required that LLNL establish, implement, and maintain a configuration management program to control facility configuration and to identify and document the technical baseline of facility structures, systems, and components. Specific requirements included a process for developing, assessing, approving, issuing, and implementing changes to the technical baseline, and a process for recording, controlling, and indicating the current status of technical baseline documentation.

Contrary to the above, LLNL failed to ensure that a configuration management control program was implemented and maintained such that the Building 332 technical baseline was identified, documented, and maintained. A Livermore Site Office (LSO) assessment of the implementation of the configuration management program at Building 332 found that documentation of the technical baseline for safety structures, systems, and components was not complete and current. In addition, as-built walk downs for vital safety systems (VSS) had not been completed, and the drawings had not been updated.

2. TSR 5.6.6 requires that a maintenance program be established and implemented. One key element of this program was a Master Equipment List (MEL).

Contrary to this requirement, the DOE OA Assessment found that the approved version of the MEL had not been updated since 1999 to include many of the modifications that had occurred in the intervening time. The master equipment list plays an important role in design change evaluations, maintenance activities, procurement of equipment, and in the unreviewed safety question (USQ) process.

3. TSR surveillance requirement (SR) 4.3.4 required functional testing of the fire dampers actuated by fusible links in the RMA to ensure operation.

Contrary to the above, TSR surveillance requirement, on February 17, 2005, LLNL management identified that two fire dampers in Building 332 with fusible links had not been functionally tested and were not exempted from the testing requirement.

4. TSR SR 4.7.1.3 required that the back up water supply tanks be maintained at 2/3 full  $\pm$  one inch of the prescribed check marks. The prescribed check marks were to be located at a specified distance from center of the end of the tank cylinder.

Contrary to this requirement, the DOE OA Assessment found that the method being used by LLNL to verify the 2/3 level was to measure from a line drawn on the tank in ink. The accuracy and calibration of this mark was neither established nor controlled as an operator's aid as required by the Building 332 Maintenance and Operations Manual 3.2.6.

5. The LLNL Building 332 Safety Analysis Report was approved by DOE on July 31, 2002, and included a number of conditions of approval. The conditions of approval were required to be completed no later than October 2003.

Contrary to this requirement, a DOE LSO letter dated November 2004 identified three conditions of approval that were not completed by October 2003. DOE LSO considered the conditions of approval requirements to be equivalent to the safety basis TSRs. The specific conditions of approval that were not met are listed below:

- a. COA #11 required that the B332 safety basis be updated to include the technical basis for the functional requirements and performance criteria of the Fire Detection and Suppression System. LSO concluded that the technical basis required for continued operability of the Final Stage HEPA filters was inadequate and lacked the technical basis supported by references to establish the temperatures during fires.
- b. COA #19 required that TRU waste drums sorted or handled outside the B332 RMA be designated as safety significant. LSO concluded that the TSRs were not updated to reflect this requirement.
- c. COA #27 required that the confinement HEPA filters be evaluated for operability under both high humidity and smoke conditions during a fire. LSO concluded that only the high humidity requirement was addressed by LLNL. Subsequently the smoke condition was addressed and LLNL issued a Potential Inadequate Safety Analysis finding on March 11, 2005.

Collectively, these violations constitute a Severity Level II problem.  
Civil Penalty – \$41,250 (Waived by Statute)

#### C. Safety Basis Program – Unreviewed Safety Question Violations

10 CFR 830.203, *Unreviewed Safety Question Process*, requires that LLNL establish, implement, and take actions consistent with a DOE approved USQ

process for hazard category 1, 2, and 3 DOE nuclear facilities. Specifically, LLNL must implement the DOE approved USQ procedure in situations for which there is a (1) temporary or permanent change in the facility as described in the existing documented safety analysis, (2) temporary or permanent change in the procedures as described in the existing documented safety analysis, [. . .] or (4) potential inadequacy of the documented safety analysis because the analysis potentially may not be bounding or may be otherwise inadequate.

Contrary to this requirement, several DOE assessments found deficiencies related to the implementation of LLNL's USQ procedure, Document 51.3. Adequate implementation of the USQ review process is necessary to ensure that operations, modifications, and safety system functions remain within the DOE approved safety basis, or that DOE is notified in a timely manner of a condition outside of the safety basis. Specific deficiencies identified with the LLNL USQ procedure implementation are listed below.

1. LLNL's USQ procedure, Document 51.3 dated August 6, 2004, section 6.6 requires that the USQ review process start when facility management has knowledge of a potential discrepant condition and be completed within days. Contrary to this, the USQ review process was not implemented and completed in a timely manner for discrepant conditions related to design and functional testing of the Building 332 nitrogen backup system for the safety class Emergency Fire Water System. The OA assessment identified that LLNL failed to evaluate the following discrepant conditions in a timely manner after they were discovered during the assessment: (1) no evaluation of the potential impact of the fire water tanks on the safety class pressure boundary was performed when the nitrogen backup system modification was designed and installed, (2) the values used in calculation of record were not consistent with the 400 psig minimum pressure established by the TSR, and (3) the safety class function of the pressure control valves had never been tested.
2. LSO notified LLNL, by letter dated November 2004, that the evaluation of the HEPA filters for smoke conditions had not been performed as required by the Conditions of Approval of the SAR. This letter required that LLNL conduct a USQ review of this condition. However, LLNL did not complete this review until March 11, 2005.
3. The LLNL USQ procedure Document 51.3, section 6.5, requires that the reviewer document a description of the change being evaluated and its effect on SSCs, operations, and procedures. This section of the procedure also requires that the reviewer document the review in sufficient detail such that an independent reviewer can understand the basis for the conclusions. Specific examples of USQs that did not have adequate detail were identified in the two assessments listed below.

- a. DOE/NNSA LSO assessment, dated March 31, 2005, found that five USQDs for modifications at Building 332 were not sufficiently detailed to provide an independent reviewer an adequate understanding of the basis for the conclusion. Specific USQDS that were determined to have insufficient detail in this assessment include the following:
    - (1) USQD: B332-03-020-D, "Removal of Workstation 7002 and Workstation 7003 from Room 1370" - June 5, 2003
    - (2) USQD: B332-04-027-D, "Removal of Workstation 4509 from Room 1345" - May 25, 2004
    - (3) USQD: B332-03-006-D, "Connection and Use of Argon in the Metal Conversion Glovebox (Workstation 0608) in Room 1006" - November 11, 2003
    - (4) USQD: B332-04-039-D, "Add Nitrogen Header and Inert Gas Connection to the Integrated Surveillance Glovebox Line (WR 03-53)" - September 27, 2004
    - (5) USQD: B332-04-028-D, "Criticality Alarm System Detector Head Locations for Phase II Reconfiguration" - June 14, 2004
  - b. A DOE Environmental Management Operations Team assessment dated February 2005 also found that the screening of USQs was not sufficiently detailed to allow an independent reviewer to reach the same conclusion. Specific examples are listed below.
    - (1) S&D-04-020, "Include TRU Segment on form SDF 054, Weekly Inspections Log for B695 & B696R Segment Yard Areas – October 2003
    - (2) HWM-04—022, Revise STO 106 revision 1, Inventory Movements between RHWM Facilities
    - (3) HWM-04-027, The Self-Help Plan for the Radioactive and Hazardous Waste Management Division
4. The LLNL USQ procedure Document 51.3, section 6.0 requires that a USQD review be performed for temporary or permanent changes in the facility or facility procedures that are described in the DOE approved safety basis. Several DOE assessments found that the USQ screening process was not adequate in that issues reviewed were being inappropriately screened such that a USQD review was not being performed. Two DOE/NNSA assessments found examples of inadequate screening and are listed below.

- a. A DOE OA Assessment found that USQDs required by the LLNL USQ procedure were not performed in the following cases due to incorrect screening:
- (1) USQ B332-03-12S, Revision 0, Covering of the Floor Openings in room 1006. The screening incorrectly determined the modification was not a change to the facility as described in the documented safety analysis.
  - (2) USQ B332-03-075-S Revision 0, Revision of OSP 332.188 Materials Characterization, Recovery, and Purification. A procedural change was made to allow a new process for the separation of beryllium from plutonium using a caustic. The USQ screening incorrectly identified that no USQD review was required.
  - (3) USQ B332-03-066-S Revision 0, Revision of OSP 332.043 to add machine lapping operations. A change was made to the operations procedure to allow machine lapping and moved the appropriate machinery into the room where lapping was performed. Incorrect screening of this change resulted in the failure to perform a USQD.
- b. A DOE Environmental Management Operations Team assessment dated February 2004 also found examples of inappropriate screening such that USQD reviews were not performed. The specific examples are listed below.
- (1) TWLP-04-042, Replace Motor Bracket on HEPA Filter Blower (MOVER). The motor bracket was not replaced in kind. Rather, a larger and more robust motor bracket was installed. Therefore, the justification of replacement by like-in-kind to screen out this modification was not appropriate.
  - (2) TWLP-04-061, Baseline CCP-TP-030, Revision 11 CCP TRU Waste Certification and WWIS Data Entry. This change was screened based upon the reviewer incorrectly stating that the certification activities were not addressed in the SAR.

Collectively, these violations constitute a Severity Level II problem.  
Civil Penalty – \$55,000 (Waived by Statute)

#### D. Quality Assurance Program Design and Documents Violations

10 CFR 830.122(f) Criterion 6–*Performance/Design* requires that LLNL [. . .]  
(2) incorporate applicable requirements and design basis in design work and design changes, (3) identify and control design interfaces, (4) verify or validate the adequacy of design products using individuals or groups other than those who performed the work, and (5) verify or validate work before approval and implementation of the design.



10 CFR 830.122(d) Criterion 4– *Management Document* requires that LLNL “(1) Prepare, review, approve, issue, use, and revise documents to prescribe processes, specify requirements, or establish design, and (2) [. . .] maintain [those] records.”

Contrary to the above, LLNL failed to incorporate applicable requirements and design basis in design work and design changes, and failed to verify or validate the work prior to implementation of the design for systems and components that had a safety function defined in the DOE approved Building 332 Safety Basis. Specific examples are provided below.

1. LLNL Building 332 *Work Control/Design Change Control Process Manual* established the requirements for corrective maintenance, Category D activity, and design change, Category E activity. Both Categories D and E activities require post-maintenance or post-modification testing and acceptance criteria to be included in the work package. Contrary to these requirements, the OA assessment found that work packages did not include acceptance criteria and documentation that the required tests were performed. Specific deficiencies are listed below:
  - a. Work Package WR 03-25, *Replace Increment 1 Exhaust Damper Solenoid*. The deficiencies included the following: no testing acceptance criteria was found, acceptance sheets were not signed; and post maintenance test results were not included in the work package.
  - b. Work Package WR 03-43, *Replace Increment 1 Room Supply Motor Damper Actuator*. No test results were in the work package to demonstrate that the acceptance criteria were met.
  - c. Work Package WR 03-30, *Install Damper ACU3*. No acceptance criteria and no test results were in the work package.
  - d. Work Package WR 02-15, *Nitrogen Back-up Air Tank Relocation Project*. No documentation of post-modification testing was in the work package.
2. Building 332 SAR, Section 4.3.7.3 requires that the fire suppression system deliver 3 gpm flow to each demister nozzle of the HEPA filter deluge system. Contrary to this requirement, the OA assessment identified that no analysis had been performed to demonstrate that this design condition could be met by the fire suppression system. Subsequent to the OA assessment finding, LLNL performed an analysis and found that only 2.8 gpm could be delivered to each demister nozzle. The proper function of the demister nozzles was an important safety function necessary to protect the HEPA filters from damage due to hot air in the event of a fire. Additional review by LLNL identified that the National Fire Protection Association (NFPA) standard allowed 2 gpm and, although the SAR

value was not met, the calculated flow rate would comply with the NFPA standard.

3. Building 332 SAR section 4.3.7.3 and surveillance requirement SR 4.7.3.2 required that 400 psig was the minimum pressure for the nitrogen backup tanks; however, the OA assessment found that a much higher value, 2000 psig, was used in the calculation of record to demonstrate adequate capacity of the back up nitrogen system. A subsequent analysis performed by LLNL discovered that the minimum pressure needed for the nitrogen tanks to meet the functional requirements of the backup water system was 1000 psig. In 2004, a modification to the nitrogen backup system was performed to replace the existing aging nitrogen tanks. The aging tanks pressure decreased to approximately 400 psig. The recent calculation demonstrated that the pressure of 400 psig in the old nitrogen tanks would not have been adequate to meet the safety function of the backup water supply system had it been called upon to operate.
4. The documentation required by Procedure NMTP-FMP-0200, revision 1, for dedicating commercial grade equipment for a safety grade application was not complete. Specific deficiencies included the following:
  - a. Like-in-kind documentation for the room ventilation supply damper actuators purchased in 2003 lacked the individual signoffs confirming that the inspection criteria were satisfied.
  - b. The like-in-kind documentation for the purchase of the solenoid installed to control the Increment 1 exhaust damper is incomplete in that the acceptance sheet was not signed.
  - c. The motor for exhaust fan FHE 1000 was replaced in 2004. No quality significant procurement dedication documentation was found for the motor, which had been installed.
  - d. No quality-significant procurement dedication documentation was found for the current spare motor for the safety-class exhaust fans FHE 1000 and FHE 2000 to show dedication of commercial grade material for safety-class application.
  - e. No like-in-kind documentation or other quality significant dedication documentation was found for three spare motors for the glovebox exhaust fans to show dedication for safety class use.

- f. No like-in-kind documentation or quality significant dedication documentation was available for belts to be used in safety-related systems. The spare belts for the FHE 1000/FHE 2000 were not marked as quality significant and have been stored unprotected in the plenum exhaust building close to the installed motors.

Collectively, these violations constitute a Severity Level II problem.  
Civil Penalty – \$41,250 (Waived by Statute)

#### IV. Quality Improvement Violations in Radiation Protection & Quality Assurance

10 CFR 830.122(c)(1) Criterion 3–*Management/Quality Improvement* requires that LLNL (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 part of correcting the problem.

LLNL ES&H Manual 4.2 contains institutional level requirements for issues management including the use of a database (DefTrack, now replaced by Issues Tracking System) to document the tracking, correction and closure of certain site deficiencies.

1. Contrary to the above, LLNL failed to correct quality problems that were identified in 10 CFR 835 internal assessments. The NNSA LSO For-Cause assessment found that a significant number of deficiencies, identified in LLNL internal audits concerning compliance with 10 CFR 835, were not being adequately corrected. The assessment found that 12 of 21 LLNL audits reviewed had repeat or uncorrected findings from an earlier internal audit. The assessment concluded that the extent of recurring deficiencies across the site provided clear evidence that those issues are not being adequately corrected. Examples of recurring or uncorrected deficiencies identified in LLNL internal audits are listed below.
  - a. The March 2004 LLNL 10 CFR 835.102 Internal Audit of the Radiation Safety Program of Building 334: Repeat findings included (1) failures to document CAM operational information in logbooks (such as run times) to ensure adequate air monitoring determinations, (2) CAM filters are not being sent to the Radiation Materials Laboratory for counting as required (a Ludlum has been used exclusively), and (3) failure to document surveys as required when special nuclear material enters the building.
  - b. The October 2003 LLNL 10 CFR 835.102 Internal Audit of the Radiation Safety Program of Radioactive and Hazardous Waste Management: Over half of the previous audit findings were identified as still open or ineffectively resolved during this review.

- c. The March 2004 LLNL 10 CFR 835.102 Internal Audit of the Radiation Safety Program of the Tritium Facility (B331): The facility could not demonstrate that workers submitted required bioassay samples as specified on the RWP.
2. The NNSA LSO For-Cause Assessment team also determined that several elements of the Laboratory's quality improvement process were not being implemented as required. For example, a review by the team regarding the manner in which 10 CFR 835 internal audit findings were managed by five separate Directorate organizations revealed that none of the organizations were in full compliance with the requirements of ES&H manual 4.2. Deficiencies included (1) failures to enter 10 CFR 835 internal audit findings into ITS or DefTrack, (2) the use of substitute local and informal processes to track findings, and (3) failure to release required audit findings into the "Laboratory View" mode for more formal communication, analysis, lessons learned, and tracking. In one case, audit findings were not entered into the tracking system until after the NNSA team had brought it to the attention of the responsible LLNL organization.
3. Other quality improvement problems identified by the NNSA LSO Assessment team included (1) the lack of a change control process for ITS findings/actions, including the ability to modify elements without justification, documented analysis, review, and approval; (2) no formal processes to record and document resolution of radiological deficiencies that are not associated with a planned assessment activity or meet the thresholds for ORPS/NTS reporting; (3) lack of a formal process to conduct performance analysis and identification of recurring events and audit findings so as to identify programmatic or systemic concerns and their underlying causes. Overall, the NNSA LSO For-Cause Assessment team concluded that LLNL issues management processes are not capable of ensuring that radiological protection issues are adequately identified and evaluated, and that appropriate corrective actions are developed, completed and effective.
4. LLNL failed to establish and implement a process to capture and report radiological deficiencies and items that did not conform to requirements into a system so that they could be controlled and corrected. Specifically, near the end of May 2004, the HP assigned to the MOVER identified that chronic airborne radioactivity conditions were occurring in the MOVER. Airborne radioactivity was not planned or expected in the MOVER, and workers were not required to wear respirators for much of the activities conducted at the MOVER. However, a formal report of this condition was not made and the airborne radiation was not controlled or corrected from its discovery in May until a second CAM alarmed on August 19, 2004. The failure to establish a process to identify and correct deficiencies contributed to workers being exposed to airborne radioactivity on three to five separate occasions between May and August 19, 2004.

5. Contrary to the above, LLNL failed to identify and correct quality problems that prevented the implementation of a configuration management program at Building 332. The NNSA/LSO transmitted a letter to LLNL in December 2003 indicating that DOE was extremely concerned with LLNL's progress regarding the implementation of the Configuration Management Program. The DOE letter stated that the LLNL Assurance Review Office (ARO) Phase II assessment identified serious flaws in implementation of this program and in the use of the "go forward approach." A February 2004 letter from LLNL indicated that appropriate corrective actions would be taken to clarify the "go forward approach" and address the other LSO concerns. Subsequent to these corrective actions, an OA assessment issued in December 2004 and a NNSA/LSO assessment in March 2005 found the Configuration Management Program in Building 332 to be incomplete and ineffective. The corrective actions plan submitted by LLNL on March 31, 2005, was found to be inadequate by LSO, in a letter dated April 1, 2005, because no formal causal analysis was performed for all findings specific to the Nuclear Materials Technology Program (NMTP).
6. Contrary to 10 CFR 830.122, Criterion 3, LLNL failed to correct longstanding and widespread quality problems with the implementation of a USQ process established by LLNL's USQ procedure, Document 51.3. In November 2002, DOE LSO identified major and systemic deficiencies with the implementation of the USQ process at the B-231-V facility. These deficiencies were documented in DOE Activity Report ACT 0005at. In November 2002, concurrent with the DOE LSO assessment, LLNL formed a special review team (Red Team) to investigate this problem. The Red Team review found that operations at the B-231-V facility had been conducted with a degraded safety-significant ventilation system that was not compliant with the safety basis, and multiple failures to comply with USQ requirements existed. In March 2003, LLNL performed an internal independent assessment (ARO-02-11) of USQ implementation at category 2 and 3 nuclear facilities. This assessment discovered significant problems with USQ implementation at nuclear facilities in addition to B-231-V. Specifically the assessment found that the effectiveness of the USQ implementation varied from good to poor among the nuclear facilities. In addition, the assessment found inadequate implementation of the USQ process related to onsite transportation and with maintenance and change control activities at the Radioactive Hazardous Waste Management (RHWM) facilities.

The problems identified in this series of DOE and internal assessments clearly identified a significant and site-wide problem with USQ implementation. The efforts to fully understand the extent of this problem, the causes, and implementation of effective corrective actions were not adequate. For instance, even though it was known that the USQ process was not fully adequate at several LLNL nuclear facilities, LLNL chose not to conduct a review of the adequacy of completed USQ determinations. In response to the ARO assessment, a corrective action plan was issued, but not until September 2003, almost six months following the issuance of the assessment report. The

corrective action plan did not include a causal analysis or an extent-of-condition review although determination of the causes of PAAA noncompliances was a requirement in the Quality Assurance Rule. The corrective actions identified did not adequately address all of the causes of these problems nor address the adequacy of USQs already performed.

In October 2003, DOE LSO conducted a limited scope review to evaluate the adequacy of LLNL USQ reviews and effectiveness of LLNL's corrective actions. DOE LSO notified LLNL, by letter dated December 23, 2003, that significant quality problems still existed with USQ implementation. In addition, this assessment found that some of same problems identified in the March 2003 ARO assessment still existed, an indication that corrective actions were not effective. Specifically, this assessment reviewed the adequacy of 28 completed USQ reviews and found quality problems with about half of them. Quality problems with three USQs were significant in they were determined to have reached the wrong conclusion related to whether the activity was adequately addressed in the LLNL safety basis. In addition, the assessment found that maintenance activities had still not received USQ reviews, and that USQ deficiencies related to onsite transportation had not been corrected.

DOE LSO also determined that several corrective actions related to deficiencies found by the ARO assessment were ineffective. Recent assessments conducted in late 2004 and early 2005 by DOE OA, LSO, and EM all identified multiple deficiencies with the implementation of requirements in the LLNL USQ procedure. These deficiencies were similar in that they identified quality problems associated with implementation of the USQ process, related to inadequate reviews and levels of documentation. Although the majority of the recent findings individually had only minor safety significance, based upon a further review by LLNL that concluded that the original decisions were correct, the findings still represent a continuing quality problem.

Collectively, these violations constitute a Severity Level I problem which is being assessed at \$110,000 per day for two days.  
Civil Penalty – \$220,000 (Waived by Statute)

Pursuant to the provisions of 10 CFR 820.24, Lawrence Livermore National Laboratory is hereby required, within 30 days of the date of this Preliminary Notice of Violation (PNOV), to submit a written reply by overnight carrier to the following address:

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 Livermore Site Office Manager as well as to my 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 which are asserted to be incorrect; and (3) the reasons for the violations if admitted, or if denied, the basis for the denial. Corrective actions that have been or will be taken to avoid further violations should be delineated with target and completion dates in DOE's Noncompliance Tracking System. In the event the violations set forth in this PNOV are admitted, this PNOV will constitute a Final Order in compliance with the requirements of 10 CFR 820.24.



Linton F. Brooks  
Administrator  
National Nuclear Security Administration

Dated at Washington, DC  
this 23rd day of February 2006

**Lawrence Livermore National Laboratory  
MOVER Uptake Event and  
Radiological Program, Quality and Safety Basis Issues**

**Enforcement Conference Summary**

On October 5, 2005, the Department of Energy's Office of Price-Anderson Enforcement (OE) held an Enforcement Conference with Lawrence Livermore National Laboratory senior management in Germantown, Maryland. The conference was held to discuss apparent violations identified in the OE Investigation Summary Report that was provided to LLNL on August 30, 2005.

The scope of the OE investigation included the August 2004 MOVER event, the April 2005 Phosphorous-32 spill event, and longstanding radiological program, quality and safety basis Issues.

The conference was opened by Mr. Stephen Sohinki, Director, Office of Price-Anderson Enforcement, who provided introductions and an overview of the conference's purpose and objectives.

The LLNL presentations were opened by the Laboratory Director Dr. Michael Anastasio. Dr. Anastasio discussed his perspectives on the fundamental safety issues surrounding the problems identified in the investigation including the need to (1) assure management commitment and accountability for safety, (2) improve deficiency identification and corrective action effectiveness, (3) assure more rigorous implementation of ISM and critical safety programs, and (4) to resolve longstanding problems. His presentation included an update of specific actions intended to address the above issues. Dr. Anastasio also stated that the OE investigation was factually accurate in all important respects and that LLNL did not need to submit any comments for the record.

Mr. William Bookless, Associate Director, Safety and Environmental Protection, made two presentations. His first presentation covered organizational changes and several other initiatives intended to improve institutional support for safety performance at the Laboratory. He outlined steps intended to improve performance data gathering, analysis, and subsequent management action, including the use of leading indicators as well as enhanced requirements for assessment and causal analysis processes. He also discussed actions to improve the implementation of critical safety programs including ISM, Radiation Protection, Safety Basis, Configuration Management, and Nuclear Safety Management.



Mr. Bookless's second presentation provided an update to the Laboratory's Radioactive and Hazardous Waste Management facility operations post the MOVER event. Organizational changes and corrective actions were the main focus of the discussions.

Mr. Bruce Goodwin, Associate Director, Defense Nuclear Technology, provided an update on Building 332 resumption activities. Discussions focused on actions intended to improve the implementation of critical nuclear safety programs, including organizational changes, increased staffing, compensatory measures, and longer term actions.

Mr. James Koonce, Deputy Vice President, University of California (UC), provided a presentation concerning ongoing efforts by UC associated with LLNL performance improvement. Mr. Koonce indicated that UC was committed to following through on the corrective actions to which LLNL had committed. Key oversight initiatives were highlighted.

Mr. Larry Pendexter, Director, ES&H Assurance Office, provided presentations on LLNL PAAA Program Review corrective actions, and factors associated with a request for mitigation. Mr. Sohinki stated he would take under consideration the request for mitigation.

Dr. Anastasio then summarized the corrective actions that were being taken and reiterated his concerns about and commitment to improving LLNL performance.

Mr. Sohinki concluded the conference by indicating that DOE would consider the information presented in its enforcement deliberations. The conference was then adjourned.

Enforcement Conference List of Attendees

Lawrence Livermore National Laboratory  
August 2004 MOVER Event and  
Longstanding Radiological Protection Program,  
Quality Assurance and Safety Basis Deficiencies

October 5, 2005

DOE – Office of Price-Anderson Enforcement

Stephen Sohinki, Director  
Howard Wilchins, Senior Litigator  
Peter Rodrik, Enforcement Specialist  
Ronald Collins, Enforcement Specialist  
Steve Hosford, Technical Advisor

DOE-National Nuclear Security Administration

Frank Russo, Senior Advisor for Environment, Safety, and Health, NA-3.6  
Doug Minnema, NNSA PAAA Coordinator, NA-3.6  
Mike Thompson, Technical Director Facilities Management & ES&H Support, NA-11

DOE – Livermore Site Office

Camille Yuan-Soo Hoo, Manager  
Ralph Kopenhaver, Senior Safety Advisor

Lawrence Livermore National Laboratory

Michael Anastasio, Director  
Wayne Shotts, Deputy Director  
William Bookless, Associate Director  
Bruce Goodwin, Associate Director  
Larry Pendexter, Director, ES&H Assurance Office  
Garry Holman, Acting PAAA Coordinator  
Mark Martinez, Program Leader Office of Nuclear Materials Technology Program  
Melissa Allain, Laboratory Counsel

University of California

James Koonce, Deputy Associate Vice President of Laboratory Operations  
Howard Hatayama, Director, Office of Environment, Safety, and Health