Department of Energy
Washington, DC 20585

October 4, 2012

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. John J. Grossenbacher
President and Laboratory Director
Battelle Energy Alliance, LLC
2525 North Fremont Avenue
Idaho Falls, Idaho 83415-3695

NEA-2012-01

Dear Mr. Grossenbacher:

This letter refers to the U.S. Department of Energy (DOE) Office of Health, Safety and Security's Office of Enforcement and Oversight investigation into the facts and circumstances associated with the August 30, 2011, elevated extremity dose at the Hot Fuel Examination Facility (HFEF) and the November 8, 2011, plutonium contamination at the Zero Power Physics Reactor (ZPPR) facility at the Idaho National Laboratory Materials and Fuels Complex (MFC). The results of the investigation were provided to Battelle Energy Alliance, LLC (BEA) in an investigation report dated June 25, 2012. An enforcement conference was held with BEA representatives on August 3, 2012, to discuss the report's findings and BEA's corrective actions. A summary of the enforcement conference and list of attendees is enclosed.

Based on an evaluation of the evidence in this matter, including information presented during the enforcement conference, DOE has concluded that violations of 10 C.F.R. Part 830 Subpart A, *Quality Assurance Requirements*, and 10 C.F.R. Part 835, *Occupational Radiation Protection,* have occurred. The enclosed Preliminary Notice of Violation (PNOV) cites four Severity Level I violations and one Severity Level III violation, with a total proposed base civil penalty of $600,000.

DOE considers these events to be of high safety significance. In the HFEF event, the failure to control work resulted in a worker receiving an unplanned extremity dose of nearly 3.6 rem, which occurred 8 months after a precursor event in which two workers received unplanned extremity doses in excess of 9 rem. In the ZPPR event, multiple failures in the work controls used to protect workers from plutonium resulted in the contamination of 16 workers. The magnitude and duration of the uncontrolled plutonium release presented a high potential for an adverse impact on worker safety that could have resulted in an uptake sufficient to exceed the dose limits in 10 C.F.R. Part 835.

Contrary to these requirements, BEA failed to effectively correct known radiological control deficiencies at MFC, as illustrated by the following:

1. On January 3, 2011, BEA identified two workers in the HFEF Fuel Conditioning Facility Manipulator Repair Group who received unplanned doses to their hands from unmonitored beta contamination inside a glovebox. One worker received an elevated extremity dose of 9.98 rem, and the other received a dose of 9.14 rem. BEA determined that the controlling Radiation Work Permit (RWP) had no requirement to monitor for beta radiation. In response to this event and several other radiological work noncompliances, BEA instituted a voluntary suspension of radiological work at MFC in early 2011. All radiological work at MFC was stopped and gradually resumed over a 3-month period as BEA reviewed, modified, and approved work control documents; trained the workforce on the new procedures; and validated readiness. However, these corrective actions were not effective in preventing the elevated extremity dose at HFEF on August 30, 2011, when workers monitored for beta radiation, as required, but then ignored the readings.

2. In May 2011, samples were brought to the HFEF Glove Wall for a radiation survey, which showed an off-scale high dose rate. The samples were returned to the decontamination cell, and the health physics technician (HPT) supervisor was informed of the situation. Subsequently, the HPT supervisor reviewed the RWP used to control the radiological work and noted that it needed to be revised, because it did not have any limits for beta radiation. However, the RWP was not revised.

Title 10 C.F.R. § 830.122(c), *Management/Quality Improvement*, at subsection 4, requires DOE contractors to "[r]eview item characteristics, process implementation, and other quality-related information to identify items, services, and processes needing improvement."

BEA quality improvement requirements in LRD-13800, section 3.1.4, state that "[i]tem characteristics, process implementation, and other quality-related information shall be reviewed to identify items, services, and processes needing improvement."

Contrary to these requirements, BEA failed to effectively and comprehensively review quality-related information regarding ZPPR plutonium fuel plates and, as a result, failed to identify necessary process improvements, as illustrated by the following:

3. As documented in a January 18, 2012, DOE accident investigation report, *Plutonium Contamination in the Zero Power Physics Reactor Facility at the Idaho National Laboratory*, historical records of damaged plutonium fuel plates at ZPPR existed in a Suspect Fuel Log maintained before 1991 by a previous contractor. However, this information was not effectively transitioned when responsibility for the MFC was transferred to BEA in 2005, and the Suspect Fuel Log was not used during work planning. After the event, BEA located three separate volumes of the Suspect Fuel Log inside the ZPPR workroom. The Suspect Fuel Log recorded (in log VI.81 on page 000005) that the corner of fuel plate #042-41, stored in clamshell (fuel storage container) 45 M on the day of the event, was swollen, with a discovery date of July 15, 1982.

4. On January 26, 2009, the chairman of the MFC Independent Safety Review Committee (ISRC) provided an informal letter to MFC management outlining past personal experience with ZPPR plutonium fuel plates and offering recommendations for safer handling practices. The MFC ISRC chairman characterized the potential for finding breached plutonium fuel plates in the ZPPR vault as "greater than facility and senior management realize[s]" and recommended having "proper procedures in place, if a failed ZPPR ^{239}Pu plate is discovered." However, MFC management took no action to address the increased potential for airborne contamination from a breached plutonium fuel plate.

5. On June 23, 2011, the informal letter was again presented to the newly appointed MFC nuclear operations director by the chairman of the MFC ISRC. Again, no process improvements were identified or put in place to address the increased potential for airborne contamination from a breached plutonium fuel plate.

Collectively, these noncompliances constitute a Severity Level I violation.
Base Civil Penalty – $150,000
Proposed Civil Penalty – $150,000

B. Work Processes

Title 10 C.F.R. § 830.122(e), *Performance/Work Processes*, at subsection (1), requires DOE contractors to "[p]erform 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."

BEA requirements for work processes are documented in LRD-13100, *Work Processes*, revision 2. LRD-13100, section 3.1.4 states that "[w]ork shall be performed consistent with technical standards, administrative controls, and hazard controls adopted to meet regulatory or contract requirements using approved instructions, procedures, etc."

BEA requirements for hazard analysis and control are documented in LRD-14005, *Activity Level Hazard Identification, Analysis and Control*, revision 2. LRD-14005, section 3.1 states that "[w]ork/job activities shall be evaluated to identify and analyze associated hazards and develop controls."

BEA requirements for timeout and stop-work authority are documented in Laboratory Wide Procedure (LWP)-14002, *Timeout and Stop Work Authority*, revision 4. LWP-14002, section 1 authorizes INL employees to take a timeout and/or stop work for potentially unsafe conditions. LWP-14002, section 6 states that a potentially unsafe condition can exist "when an employee encounters any situation, condition or potential hazard not discussed in briefings, or if any employee has a concern about whether a job can be performed safely."

For radiological work, BEA requirements for timeout and stop-work authority are documented in LRD-15001, *Radiological Control Manual*, article 751.2, which states that "[u]pon identification of radiological concerns, such as inappropriate work controls or

procedural deficiencies, workers should immediately report the concern to line supervision or the radiological control organization. If appropriate to control individual exposure to radiological hazards, the affected individuals should exit the radiological area until these issues are resolved and appropriate controls have been instituted."

Contrary to these requirements, BEA issued deficient work control documents and failed to perform work consistent with approved procedures, as illustrated by the following:

1. On August 30, 2011, a survey of an irradiated fuel sample, designated as sample 71T, showed an off-scale high (>50 rem/hour) contact dose rate for beta radiation. Employees stopped work, per LWP-14002, and contacted the acting HPT supervisor, who consulted RWP MFC2011129, *HFEF-Hot Repair Area Glovewall Operations, HFEF-OI-3150 and HFEF-OI-3152*. The acting HPT supervisor made the decision to continue the work with sample 71T, because RWP MFC2011129 did not have any limit for beta radiation. The hazard presented by the off-scale high contact beta dose rate for sample 71T was not evaluated and controls were not developed as required by LRD-14005. The requirements in RWP MFC2011129 were based on As Low As Reasonably Achievable (ALARA) Review HFEF-2011007, *HFEF-785 Hot Repair Area (HRA) Entries, Cart Room Operations, HRA Glove Wall Activities*, revision 1. HFEF-2011007 includes an evaluation point that was required to be incorporated into RWP MFC2011129. The evaluation point states that for a "[c]ontact exposure rate of >5 R/hr [Roentgen/hour] β-γ [beta-gamma], an HPT may install or direct installation of ALARA shielding, as many times as required. Contact Radiological Engineer to assess effectiveness of ALARA shielding." However, this evaluation point was not incorporated into RWP MFC2011129, as required by LRD-15001.

2. The acting HPT supervisor then directed workers to transfer sample 71T through the stepout room per RWP MFC2011130, *HFEF-Hot Repair Area Stepout Room to Transfer Items Into Or Out Of The Hot Repair Area, LST-482 & LST-483,* which includes an evaluation point that requires workers to notify facility management if radiation levels exceed 100 millirem per hour at 30 centimeters. This evaluation point was exceeded, but the workers did not review the RWP or notify facility management. Subsequently, an operator transferred sample 71T into a small shielded cask, resulting in a 3.58 rem dose to the operator's right hand.

3. BEA requirements for briefings are documented in LWP-9201, *Briefings*. As documented in the INL Level 1 Cause Analysis INL/EXT-11-24112, *Causal Analysis for the Unanticipated Extremity Exposure at HFEF, November 2011*, the pre-job briefing for the work at HFEF on August 30, 2011, did not cover the fourth Basic Briefing Element in LWP-9201, item 4.3, "[w]hat could go wrong with the facility, the environment, the equipment, or personnel?"

4. LWP-9201, item 4.6, states that "[a]ll personnel involved in performing the activity shall be briefed." On September 13, 2011, the pre-job briefing for returning sample 71T to HFEF did not include all personnel performing the work.

With regard to the plutonium contamination event at ZPPR, the work control documents used to package ZPPR plutonium fuel plates were Process Work Sheet (PWS)-34, *Breakout and Packaging of Pu Plates*, used in conjunction with operating instructions EF-OI-007, *9975 Shipping Container Handling*; ZPPR-OI-005, *Nuclear Material Handling*; and ZPPR-OI-010, *ZPPR Fuel Storage Container Handling*. Contrary to these requirements, BEA issued deficient work control documents and failed to perform work consistent with approved procedures, as illustrated by the following:

5. PWS-34, Part 6, *Accountable Material*, step 7, directs workers to perform breakout activities per shift supervisor (SS) direction. PWS-34 did not provide specific directions for processing the clamshells, leading to the creation of work steps without an appropriate hazard analysis or accompanying means of mitigation. During the breakout activities on November 8, 2011, potentially unsafe conditions (i.e., any situation, condition, or potential hazard not discussed in briefings) were encountered on two occasions. On the first occasion, the work group appropriately stopped work after finding atypical labels on two of the clamshells (47 S and 45 M), indicating potential abnormalities in the enclosed plutonium fuel plates. After the work was stopped, the SS consulted with the nuclear facility manager and subsequently directed workers to open clamshell 45 M. The second potentially unsafe condition was encountered when, after opening clamshell 45 M, the workers discovered that the plutonium fuel plate inside (fuel plate #042-41) was wrapped in plastic and tape, presenting a condition that had not been discussed in briefings. No timeout or stop-work was taken to identify and analyze the hazards and develop controls for this potentially unsafe condition, as described in LWP-14002. The SS directed workers to cut the plastic wrapping around the plutonium fuel plate, thereby releasing hazardous plutonium aerosols and exposing visible particles of plutonium that had been hidden underneath the plastic wrapping. Removal of the tape and plastic was not specified in the work instructions.

6. The breakout activities were conducted inside the ZPPR Workroom South Hood, as specified by PWS-34. The ALARA review ZPPR-2011-003, *ZPPR – Plutonium (Pu) Packaging for Shipment*, states on page 4, item 6 that the clamshells would be opened in the fume hood to "prevent the potential spread of contamination." However, as documented in the BEA investigation and cause analysis report, airflow through the hood was significantly impaired because the exhaust fan for the ZPPR Workroom South Hood was aligned to an out-of-service damper at the time of the plutonium contamination event. There was no requirement to test or validate hood function before performing work.

7. RWP MFC2011415, *Pu Packaging for Shipments*, revision 0, requires that an extra pair of gloves, gauntlets, and a lab coat be worn for hands-on work inside the fume hood. As documented in the BEA investigation and cause analysis report, an HPT reached into the fume hood without wearing a lab coat, gauntlets, or an extra pair of gloves to receive a smear transfer.

8. Operating instruction ZPPR-OI-005 provides instructions for the safe receipt, transfer, and storage of nuclear materials at ZPPR. However, ZPPR-OI-005 provides no specific

instructions on handling plutonium fuel plates and does not address any potential for airborne contamination.

9. Operating instruction ZPPR-OI-010 provides instructions for handling fuel storage containers at ZPPR. However, ZPPR-OI-010 provides no instructions for handling plutonium or for transferring materials from the vault to the hood.

Collectively, these noncompliances constitute a Severity Level I violation.
Base Civil Penalty – $150,000
Proposed Civil Penalty (as adjusted) – $112,500

C. Training

Title 10 C.F.R. § 830.122(b), *Management/Personnel Training and Qualification*, at subsection (1), requires contractors to "[t]rain and qualify personnel to be capable of performing their assigned work."

BEA requirements for personnel training and qualification are documented in LRD-13020, *Personnel Training and Qualification*, revision 0. LRD-13020, section 3.1.1 states that "[p]ersonnel shall be trained and qualified to be capable of performing assigned work."

Contrary to these requirements, BEA failed to effectively train personnel to be capable of performing assigned work involving plutonium, as illustrated by the following:

1. As documented in the BEA investigation and cause analysis report, BEA training course MFC00027, *MFC Plutonium Awareness*, does not provide sufficient information on hazards and MFC's standards and expectations to effectively mitigate plutonium contamination and airborne hazards. MFC00027 is required for HPTs and MFC basic operators, but was not required for all workers who performed the plutonium fuel plate packaging on November 8, 2011, including security and management personnel. Some employees working in the area at the time of the event had no training on plutonium hazards.

2. As documented in the DOE accident investigation report, the Accident Investigation Board concluded that:

   a. MFC00027 and other training experiences did not inform the workers adequately to alert them to stop working when they encountered the abnormal condition of multiple wraps of plastic and tape after opening the clamshell.

   b. MFC00027 was not effective in providing the workers with the knowledge needed to recognize that a visible plutonium particle represented a hazard warranting immediate evacuation.

This noncompliance constitutes a Severity Level I violation.
Base Civil Penalty – $150,000
Proposed Civil Penalty (as adjusted) – $75,000

D. Air Monitoring

Title 10 C.F.R. § 835.403, *Air Monitoring*, at subsection (b) requires that "[r]eal-time air monitoring shall be performed as necessary to detect and provide warning of airborne radioactivity concentrations that warrant immediate action to terminate inhalation of airborne radioactive material."

BEA requirements for air monitoring are documented in LRD-15001, *Radiological Control Manual*, revision 3, article 555.3, which states, "[c]ontinuous (or real-time) air monitors are used to provide early warning to individuals of events that could lead to substantial unplanned exposures to airborne radioactivity. Such exposures could result from a breakdown of engineered controls or improper establishment of boundaries during work that creates airborne radioactivity. Real-time air monitoring shall be performed as necessary to detect and provide warning of airborne radioactivity concentrations that warrant immediate action to terminate inhalation of airborne radioactive material [see 10 CFR 835.403(b)]."

Contrary to these requirements, BEA failed to perform real-time air monitoring to detect and provide early warning to individuals of events that could lead to substantial unplanned exposures to airborne radioactivity. RWP MFC2011415 states, in *HPT/RCT Instructions*, that "[j]ob specific air sampling is required to open primary containers in fume hood; place air monitor in the breathing zone." As documented in the BEA investigation and cause analysis report, a portable air sampler was placed near the hood during the breakout activities, but it was not in the breathing zone as required. The portable air sampler was not equipped with an alarm and did not provide any audible or visual warning to personnel when airborne radioactivity was detected. In addition to the portable air sampler, a continuous air monitor (CAM) was positioned near an exhaust vent approximately 15 feet away from the fume hood; this location was also outside the breathing zone. This CAM first alarmed nearly 4 minutes after workers cut the plastic wrapping around the plutonium fuel plate. Employees evacuated the ZPPR workroom upon hearing the CAM alarm.

The failure to perform real-time monitoring and the failure to provide warning of airborne plutonium resulted in the contamination of 16 workers. This uncontrolled exposure had a high potential for an adverse impact on worker safety and could have resulted in sufficient uptake to exceed the dose limits prescribed under 10 C.F.R. § 835.202

This noncompliance constitutes a Severity Level I violation.
Base Civil Penalty – $150,000
Proposed Civil Penalty (as adjusted) – $75,000

E. Recordkeeping

Title 10 C.F.R. § 835.703, *Other Monitoring Records*, requires that "[t]he following information shall be documented and maintained...(a) [r]esults of monitoring for radiation and radioactive material as required by subparts E and L of this part, except for monitoring required by § 835.1102(d)." The exception in 10 C.F.R. § 835.1102(d) applies to the monitoring of "[i]ndividuals exiting contamination, high contamination, or airborne radioactivity areas... for the presence of surface contamination."

BEA requirements for documenting and maintaining results for monitoring radiation are documented in LRD-15001, *Radiological Control Manual*, article 751.2, which states that records shall be maintained to document "[r]esults of monitoring and surveys for radiation and radioactive materials [see 10 CFR § 835.703(a)]."

Contrary to these requirements, BEA failed to accurately document and maintain results of radiation monitoring. As documented in the INL Level 1 Cause Analysis INL/EXT-11-24112, the survey map (number M-20110830-31) used to record the radiation surveys of irradiated fuel samples on August 30, 2011, did not indicate the off-scale high meter indication for irradiated fuel sample 71T. M-20110830-31 recorded sample 71T as having a corrected beta dose rate of 78.6 rem/hour. Upon discovery by BEA on October 6, 2011, this error was corrected on new survey map number M-20111006-30 to indicate a >50 rem/hour beta-gamma reading for sample 71T.

This noncompliance constitutes a Severity Level III violation.
Base Civil Penalty – $15,000
Proposed Civil Penalty (as adjusted) – $0

REPLY

Pursuant to 10 C.F.R. § 820.24(b), BEA is hereby obligated, within 30 calendar days after the date of filing of this Preliminary Notice of Violation (PNOV), to submit a written reply. The reply should be clearly marked as a "Reply to the Preliminary Notice of Violation" and must be signed by the person filing it.

If, in its reply, BEA agrees to comply with the proposed penalty and waives any right to contest this PNOV or the proposed penalty, then, pursuant to 10 C.F.R.§ 820.24(d), this PNOV will constitute a Final Order upon the filing of the reply. In such cases and in accordance with 10 C.F.R. § 820.32(c), the total proposed civil penalty of $412,500 must be remitted within 30 calendar days after the Final Order is filed. Payment of the civil penalty must be made by check, draft, or money order payable to the Treasurer of the United States (Account 891099) and mailed to the address provided below.

If BEA disagrees with any aspect of this PNOV or the proposed remedy, then, as applicable and in accordance with 10 C.F.R. § 820.24(c), the reply shall include: (1) any facts, explanations, and arguments which support a denial that a violation has occurred as alleged; (2) any extenuating circumstances or other reason why the proposed remedy should not be imposed or

should be mitigated; (3) a discussion of the relevant authorities which support the position asserted, including rulings, regulations, interpretations, and previous decisions issued by DOE. In addition, 10 C.F.R. § 820.24(c) requires that the reply include copies of all relevant documents.

Please send the appropriate reply by overnight carrier to the following address:

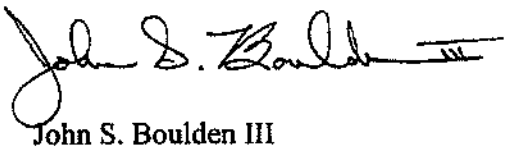
Director, Office of Enforcement and Oversight
Attention: Office of the Docketing Clerk
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

A copy of the reply should also be sent to the Manager of the DOE Idaho Operations Office.

Pursuant to 10 C.F.R. § 820.33(a), if BEA does not submit a written reply within 30 calendar days after the date of filing of this PNOV, the Director of the Office of Enforcement and Oversight will request that a Default Order be issued against BEA.

CORRECTIVE ACTIONS

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.



John S. Boulden III
Director
Office of Enforcement and Oversight
Office of Health, Safety and Security

Washington DC
This 4th day of October 2012