



Department of Energy

Washington, DC 20585

June 20, 2014

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

WEA-2014-01

Dear Mr. Grossenbacher:

This letter refers to the U.S. Department of Energy's (DOE) investigation into the facts and circumstances associated with the sparger unit testing event that resulted in a Battelle Energy Alliance, LLC (BEA) researcher sustaining second- and third-degree burns at the Idaho National Laboratory Engineering Demonstration Facility on February 11, 2013. The results of the investigation were provided to BEA in an investigation report dated October 25, 2013. An enforcement conference was held on December 10, 2013, with BEA representatives to discuss the report's findings and BEA's response. A summary of the conference and list of attendees is enclosed.

Based on an evaluation of the evidence in this matter, DOE has concluded that violations of 10 C.F.R. Part 851, *Worker Safety and Health Program*, by BEA have occurred. Accordingly, DOE is issuing the enclosed preliminary notice of violation (PNOV), which cites four Severity Level I violations and one Severity Level II violation, with a total base civil penalty of \$337,500.

DOE considers the serious injuries sustained by the researcher and the associated violations to be of high safety significance. DOE's evaluation of the circumstances concluded that BEA did not apply rigor and formality to work planning, control, execution, and oversight at a level commensurate with the hazards and risks associated with the scope of work for the sparger test. BEA used a laboratory work control document that did not provide sufficient details regarding the complexity of the test, the potential hazards, and the operational safety of the work activity. As a result, responsible BEA management was not aware of the hazards and mitigating measures.

Notwithstanding these issues, DOE acknowledges BEA's initial response to the event and subsequent corrective actions to address the potential violations and prevent their recurrence. DOE has concluded that BEA's corrective action plan appears to address the deficiencies identified in the March 2013 BEA accident investigation team report and the violations cited in this PNOV. DOE recognizes BEA's substantial progress in strengthening processes for identifying and controlling hazards and for reviewing and revising institutional procedures



related to work planning and control, work oversight, training, and pre-job briefings to ensure that workers are properly equipped to meet BEA's expectations for work performance. In recognition of BEA's response to the event and corrective actions that address the Part 851 violations in the enclosed PNOV, DOE is granting 50 percent mitigation of the base civil penalty for the four Severity Level I violations related to hazard identification and assessment; hazard prevention and abatement; management responsibilities; and pressure safety. DOE also grants 50 percent mitigation of the base civil penalty for the Severity Level II violation related to training and information. As a result, the total proposed civil penalty is \$168,750.

Pursuant to 10 C.F.R. § 851.42, *Preliminary Notice of Violation*, you are obligated to submit a written reply within 30 calendar days of receipt of the enclosed PNOV, and to follow the instructions specified in the PNOV when preparing your response. If you submit no reply within 30 days, in accordance with 10 C.F.R. § 851.42(d) you relinquish any right to appeal any matter in the PNOV, and the PNOV will constitute a final order.

After reviewing your response to the PNOV, including any proposed additional corrective actions entered into DOE's Noncompliance Tracking System, DOE will determine whether further action is necessary to ensure compliance with worker safety and health requirements. DOE will continue to monitor the completion of corrective actions until these matters are fully resolved.

Sincerely,



Steven C. Simonson

Director

Office of Enforcement

Office of Independent Enterprise Assessments

Enclosures: Preliminary Notice of Violation (WEA-2014-01)
Enforcement Conference Summary and List of Attendees

cc: Rick Provencher, DOE-ID
Sherry Kontes, BEA

Preliminary Notice of Violation

Battelle Energy Alliance, LLC
Idaho National Laboratory

WEA-2014-01

A U.S. Department of Energy (DOE) investigation into the facts and circumstances associated with the sparger testing event that occurred on February 11, 2013, at the Idaho National Laboratory Engineering Demonstration Facility (IEDF) identified multiple violations of DOE worker safety and health requirements by Battelle Energy Alliance, LLC (BEA). The sparger test involved injecting steam into a bath of molten salt inside a reactor vessel. During the test, an unexpected increase in pressure in the steam line prompted researchers to open the access panel in the test enclosure to adjust the pump flow and reduce the pressure. The excessive pressure in the line vented into the molten salt bath, forcing molten salt and steam out the top of the reactor vessel and striking and severely burning a researcher.

The violations associated with this event involved deficiencies in hazard identification and assessment; hazard prevention and abatement; management responsibilities; pressure safety; and training and information. DOE has grouped and categorized the violations as four Severity Level I violations and one Severity Level II violation, and, in consideration of the mitigating factors, imposes a total proposed civil penalty of \$168,750. As explained in 10 C.F.R. Part 851, Appendix B, *General Statement of Enforcement Policy*, § VI(b)(1), “[a] Severity Level I violation is a serious violation. A serious violation shall be deemed to exist in a place of employment if there is a potential that death or serious physical harm could result from a condition which exists, or from one or more practices, means, methods, operations, or processes which have been adopted or are in use, in such place of employment.” Section VI(b)(2) states, “[a] Severity Level II violation is an other-than-serious violation. An other-than-serious violation occurs where the most serious injury or illness that would potentially result from a hazardous condition cannot reasonably be predicted to cause death or serious physical harm to employees but does have a direct relationship to their safety and health.”

As required by 10 C.F.R. § 851.42(b) and consistent with Part 851, Appendix B, the violations are listed below. If this preliminary notice of violation (PNOV) becomes a final order, then BEA may be required to post a copy of this PNOV in accordance with 10 C.F.R. § 851.42(e).

I. VIOLATIONS

A. General Requirements and Hazard Identification and Assessment

Title 10 C.F.R. § 851.10, *General requirements*, subsection (a), states that “[w]ith respect to a covered workplace for which a contractor is responsible, the contractor must: . . . (2)

[e]nsure that work is performed in accordance with: (i) [a]ll applicable requirements of [10 C.F.R. Part 851]; and (ii) [w]ith the worker safety and health program for that workplace.”

Title 10 C.F.R. § 851.21, *Hazard identification and assessment*, subsection (a), states that “[c]ontractors must establish procedures to identify existing and potential workplace hazards and assess the risk of associated workers injury and illness. Procedures must include methods to: (1) [a]ssess worker exposure to chemical, physical, biological, or safety workplace hazards through appropriate workplace monitoring;... (4) [a]nalyze designs of new facilities and modifications to existing facilities and equipment for potential workplace hazards; (5) [e]valuate operations, procedures, and facilities to identify workplace hazards; (6) [p]erform routine job activity-level hazard analyses; [and] (7) [c]onsider interactions between workplace hazards...” In accordance with subsection (c) of the same section, “[c]ontractors must perform [these activities] initially to obtain baseline information and as often thereafter as necessary to ensure compliance with the requirements [of 10 C.F.R. Part 851, subpart C].”

Contrary to these requirements, BEA failed to establish and implement a work planning and control process that identified, assessed, and abated workplace hazards consistent with the applicable requirements and procedures invoked by the approved BEA 10 C.F.R. Part 851 worker safety and health program described in BEA’s program description document (PDD)-14700 (revision 2, dated April 25, 2012) and the general laboratory requirements document (LRD)-14700 (revision 2, dated April 25, 2012). Specific examples include the following:

1. BEA did not apply a level of rigor to hazard analysis and work controls required by laboratory-wide procedure (LWP)-21220, *Work Management* (revision 10, dated October 10, 2012), for activities categorized greater than low risk. BEA performed the sparger test using laboratory instruction (LI) 1491-08-IEDF, *Alkaline Metal Reformer*, which did not incorporate the work management process described in LWP-21220 to conduct work safely and within applicable requirements. The LI provided vague guidance on operational activities and did not accurately define the scope of work or include specific details of the sparger test. BEA performed the sparger test using a molten salt gasification (MSG) system in a variety of configurations, including an open configuration in which the top flange was not secured with bolts. The open configuration introduced an unanalyzed hazard, and was contrary to the LI’s assumptions and the defined hazard controls. The use of an open configuration introduced a potentially hazardous activity that BEA did not evaluate.
2. BEA did not involve subject matter experts and did not conduct a walkdown validation of the sparger test prior to operation, as required by LWP-21220, to ensure that the LI scope of work incorporated the work activity’s parameters and bounds and that the risks and controls adequately addressed the associated hazards.

Collectively, these noncompliances constitute a Severity Level I violation.

Base Civil Penalty - \$75,000

Proposed Civil Penalty (as adjusted) - \$37,500

B. Hazard Prevention and Abatement

Title 10 C.F.R. § 851.22, *Hazard prevention and abatement*, subsection (a), states that “[c]ontractors must establish and implement a hazard prevention and abatement process to ensure that all identified and potential hazards are prevented or abated in a timely manner.” This subsection also requires that “(1) [f]or hazards identified either in the facility design or during the development of procedures, controls must be incorporated in the appropriate facility design or procedure.”

Title 10 C.F.R. § 851.23, *Safety and Health Standards*, subsection (a), states that “[c]ontractors must comply with the following safety and health standards that are applicable to the hazards at their covered workplace: . . . (3) Title 29 C.F.R. Part 1910, “Occupational Safety and Health Standards,” excluding 29 C.F.R. 1910.1096, “Ionizing Radiation,” [and] (9) American Conference of Governmental Industrial Hygienists (ACGIH), “Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices,” 2005 (incorporated by reference; see [10 C.F.R.]§ 851.27) when the ACGIH Threshold Limit Values (TLVs) are lower (more protective) than the permissible exposure limits in 29 C.F.R. [Part] 1910.”

Title 29 C.F.R. § 1910.132, *General requirements*, subsection (a), states that “[p]rotective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact.”

Title 29 C.F.R. § 1910.132, paragraph (d)(1), states in part that “[t]he employer shall: (i) [s]elect, and have each affected employee use, the types of personal protective equipment (PPE) that will protect the affected employee from the hazards identified in the hazard assessment; (ii) [c]ommunicate selection decisions to each affected employee; and (iii) [s]elect PPE that properly fits each affected employee.”

Title 29 C.F.R. § 1910.133, *Eye and face protection*, paragraph (a)(1), states that “[t]he employer shall ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.”

Title 29 C.F.R. § 1910.134, *Respiratory protection*, paragraph (a)(2), states that “[a] respirator shall be provided to each employee when such equipment is necessary to protect the health of such employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protection program, which shall include the

requirements outlined [in 29 C.F.R. § 1910.134 (c)]. The program shall cover each employee required [by 29 C.F.R. § 1910.134] to use a respirator.”

Title 29 C.F.R. § 1910.134, subsection (d), “[r]equires the employer to evaluate respiratory hazard(s) in the workplace, identify relevant workplace and user factors, and base respirator selection on these factors. The paragraph also specifies appropriately protective respirators for use in [atmospheres immediately dangerous to life or health], and limits the selection and use of air-purifying respirators.”

Title 29 C.F.R. § 1910.138, *Hand protection*, subsection (a), states that “[e]mployers shall select and require employees to use appropriate hand protection when employees’ hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature extremes.”

Title 29 C.F.R. § 1910.138, subsection (b), states that “[e]mployers shall base the selection of the appropriate hand protection on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards and potential hazards identified.”

Title 29 C.F.R. § 1910.1000, *Air contaminants*, establishes permissible exposure limits for toxic and hazardous substances.

Contrary to these requirements, BEA failed to identify, document, and implement appropriate hazard control measures, including PPE, to protect workers from potential hazards of splashing/spilling of molten salt due to crucible containment failure and exposure to toxic air contaminants, such as carbon monoxide and sodium hydroxide vapor, that could be generated during the sparger test. Specific examples include the following:

1. BEA did not ensure that the researcher wore leather gloves, safety glasses with side shields, and fire resistant coveralls as required by the activity/task *Crucible and Furnace Operation*, identified in Section 2, *Risk and Controls*, of LI 1491-08-IEDF. Instead of the required PPE, the researcher wore a flame resistant laboratory coat designed for low risk activities (which did not provide complete body protection), cryogenic gloves, and a plastic face shield.
2. BEA did not effectively assess the activity/task *Crucible and Furnace Operation* to ensure that the researcher wore eye and face protection designed for impact and heat-related hazards, such as PPE identified by the Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health. The researcher did not wear a metalized face shield as a secondary protector in addition to safety glasses with side shields to guard against splashes from molten material while performing the sparger test.

3. BEA did not evaluate the MSG unit's plexiglass enclosure, which the LI activity/task *Crucible and Furnace Operation* identified as a PPE control measure, to determine its appropriateness as a measure for controlling molten salt hazards. Workers performing the sparger test had to open the enclosure access panel to adjust the water/steam line flow rates, potentially exposing themselves to toxic air contaminants from the reactor vessel and to a direct physical hazard from steam and molten salt.
4. BEA did not conduct air monitoring to determine the occupational exposure levels during the sparger test in order to evaluate the effectiveness of hazard control measures, such as the MSG unit plexiglass enclosure, and to determine whether exposure levels exceeded ACGIH TLVs. In the absence of air monitoring, BEA did not provide respiratory protection to ensure that workers were adequately protected from potential airborne contaminants.

Collectively, these noncompliances constitute a Severity Level I violation.

Base Civil Penalty - \$75,000

Proposed Civil Penalty (as adjusted) - \$37,500

C. Management Responsibilities

Title 10 C.F.R. § 851.20, *Management responsibilities and worker rights and responsibilities*, subsection (a), states that “[c]ontractors are responsible for the safety and health of their workforce and must ensure that contractor management at a covered workplace: ... (3) [a]ssign worker safety and health program responsibilities, evaluate personnel performance, and hold personnel accountable for worker safety and health performance.”

Contrary to this requirement, BEA failed to meet the requirements of LWP-9500, *Laboratory Excellence Program Organization and Administration*, to ensure that the laboratory manager had general knowledge of research and related work being performed in assigned laboratory spaces, as well as specific understanding of work hazards and expected mitigations; that the laboratory manager could stop work upon observing a noncompliant condition, unsafe condition, or at-risk behavior, or an action associated with a work process that, if not corrected, could pose a threat to personnel safety, the facility, or process operations; and that supervision and observations were conducted in accordance with established work control documents. For example, the laboratory manager at the time of the sparger test event was new to the position, and BEA had not implemented an effective turnover process to ensure that the new laboratory manager was provided with all necessary information. As a result, the laboratory manager was not fully familiar with LI 1491-08-IEDF, including the work scope, risks, and controls associated with the MSG project; did not have knowledge of the work activity involving the sparger test; and therefore was not able to oversee and control this work, which was categorized as greater than low risk.

This noncompliance constitutes a Severity Level I violation.

Base Civil Penalty - \$75,000

Proposed Civil Penalty (as adjusted) - \$37,500

D. Pressure Safety

Title 10 C.F.R. Part 851, Appendix A, Section 4, *Pressure Safety*, subsection (a), states that “[c]ontractors must establish safety policies and procedures to ensure that pressure systems are designed, fabricated, tested, inspected, maintained, repaired, and operated by trained and qualified personnel in accordance with applicable and sound engineering principles.”

Subsection 4(b) states that “[c]ontractors must ensure that all pressure vessels, boilers, air receivers, and supporting piping systems conform to: (1) [t]he applicable American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (2004), sections I through section II including applicable Code Cases (incorporated by reference; see 10 C.F.R. § 851.27), (2) [t]he applicable ASME B31 (Code for Pressure Piping) standards [as indicated in paragraphs (b)(2)(i) through (x)] [and] (3) [t]he strictest applicable state and local codes.”

Contrary to these requirements, BEA failed to install a pressure relief device on the steam line feeding the molten salt bath, or otherwise properly contain the system pressure, in accordance with the requirements described in ASME B31.3-2002 § 301.2.2, *Required Pressure Containment or Relief*. For example, the MSG system, as designed, had an open configuration and used a positive displacement pump to inject steam into a bath of molten salt. An unexpected increase in pressure in the steam line during the sparger test prompted the researchers to open the access panel in the plexiglass enclosure to adjust the pump flow and reduce the pressure. The excessive pressure in the line vented into the molten salt bath, forcing molten salt and steam out the top of the reactor vessel and striking and severely burning a researcher.

This noncompliance constitutes a Severity Level I violation.

Base Civil Penalty - \$75,000

Proposed Civil Penalty (as adjusted) - \$37,500

E. Training and Information

Title 10 C.F.R. § 851.25, *Training and information*, subsection (a), states that “[c]ontractors must develop and implement a worker safety and health training and information program to ensure that all workers exposed or potentially exposed to hazards are provided with the training and information on that hazard in order to perform their duties in a safe and healthful manner.”

Title 10 C.F.R. § 851.25, paragraph (b)(3), states that “[t]he contractor must provide:...(3) [a]dditional training when safety and health information or a change in workplace conditions indicates that a new or increased hazard exists.”

Title 10 C.F.R. § 851.25, subsection (c), states that “[c]ontractors must provide training and information to workers who have worker safety and health program responsibilities that is necessary for them to carry out those responsibilities.”

Contrary to these requirements, BEA failed to meet the provisions of LWP-9201, *Briefings*, and PDD-1004, *Integrated Safety Management System*. These procedures require that properly trained and qualified workers receive documented briefings before performing high-risk activities. Specific examples include the following:

1. BEA did not conduct a pre-job briefing before performing the sparger test to ensure that: the workers were prepared; the activity work scope was appropriately defined and communicated; the hazards were identified and fully understood; and the LI was reviewed to confirm that mitigating controls were implemented before commencing work.
2. BEA did not ensure that workers possessed competence commensurate with responsibility, including appropriate training and qualifications, before performing the sparger test. Workers were not adequately familiar with the safety and technical aspects of MSG unit operations to appropriately address mitigation strategies. The injured researcher was unfamiliar with the type and level of protection afforded by the PPE he used while performing the sparger test.

Collectively, these noncompliances constitute a Severity Level II violation.

Base Civil Penalty - \$37,500

Proposed Civil Penalty (as adjusted) - \$18,750

II. REPLY

Pursuant to 10 C.F.R. § 851.42(b)(4), BEA is hereby obligated, within 30 calendar days of receipt of this PNOV, to submit a written reply. The reply should be clearly marked as a “Reply to the Preliminary Notice of Violation.”

If BEA chooses not to contest the violations set forth in this PNOV, the reply should clearly state that BEA waives the right to contest any aspect of this PNOV. In such case, this PNOV will constitute a final order upon the filing of the reply.

If BEA disagrees with any aspect of this PNOV, then as applicable and in accordance with 10 C.F.R. § 851.42(c)(1), the reply must: (1) state any facts, explanations, and arguments that support a denial of an alleged violation; and (2) discuss the relevant authorities that support the position asserted, including rulings, regulations, interpretations, and previous decisions issued by DOE. In addition, 10 C.F.R. § 851.42(c)(2) 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
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 Idaho Operations Office.

Pursuant to 10 C.F.R. § 851.42(d), if BEA does not submit a written reply within 30 calendar days of receipt of this PNOV, BEA relinquishes any right to appeal any matter in this PNOV, and this PNOV will constitute a final order.

III. 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.



Steven C. Simonson
Director
Office of Enforcement
Office of Independent Enterprise Assessments

Washington, DC
This 20th day of June 2014