DOE Accident Prevention and Investigation

Bi-Annual Summary Report

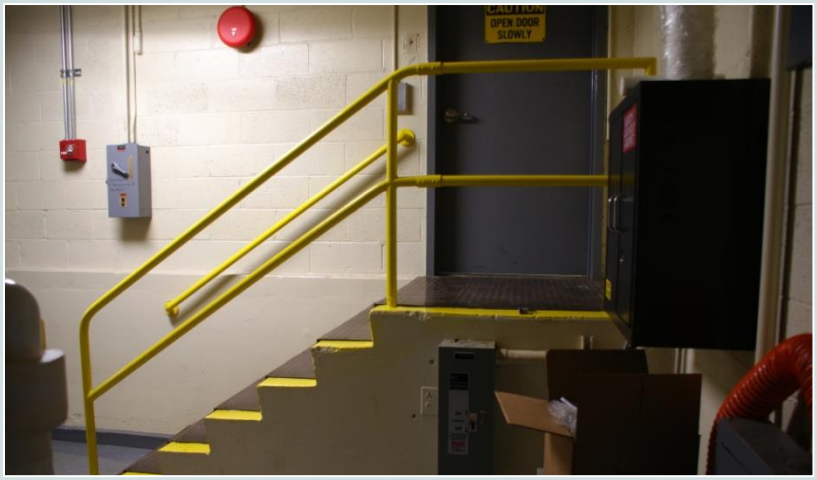
U.S. Department of Energy ▪ Office of Health, Safety and Security ▪ AI-2013-02 ▪ January 28, 2014

Federally Led Accident Investigation:

Scissor Lift Accident in the West Hackberry Brine Tank-14 Resulting in Injury, February 7, 2013

Federally Led Accident Investigation:

Stairway Fall Resulting in a Federal Employee Fatality at DOE Headquarters, Germantown, Maryland June 1, 2013



Level 1 Accident Investigation:

Wilson Construction Company Employee Fatality on the Bandon-Rogue No. 1 115kV Line, July 30, 2013

This series of reviews is intended to provide summary analyses of Federally-appointed investigations conducted by the U.S. Department of Energy (DOE). The goal of conducting these reviews and analyses is to provide DOE and contractor management with an overview of the safety management system weaknesses identified and discussed in each of the investigation reports and related occurrence reports on file in the Occurrence Reporting and Processing System (ORPS) database.

The Office of Health, Safety and Security (HSS) encourages both DOE and contractor management to review these reports and use the information provided to assess the identified weaknesses against current work practices to ensure a safe work environment.

Accident Investigations Completed:

ORPS Event	Description	Investigation Board Appointed
FE--SPRO-SPR-WH-2013-0002	Scissor Lift Accident in the West Hackberry Brine Tank-14 Resulting in Injury.	February 15, 2013
MA-HQ--GOHQ-DOEHQ-2013-0001	Stairway Fall Resulting in a Federal Employee Fatality at DOE Headquarters, Germantown, Maryland	June 28, 2013
No ORPS Report	Wilson Construction Company Employee Fatality on the Bandon-Rogue No. 1 115kV Line	August 7, 2013

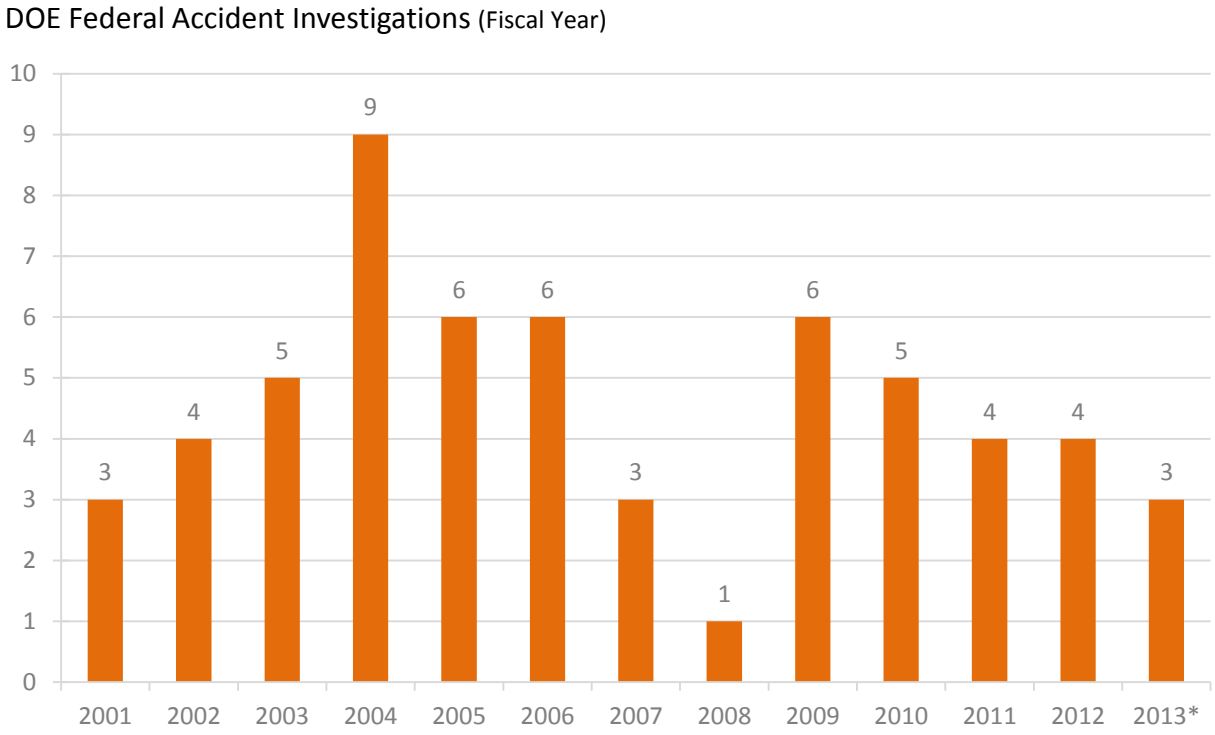
The Strategic Petroleum Reserve (SPR) West Hackberry storage site is located in Cameron Parish, Louisiana, approximately 25 miles southwest of Lake Charles, Louisiana. The site has 22 storage caverns with a combined storage capacity of 228 million barrels, and a cavern inventory of 215.8 million barrels. The West Hackberry site was completed in 1988. SPR annually performs a number of major maintenance projects to maintain the site's operational capabilities. One of these activities is maintenance of two tanks that are used to store brine water that is needed to displace stored crude oil when oil is withdrawn from underground storage caverns. The brine tanks must be repaired and repainted every three to five years to protect them from corrosion.

The DOE Germantown Headquarters facility was dedicated by President Eisenhower in 1957. The 618,852-square-foot complex is situated on approximately 98.6 acres in Montgomery County, Maryland, and includes offices, an auditorium, a heating and refrigeration plant, a radio building, and equipment sheds and garages. The main office building also includes a cafeteria, various data centers, a warehouse, and a computer center.

The Bonneville Power Administration (BPA) is a U.S. Federal agency based in the Pacific Northwest. BPA was created by an act of Congress in 1937 to market electric power from the Bonneville Dam located on the Columbia River and to construct facilities necessary to transmit that power. Congress has since designated Bonneville to be the marketing agent

for power from all of the Federally-owned hydroelectric projects in the Pacific Northwest. Bonneville, whose headquarters is located in Portland, Oregon, is one of four regional Federal power marketing agencies within the DOE.

Overall Condition: Historical Perspective



**One additional accident investigation was started in 2013 but was not completed in time for this review. The total number of accident investigations in 2013 will be adjusted to4 after the investigation is complete and the final report is released.*

In March 2011, DOE Order (O) 225.1B, *Accident Investigations*, was revised and approved. Although the classification of types of investigations was changed, the criteria remained the same. The Heads of Headquarters Elements must consider the criteria identified in Appendix A of DOE Order (O) 225.1B, *Accident Investigations*, the value of the knowledge to be gained by conducting the investigation, and other relevant factors, to determine whether an Accident Investigation Board (AIB) must be appointed.

Causal Analysis Summary

HSS reviewed the three accident investigation reports completed this period with special emphasis on the analyses and conclusions presented in each of the investigation reports. The conclusions and contributing causes listed in the investigation reports were reviewed and summarized. The summary causes from these reports were binned and evaluated against the Integrated Safety Management (ISM) *Guiding Principles* and *Core Functions.*

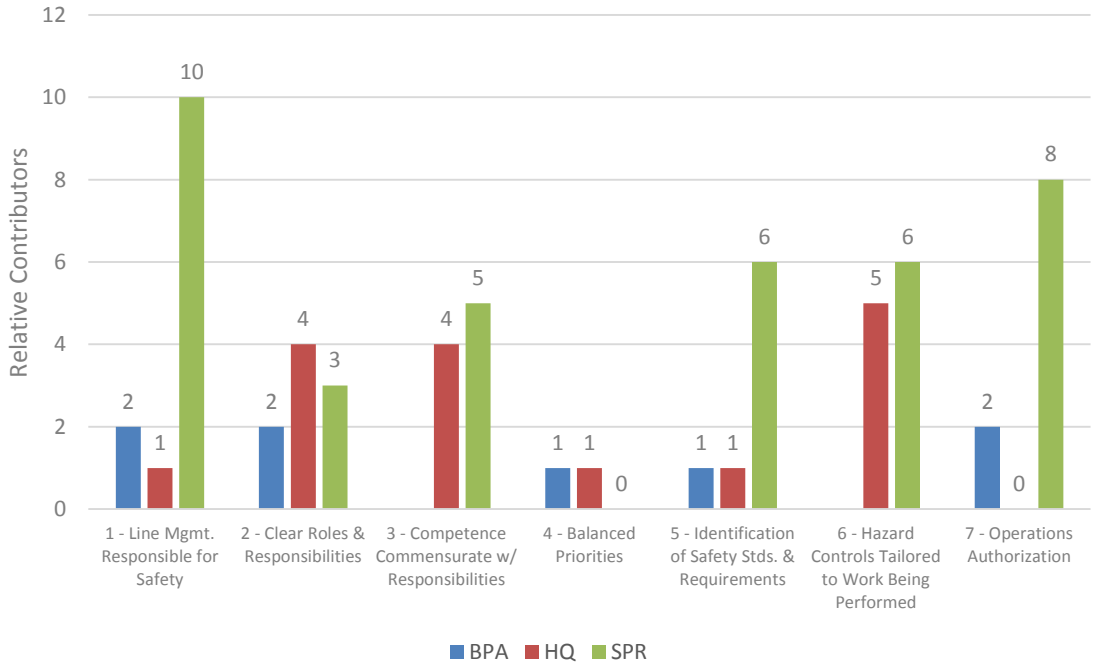
All three of the investigation reports reviewed in this summary identified significant weaknesses in the subject organization's awareness of the state of their safety management processes and practices. As a result, all DOE organizations are encouraged to review the effectiveness of their oversight process on a regular basis to identify safety management system weaknesses. It is important that these reviews are not just surface level reviews, but that they dig deeper to identify systemic gaps in the safety management systems.

In the investigation reports completed this period, the AIBs identified a total of 44 Conclusions/Findings, resulting in 54 Judgments of Need (JON)/Recommendations. The SPR investigation resulted in 16 Conclusions and 25 JONs, the HQ investigation resulted in 10 Conclusions and 14 JONs, and the BPA investigation 18 Findings (similar to Conclusions) and 15 Recommendations (similar to JONs). Together, these Conclusions and JONs represent gaps identified across all aspects of the ISM *Core Functions* and *Guiding Principles*, and should be used by the field to understand potential gaps in the safety management systems and processes.

ISM Guiding Principles

The ISM Guiding Principles are the fundamental policies that guide the Department and contractor actions, from development of safety directives to performance of work. They form the foundation to achieve a comprehensive integrated approach to performing work.

ISM Guiding Principle Weaknesses Identified in Investigation Reports



The investigation at BPA found strong evidence of deficiencies in ISM Guiding Principle 1, line management's responsibility. Multiple opportunities to correct the improper grounding existed prior to the fatality, and had the supervision been more robust, the accident may have been prevented. Unclear roles and responsibilities also prevented workers from stopping the work when the proper grounding technique was unclear or when workers were unsure of who to contact for clarification.

The HQ investigation identified deficiencies with ISM Guiding Principle 6, hazard controls, because the controls were not tailored to the work being performed. In this case, the controls were administrative and failed by allowing the worker to return to work without a proper fitness for duty evaluation. In addition, there was confusion as to the timing of the employees' return to work and the supervisor's and Human Capital department's responsibilities. The AIB described one missed opportunity for establishing controls:

> *"There was no further identification of hazards, or analysis performed, based on the employee's disability, to establish appropriate administrative and engineering controls. A formal analysis and written limitations of duty would have most likely resulted in restricting the employee from entering the MERs and other higher hazard areas of the building."*

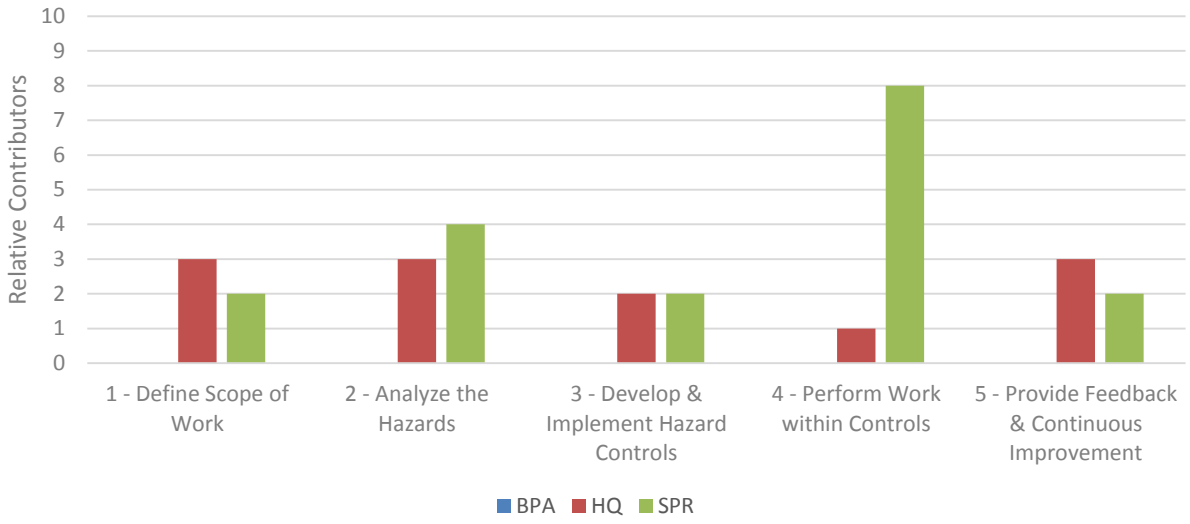
The SPR AIB identified numerous instances where the line management responsibility for safety was not properly administered, resulting in an unsafe method for cleaning the brine tanks. Confusion among the contractors performing the work, the prime contractor, and DOE Federal safety representatives led to gaps in work package review and the authorization for work to begin. Instead of safety reviews targeted to the specific work tasks and hazards, more generic reviews were conducted and ultimately allowed the work to be performed with very little understanding of the methods and techniques that were to be utilized.

Organizations are urged to take an inward look to ensure the expectations in organizational policies and procedures are indeed being implemented in the safety management systems practices. Managers also need to consider the human performance aspects of work planning and execution to ensure that the organizational safe work performance goals are actually being met.

ISM Core Functions

The ISM Core Functions serve as a framework to performing work safely. Looking at the investigation reports, the SPR investigators highlighted Core Function 4, Perform Work within Controls as having the most deficiencies or weaknesses. Numerous issues were identified with failure to follow warnings and instructions in the scissor lift manual that directly led to the instability in scissor lift operations.

ISM Core Function Weaknesses Identified in Investigation Reports



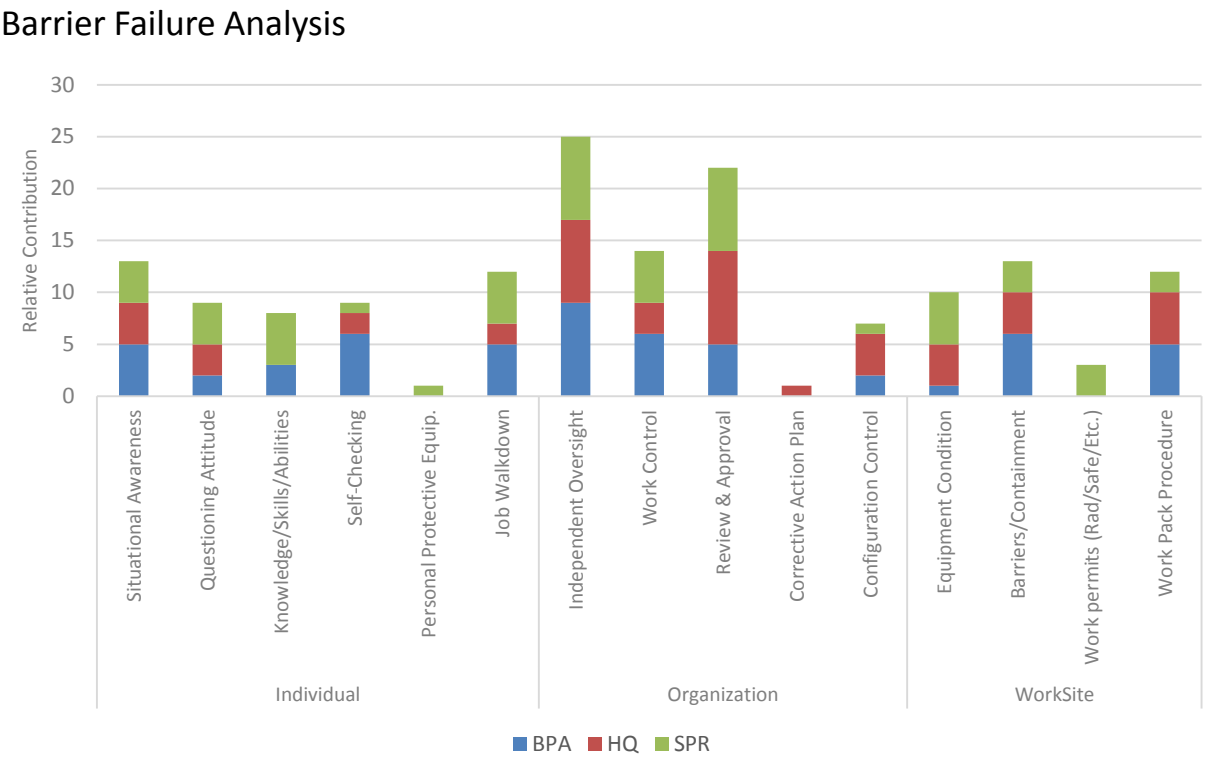
Note: The BPA accident report did not include ISM analysis as part of the investigation.

In the HQ event, the AIB identified issues with Core Function 1, defining the scope of the work, Core Function 2, analyzing the hazards, and Core Function 5, providing feedback and continuous improvement). These failures were illustrated by the lack of clear roles and responsibilities for returning an employee to work, the near-misses the employee suffered prior to the fatal fall, and a missed opportunity to provide administrative controls to prevent the employee from performing duties that were beyond his physical capabilities.

Managers and oversight organizations should renew efforts to ensure that clear lines of responsibility are defined and followed by all of those performing work. Work planning and control documents should be formalized and include rigorous hazard identification and control. Management must observe work in progress to capture workers' actions in response to written work instructions and determine whether or not workers perform work steps within the established controls.

Barrier Failure Analysis

Barrier failures were identified in each of the three investigation reports. HSS classifies barrier failures in three levels: the individual, the organization and the work site. The most common cumulative barrier failures identified were Independent Oversight and Review & Approval of Work; both organizational issues are tied to Core Functions 3 and 4.



Whether grouping causal factors into ISM categories or the HSS Barrier Failures method, the results indicate the greatest concentration of weaknesses occurs at the organizational level rather than at the individual or the worksite level.

The causal factors identified above correlate well with the basic organizational weaknesses discussed in the *DOE Accident Investigation and Prevention Handbook* (DOE-HDBK-1208-2012, Vol. 1: *Accident Analysis Techniques*). As relates to these specific accidents:

- Flawed defenses – faulty risk identification processes; employee concerns / disagreements not recognized; ineffective return to work processes.
- Active failures (or unsafe acts) – Failures to recognize unsafe conditions; workers not adhering to established work procedures.
- Human performance (or error precursors) – Incorrect perception of risk of elevated work; not stopping work when questions on the type of grounding were identified.
- Latent organizational factors (errant assumptions and situations in the management systems) – Not following the manufacturer's requirements for scissor lift operation; oversight roles and responsibilities were not clear; activity-specific deviations from established safety and health programs and procedures were not identified.

Management at all levels is encouraged to dig deep into its local safety management policies and implementing procedures to ensure a thorough understanding of how to achieve the goal of performing work safely. Management must take a step back and ask, "Do I really understand this? The *DOE Accident Investigation and Prevention Handbook* contains many examples of how to apply these investigation techniques pro-actively.

Occurrence Reporting and Processing System Precursor Analysis

HSS conducted a review of occurrence reports filed at each of the sites and respective Program Offices involved in the accident investigations for the six months prior to the respective accidents. At each site, the accident itself was the only recorded ORPS occurrence within the six-month time frame. BPA, as part of the Power Marketing Administration, is not required to report operational events in ORPS and therefore no comparable pre-accident information was available.

Human Performance Improvement Considerations

Human Performance Improvement (HPI) theory states that human error alone is not the cause of failure, but rather the effect or symptom of deeper trouble within the system, and strives to reduce errors and manage defenses to prevent significant events. The application of HPI principles in numerous organizations (medical, nuclear, chemical, etc.) has resulted in improved safety, quality, and productivity. HPI is not a program, but rather a distinct way of thinking based on a performance model that illustrates the organizational context of human performance.

The ORPS database allows for the analysis of human performance trends associated with any one event. None of the three sites with AIs reviewed in this report reported ORPS occurrences in the six months prior to the accidents. Consequently, HPI insights from precursor events cannot be determined.

The lack of data points highlights potential issues with underreporting or less than complete reporting that can occur across the DOE Complex. Reporting events into ORPS provides valuable insights into operations that can be used to identify trends related to HPI, accident prevention, safety culture, and work planning and control. These trends and insights gained from the analysis of events can be used to help identify organizational weaknesses prior to future accidents.

Conclusion

All of these accidents underscore the necessity of proper planning, oversight, and supervision. Management system and organizational weaknesses contributed to all of these accidents either directly or indirectly. In each of their reports, the Boards cited missed opportunities to prevent the accidents.

At SPR, generic work packages were used and contributed to the failure of multiple groups to identify the hazards associated with using scissor lifts to perform the tank maintenance operations. Clear warnings on the scissor lifts themselves were ignored, leading to the improper configuration of the blasting equipment and subsequent instability in the blasting process.

At the Germantown HQ, clear responsibilities and oversight for the return to work process were not defined, and no formal review was ever conducted to determine whether the employee could perform the duties as assigned. These represented two missed opportunities for the organization to act prior to the accident. It is important to understand the role that the organization's policies and procedures have in preventing accidents and/or mitigating the consequences of accidents.

At BPA, several organizational weaknesses ultimately led to the accident. From the improper original design of the switching station to the less-than-adequate supervision of the repair task, opportunities to prevent the electrocution were missed. The BPA work was inherently complex and dangerous: high voltage combined with a remote location created a situation that demanded the highest rigor of safety and work planning. Because seemingly minor mistakes can have serious consequences, all work must be executed with consequences in mind.

In all three accidents, organizational weaknesses exposed workers to hazards for which they were unprepared or did not completely understand. Managers must be alert to ISM weaknesses in all phases of operations from planning, to pre-job briefings, to execution, to post-job briefings.

Managers are also encouraged to review and implement the principles of HPI that complement the ISM systems to ensure that worker and organizational behaviors support a defense-in-depth against error and the safe performance of work at all levels.

Accident Investigation Report Summaries

This section contains abstracts of the three Accident Investigations summarized in this report. Occurrence reports whose status is Final are available through public ORPS; reports that are not Final are not yet available through public ORPS and a valid ORPS login is required to view them.

Scissor Lift Accident in the West Hackberry Brine Tank-14 Resulting in Injury on February 7, 2013 (FE--SPRO-SPR-WH-2013-0002) On February 7, 2013, at approximately 10:42 a.m. (Central Standard Time), a Performance Blasting & Coating, LP (PBC) employee was seriously injured at the West Hackberry Strategic Petroleum Reserve (SPR) in West Hackberry, Louisiana, when a fully extended scissor lift tipped over during an abrasive blasting operation.

Because of the severity of the worker's injuries, the Acting Assistant Secretary of DOE's Office of Fossil Energy appointed an Accident Investigation Board (the Board) to investigate the accident. The scope of the investigation was to identify all relevant facts; analyze the facts to determine the direct, root and contributing causes of the accident; and specifically to focus on and address the role of DOE and contractor organizations and Integrated Safety Management Systems as they may have contributed to the accident.

The Board concluded that this accident was preventable. The injured worker was not available to the Board and did not respond to requests for interviews nor did the worker provide any written statements. The Board depended on examination of the scene, witness statements, and engineered calculations of the potential lateral force of the blasting hose on the extended scissor lift.

The work was to perform maintenance cleaning of the interior of the brine tanks using abrasive blasting. The contractor rented two scissor lifts to reach the top edge of the tank height of 32 feet. Contrary to label warnings and instructions available in the provided Operating Manual, the blasting hose and air hose were attached to the basket of the scissor lift using duct tape and rope, thus creating a dangerous lateral force potential. A significant portion of the hose was suspended in the air and was being supported by the work platform in the fully extended upright position just prior to the accident, resulting in significant lateral forces on the work platform guardrails.

PBC Blaster 1 and PBC Blaster 2 were connected by separate blast hoses to a common abrasive pot, and began blasting the upper four feet (at the 28 to 32 foot level above the floor of the tank) of the interior tank wall. PBC Blaster 1 was working the scissor lift in a fully extended position, in a counterclockwise direction, and was visible from the location where the PBC Hole Watch was monitoring the activity. The PBC Hole Watch reported that PBC Blaster 1 was making good progress, and had experienced few problems with the equipment.

PBC Blaster 2 was working from a different scissor lift on the opposite side of the tank, just to the left of the opening where the PBC Hole Watch was stationed. The PBC Hole Watch monitored PBC Blaster 2 with a mirror because he was not allowed to place his head inside the tank. The PBC Hole Watch communicated with PBC Blasters 1 and 2 using hand signals, and relayed their requests to the PBC Pot Tender.

PBC Blaster 3 was working from the exterior catwalk between PBC Blaster 1 and PBC Blaster 2, and was blasting the tank rim and the top six inches of the tank exterior. PBC Blaster 3 was on a separate pot and communicated directly with the PBC Pot Tender using hand signals.

At approximately 10:42 a.m., the PBC Hole Watch felt the hose supplying air and abrasive to PBC Blaster 1 "pulse", an indication that the nozzle had been opened to begin blasting, and he looked up to observe the scissor lift and PBC Blaster 1 falling toward the center of the tank. The PBC Hole Watch immediately sounded an air horn, which was PBC's designated emergency signal, to alert others in the area that a problem had occurred.

PBC Blaster 3 had just completed clearing the blast nozzle of his equipment by pointing it inside the tank and pulling the trigger. He did not observe the initiation of the accident, but observed PBC Blaster 1 and the scissor lift as they were falling. PBC Blaster 2 was not aware of a problem until he heard the scissor lift hit the floor of the tank.

PBC Blaster 1 and the scissor lift came to rest on the floor of the tank with PBC Blaster 1 lying partially out of the work platform guardrails, still connected to the work platform by a lanyard that was attached to his fall protection harness.

Causal factors are the significant events and conditions that produced or contributed to the Direct Cause, the Contributing Causes and the Root Cause(s) of the accident.

The direct cause of the accident was lateral forces exceeded the capability of the scissor lift to remain upright.

Root causes are the causal factors that, if corrected, would prevent recurrence of the same or similar accidents. They are fundamental causal factors that address classes of deficiencies, rather than single problems or faults. The Board identified both a local root cause and a systemic root cause.

The local root cause was that Strategic Petroleum Reserve Project Management Office (SPRPMO), DM Petroleum Operations Company (DM), ASRC Gulf States Constructors, LLC (AGSC), and PBC failed to recognize, understand, and manage operating conditions within the safe operating limits specified by the equipment manufacturer.

The systemic root cause of this accident was that SPRPMO, DM, and AGSC failed to adequately implement several of the guiding principles of ISM. Examples of specific deficiencies included: (1) unclear responsibilities of the PBC site supervisor and site safety representative for supervising and overseeing the work; (2) unclear responsibilities of the

DM and PBC employees regarding emergency response operations; (3) unclear responsibilities at the SPRPMO for review of field site plans and work documents; (4) inexperience of AGSC and PBC employees for overseeing and conducting blasting work inside a tank using scissor lifts; (5) failure by PBC to evaluate and designate, in writing, who the Occupational Safety and Health Administration (OSHA) competent person was for the project; and (6) job specific safety documents developed by PBC, approved by AGSC, and reviewed by DM and the SPRPMO did not include detailed lateral force restriction hazard information (0 mph wind / 90 lb side) as provided by the manufacturer.

Contributing causes are events or conditions that collectively with other causes increased the likelihood of an accident but that individually did not cause the accident. Contributing causes may be longstanding conditions or a series of prior events that, alone, were not sufficient to cause the accident, but were necessary for it to occur.

The Board identified eight contributing causes to the accident: (1) safety documents such as the Job Hazard Analysis were generic and did not address lateral force as a hazard; (2) supervisors and safety personnel were not aware of the lateral force hazard; (3) scissor lift operators were not trained to be aware of the lateral force hazard; (4) scissor lift operators were allowed to operate the scissor lift without regard to the lateral force hazard; (5) oversight organizations were not technically knowledgeable in the operational limitations and specific safety requirements for scissor lift operations; (6) work planning depended on skill of the craft due to a lack of adequate safe work procedures and competent supervision; (7) the length of the blast hose was not sufficient to prevent excessive lateral loading of the elevated work platform; and (8) the operators were inexperienced in using scissor lifts for blasting jobs inside tanks.

The Board also arrived at 16 Conclusions that led to the development of 25 Judgments of Need related to not only the cause of the accident, but the emergency response delays immediately following the accident.

Wilson Construction Company (WCC) Employee Fatality on the Bandon-Rogue No. 1 115kV Line, July 30, 2013 (Note: BPA, as part of the Power Marketing Administration, is not required to report operational events in ORPS.) WCC Crew Foreman 2 climbed up to the top of B447 switch stand to attach lift slings suspended from the crane at approximately 9:30 a.m. (Pacific Daylight Time). Once the lift slings were placed and pulled up snug, the Crew Foreman 2 positioned himself to assist in the removal of the blade end sectionalizing jumper on B-phase. At approximately 9:45 a.m., the Crew Foreman 2 made contact with a difference of potential across the blade end insulator stack of B447 and received a fatal electrical shock.

BPA appointed a Level 1 Accident Investigation Board to investigate the fatality of the WCC Crew Foreman 2. The scope of the investigation included gathering and documenting all relevant facts of the accident, conducting interviews, and reviewing employee statements, work procedures, management systems, and other elements factoring into the incident. The scope also included review of BPA's programs and oversight activities. The Board determined that this accident was preventable.

Background

In 2010, BPA contracted for the rebuild of miles 1 through 46 of the Bandon-Rogue No. 1 115kV transmission line. Work included removal of all existing structures, components, guys, anchors, and conductors; and installation work including new poles, guys, anchors, steel cross braces, steel wide-flange cross arms, insulators, line hardware, and the replacement of the conductor. This work also included upgrades to existing switches located in miles 4, 15, 24, and 46. Additional project work included improvement and maintenance of access roads, and disposal of removed components.

In October 2010, Jacobs Engineering Group, Inc. was awarded a contract to provide on-site construction administration and inspection services for the rebuild and replacement of the Bandon-Rogue No. 1 115kV transmission line project. December 2010, BPA awarded WCC the contract for the Bandon-Rogue No. 1 115kV line rebuild project. This work was to be completed between December 2010 and December 2011.

Following the completion of the work for the release above, BPA determined there was warranty work that needed to be completed to correct workmanship deficiencies in the original construction as well as work to correct errors in the original drawing provided to WCC by BPA.

Due to an error, the original drawings showed incorrect offsets for the switch stands of five feet while the proper offset should have been seven feet, resulting in switch stands in miles 4, 15, 24, and 46 incorrectly located in relation to the transmission structures. The switch stands would need to be moved to secure proper clearances for future maintenance activities and safe operation of the switches. The drawings were corrected and WCC was awarded the corrective work.

It was decided to have this work completed in two parts due to the long lead times for some of the materials and limited access to the site due to weather conditions. WCC submitted their plans for this two-part work. The corrective work was to be done concurrent with the warranty work.

The Accident

On July 30, 2013, at approximately 7:00 a.m., the WCC work crews assembled at their materials yard located near U.S. Route 101 on Cape Blanco Road in Curry County, Oregon. Following a general safety meeting, the crews gathered tools, materials and trucks, and traveled to the Geisel worksite and conducted a job briefing including a Task Hazard Analysis (THA). The plan of the day was to relocate two 115kV sectionalizing disconnect switches at Geisel. Grounding for the Geisel Monument (Geisel) worksite was discussed.

Following the general meeting, Crew Foreman 1 and Crew Foreman 2 discussed the grounding for the Geisel worksite. The Wilson Site Superintendent (SI) left the Cape Blanco Road material yard and traveled to another location prior to arriving at the Geisel site.

Upon arrival at the Geisel worksite at approximately 8:00 a.m., the crews conducted the job briefing of the specific work hazards and how the work was to be performed. The plan of the day was for the six men to break into two crews for work on their respective switch at 46/5 and 46/6. Crew 1 was at structure 46/6 and Crew 2 at structure 46/5.

After completing the job briefing, Crew Foreman 1 and Crew Foreman 2 continued their discussion on how they planned to ground at their respective work locations. Crew Foreman 1 believed that the discussion was complete; however Journeyman Lineman 1 felt the need to have a follow-up discussion with Crew Foreman 2 about the grounding. At the end of this discussion, Journeyman Lineman 1 believed that he had gained agreement with Crew Foreman 2 but as he left to get to work, Journeyman Lineman 1 again heard Crew Foreman 2 express a difference of opinion on how the grounding was to be conducted. After a short discussion about Crew Foreman 2's opinion, Crew Foreman 1 and Journeyman Lineman 1 began to isolate the 46/6 worksite from the 46/5 worksite by getting their conductor jumpers open.

A three phase ground set was installed on the overhead line above the worksite at 46/6 by Crew 1. A step and touch[1] voltage measurement was taken at the 46/6 worksite. Crew 1 established an equipotential zone (EPZ) between the 46/6S switch structure, the B461 sectionalizing switch, the 46/6 wood pole down ground, the driven ground rod, and the 115kV transmission line.

A three phase ground set was installed on the overhead line above the worksite at 46/5 by Crew 2. There was no step and touch voltage measurement taken at the 46/5 ground rod. No EPZ was established by Crew 2 at 46/5 because they did not bond the driven ground rod to 46/5S. The tap into Geisel Monument was left ungrounded as neither crew installed a master set of grounds on the tap line.

By about 9:30 a.m., at structure 46/5, Journeyman Lineman 2 was in the bucket truck removing the sectionalizing jumper on A-Phase when Crew Foreman 2 climbed up to the top of the switch stand to attach lift slings suspended from the crane. Once the lift slings were placed and pulled up snug, Crew Foreman 2 positioned himself at the east side of the center switch to assist Journeyman Lineman 2 in the removal of the blade end sectionalizing jumper on B-Phase.

At approximately 9:45 a.m., Crew Foreman 2 made contact with a difference of potential across the blade end insulator stack on B447 and received a fatal electrical shock.

Causal Factors to the Accident

After examining the evidence and performing analysis of the identified events and causal factors, the Board found that the direct cause of the accident was that Crew Foreman 2 made contact with a difference of potential across the blade end insulator stack of B447.

The Board determined the root cause of the accident was Crew 2's failure to establish an EPZ.

The Board identified the following eleven Contributing Causes: (1) the grounding system installed at worksite 46/5 did not ensure all structures/components were bonded to establish an EPZ, uncontrolled and unrecognized electrical potential existed; (2) failure to test and monitor step and touch voltage did not identify the high electrical potential which existed at worksite 46/5; (3) by not following the requirements of the WCC Safety Manual and Site Specific Safety Plan for grounding, bonding and creation of an EPZ, an unrecognized electrical potential existed; (4) failure to follow the hazard control measures in the Task Hazard Analysis resulted in failure to create an EPZ and was a lost opportunity for Crew 2 to identify and mitigate any hazardous electrical potential in the work area; (5) a

[1] **Step and touch potential**. Awareness of step and touch potential, caused by ground potential rise, is important for anyone working on high-voltage power transmission systems. In a typical step and touch application, the transmission line is de-energized and is bonded to the tower to be safe to work on. However, the transmission line itself acts as a very large antenna, and can pick up large amounts of energy which must be shunted to earth ground. And if the tower ground is faulty, the ground potential may rise and a dangerous condition can result.

difference of opinion between Crew Foreman 2 and Journey Lineman 1 about the EPZ was not elevated for resolution to the SI and did not result in the establishment of an EPZ at Crew 2's worksite; (6) absence of the Wilson Superintendent from the worksite was a lost opportunity to observe work activities and be available to resolve work practice differences and performance; (7) Wilson Quality Assurance/Quality Control/Safety Audit Manager's presence could have resolved the EPZ differences; (8) Structure 46/5 had about 22+ miles of transmission line between the open breaker at Port Orford B659 and the sectionalizing switch B447, the lines coming into 46/5 may have provided a higher probability of induction source; (9) incorrect initial switch design resulted in BPA needing to initiate corrective actions; (10) Defects in workmanship required WCC to initiate warranty actions; and (11) the ungrounded isolated line section of the Geisel Monument Tap section was part of the worksite and should have been included in the EPZ.

During the investigation, the Board identified 18 Findings leading to 15 Recommendations to improve safety and reduce the likelihood of recurrence of similar accidents.

Background on the Power Marketing Reporting and Investigative Processes – BPA uses several processes to track and inform employees and of health and safety related issues. These are basically divided into two process areas: reporting and investigation. The reporting processes include Safety Alerts, which require action be taken; Safety Notices, which are used to inform employees of potential health and safety issues; and Near Miss/Lessons Learned, which convey operational events.

Investigations are categorized as Level 1, Level 2 and Level 3. Level 1 and Level 2 closely correspond to the former Type A and Type B accident investigations, with Level 1 being the most severe consequence accidents. BPA attempts to comply as closely as possible with the requirements of DOE Order 225.1B, *Accident Investigations*. This investigation was conducted as a Level 1 investigation.

Stairway Fall Resulting in a Federal Employee Fatality at DOE Headquarters Germantown, Maryland, June 1, 2013 (MA-HQ--GOHQ-DOEHQ-2013-0001) On Saturday, June 1, 2013, at approximately 8:27 a.m. (Eastern Daylight Time), a DOE Facility Management Specialist (FMS) fell from the stairs in Mechanical Equipment Room (MER) 7 of the DOE Germantown Headquarters Main Building and landed on the concrete floor. The FMS suffered fractures of the skull, orbital bone, and nose requiring hospitalization, and he died as a result of his injuries on June 24, 2013. The Board determined that this accident was preventable.

Background - In May 2010, the FMS suffered a spinal cord injury (a spinal infarction or stroke) as a non-work related accident in his home. This injury left him paralyzed from the neck down and required several months of recovery and physical rehabilitation to gradually regain mobility.

Between October 2010 and November 2010, the FMS requested to return to work. Initially the request included working from home but this request was denied because the position required his physical presence in support of facility operations. On November 16, 2010, he notified his Supervisor of a pending letter from the doctor recommending his return to full duties. The Supervisor agreed, and on November 22, 2010, the FMS returned to work. He was permitted to work on a limited basis; however, no record of a fitness for duty review was found.

Using personal judgment, the Supervisor told the FMS verbally that he was not allowed to go on ladders or on the building roof, actions that were otherwise normal parts of position description.

In August 2011 and March 2013, the FMS experienced two other on-the-job incidents that resulted in minor injuries. The Office of Human Capital (HC) was not involved in any return to work/fitness for duty process or reasonable accommodation process for the either incident. There was no evidence of any formal review of the FMS's return to work/fitness for duty or of a reasonable accommodation.

Description of the Work - In April 2013, the old drinking water filtering and cooling system in MER 7 was removed and replaced with a new Filtrine system. During this task, the stair railings were temporarily removed and reinstalled for equipment removal. The installation contractor stated that the stairs were scuffed including damage noted on the stair treads after the accident on June 1, 2013. The Board found no one noticed nor reported the tread damage before the accident.

In May 2013, an emergency generator electrical upgrade project began for the Germantown Main Building that would occur over several months including weekends.

During the weeks prior to the accident, the Supervisor discussed roles, requirements, and weekend coverage with the team, including the FMS. The FMS accepted the assignment to provide Governmental oversight of the electrical outage and the related scheduled weekend

work on the generator upgrade project and the electrical expansion work scheduled on Saturday, June 1, 2013.

The Accident - On June 1, 2013, workers for the emergency generator/electrical upgrade work started arriving at approximately 6:00 a.m. Two workers, the Building Electrician and Building Engineer, associated with the upgrade work also had other duties that day. Two witnesses observed the FMS to be alert and moving about using a walker to navigate the hallways.

Because de-energizing the load center in MER 6 resulted in a loss of power to the sump pumps in MER 7, the FMS became concerned that there may have been a risk of flooding from water from existing equipment installed in MER 7. At 7:48 a.m., the electronic door log records indicate that he opened the door to MER 7, but there were no witnesses and no record of whether he entered the room at this time.

Still concerned about flooding, the FMS requested that the Building Electrician and Building Engineer meet him at MER 7 to review the power connections on the MER 7 sump pump. At 8:26 a.m., the electronic door log recorded that the Building Engineer opened the door to MER 7. The FMS left his walker in the hallway by the MER 7 door and, after holding the door open for the others to enter first, he continued into the room with his cane.

The Building Engineer and Building Electrician walked ahead of the FMS down the stairs into MER 7. The Building Engineer descended the stairs first and proceeded towards the sumps at the far end of MER 7. The Building Electrician descended the stairs after the Building Engineer and, as directed by the FMS, proceeded toward the Filtrine Water Chiller which was located approximately five feet from the base of the stairs.

Both the Building Engineer and the Building Electrician observed the FMS entering the room at the stair landing, but did not observe him descending the stairs.

Neither the Building Electrician nor the Building Engineer heard the FMS cry out or make any other noise as he fell. The Building Electrician stated that he heard a single thud-like impact noise, likely from the FMS striking the concrete floor, turned to face the noise, and found the FMS face down on the floor at the bottom of the stairs.

The Board believes the fall was the result of the FMS descending or transitioning from the stairs to the floor. The FMS was last observed standing on the landing at the top of the stairs, and it is unclear what caused him to fall.

Causal Factors

The Board identified the direct cause of this accident to be that the FMS fell while descending or transitioning from the stairs to the floor striking his head on the floor of MER 7 resulting in a fatal head injury.

The Board identified the root cause of this accident to be that an effective fitness for duty requirement and process does not exist at DOE Headquarters for Federal employees returning to work from a non-work related injury or illness.

The Board identified six Contributing Causes to this accident: (1) a reasonable accommodation was not provided such as a medical flexi-place agreement or position description revision, and a review by the Office of Human Capital or Federal Occupational Health was not performed. A request to work from home, supported by the Facilities Management Specialist's physician's letter dated September 20, 2010, was denied; (2) a formal documented and appropriate review of the FMS's fitness for duty did not occur; (3) clear responsibilities and guidance did not exist for conducting oversight of the fitness for duty and return to work processes; (4) the FMS was assigned duties that included entering and transiting stairs in MERs without a formal review of his physical capabilities; (5) management systems weaknesses existed because oversight of return to work, fitness for duty, and Federal Employee Occupation Safety and Health programs had not been conducted; and (6) the MER 7 stairs were not in compliance with codes and standards and were not in optimum condition for traversing.

In addition to the causal findings, the Board determined there were ten Conclusions and 14 corresponding Judgments of Need.

Accident Investigation Training

The HSS National Training Center (NTC) provides training for the DOE Accident Prevention and Investigation Program. The Accident Investigator course (SAF-230) scenario was completely revised in April 2010, and the revised course has received positive feedback from attendees. For course description information and planned training sessions, please visit the HSS NTC website at: http://ntc.doe.gov.

To arrange for training:

Registration for training is done through the CHRIS system.

To view the upcoming schedule for SAF230 go the HSS National Training Center (NTC) schedule URL at:
http://ntc.doe.gov/shared/schedule.aspx