Office of Health, Safety and Security

Monthly Analysis of Electrical Safety

May 2011

Purpose

The purpose of this report is to provide a timely review and analysis of electrical safety events, which were reported in the Occurrence Reporting and Processing System (ORPS), to the DOE electrical safety community and to serve as a valuable resource for their analysis. The intent of this monthly analysis is to offer a DOE-wide overview of electrical safety, including the numbers and types of events, the workers involved, as well as the consequences and severity of these events.

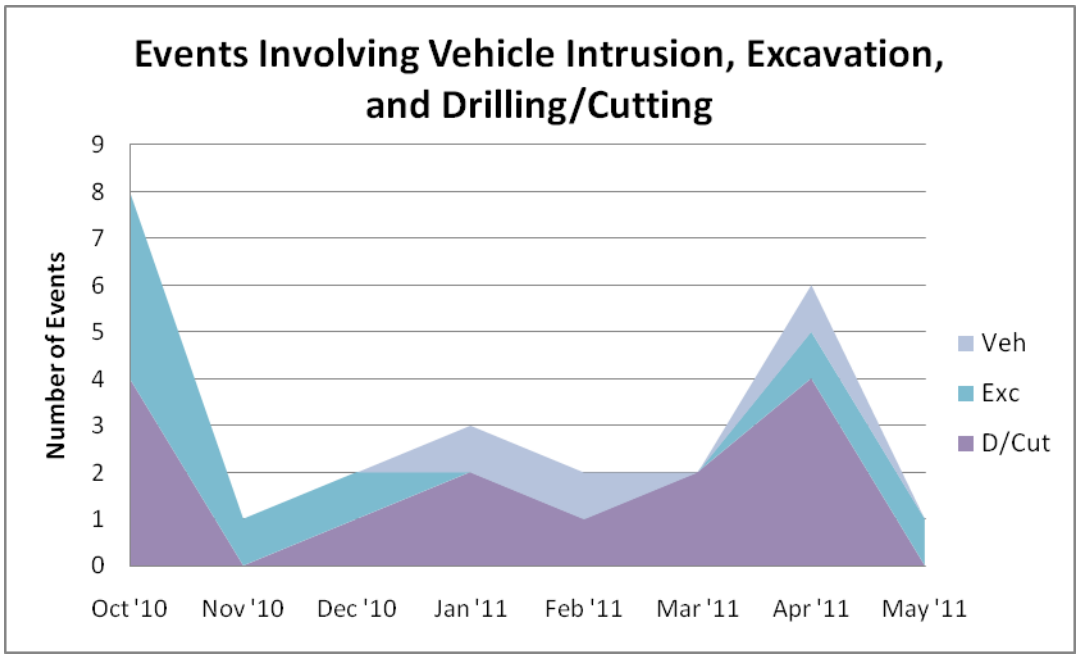
Key Observations

The number of electrical safety events has continued to decrease since the peak in July 2010. However, we have seen an increase in the number of events with high electrical severity scores, most involving contact with energized parts. A continuing area of concern is the need to improve hazardous energy control. This month we had events in which workers did not use a LOTO, failed to perform safe-to-work checks, and locked a circuit breaker in the wrong position. Proper hazards identification and correct implementation of controls and barriers is the first line of defense to protect workers from exposed energized conductors and circuit parts.

Electrical Safety Occurrences

The number of electrical safety occurrences for May decreased from nine in April to six. One of these events involved an electrical shock. In that event, an operator, who was helping the IT group install a network switch box inside a power supply relay cabinet, accidentally touched an energized component and received a mild electrical shock. The operator was medically evaluated and returned to work with no restrictions. The network switch was rack-mounted inside a relay cabinet belonging to a power supply group. The cabinet was fed from a 120-volt, 20-amp circuit breaker in a power distribution panel that powered an internal power strip and a power supply for other components mounted in the cabinets. The operator had current NFPA 70E-required training; however, the operator was not wearing PPE for working around energized electrical equipment. The power supply group, who owned the cabinet, was not contacted nor was a request made to have a lockout/tagout (LOTO) applied to the cabinet before installing the switch. The electrical severity score for the event was high because there was a large transformer with a significant arc flash hazard within close distance to where the operator entered the cabinet with his hand.

This month there were no electrical penetration/cutting events and no vehicle intrusion events. However, there was one reported excavation event in which the bucket teeth of a mini excavator hit and broke a section of PVC conduit that contained 208-volt power for sump pumps. The electrical cabling inside the conduit was not damaged. A subcontractor decided to use the excavator to break up the soil in the area adjacent to the visibly marked utility location. Use of the excavator instead of hand digging violated site policy and the approved dig permit for the job, which required hand digging and positive utility location in accordance with the utility markings. Most events that involve vehicle intrusion, penetration, or excavation are associated with industrial operations and usually have nothing to do with planned electrical work. Unfortunately, when conduct of operations fails (e.g., permit or procedure compliance) or hazards are not recognized when planning, then non-electrical workers can become exposed to electrical hazards. The following chart shows that drilling and cutting of energized conductors has been the predominant area of weakness since the beginning of FY 2011.



This month there were five reported events involve LOTO issues. In addition to the electrical shock event discussed previously. A summary of the other four events follows.

1. A work supervisor found an incorrectly installed LOTO during a field walk-down. The circuit breaker, which supplies power to an HVAC unit that was being installed, was locked in the closed (ON) position. The supervisor found the mistake before authorized workers had performed their walk-downs and safe-to-work checks. The installer had closed the breaker and installed the locking device. The LOTO verifier did not catch the error.

2. A Division Electrical Safety Officer discovered that an air gap could not be identified for the utility feed for the installation of real-time radiography equipment. Several electricians were working on the electrical installation, but none of them had a LOTO applied to protect themselves from a potential energizing of the system.

3. While experiment collaborators were investigating a power supply problem, a borescope accidentally touched an exposed energized AC lug with a resulting arc flash. The collaborators did not turn off the 208-volt AC power to the power supply rack. Although the collaborators had received electrical safety training, they did not perform a zero energy check of the power supply or recognize the need to isolate the source of the power to the power supply. Their supervisor did not communicate the need to de-energize the chassis.

4. A staff member had opened the door to a chiller and was exposed to a 480-volt electrical hazard. The staff member's actions were not in compliance with the site's hazardous energy control program.

During the month of May, DOE recognized National Electrical Safety Month with a focus on hazardous energy control awareness. The EFCOG Electrical Safety Task Group prepared training material, posters, and other important information for this year's campaign, which can be found at http://www.efcog.org/wg/esh_es/electrical_safety_month.htm. We are anticipating that the efforts of this year's campaign will produce favorable results regarding hazardous energy control issues.

The following table shows a breakdown of the electrical safety events for May, 2011.

Number of Events	Involving:	Last Month
1	Electrical Shocks	1
0	Electrical Burns	0
5	Hazardous Energy Control	2
2	Inadequate Job Planning	3
0	Inadvertent Drilling/Cutting of Electrical Conductors	4
1	Excavation of Electrical Conductors	1
0	Vehicle Intrusion of Electrical Conductors or Equipment	0
3	Electrical Near Misses	4
3	Electrical Workers	5
3	Non-Electrical Workers	4
2	Subcontractors	6

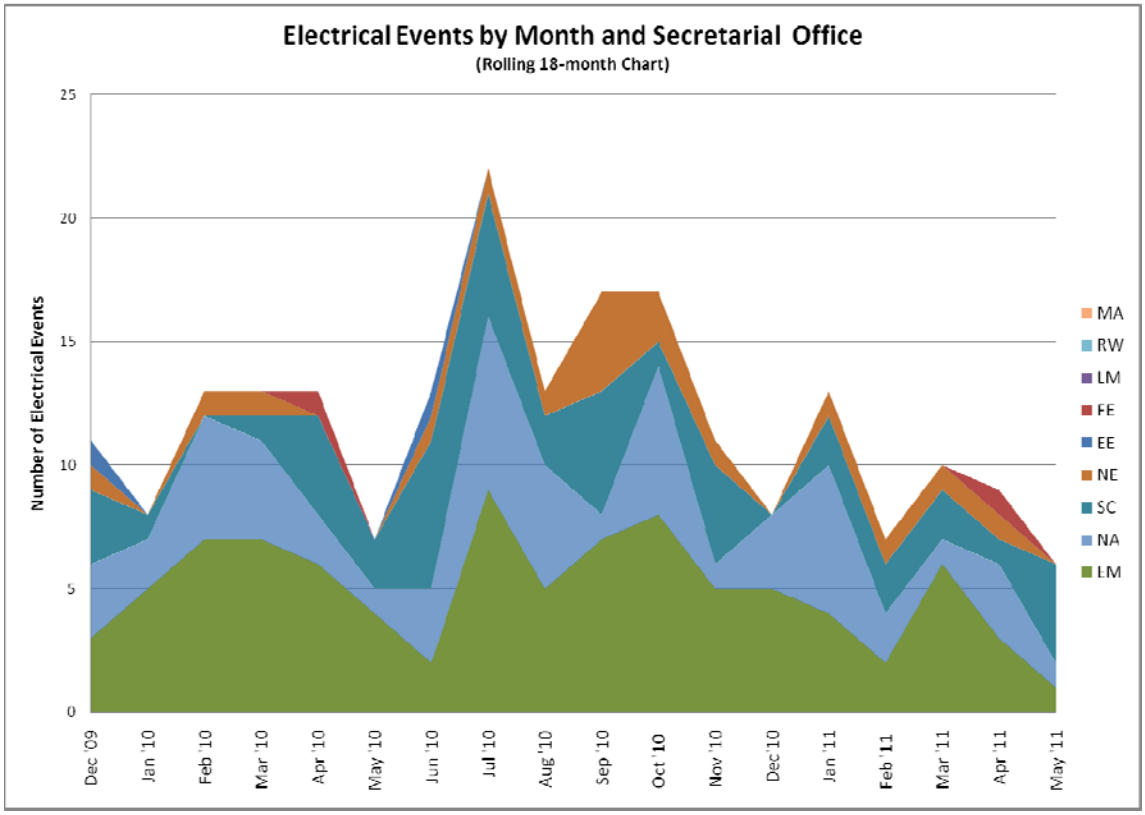
In compiling the monthly totals, the search initially looked for occurrence discovery dates in this month (excluding Significance Category R reports), and for the following ORPS "HQ keywords":
01K – Lockout/Tagout Electrical, 01M - Inadequate Job Planning (Electrical),
08A – Electrical Shock, 08J – Near Miss (Electrical), 12C – Electrical Safety

Below is the current summary of the electrical safety occurrences for CY 2011:

Period	Electrical Safety Occurrences	Shocks	Burns	Fatalities
May	6	1	0	0
April	9	1	0	0
March	10	1	0	0
February	7	3	0	0
January	13	3	1	0
2011 total	45 (avg. 9.0/month)	9	1	0
2010 total	155 (avg. 12.9/month)	28	2	0
2009 total	128 (avg. 10.7/month)	25	3	0
2008 total	113 (avg. 9.4/month)	26	1	0
2007 total	140 (avg. 11.7/month)	25	2	0
2006 total	166 (avg. 13.8/month)	26	3	0
2005 total	165 (avg. 13.8/month)	39	5	0
2004 total	149 (avg. 12.4/month)	25	3	1

The monthly average for 2011 is lower than the monthly average in any of the previous calendar years. Since December 2008, DOE has averaged 11.1 events per month.

The following chart shows the distribution of electrical safety events by secretarial office.

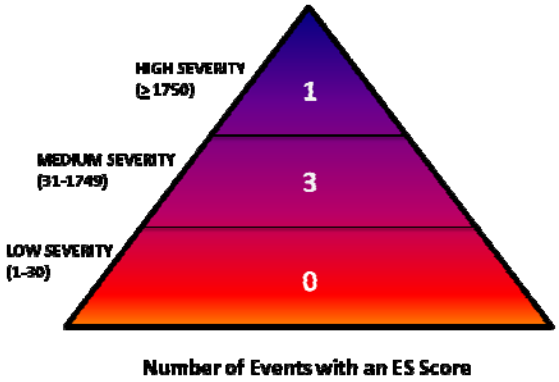


Electrical Severity

The electrical severity of an electrical event is based on an evaluation of electrical factors that include: electrical hazard, environment, shock proximity, arc flash proximity, thermal proximity and any resulting injury(s) to affected personnel. Calculating an electrical severity for an event provides a metric that can be consistently applied to evaluate electrical events across the DOE complex.

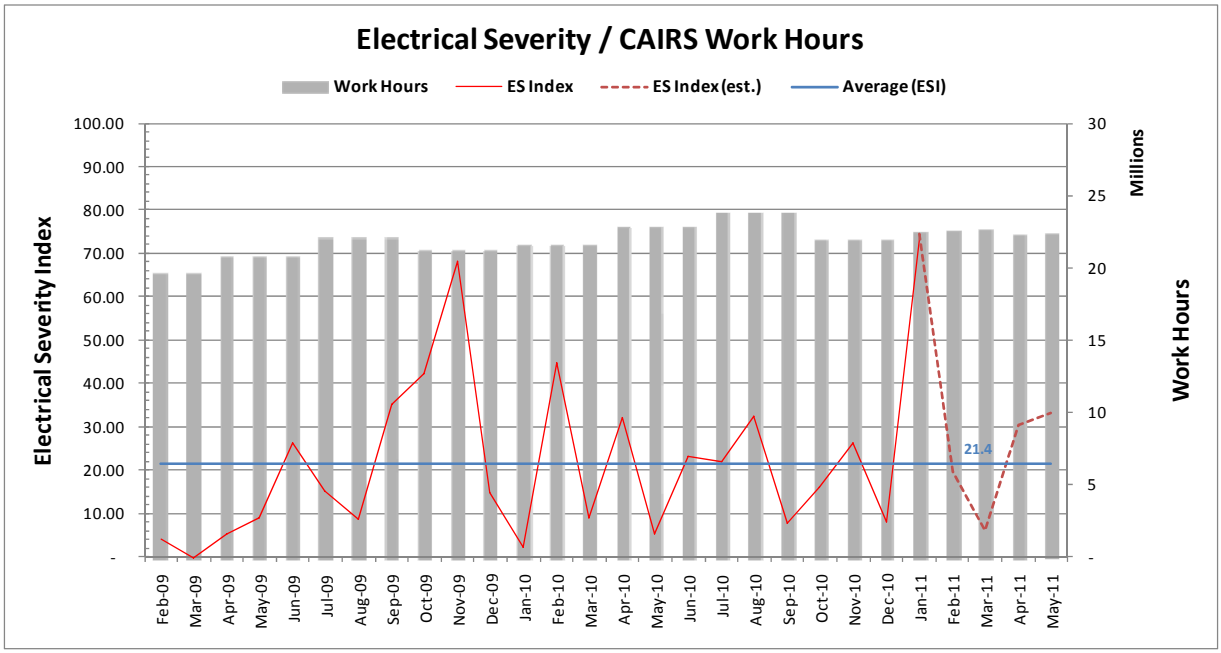
Electrical Severity Scores

The electrical severity scores are calculated using Revision 2 of the Electrical Severity Measurement Tool, which can be found on the EFCOG website at http://www.efcog.org/wg/esh_es/docs/Electrical_Severity_Measurement_Tool.pdf. Two of the electrical events this month did not have an Electrical Severity (ES) score. The other four events are distributed as shown in the triangle, with the highest ES score being 3,150. The actual score for each event is provided in the event tables.



Electrical Severity Index

The Electrical Severity Index (ESI) is a performance metric that was developed to normalize events against organizational work hours. The ESI is calculated monthly and trended. The present goal is to consistently maintain an average ESI below 20.0. The following chart shows a calculated ESI for the DOE complex.



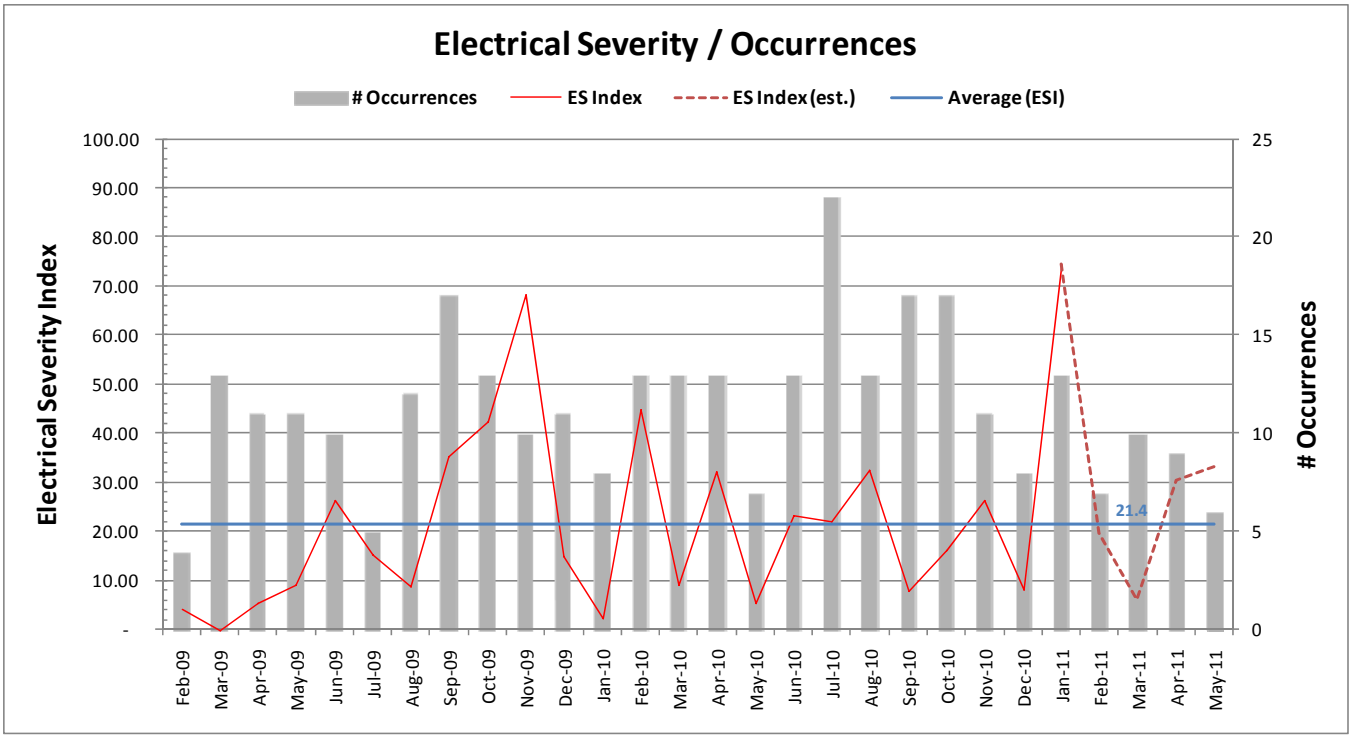
Note: An estimated ESI is calculated until accurate CAIRS man-hours are available. The chart will be updated monthly.

Category	April	May	Δ
Total Occurrences	9	6	-3
Total Electrical Severity	3,325	3,700	+325
Estimated Work Hours	22,256,450* (22,256,450)	22,301,737	+45,278
ES Index	30.33* (30.33)	33.18	+2.85
Average ESI	20.6	21.4	+0.8

* These are estimated CAIRS work hours for February and ES Index based on the estimated hours. The estimated hours and ES Index based on the estimated hours (as reported in February) are shown below in parentheses.

Electrical Severity Index = (Σ Electrical Severity / Σ Work Hours) 200,000

The following chart shows ESI with the number of Occurrences instead of work hours.

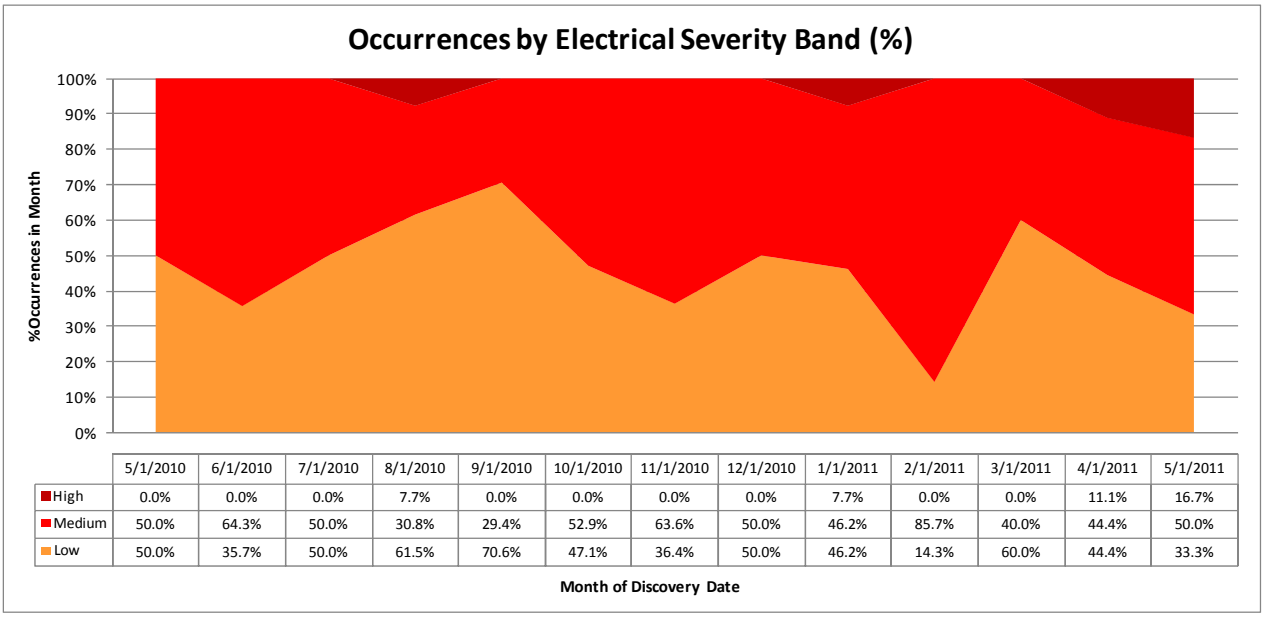


The average ESI has increased from 19.2 in June 2010 to 21.4 in May 2011. It will take many months of lower electrical severity scores to bring the average back down below 20. We should challenge ourselves and our electrical safety programs to achieve this goal.

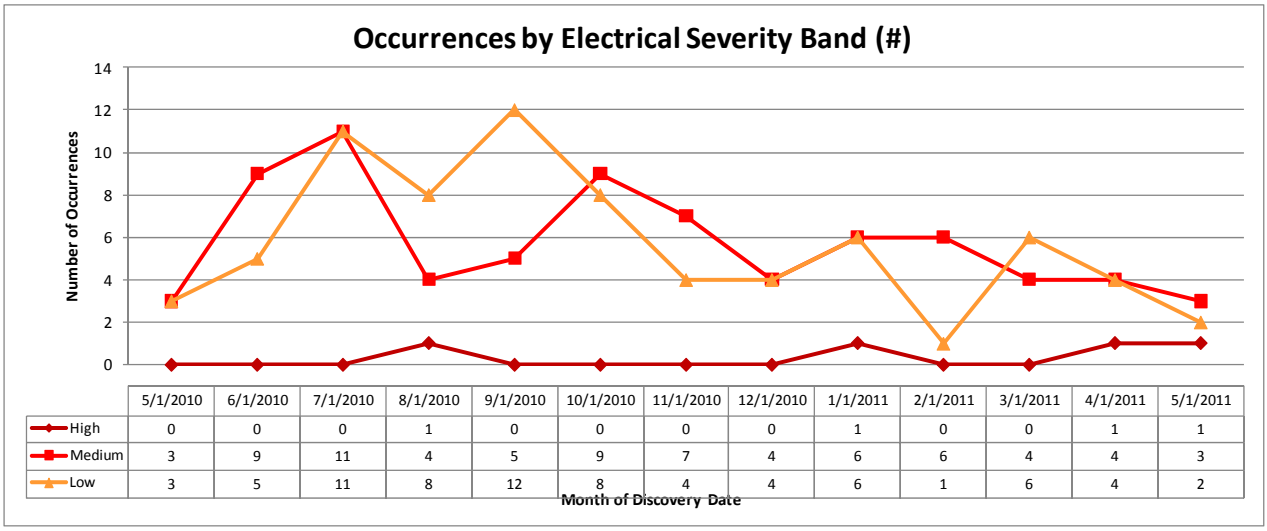
Summary of Occurrences by Severity Band

For the interval May 2010 through May 2011 (current month and the past 12), the next two charts summarize occurrences by severity band and month of discovery date:

- By percentage of total occurrences in month
- By number of occurrences in month



	5/1/2010	6/1/2010	7/1/2010	8/1/2010	9/1/2010	10/1/2010	11/1/2010	12/1/2010	1/1/2011	2/1/2011	3/1/2011	4/1/2011	5/1/2011
High	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%	11.1%	16.7%
Medium	50.0%	64.3%	50.0%	30.8%	29.4%	52.9%	63.6%	50.0%	46.2%	85.7%	40.0%	44.4%	50.0%
Low	50.0%	35.7%	50.0%	61.5%	70.6%	47.1%	36.4%	50.0%	46.2%	14.3%	60.0%	44.4%	33.3%

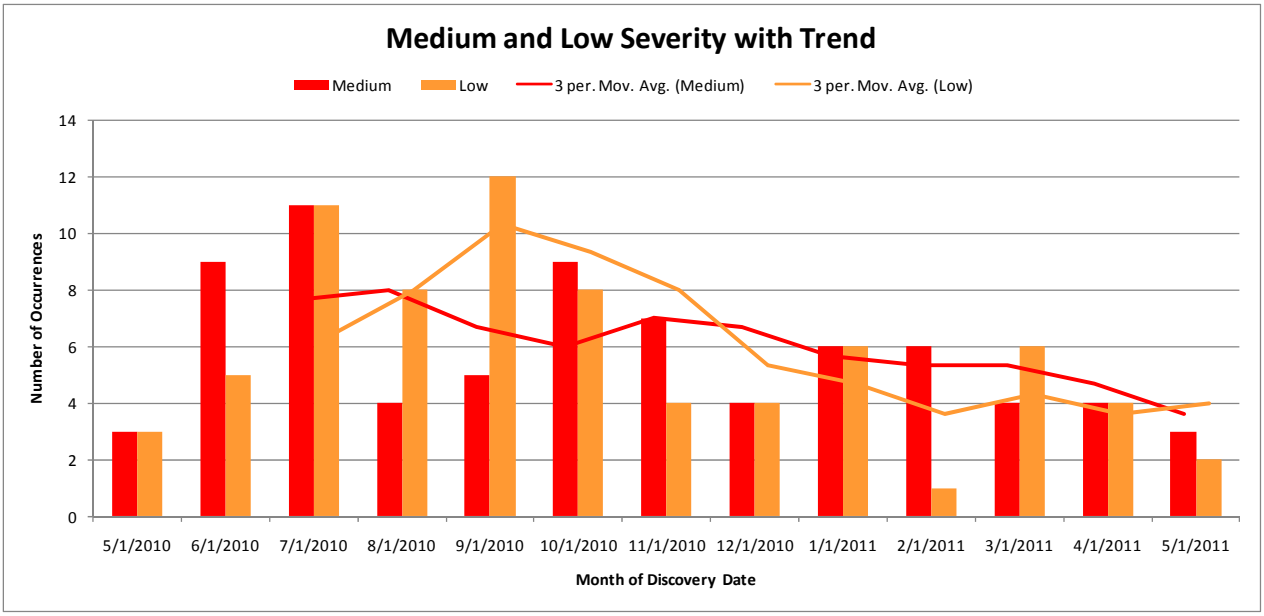


	5/1/2010	6/1/2010	7/1/2010	8/1/2010	9/1/2010	10/1/2010	11/1/2010	12/1/2010	1/1/2011	2/1/2011	3/1/2011	4/1/2011	5/1/2011
High	0	0	0	1	0	0	0	0	1	0	0	1	1
Medium	3	9	11	4	5	9	7	4	6	6	4	4	3
Low	3	5	11	8	12	8	4	4	6	1	6	4	2

What we can see from the previous two charts is an increase in the number of events with High electrical severity scores and a decrease in the number of events with Low electrical severity scores while the number of occurrences with Medium scores remained almost unchanged.

Medium and Low Severity with Trend

The following chart focuses on the Medium and Low severity data series for May 2010 through May 2011. Trend lines are included for each, using a 3-month moving average.



The chart shows an overall improvement in the trend of Medium and Low severity scores by number of occurrecnces.

Additional Resources

Electrical Safety Blog
http://hsselectricalsafety.wordpress.com/

Electrical Safety Wiki
http://electricalsafety.doe-hss.wikispaces.net/home

EFCOG Electrical Safety Subgroup
http://www.efcog.org/wg/esh_es/index.htm

Center of Excellence for Electrical Safety
http://www.lanl.gov/safety/electrical/

Contact

Glenn S. Searfoss
Office of Analysis, HS-24
Phone: 301-903-8085
Email: glenn.searfoss@hq.doe.gov

Electrical Safety Occurrences – May 2011

No	Report Number	Event Summary	SHOCK	BURN	ARCF[1]	LOTO[2]	PLAN[3]	EXCAV[4]	CUT/D[5]	VEH[6]	SC[7]	RC[8]	ES[9]
1	EM-RP--WRPS-ANALLAB-2011-0001	An incorrectly installed LOTO resulted in an energized local disconnect for an HVAC unit.				X					3	2C(2)	0
2	NA--LASO-GOLA-BOPLASO-2011-0001	Electricians did not have a LOTO applied to protect from a potential energizing of the system.				X	X				3	10(3)	0
3	SC--ASO-ANLE-ANLEAPS-2011-0002	A worker received a 120V shock while working inside a power supply cabinet.	X			X	X				2	2C(1)	3150
4	SC--FSO-FNAL-FERMILAB-2011-0002	A borescope touched an exposed energized AC lug resulting in a 120V arc flash.				X					3	2C(2)	150
5	SC--PNSO-PNNL-PNNLBOPER-2011-0005	A staff member opened a door to a chiller and was exposed to an energized 480V hazard.				X					3	2C(2)	350
6	SC--TJSO-JSA-TJNAF-2011-0004	An excavator broke a section of PVC conduit that contained 208V power cables for sump pumps.						X			3	10(3)	50
	TOTAL		1	0	0	5	2	1	0	0			

Key

(1) ARCF = significant arc flash, (2) LOTO = lockout/tagout, (3) PLAN = job planning, (4) EXCAV = excavation/penetration, (5) CUT/D = cutting or drilling, (6) VEH = vehicle event, (7) SC = ORPS significance category, (8) RC = ORPS reporting criteria, (9) ES = electrical severity

ES Scores: High is $\geq$ 1750, Medium is 31-1749, and Low is 1-30

Electrical Safety Occurrences – May 2011

No	Report Number	Event Summary	EW[1]	N-EW[2]	SUB[3]	HFW[4]	WFH[5]	PPE[6]	70E[7]	VOLT[8] H	VOLT[8] L	C/I[9]	NEUT[10]	NM[11]
1	EM-RP--WRPS-ANALLAB-2011-0001	An incorrectly installed LOTO resulted in an energized local disconnect for an HVAC unit.	X				X				X			
2	NA--LASO-GOLA-BOPLASO-2011-0001	Electricians did not have a LOTO applied to protect from a potential energizing of the system.	X		X		X		X		X			X
3	SC--ASO-ANLE-ANLEAPS-2011-0002	A worker received a 120V shock while working inside a power supply cabinet.	X			X		X	X		X			
4	SC--FSO-FNAL-FERMILAB-2011-0002	A borescope touched an exposed energized AC lug resulting in a 120V arc flash.		X		X					X			X
5	SC--PNSO-PNNL-PNNLBOPER-2011-0005	A staff member opened a door to a chiller and was exposed to an energized 480V hazard.		X			X	X	X		X			
6	SC--TJSO-JSA-TJNAF-2011-0004	An excavator broke a section of PVC conduit that contained 208V power cables for sump pumps.		X	X		X				X			X
	TOTAL		3	3	2	2	4	2	3	0	6	0	0	3

Key

(1) EW = electrical worker, (2) N-EW = non-electrical worker, (3) SUB = subcontractor, (4) HFW = hazard found the worker, (5) WFH = worker found the hazard, (6) PPE = inadequate or no PPE used, (7) 70E = NFPA 70E issues, (8) VOLT = H (>600) L(≤600), (9) C/I = Capacitance/Inductance, (10) NEUT = neutral circuit, (11) NM = near miss

ORPS Operating Experience Report

ORPS contains 55226 OR(s) with 58536 occurrences(s) as of 6/10/2011 2:31:44 PM
Query selected 6 OR(s) with 6 occurrences(s) as of 6/10/2011 2:31:59 PM

Download this report in Microsoft Word format.

1)Report Number:	EM-RP--WRPS-ANALLAB-2011-0001 **After 2003 Redesign**
Secretarial Office:	Environmental Management
Lab/Site/Org:	Hanford Site
Facility Name:	222-S/Analytical Laboratory
Subject/Title:	Field Walk-down Identifies Incorrectly Installed Lockout/Tagout (ARRA)
Date/Time Discovered:	05/10/2011 14:45 (PTZ)
Date/Time Categorized:	05/10/2011 16:30 (PTZ)
Report Type:	Notification
Report Dates:	Notification: 05/11/2011 19:03 (ETZ) Initial Update: Latest Update: Final:
Significance Category:	3
Reporting Criteria:	2C(2) - Failure to follow a prescribed hazardous energy control process (e.g., lockout/tagout) or a site condition that results in the unexpected discovery of an uncontrolled hazardous energy source (e.g., live electrical power circuit, steam line, pressurized gas). This criterion does not include discoveries made by zero-energy checks and other precautionary investigations made before work is authorized to begin.
Cause Codes:	
ISM:	2) Analyze the Hazards 3) Develop and Implement Hazard Controls
Subcontractor Involved:	No
Occurrence Description:	On May 10, 2011, at 1445 hours, a 222-S Laboratory field work supervisor performing a field walk-down identified an incorrectly installed lockout/tagout (LOTO). The incorrectly installed LOTO resulted in a local disconnect, which supplies power to a heating, ventilating, and air conditioning (HVAC) unit being installed in room 4TUV becoming energized. The incorrect LOTO was identified prior to the authorized workers performing their walk-downs and safe-to-work checks.
Cause Description:	
Operating Conditions:	Does not apply.
Activity Category:	Normal Operations (other than Activities specifically listed in this

	Category)
Immediate Action(s):	The area surrounding the local disconnect was immediately isolated with tape and barriers and the entire room was placed on restricted access pending further investigation. An event investigation was scheduled for May 11, 2011.
FM Evaluation:	
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	Yes. Before Further Operation? No By Whom: Hardy, Don B By When:
Division or Project:	Washington River Protection Solutions, LLC (WRPS)
Plant Area:	200 West
System/Building/Equipment:	HVAC/222-S/Local Disconnect
Facility Function:	Laboratory - Analytical
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	01K--Inadequate Conduct of Operations - Lockout/Tagout Noncompliance (Electrical) 12I--EH Categories - Lockout/Tagout (Electrical or Mechanical) 13H--Management Concerns - American Recovery and Reinvestment Act (ARRA) 14E--Quality Assurance - Work Process Deficiency
HQ Summary:	On May 10, 2011, a 222-S Laboratory field work supervisor performing a field walk-down identified an incorrectly installed lockout/tagout (LOTO). The incorrectly installed LOTO resulted in a local disconnect, which supplies power to a heating, ventilating, and air conditioning unit that was being installed in room 4TUV, becoming energized. The incorrect LOTO was identified prior to the authorized workers performing their walk-downs and safe-to-work checks. The area surrounding the local disconnect was immediately isolated with tape and barriers. The entire room was placed on restricted access pending further investigation. An event investigation was scheduled for May 11.
Similar OR Report Number:	
Facility Manager:	Name: Hardy, Don B Phone: (509) 373-0364 Title: Manager, Facility
Originator:	Name: WATERS, SHAUN F

	Phone (509) 373-3457 Title OPERATIONS SPECIALIST
HQ OC Notification:	Date: NA, Time: NA, Person Notified: NA, Organization: NA
Other Notifications:	05/10/2011 15:00 (PTZ) Hardy, Don B WRPS 05/10/2011 16:30 (PTZ) Davis, K. W. MSA-ONC 05/10/2011 16:30 (PTZ) Sondag, J. M. DOE-ORP
Authorized Classifier(AC):	

2)Report Number:	NA--LASO-GOLA-BOPLASO-2011-0001 **After 2003 Redesign**
Secretarial Office:	National Nuclear Security Administration
Lab/Site/Org:	Los Alamos Site
Facility Name:	Balance of Plant Los Alamos Site Office
Subject/Title:	Near Miss: Failure to Control Hazardous Energy Results in Near Miss
Date/Time Discovered:	05/23/2011 13:30 (MTZ)
Date/Time Categorized:	05/25/2011 14:00 (MTZ)
Report Type:	Notification
Report Dates:	Notification 05/27/2011 17:37 (ETZ) Initial Update Latest Update Final
Significance Category:	3
Reporting Criteria:	10(3) - A near miss, where no barrier or only one barrier prevented an event from having a reportable consequence. One of the four significance categories should be assigned to the near miss, based on an evaluation of the potential risks and the corrective actions taken. (1 of 4 criteria - This is a SC 3 occurrence)
Cause Codes:	
ISM:	2) Analyze the Hazards 3) Develop and Implement Hazard Controls 4) Perform Work Within Controls
Subcontractor Involved:	Yes CCP, JB Henderson, B&D Industries
Occurrence Description:	MANAGEMENT SYNOPSIS: On Monday, May 23, 2011, at 1330 the Designated Division Electrical

	Safety Officer (DESO)(W1) arrived on site to conduct the initial on-site ESO inspections of the HE-RTR-02 installation and to verify that the site was safe to power up. W1 began his inspection by walking down the utility feed between Disconnect-E (CDD-E) and the power pole to verify that the air gap was still in place prior to commencing his inspection. No air gap could be identified (it should have been clearly visible to all working on the site). W1 noted that a single Lock Out/Tag Out (LO/TO) was applied to CDD-A near the east side of pad 10 that disconnected power from the HE-RTR (CDD-E) power feed. When returning to the HE-RTR, W1 noted several electricians were working on the electrical installation, but none of them had a LO/TO applied to protect them from a potential energizing of the system they were working on. At this time W1 called a pause work for all electrical work at the HE-RTR and indicated that a LO/TO must be applied at CDD-E, (per the IWD) now that the air gap did not exist anymore for anyone working on the electrical systems of the HE-RTR. W1 informed his escort (W3) of the problem. The escort immediately notified the TA-54 Operations Center. Two Los Alamos National Laboratory (LANL), Maintenance and Site Services (MSS) electricians left and got LO/TO, applied them and preformed the zero energy test as required as W1 observed. W1 inspection was completed under the escort of the two electricians with the LO/TO applied to CDD-E. Prior to leaving the site W1 reiterated that ALL electricians working on the HE-RTR must have proper protection by applying LO/TO individually which was done. On Tuesday, May 24, 2011, questions arose about how the X-ray machine would be tested. W1 was not on site that day, so when W1 returned on Wednesday, May 25, 2011 he began to review the proposed changes to the IWD. W1 did not think the IWD had sufficient detail and suggested that all workers involved meet work out the remaining issues. During this review it was noted that the IWDs being worked were not coordinated with each other. A critique was held on Wednesday, May 25, 2011 at 1400 and the Acting Environmental Waste Management Operations (EWMO), Facility Operations Director (FOD) determined the event to be reportable against ORPS Criterion 10(3c), significance category 3 (SC 3). The management concerns the EWMO FOD identified during the critique were the near miss with only one barrier (the LO/TO on CDD-A) to workers coming in contact with hazardous energy, as well as issues with work control and communication between work groups.
Cause Description:	
Operating Conditions:	Inspection Activities
Activity Category:	Inspection/Monitoring

Immediate Action(s):	-Work Paused. -Operations Center Notified. -LO/TO applied.
FM Evaluation:	
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	Yes. Before Further Operation? No By Whom: EWMO, CAO-PF By When: 07/08/2011
Division or Project:	TA-54
Plant Area:	TA-54, Area G
System/Building/Equipment:	High Energy Real Time Radiography (HE-RTR)
Facility Function:	Balance of Plant - Infrastructure (Other Functions not specifically listed in this Category)
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	01A--Inadequate Conduct of Operations - Inadequate Conduct of Operations (miscellaneous) 01K--Inadequate Conduct of Operations - Lockout/Tagout Noncompliance (Electrical) 01M--Inadequate Conduct of Operations - Inadequate Job Planning (Electrical) 01P--Inadequate Conduct of Operations - Inadequate Oral Communication 08H--OSHA Reportable/Industrial Hygiene - Safety Noncompliance 08J--OSHA Reportable/Industrial Hygiene - Near Miss (Electrical) 11G--Other - Subcontractor 12K--EH Categories - Near Miss (Could have been a serious injury or fatality) 14E--Quality Assurance - Work Process Deficiency 14G--Quality Assurance - Procurement Deficiency
HQ Summary:	On May 23, 2011, the Division Electrical Safety Officer (DESO) discovered that an air gap could not be identified for the utility feed at the High Energy-Real Time Radiography-02 (HE-RTR) installation. The DESO noted that a single Lock Out/Tag Out (LO/TO) was applied, near the east side of Pad 10 that disconnected power from the HE-RTR power feed. When returning to the HE-RTR, the DESO noted several electricians were working on the electrical installation, but none of them had a LO/TO applied to protect from a potential energizing of the system. The DESO called a pause for all electrical work at the HE-RTR and indicated that a LO/TO must be applied for anyone working on the electrical systems of the HE-RTR now that the air gap no longer existed . Management

	notifications were made. Two Maintenance and Site Services electricians applied the required LO/TO and performed the zero energy test as the DESO observed. The DESO inspection was completed under the escort of the two electricians. On May 24, questions arose about how the X-ray machine would be tested. On May 25, the DESO began to review the proposed changes to the work documentation. The DESO did not think the work documentation had sufficient detail and suggested that all involved workers meet and work out the remaining issues. During this review, it was noted that the various work documents being used were not coordinated with each other. A critique was held on May 25.
Similar OR Report Number:	
Facility Manager:	Name: Clifford Kirkland Phone: (505) 606-0576 Title: EWMO Acting Facility Operations Director
Originator:	Name: HAKONSON-HAYES, AUDREY C Phone: (505) 667-9364 Title: OCCURRENCE INVESTIGATOR
HQ OC Notification:	Date: NA; Time: NA; Person Notified: NA; Organization: NA
Other Notifications:	Date: 05/25/2011; Time: 15:30 (MTZ); Person Notified: Dave George; Organization: NNSA
Authorized Classifier(AC):	Martha D. Waters Date: 05/26/2011

3)Report Number:	SC--ASO-ANLE-ANLEAPS-2011-0002 **After 2003 Redesign**
Secretarial Office:	Science
Lab/Site/Org:	Argonne National Laboratory East
Facility Name:	Advanced Photon Source
Subject/Title:	Worker Receives Minor Shock While Installing Network Switch Box
Date/Time Discovered:	05/03/2011 10:17 (CTZ)
Date/Time Categorized:	05/03/2011 13:30 (CTZ)
Report Type:	Notification
Report Dates:	Notification: 05/05/2011 18:27 (ETZ) Initial Update: Latest Update: Final:
Significance Category:	2
Reporting Criteria:	2C(1) - Failure to follow a prescribed hazardous energy control process

	(e.g., lockout/tagout) or disturbance of a previously unknown or mislocated hazardous energy source (e.g., live electrical power circuit, steam line, pressurized gas) resulting in a person contacting (burn, shock, etc.) hazardous energy.
Cause Codes:	
ISM:	
Subcontractor Involved:	No
Occurrence Description:	At about 0900 CDT on May 3, 2011, a worker helping to install a network switch box inside a power supply relay cabinet contacted an energized component and received a mild shock. The worker felt a tingling sensation in their arm. The worker subsequently was taken to the Argonne Medical Department for examination. After examination the worker was released with a "no injury" determination and returned to work with no restrictions. The worker was one of two main control room operators assigned to assist an APS IT group in installing/replacing network switches located around the APS accelerator system as part of an IT network upgrade. The operators worked as a pair for this assignment. They had replaced approximately a dozen switches prior to the incident. The network switch being installed at the time the shock occurred was rack mounted inside a relay cabinet belonging to a power supply group. The cabinet was fed from a 120 VAC, 20A breaker in a power distribution panel and powered an internal power strip and a power supply for other components mounted in the cabinets. The power supply was located at the bottom of the cabinet and its open end was covered with a clear Plexiglas shield. A wire from the power supply was routed to a small transformer in a secondary power supply used to provide 24 VDC to various components. The secondary power supply was mounted immediately below the slot where the network switch was being installed. The door to the cabinet was posted as "DANGER-ELECTRICAL HAZARD-EXPOSED 120 Volts AC INSIDE CABINET". The employees did not contact the power supply group which owned the cabinet and did not request to have a LOTO applied to the cabinet prior to installing the switch. Both employees stated in their initial interviews after the incident that they felt all exposed voltages were located under the Plexiglas shield covering the open end of the power supply located at the bottom of the cabinet. They failed to detect the transformer located higher in the cabinet that was being fed from that power supply. The network switch was inserted from the cabinet front by one worker while the other worker reached into the cabinet between components installed above and below the slot being used in order to grab the rear of the network switch box to hold it while the first worker fastened it in

	place. The worker contacted the live feed to the transformer while holding the rear switch. Both workers had received NFPA 70E required training and were current in that training. Neither worker was wearing PPE for working around energized electrical equipment. The electrical severity index for this incident was calculated to be 3150 (high).
Cause Description:	
Operating Conditions:	Facility was shut down for scheduled maintenance.
Activity Category:	Maintenance
Immediate Action(s):	The worker was taken to the Argonne Medical Department for examination. After examination the worker was released with a "no injury" determination and returned to work with no restrictions. A formal investigation team is being formed to evaluate the incident and to perform a causal analysis. The network involved was reviewed to determine how many switches were located inside power supply cabinets. Two out of 155 switches were, including the one involved in this incident. These two switches have been removed from the cabinets and have been wall mounted so no one needs to go into power supply cabinets in the future to work on them.
FM Evaluation:	
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	Yes. Before Further Operation? No By Whom: Facility Manager designee By When:
Division or Project:	X-Ray Science Division
Plant Area:	PAR Mezzanine
System/Building/Equipment:	power supply/Building 412/relay cabinet
Facility Function:	Accelerators
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	01K--Inadequate Conduct of Operations - Lockout/Tagout Noncompliance (Electrical) 01M--Inadequate Conduct of Operations - Inadequate Job Planning (Electrical)

	08A--OSHA Reportable/Industrial Hygiene - Electrical Shock 08H--OSHA Reportable/Industrial Hygiene - Safety Noncompliance 12C--EH Categories - Electrical Safety 14E--Quality Assurance - Work Process Deficiency
HQ Summary:	On May 3, 2011, a worker helping to install a network switch box, inside a power supply relay cabinet, contacted an energized component and received a mild electrical shock. The worker was taken to medical for evaluation. After examination, the worker was released with a "no injury" determination and returned to work with no restrictions. The worker was one of two main control room operators who were assigned to assist an Advanced Photon Source (APS) IT group in installing/replacing network switches located around the APS accelerator system as part of an IT network upgrade. They had replaced approximately a dozen switches before the event. The network switch being installed, at the time the shock occurred, was rack-mounted inside a relay cabinet belonging to a power supply group. The cabinet was fed from a 120-volt, 20-amp breaker in a power distribution panel that powered an internal power strip and a power supply for other components mounted in the cabinets. Both workers had received NFPA 70E required training and were current in that training; however, neither worker was wearing PPE for working around energized electrical equipment. A formal investigation team was formed to evaluate the incident and to perform a causal analysis.
Similar OR Report Number:	
Facility Manager:	Name: BARKALOW, THOMAS W Phone: (630) 252-9243 Title: SUF ESH/QA COORDINATOR
Originator:	Name: BRINDLE, SUSAN K Phone: (630) 252-6286 Title: ORPS COORDINATOR
HQ OC Notification:	Date: NA; Time: NA; Person Notified: NA; Organization: NA
Other Notifications:	05/03/2011 14:03 (CTZ) Susan Brindle COA 05/03/2011 14:15 (CTZ) John Houck DOE-ASO
Authorized Classifier(AC):	

4)Report Number:	SC--FSO-FNAL-FERMILAB-2011-0002 **After 2003 Redesign**
Secretarial Office:	Science
Lab/Site/Org:	FERMI National Accelerator Laboratory
Facility Name:	FERMI National Accelerator Lab.(BOP)

Subject/Title:	Inadvertent Grounding of a 120 V Electrical Contact Point
Date/Time Discovered:	05/24/2011 16:00 (CTZ)
Date/Time Categorized:	05/25/2011 13:58 (CTZ)
Report Type:	Final
Report Dates:	Notification 05/27/2011 16:07 (ETZ) Initial Update 06/10/2011 09:05 (ETZ) Latest Update 06/10/2011 09:05 (ETZ) Final 06/10/2011 09:05 (ETZ)
Significance Category:	3
Reporting Criteria:	2C(2) - Failure to follow a prescribed hazardous energy control process (e.g., lockout/tagout) or a site condition that results in the unexpected discovery of an uncontrolled hazardous energy source (e.g., live electrical power circuit, steam line, pressurized gas). This criterion does not include discoveries made by zero-energy checks and other precautionary investigations made before work is authorized to begin.
Cause Codes:	A3B1C01 - Human Performance Less Than Adequate (LTA); Skill Based Errors; Check of work was LTA -->couplet - A4B1C03 - Management Problem; Management Methods Less Than Adequate (LTA); Management direction created insufficient awareness of the impact of actions on safety / reliability A3B1C04 - Human Performance Less Than Adequate (LTA); Skill Based Errors; Infrequently performed steps are performed incorrectly -->couplet - A4B1C04 - Management Problem; Management Methods Less Than Adequate (LTA); Management follow-up or monitoring of activities did not identify problems A3B1C03 - Human Performance Less Than Adequate (LTA); Skill Based Errors; Incorrect performance due to mental lapse -->couplet - A4B1C04 - Management Problem; Management Methods Less Than Adequate (LTA); Management follow-up or monitoring of activities did not identify problems A4B1C03 - Management Problem; Management Methods Less Than Adequate (LTA); Management direction created insufficient awareness of the impact of actions on safety / reliability A6B1C02 - Training deficiency; No Training Provided; Training requirements not identified
ISM:	2) Analyze the Hazards
Subcontractor Involved:	No
Occurrence Description:	On May 24, 2011, Fermilab MINOS/MINERvA experiment collaborators were investigating a problem with a power supply mounted inside a chassis at the MINOS underground cavern near the MINOS detector at Fermilab. The collaborators turned off the power supply in the power supply rack and began investigating the power supply with a borescope in

	the power supply chassis. The collaborators did not turn off the 208 V AC power to the power supply rack. During the inspection, the borescope made contact with the exposed AC lug inside the chassis and an arc flash occurred. It is important to note that the power supply operates between two phases of a 208 V three plug, however the contact point was to ground thus making this a 120 V AC incident. The operator of the borescope was not shocked and there was no significant damage to either the borescope or the power supply. Even though the collaborators had received electrical safety training, they did not perform a zero energy check of the power supply or recognize the need to isolate the source of the 208 V power to the power supply. Despite having multiple energy inputs/outputs, there were no specific procedures for accessing the power supplies.
Cause Description:	The collaborators were unfamiliar with the internals and the hazards contained within the power supply. They performed a quick assessment of the hazards and decided to de-energize the DC side of the power supply, neglecting to de-energize the AC line in the power supply. They did not have any procedures for accessing the power supplies in-situ. Though the supervisor of the task understood that power was going into and leaving the chassis, the supervisor did not communicate the need to de-energize and isolate the chassis from the incoming power. Though the supervisor of the task understood the need to de-energize and isolate the chassis from the incoming power the supervisor was also unfamiliar with the requirement for a zero energy check before conducting work inside the chassis. Only one of the crew members were trained in LOTO, and NFPA 70E and authorized to apply a local and tag. The collaborators were working on a piece of equipment that was transferred to them when they acquired it from another experiment. There were not adequate shutdown procedures to put the equipment into a safe state for maintenance.
Operating Conditions:	Normal
Activity Category:	Inspection/Monitoring
Immediate Action(s):	Stop of work activity, interviews conducted, information gathering.
FM Evaluation:	A task as simple as this can pose great risk. It is mandatory that employees must understand and limit their activities to choose that they are qualified and trained to do. Particle Physics Division's investigation will provide more thorough understanding of the event and what actions are needed to prevent a future occurrence.
DOE Facility Representative Input:	
DOE Program Manager Input:	

Further Evaluation is Required:	No
Division or Project:	Particle Physics Division
Plant Area:	MINOS Underground
System/Building/Equipment:	MINOS underground cavern near the MINOS detector
Facility Function:	Balance of Plant - Infrastructure (Other Functions not specifically listed in this Category)
Corrective Action 01:	**Target Completion Date:**08/12/2011 **Actual Completion Date:**
	Communicate training/hazard analysis requirements for tasks involving hazards to supervisors and lead experiment/project personnel. This would include, but not limited to, Hazard Awareness training, LOTO level 2, Electrical Safety in the Workplace (NFPA 70E), etc
Corrective Action 02:	**Target Completion Date:**08/12/2011 **Actual Completion Date:**
	Experiments/projects to work with system and equipment designers to create basic shutdown procedures enabling experimenters and technicians to maintain equipment in a safe state.
Corrective Action 03:	**Target Completion Date:**06/24/2011 **Actual Completion Date:**
	This would include, but not limited to, Communicate the ability to stop a job when not sure of the task, roles and responsibilities are not clear, or any safety issues that arise.
Corrective Action 04:	**Target Completion Date:**08/12/2011 **Actual Completion Date:**
	Reevaluate the need for electrical safety training in departments that conduct work described as on or near exposed live/energized parts or on equipment or circuits which are or may be energized and face a non-incidental risk of injury due to electrical arc flash, electrical shock or other electrical hazards. Update ITNAs accordingly. Training classes are being updated as elements of the new NFPA 70E standard.
Lessons(s) Learned:	
HQ Keywords:	01A--Inadequate Conduct of Operations - Inadequate Conduct of Operations (miscellaneous) 01F--Inadequate Conduct of Operations - Training Deficiency 01G--Inadequate Conduct of Operations - Inadequate Procedure 01K--Inadequate Conduct of Operations - Lockout/Tagout Noncompliance (Electrical) 01P--Inadequate Conduct of Operations - Inadequate Oral Communication 01R--Inadequate Conduct of Operations - Management issues 08H--OSHA Reportable/Industrial Hygiene - Safety Noncompliance 08J--OSHA Reportable/Industrial Hygiene - Near Miss (Electrical) 11I--Other - Visiting Scientist/Researcher or Student Employee 12I--EH Categories - Lockout/Tagout (Electrical or Mechanical) 14B--Quality Assurance - Training and Qualification Deficiency

	14D--Quality Assurance - Documents and Records Deficiency 14E--Quality Assurance - Work Process Deficiency
HQ Summary:	On May 24, 2011, while Fermilab MINOS/MINERvA experiment collaborators were investigating a power supply problem at the MINOS underground cavern, a borescope touched an exposed energized AC lug with a resulting arc flash. The collaborators did not turn off the 208-volt AC power to the power supply rack. The power supply operates between two phases of a 208-volt three phase supply; however, the contact point was to ground making this a 120-volt AC event. The borescope operator was not shocked and there was no significant damage to either the borescope or the power supply. Even though the collaborators had received electrical safety training, they did not perform a zero energy check of the power supply or recognize the need to isolate the source of the power to the power supply. Despite having multiple energy inputs/outputs, there were no specific procedures for accessing the power supplies. The collaborators were unfamiliar with the internals and the hazards contained within the power supply. They performed a quick hazard assessment and de-energized the DC side of the power supply, neglecting to de-energize the AC line in the power supply. Though the task supervisor understood that power was going into and leaving the chassis, the supervisor did not communicate the need to de-energize the chassis. An event investigation is underway.
Similar OR Report Number:	1. SC-CH-BA-FNAL-FERMILAB-1991-1006
	2. SC-CH-BA-FNAL-FERMILAB-1998-0004
	3. SC--FSO-FNAL-FERMILAB-2008-0003
	4. SC--FSO-FNAL-FERMILAB-2010-0003
Facility Manager:	Name: Bruce Chrisman Phone: (630) 840-2359 Title: Chief Operating Officer
Originator:	Name: James, William Phone: (630) 840-8901 Title: EMERGENCY PLANNER
HQ OC Notification:	Date: NA; Time: NA; Person Notified: NA; Organization: NA
Other Notifications:	05/25/2011 16:00 (CTZ) Dennis Parzyck DOE-FSO 05/25/2011 16:00 (CTZ) Bruce Chrisman COO
Authorized Classifier(AC):	

5)Report Number:	SC--PNSO-PNNL-PNNLBOPER-2011-0005 **After 2003 Redesign**

Secretarial Office:	Science
Lab/Site/Org:	Pacific Northwest National Laboratory
Facility Name:	Energy Research Programs (PNNL)
Subject/Title:	Failure to Follow Hazardous Energy Control Process
Date/Time Discovered:	05/31/2011 10:50 (PTZ)
Date/Time Categorized:	05/31/2011 15:17 (PTZ)
Report Type:	Notification
Report Dates:	Notification 06/02/2011 12:05 (ETZ) Initial Update Latest Update Final
Significance Category:	3
Reporting Criteria:	2C(2) - Failure to follow a prescribed hazardous energy control process (e.g., lockout/tagout) or a site condition that results in the unexpected discovery of an uncontrolled hazardous energy source (e.g., live electrical power circuit, steam line, pressurized gas). This criterion does not include discoveries made by zero-energy checks and other precautionary investigations made before work is authorized to begin.
Cause Codes:	
ISM:	4) Perform Work Within Controls
Subcontractor Involved:	No
Occurrence Description:	On May 31, 2011, at 1050 hours, a staff member opened a door to a 480V chiller located on the north side of the Atmospheric Measurements Laboratory (AML) Building. Opening the door with exposed 480V electrical hazards is not in compliance with the PNNL Hazardous Energy Control Program. There were no personnel injuries or shocks associated with this event.
Cause Description:	
Operating Conditions:	Partly Cloudy / Precip 0.12 inches / Wxcode "tl" / Temp 75* F
Activity Category:	Inspection/Monitoring
Immediate Action(s):	The chiller door was closed and notifications were made. A critique was held Wednesday, June 1, 2011.
FM Evaluation:	
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	Yes. Before Further Operation? No

	By Whom: By When:
Division or Project:	Fundamental and Computational Sciences Directorate
Plant Area:	RCHN Area
System/Building/Equipment:	Atmospheric Measurement Laboratory (AML)
Facility Function:	Laboratory - Research & Development
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	01K--Inadequate Conduct of Operations - Lockout/Tagout Noncompliance (Electrical) 08H--OSHA Reportable/Industrial Hygiene - Safety Noncompliance 12C--EH Categories - Electrical Safety 14E--Quality Assurance - Work Process Deficiency
HQ Summary:	On May 31, 2011, a staff member opened a door to a 480-volt chiller, where exposed 480-volt hazards were present, on the north side of the Atmospheric Measurement Laboratory Building. The door opening to a location with exposed 480-volt electrical hazards was not in compliance with the PNNL Hazardous Energy Control Program. There were no personnel injuries or shocks associated with this event. Management notifications were made and a critique was held.
Similar OR Report Number:	
Facility Manager:	Name: Schmid, B. Phone: (509) 375-2996 Title: Mgr, ARM Aerial Facility and Climate Physics Group
Originator:	Name: POLLARI, ROGER A Phone: (509) 371-7700 Title:
HQ OC Notification:	Date: NA; Time: NA; Person Notified: NA; Organization: NA
Other Notifications:	Date: 05/31/2011; Time: 15:19 (PTZ); Person Notified: Carlson, J. L.; Organization: PNSO
Authorized Classifier(AC):	Pollari, R. A. Date: 06/02/2011

6)Report Number:	SC--TJSO-JSA-TJNAF-2011-0004 **After 2003 Redesign**
Secretarial Office:	Science
Lab/Site/Org:	Thomas Jefferson National Accelerator Site
Facility Name:	Thomas Jefferson Nat'l Accelerator
Subject/Title:	TEDF-11-0503-NEW Utility Strike Near Miss at TEDF Construction Site

Date/Time Discovered:	05/03/2011 08:50 (ETZ)
Date/Time Categorized:	05/03/2011 16:50 (ETZ)
Report Type:	Notification
Report Dates:	Notification 05/06/2011 08:32 (ETZ) Initial Update Latest Update Final
Significance Category:	3
Reporting Criteria:	10(3) - A near miss, where no barrier or only one barrier prevented an event from having a reportable consequence. One of the four significance categories should be assigned to the near miss, based on an evaluation of the potential risks and the corrective actions taken. (1 of 4 criteria - This is a SC 3 occurrence)
Cause Codes:	
ISM:	
Subcontractor Involved:	Yes Bay Electric
Occurrence Description:	While potholing to locate a gas line in hard soil, a subcontractor employee opted to use a mini-excavator to break up the soil in the vicinity adjacent to the visibly marked utility location. The bucket teeth of the mini excavator hit the control and power conduit for the Test Lab basement sump pumps, breaking the PVC conduit but not impacting the electrical cabling inside. Use of the mini-excavator instead of hand digging was in violation of JLab policy and the approved dig permit that had been issued and approved for that particular job that morning. The approved dig permit called for hand digging and positive utility location in accordance with the markings. Additionally, the spotter did not intervene.
Cause Description:	
Operating Conditions:	Normal Construction Activity
Activity Category:	Construction
Immediate Action(s):	Work was stopped until the situation could be properly assessed. Power was secured to the location via a double tag-out, at which point the severity of damage to the conduit, electrical panel and cabling was assessed. A safety stand down and fact finding meeting was held with the subcontractor, prime contractor and JLab representatives.
FM Evaluation:	

DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	No
Division or Project:	Technical Engineering and Design Facility (TEDF)
Plant Area:	TEDF Site
System/Building/Equipment:	New Construction
Facility Function:	Accelerators
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	05D--Mechanical/Structural - Mechanical Equipment Failure/Damage 08F--OSHA Reportable/Industrial Hygiene - Industrial Operations Issues 08H--OSHA Reportable/Industrial Hygiene - Safety Noncompliance 08J--OSHA Reportable/Industrial Hygiene - Near Miss (Electrical) 11G--Other - Subcontractor 12G--EH Categories - Industrial Operations 14E--Quality Assurance - Work Process Deficiency 14G--Quality Assurance - Procurement Deficiency
HQ Summary:	On May 3, 2011, while potholing to locate a gas line in hard soil at the Technical Engineering and Design Facility site, the bucket teeth of a mini excavator hit and broke a section of PVC conduit that contained the control and power for the Test Lab basement sump pumps. The electrical cabling inside the conduit was not impacted. A subcontractor employee had opted to use the mini-excavator to break up the soil in the area adjacent to the visibly marked utility location. Use of the mini-excavator instead of hand digging was in violation of JLab policy and the approved dig permit for the job, which required hand digging and positive utility location in accordance with the utility markings. There was a spotter, but the spotter did not intervene. Work was stopped until the situation could be properly assessed. After power was secured to the location using a double tag-out, the severity of damage to the conduit, electrical panel, and cabling was assessed. A safety stand-down and fact finding meeting were held with the subcontractor, prime contractor, and JLab representatives.
Similar OR Report Number:	
Facility Manager:	Name: SMITH, STEPHEN JAY Phone: (757) 269-7007 Title: LEAD QUALITY AND SAFETY ENGINEER
Originator:	Name: SMITH, STEPHEN JAY Phone: (757) 269-7007

	Title	LEAD QUALITY AND SAFETY ENGINEER

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
05/03/2011	11:00 (ETZ)	Steve Neilson	TJSO

Authorized Classifier(AC): Stephen Smith Date: 05/05/2011