



Sandia National Laboratories Electrical Safety Update

Presented to the Sandia Field Office
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Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Agenda

- News
- Electrical Safety Performance
- Program Initiatives
- FMOC Initiatives
- Open Discussion

ELECTRICAL SAFETY PERFORMANCE

Current Metrics

- ESI for FY (through 3/1/14) is 19.28; Rolling 12 month average is 21.29. (DOE Average through January was 22.8)
- 5 events
 - 4 moderate severity (50, 110, 2x 330)
 - 1 low severity (0)
- Averaging 1 Event / month
- For reference
 - 2013 – 8 Events, 4 of moderate severity
 - 2012 – 9 Events, 7 of moderate severity
 - 2011 – 8 Events, 8 of moderate severity

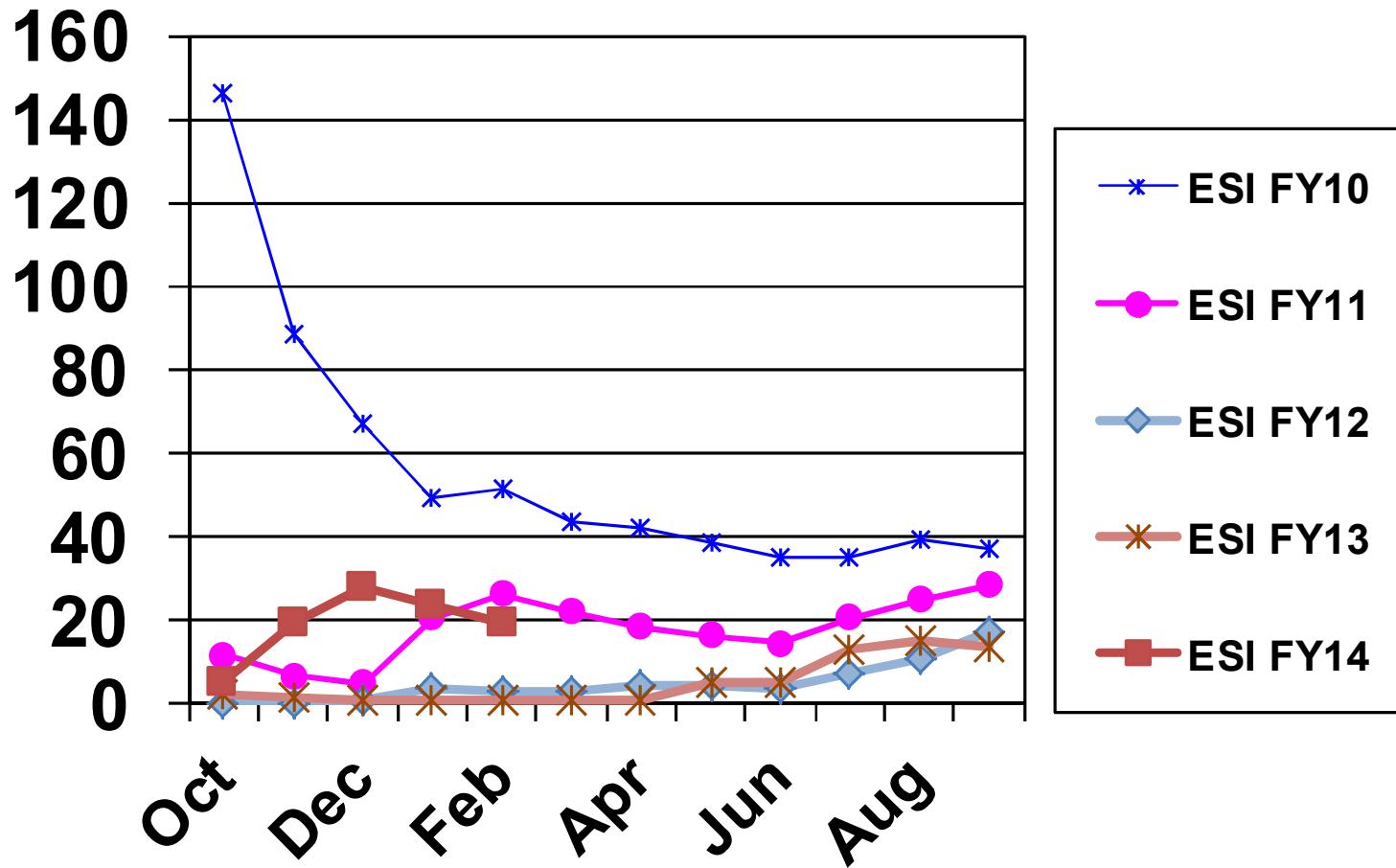
Event Summary

- 10/15/13 – Mechanical Contractor Cut Conduit (ES = 50)
- 11/18/13 – Battery Charger Plug Shock (ES = 330)
- 12/11/13 – Plug shock while on ladder (ES = 330)
- 12/16/13 – Failure to apply LOTO when required (ES = 0)
- 1/23/14 – Performance of Unauthorized Energized Work (ES = 110)

NOTES:

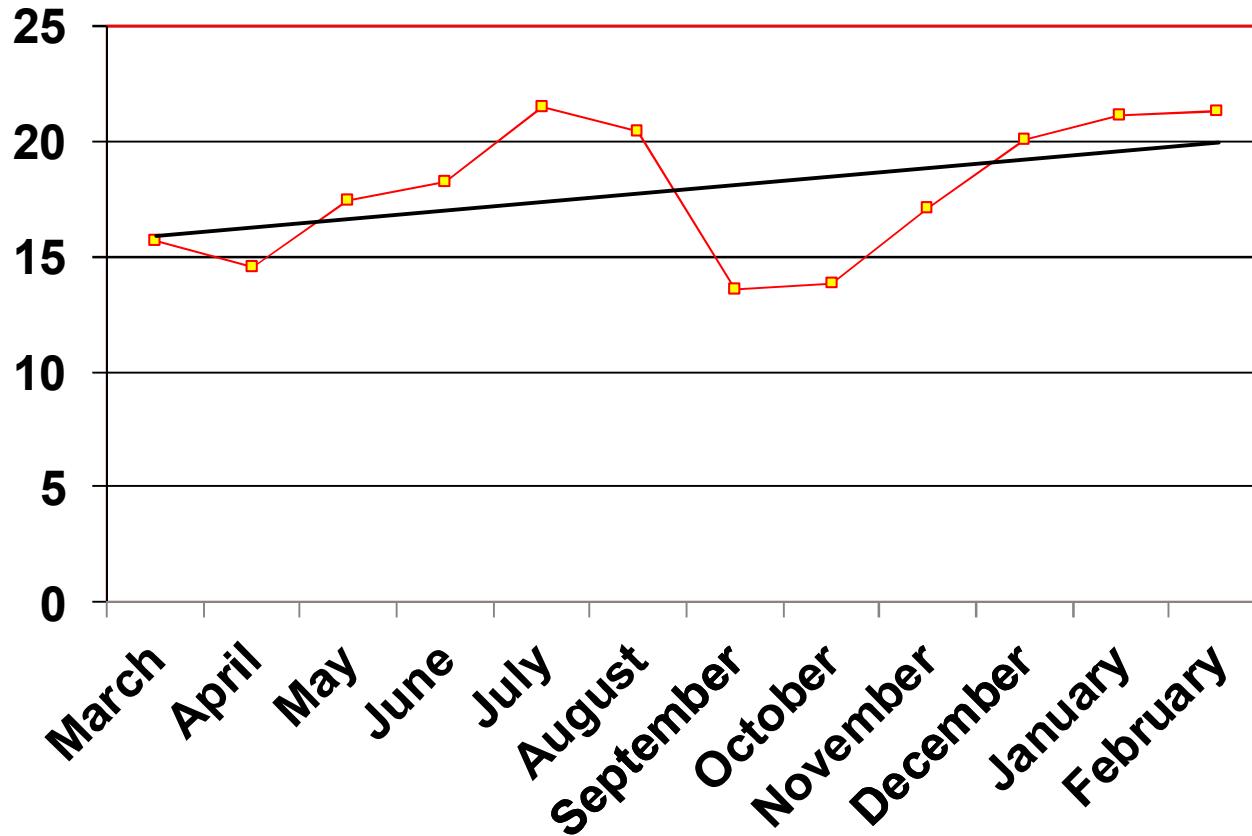
- Red indicates a shock or other injury
- ES is Electrical Severity based on the DOE Electrical Safety Handbook Appendix F, where a severity of 330 equates to a dry, 120 VAC 1 handed shock; Low severity is 1-30; Moderate severity is 31-1749, and high severity is ≥ 1750

Electrical Safety Severity Indices from FY10 (Last 5 years)

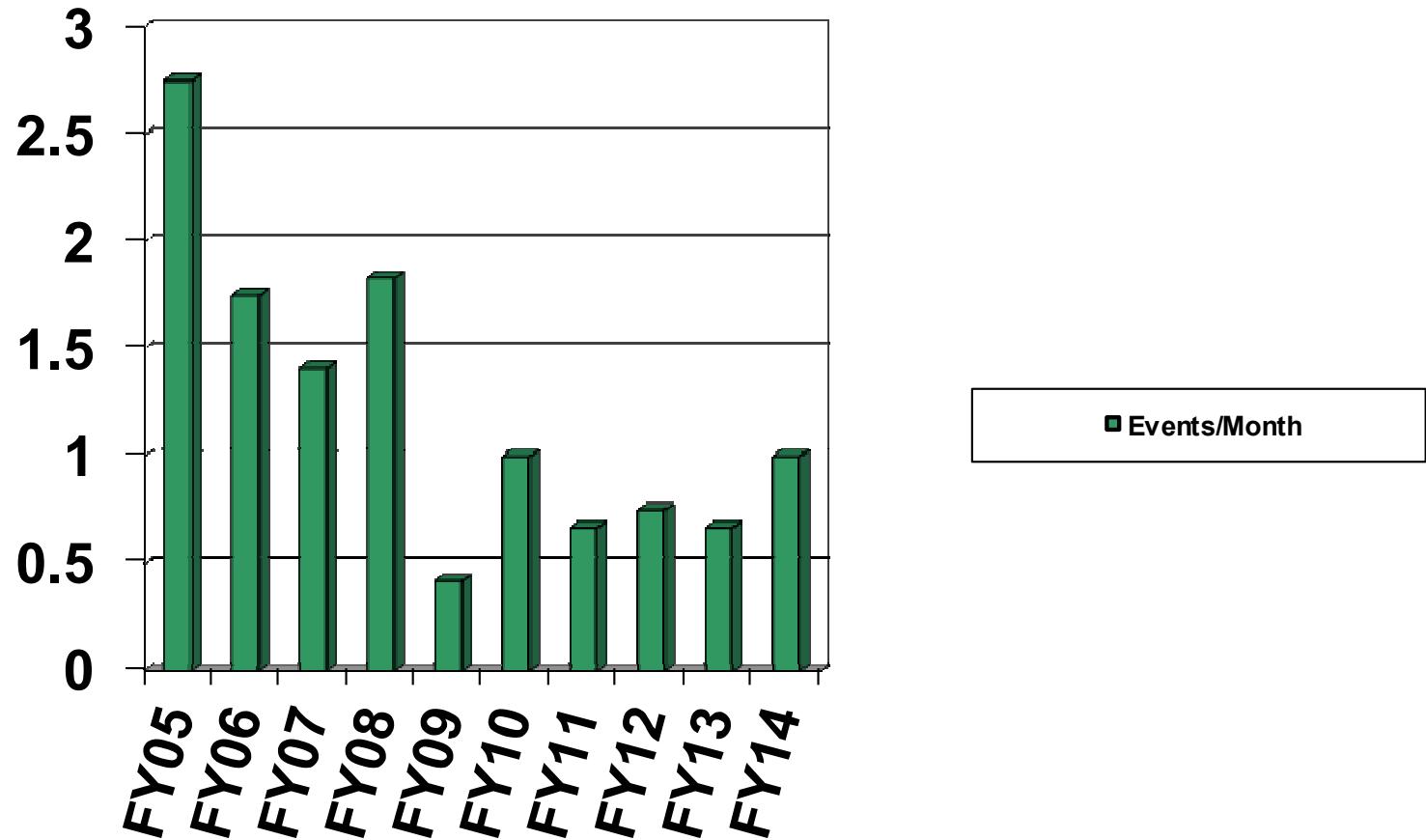


Electrical Safety Severity Indices

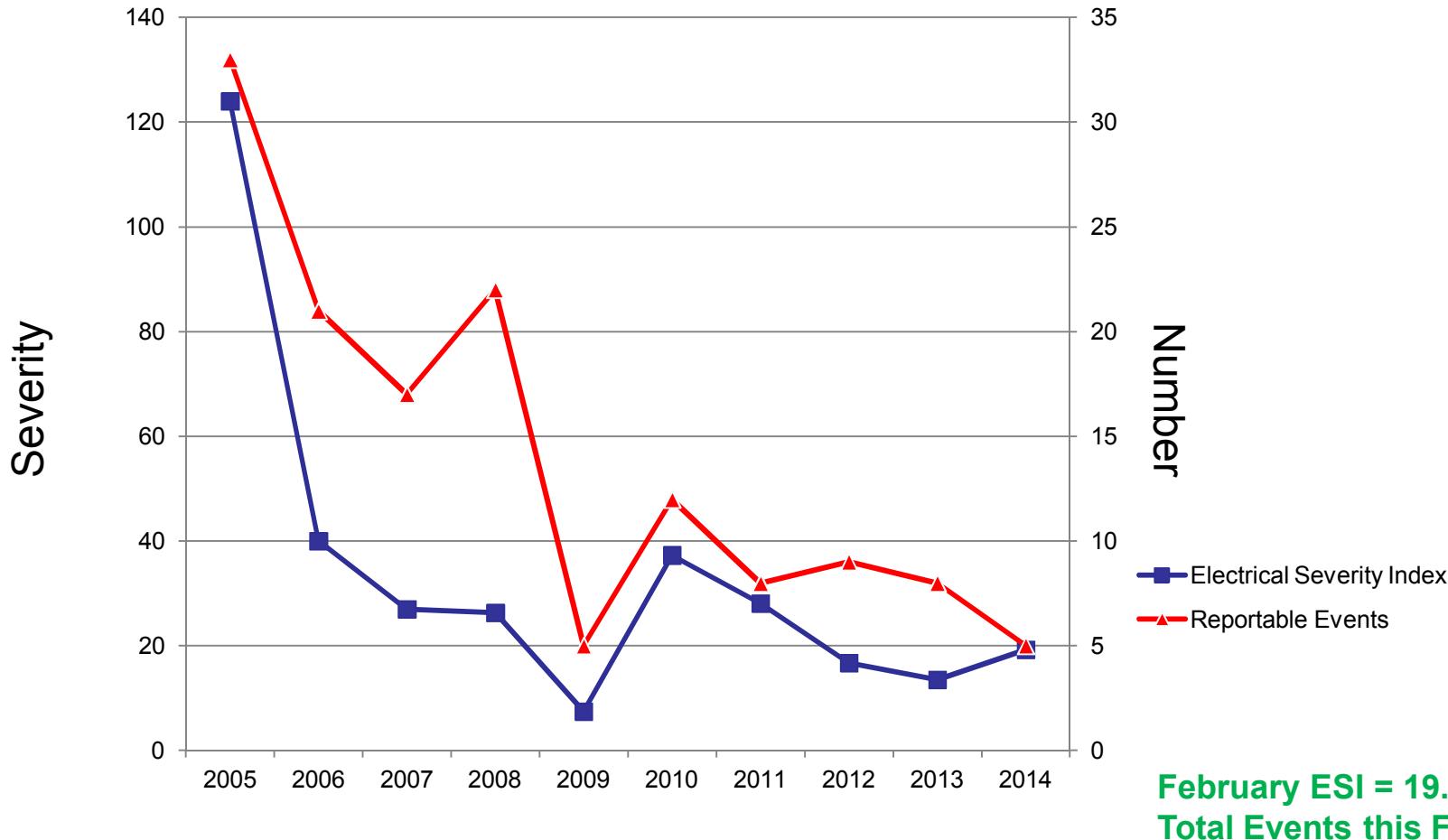
Rolling 12-Months



Electrical Events/Month by Year



ESI vs. Events



Event Review and Analysis

- October event (cut pipe) was a subcontractor who used a Sawzall blade that was too long, and his situational awareness was limited because of his ladder placement. This is the first event of this type since October 2012.
- The two shocks resulted from workers not paying attention to finger position while plugging equipment into standard receptacles.
- One event was a disregard of existing procedures, although the procedures had been recently revised and trained on
- Last event involved a worker who was working on a plug and cord connected device who mistakenly believed that the device was unplugged – a screwdriver grounded the circuit, tripping the distribution breaker

PROGRAM INITIATIVES

Program Initiatives

- Completed Extent of Condition Assessments
 - Contracted Activity Lockout/Tagout
 - LOTO Zero Energy Verification Review
- Planned Assessments for FY14
 - NFPA 70E Work Observations – Q4 FY14
 - Electrical Safety Awareness – ECD 6/30/14 in conjunction with National Electrical Safety Month

Program Initiatives

- Other activities
 - Unlisted Equipment Causal Analysis – Actions
 - Electrical Safety for Electrical Worker Improvements
 - Electrical Safety for Managers of Electrical Workers
 - Engineered Safety Support
 - Electrical Safety Month
 - Committee Oversight of Program

Contracted Activities Electrical Lockout/Tagout (AIS 4226)

- What we did:
 - Evaluated approximately 60 contracts likely to require energized work activities
 - Interviewed Sandia Designated Representative (SDR)
- What we found:
 - SDR was not always engaged in the activity
 - ES&H Coordinator Involvement improved process
- What we are doing:
 - Working with procurement to improve SDR electrical safety awareness
 - Evaluating results of corporate Kaizen on contracted services to determine additional requirements
 - Planned additional chapter to the Electrical Safety Manual to manage contracted electrical activities

Electrical Zero-Energy Verification

Extent of Condition Review (AIS 5799)

- What we did:
 - Observed zero-energy verification of 7 LOTO procedures
- What we found:
 - PPE not tested (3x)
 - Re-verification Requirements not known (2x)
 - Failed to attempt to start the equipment (2x)
 - Failed to post Limited Approach Boundary (2x)
- What we are doing:
 - Additional assessment due to small sample size
 - Awareness information to all LOTO workers on verification requirements and results of review
 - Developing an awareness “card” provided to all workers
 - Additional information on verification in LOTO training

Planned Assessments

- Electrical Safety Awareness
 - ECD 6/30/14
 - Many events are associated with non-electrical workers
 - Three parts – all lab employees, electrical workers, managers
 - Will identify gaps in existing awareness methods and aid in improving program
- NFPA 70E Required Energized Work Observations
 - ECD 9/30/14
 - Performed to meet requirements of NFPA 70E Art. 110.2 that requires an “inspection conducted on at least an annual basis” for compliance with electrical safety related work practices

Unlisted Equipment Causal Analysis



- **Background:**
 - Performed as a result of a programmatic self-assessment in 2012 suggesting that as much as 35% of the in-use equipment was not listed or inspected under Sandia's equipment inspection program
 - Causal Analysis last June
- **Proposed Corrective Actions:**
 - Site-wide survey to identify equipment
 - Inspection deadlines
 - Procurement assistance to stop/limit/control influx of unlisted equipment
 - Training of more inspectors

Safety for Electrical Workers – ELC200)

- Problem: Course was perceived to be not relevant to the R&D electrical worker, resulting in multiple failures in end-of-course exam
- Solution:
 - Improved presentation
 - Counseled instructor
 - Incorporated R&D events to improve relevance
 - Monitoring of class to ensure objectives are met
 - Revision of exam to more effectively test on critical content

Electrical Safety for Managers (ELC130)



- Based on recommendations of independent review board, the course was made mandatory for managers and senior managers of electrical workers
- All managers must complete class by May 30
- Including an electrical worker qualification guide with the notification to assist managers and senior managers in ensuring that they have the right workers performing the tasks

Engineered Safety Support



- Ongoing Effort
- Completed approximately 20 reviews across the laboratory that incorporated the Electrical Safety Team
- Identified areas in common across the lab for a more global approach:
 - Appendix for critical common items in Electrical Safety Manual
 - High voltage safety boxes – Safety Case and recommended drawings/design criteria
 - Other areas under review based on not fitting neatly into an NFPA 70E category
 - Based on NFPA 70E Art. 110.3 requirement for directing activities appropriate for the electrical hazards, voltage, energy level, and circuit conditions

Electrical Safety Month

- Joint effort with EFCOG
- Theme is electrical equipment: #1 cause of shocks to unqualified personnel is failed equipment
 - Unlisted
 - Counterfeit
 - Maintenance requirements
 - General awareness
- May 1-31 – activities will include web updates, news articles, presentations etc. This is *the* major awareness activity for the program
- Awareness survey will run concurrent with Electrical Safety month (tentative)

Committee Oversight of Program



- Chartered 2 Extent of Condition Reviews based on trending concerns
- Provides programmatic oversight, sets goals for program and committee to ensure clear path forward
- Reviews all reportable electrical events, evaluates for trends, concerns, and directs appropriate additional actions
- Direct link to Executive Management

FMOC INITIATIVES

What is FMOC Seeing in the field for Construction Electrical Trades

- FMOC work practices for NFPA 70E Articles 110 and 120 were solid.
- FY13 had 588 field observations for electrical and LOTO tasks. Of the total electrical regulatory requirements there were **610** that were compliant.
- Barricading can be better thought through to meet the letter of the law. Section Sections 130.4 & 130.4(B)
- Great teaming/communication with maintenance

What we See with Non-Electrical Trades



- Subcontractors do not understand the value of the GFCI.
- Extension cords in areas with man lifts are being damaged on some sites.
- Ceiling areas are not inspected regularly and can have electrical hazards and poor lighting that **need greater evaluations and analysis**. We will be requiring this in the new CSSP submittals.
- Exclusive control for mechanical personnel is still misinterpreted for LOTO.

Maintenance Electrical Safety Initiatives

- Maintenance has purchased a new 3 phase rotation meter “Extech PRT200” that no longer uses direct contact metal clips and replaced with an insulated induction /proximity detection. Rotations should only be done at a downstream 3 phase load this reduces Arc Flash instant energy levels. [No contact]
- Maintenance uses Ross type meter when phasing across low voltage tie breakers this can add distance from the energized system reducing Arc Flash. [Gain distance and safety]

Maintenance Electrical Safety Initiatives (Continued)

- Maintenance no longer requires grounding on transformer primary for protection of secondary system. LOTO will be used and grounding when working on HV system. [Not exposing personnel to hazard]
- Maintenance no longer needs to take voltage and rotation measurements at the Transformer. Prior to energizing acceptance testing proves nominal voltages will be achieved and rotation will be done on downstream loads. [This reduces exposure to high arc flash area.]

Additional Efforts

- Conducted a review of the lessons learned from the Lawrence-Berkley Lab 277 VAC shock to an electrical apprentice
 - Included trades and contractors
 - Evaluated program against lessons learned: “Could this happen at Sandia?”

OPEN DISCUSSION

Summary

- Based on a review of the events, independent audit results, actions in progress, and the low associated severity, the program is targeting appropriate areas for improvement
- Some improvement is necessary in implementation, and this is being worked through the updated training, improved manual, awareness efforts, and other initiatives undertaken by the program and committee