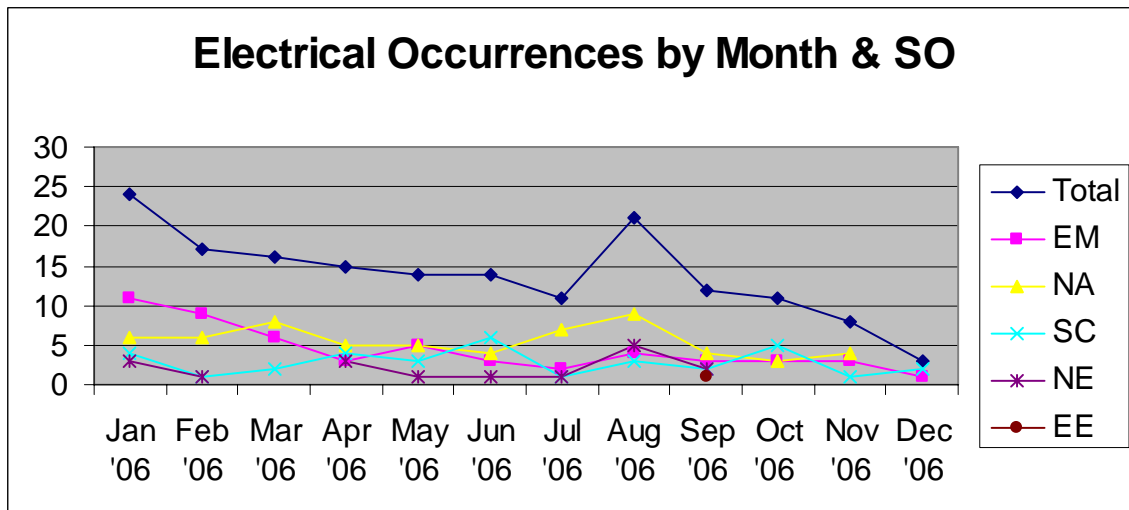


# ELECTRICAL SAFETY OCCURRENCES IN CY 2006

## Rate of Electrical Safety Occurrences

### Trends:

- *DOE facilities experienced 166 electrical safety occurrences in CY 2006 (see Appendices I and II for details). This is near the 165 experienced in 2005, slightly more than the 149 in 2004, and significantly more than the yearly average of 106.5 reported for 2002-2003.*
- *The monthly rate of occurrences generally decreased during 2006 (see chart below). However, there were 16 electrical safety occurrences in January 2007, so the downward trend has not continued since.*



- *There were 26 electrical shocks reported in 2006. This is less than the 39 reported in 2005, near the 25 in 2004 and more than the yearly average of 17.5 per year experienced in 2002-2003.*
- *There were 3 burns from electrical occurrences in 2006, which was less than the 5 experienced in 2005, and the same as the yearly rate for 2004 and 2002-2003. The three burns in 2006 were 1<sup>st</sup> and 2<sup>nd</sup> degree burns resulting from arc flashes. One initiated a Type B Accident Investigation.*
- *41% of the electrical safety occurrences in 2006 were categorized as “Near Miss (Electrical)” by HQ Keywords in ORPS. (In contrast, 68% of the 2005 electrical safety occurrences and 77% of the 2004 electrical safety occurrences were categorized as near misses. The lower percentage of near misses in 2007 is more likely due to a shift in philosophy towards near miss categorization rather than changes in the nature of the occurrences.)*
- *Slightly more than half of the 2006 electrical safety occurrences (i.e., 84 of 166) involved non-electrical workers.*
- *39% of the electrical safety occurrences in 2006 involved subcontractor. (In contrast, only 21% of all 2006 ORPS occurrences involved subcontractors.)*

## Work Activities Associated with 2006 Electrical Safety Occurrences

### Trends:

- *23% of the 2006 electrical safety occurrences involved lockout/tagout issues.*
- *10% involved cutting or drilling activities.*
- *8% involved vehicles striking electrical power lines.*
- *7% involved excavation.*
- *The following is a breakdown of work activities associated with the 2006 electrical safety occurrences, as defined in the ORPS reports:*

<b>ORPS Activity Category</b>	<b>number</b>
Normal Operations (other than Activities listed below)	62
Maintenance	44
Construction	34
Facility Decontamination/Decommissioning	8
Research	8
Facility/System/Equipment Testing	5
Startup	2
Inspection/Monitoring	2
Transportation Onsite	1
<b>Total</b>	<b>166</b>

## Causes of Electrical Safety Occurrences

### Trends:

- *ORPS reports identified a wide variety of apparent causes for electrical safety occurrences in 2006.*
- *Deficiencies in management policy guidance, job scoping, check of work, and communication were the four most commonly identified apparent causes for the 2006 electrical safety occurrences. These were also the top four apparent causes for the 2004 and 2005 electrical safety occurrences.*
- *56% of the 2006 electrical safety occurrences had “Conduct of Operations” assigned in the HQ Keywords.*
- *“Analyze the hazards,” “develop and implement hazard controls,” and “perform work within controls” were the leading ISM Core Functions cited by ORPS report writers for electrical safety occurrences.*

<b>ORPS Code</b>	<b>Apparent Cause Description<sup>1</sup></b>	<b>CY06 No.</b>
A4B1C01	Management policy guidance / expectations not well-defined, understood or enforced	32
A4B3C08	Job scoping did not identify special circumstances and/or conditions	28
A3B1C01	Check of work was LTA	14
A5B4C01	Communication between work groups LTA	14
A4B3C11	Inadequate work package preparation	12
A5B2C08	Incomplete / situation not covered	12
A3B1C03	Incorrect performance due to mental lapse	10
A3B2C05	Situation incorrectly identified or represented results in wrong rule used	10
A4B3C09	Work planning not coordinated with all departments involved in task	10
A4B5C04	Risks / consequences associated with change not adequately reviewed / assessed	10
A3B3C05	Incorrect assumption that a correlation exists between two or more facts	9
A3B1C06	Wrong action selected based on similarity with other actions	8
A3B3C03	Individual justified action by focusing on biased evidence	8
A3B3C01	Attention was given to wrong issues	7
A3B3C06	Individual underestimated the problem by using past events as basis	7
A4B1C03	Management direction created insufficient awareness of the impact of actions on safety / reliability	7
A4B1C04	Management follow-up or monitoring of activities did not identify problems	7
A1B5C02	Physical environment LTA	6
A2B6C01	Defective or failed part	6
A3B1C04	Infrequently performed steps are performed incorrectly	6
A3B2C02	Signs to stop were ignored and step performed incorrectly	6
A4B1C07	Responsibility of personnel not well defined or personnel not held accountable	6
A4B3C06	Planning not coordinated with inputs from walkdowns/task analysis	6
A4B4C02	Progress/status of task not adequately tracked	6
A4B4C03	Appropriate level of in-task supervision not determined prior to task	6
A6B1C02	Training requirements not identified	6
	(87 other causal "C nodes" identified, in quantities of 1 to 5.)	

1. The distribution of apparent causes in this table does not cover all of the electrical occurrences in 2006. Thirty four of the 166 electrical safety occurrences were reported as Significance Category 4 and thus did not require a causal analysis. Because this analysis was made in early February 2007, there may have been a few occurrences in late 2006 that had not completed their causal analyses, and so their apparent causes are not included in the table above.

<b>ORPS Code</b>	<b>ORPS “HQ Keyword” Description</b>	<b>CY06 No.</b>
01A	Conduct of Operations (miscellaneous)	93
08H	Safety Compliance	88
12C	Electrical Safety	87
07D	Electrical Wiring	77
14E	Work Process	70
08J	Near Miss (Electrical)	68
01M	Inadequate Job Planning (Electrical)	67
11G	Subcontractor	59
12K	Near Miss (Could have been a serious injury or fatality)	55
01Q	Personnel error	47
01B	Configuration Management/Control	41
01R	Management issues	40
01K	Lockout/Tagout (Electrical)	39
01P	Communication	38
13E	Facility Call Sheet	31
08A	Electrical Shock	26
14D	Documents and Records	26
08F	Industrial Operations	25
01F	Training	23
01N	Inadequate Job Planning (Other)	21
01O	Maintenance	21
12I	Lockout/Tagout (Electrical or Mechanical)	20
01G	Inadequate Procedure	19
07C	Power Outage	19
01E	Operations Procedures	15
07E	Electrical Equipment	10
14B	Training and Qualification	10
	(33 other keyword categories with counts between 1 and 9)	

<b>ISM Core Functions Cited for Electrical Occurrences</b>	<b>CY06 No.</b>
Define the Scope of Work	21
Analyze the Hazards	80
Develop and Implement Hazard Controls	67
Perform Work Within Controls	67
Provide Feedback and Continuous Improvement	19
N/A (Not applicable to ISM Core Functions as determined by management review.)	8

**Distribution of Electrical Safety Occurrences by Secretarial Offices**

**Trends:**

- *In 2006, NA had the largest percentage of electrical safety occurrences of all DOE Secretarial Offices. (In contrast, EM had the largest percentage electrical safety occurrences in 2002 through 2005.)*
- *NE had a significantly larger percentage of electrical safety occurrences in 2006 than it had in 2002 through 2005.*

Sec Office	No.CY06	% CY06	% CY05	% CY04	% CY02 & 03 <sup>1</sup>
NA	61	37%	42%	31%	28%
EM	53	32%	42%	51%	46%
SC	34	20%	13%	14%	18%
NE	17	10%	2%	1%	3%
EE	1	<1%	0%	0%	0%
RW	0	0%	<1%	2%	4%
FE	0	0%	0%	<1%	1%
total	166	100%	100%	100%	100%

1. Percentages based on distribution in slide from [Electrical Safety Occurrences - Overview of Nature, Causes and Frequency, July 27, 2004.](#)

**Distribution of Electrical Safety Occurrences by Operations, Field & Site Offices**

**Trends:**

- *In 2006, electrical safety occurrences happened at most DOE Operations and Field Offices.*
- *Facilities under the Idaho Operations Office experienced the largest number of electrical safety occurrences in CY 2006.*

Operations, Field or Site Office with Electrical Occurrences	No. CY06
Idaho Operations	26
Los Alamos Site Office	19
Richland Operations	15
Sandia Site Office	13
Livermore Site Office	9
River Protection Operations	8
Stanford Site Office	8
Oak Ridge Operations Office	7
Savannah River Operations	7
Brookhaven Site Office	7
Pantex Site Office	7
Y12 Site Office	7
Argonne Site Office	6
Berkeley Site Office	5

Ohio Operations (includes West Valley & Fernald)	4
Pacific Northwest Site Office	4
Kansas City Site Office	3
Carlsbad Field Office	2
NNSA Service Center	2
Fermi Site Office	2
Portsmouth Paducah Project Office	2
Golden Field Office	1
Nevada Site Office	1
Savannah River Site Office	1
Total	166

### **Summary and Conclusions**

The Department-wide number of electrical safety occurrences in CY 2006 was near the same as the number experienced in CY 2005. The monthly totals for CY 2006 showed an encouraging decreasing trend. However, the monthly total for January 2007 rose significantly and so the trend has not continued.

The causes for electrical safety occurrences appear to be the same as identified in several analyses performed in the last few years. (See the reports listed on the HSS Electrical Safety website: <http://www.hss.energy.gov/CSA/Analysis/electrical.html>.) A Special Operations Report (SOR) issued in August 2006 attempted to solicit more detailed causal information but, as of early February 2007, the SOR findings had not been finalized and issued by the Undersecretaries' offices.

While the SOR addresses the operations and training of electrical workers, it is important to note that typically half of the electrical safety occurrences involve non-electrical workers. Online training for non-electrical workers is available at: [http://www.efcog.org/wg/ism\\_estg/elecsafetytng.htm](http://www.efcog.org/wg/ism_estg/elecsafetytng.htm).

## **APPENDIX I – Identification of the 166 electrical safety occurrences in CY 2006.**

ORPS was searched using the following search criteria to “screen-in” electrical safety occurrences:

Discovery dates (not notification dates) were set for dates in 2006. The following ORPS “HQ keywords” were also keyed in the searches.

01K – Lockout/Tagout Electrical  
01M - Inadequate Job Planning (Electrical)  
08A – Electrical Shock  
08J – Near Miss (Electrical)  
12C – Electrical Safety

The initial search yielded 179 occurrences. Each occurrence was next read to see it really involved electrical hazard hazards. “Recurring Occurrences” were discounted to avoid double counting. The following thirteen 2006 occurrences were culled out for the reasons so cited:

1. EM-ID--CWI-LANDLORD-2006-0007, “Deviation from Work Control Procedure” - LOTO is to prevent alarms, voltage was below 28 VAC.
2. EM-ID--CWI-PHASEOUT-2006-0001, “Lock out Tagout Violation on Crane” - LOTO was for crane movement, not electrical hazard.
3. EM-RL--PHMC-GPP-2006-0004, “Incorrect Isolation Information” - LOTO was for a 24V circuit.
4. EM-RL--PHMC-GENERAL-2006-0002, “Repetitive Issue: Hazardous Energy Control/Lockout-Tagout Process” – Recurring Occurrence
5. EM-RL--PHMC-SOLIDWASTE-2006-0009, “Management Concern Related to Compliance with Work Package Requirements” - Hazard was from rotating equipment, not electrical.
6. EM-RL--WCH-GENAREAS-2006-0005, “Recurring Events Associated with Work Control Issues Resulting in Electrical Hazards” - Recurring Occurrence
7. EM-RP--BNRP-RPPWTP-2006-0011, “Subcontractor Violates WTP Procedure” - LOTO violations was for HVAC ventilation, not electrical hazard
8. EM-SR--WSRC-FCAN-2006-0003, “Severed Antenna Tower Ground Cable (U)” - Hazard from lightning strikes, not conventional electrical hazard.
9. NA--LASO-LANL-TARGETFAB-2006-0001, “Failure to follow equipment postings results in confined space violation” - Hazard was confined space, not electrical.
10. NA--PS-BWXP-PANTEX-2006-0051, “Failure to Adhere to BWXT Subcontractor LO/TO Procedures” - LOTO violation was for HVAC ventilation, not electrical hazard.
11. NA--SS-SNL-NMSITE-2006-0004, “Recurring Occurrence Reports Associated with Performance Analysis of Cause Code A4B5C04” – Recurring Occurrence
12. NA--SS-SNL-SNLCORP-2006-0001, “Hazardous Energy Recurring Occurrence” – Recurring Occurrence
13. SC--PSO-PPPL-PPPL-2006-0002, “Lockout/Tagout Violation” - Heat hazard, not electrical.

The screening and culling above yielded the 166 electrical safety occurrences for 2006 that were considered in this analysis.











0010	
156 SC--PNSO-PNNL-PNNLBOPER-2006-0019	Management Concern Associated with Electrical Shock
157 SC--SSO-SU-SLAC-2006-0002	Carpenter's Screw Penetrates Romex Wire
158 SC--SSO-SU-SLAC-2006-0004	Working Without Applying Personal Locks andTags
159 SC--SSO-SU-SLAC-2006-0006	Subcontractor Cut Lighting Cable.
160 SC--SSO-SU-SLAC-2006-0007	Subcontractor Cut 110/208V AC Energized Electrical Lines
161 SC--SSO-SU-SLAC-2006-0008	Contractor Cuts Energized 110V Line
162 SC--SSO-SU-SLAC-2006-0009	110V Extension Cord Jacket Nick
163 SC--SSO-SU-SLAC-2006-0011	Equipment Electric Fan Shock
164 SC--SSO-SU-SLAC-2006-0012	Cutting of Energized Electrical Wire
165 SC-ORO--ORAU-ORISE-2006-0001	Exposed Live Electrical Wiring in SC-1 Annex Remodeling Project
166 SC-ORO--ORNL-X10SNS-2006-0001	Near-Miss: Subcontractor Electrician Accidentally Drills Into Energized 480-volt Cable