



Electrical Safety

Frank B. Russo

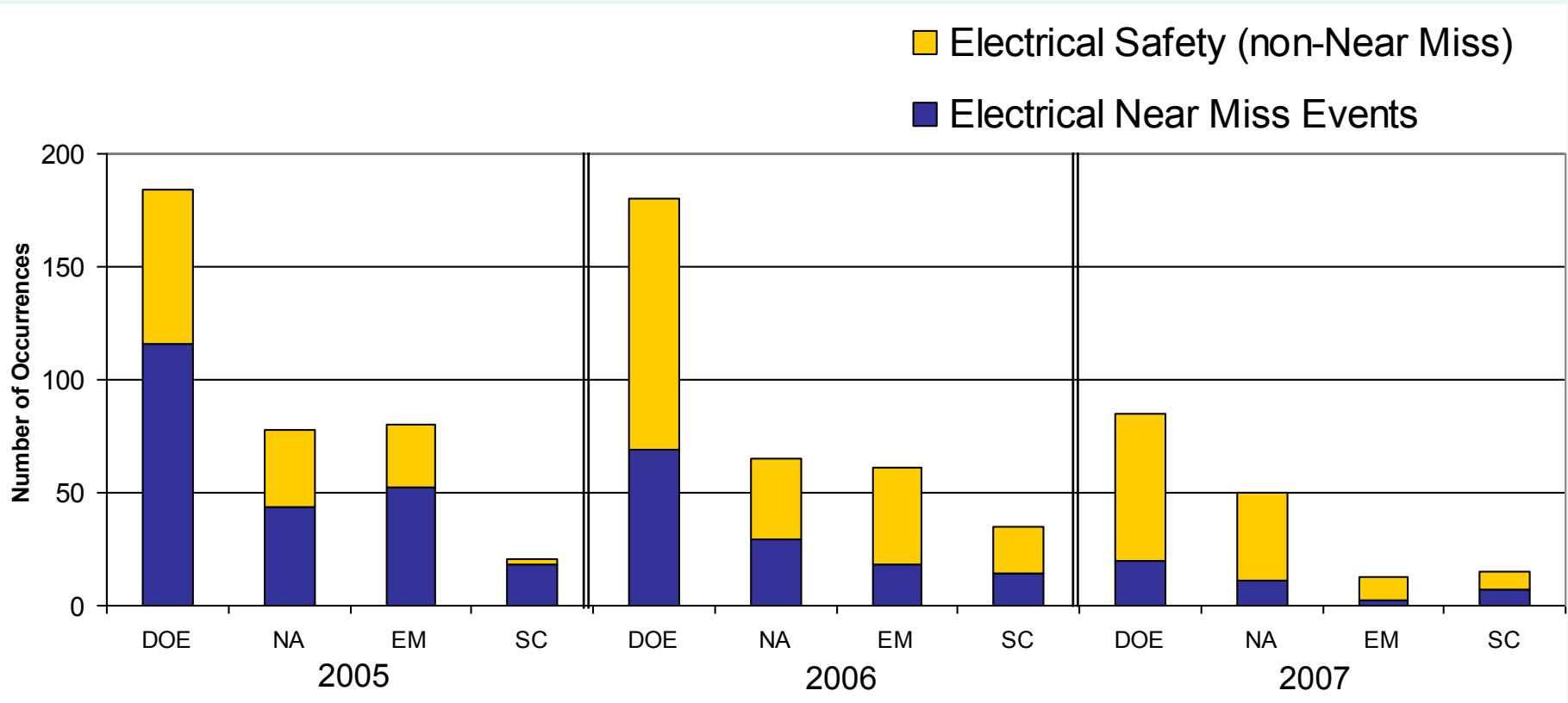
Senior Advisor for ES&H

National Nuclear Security Administration

July 17, 2007

DOE Comparisons.... For CY 05 - 07

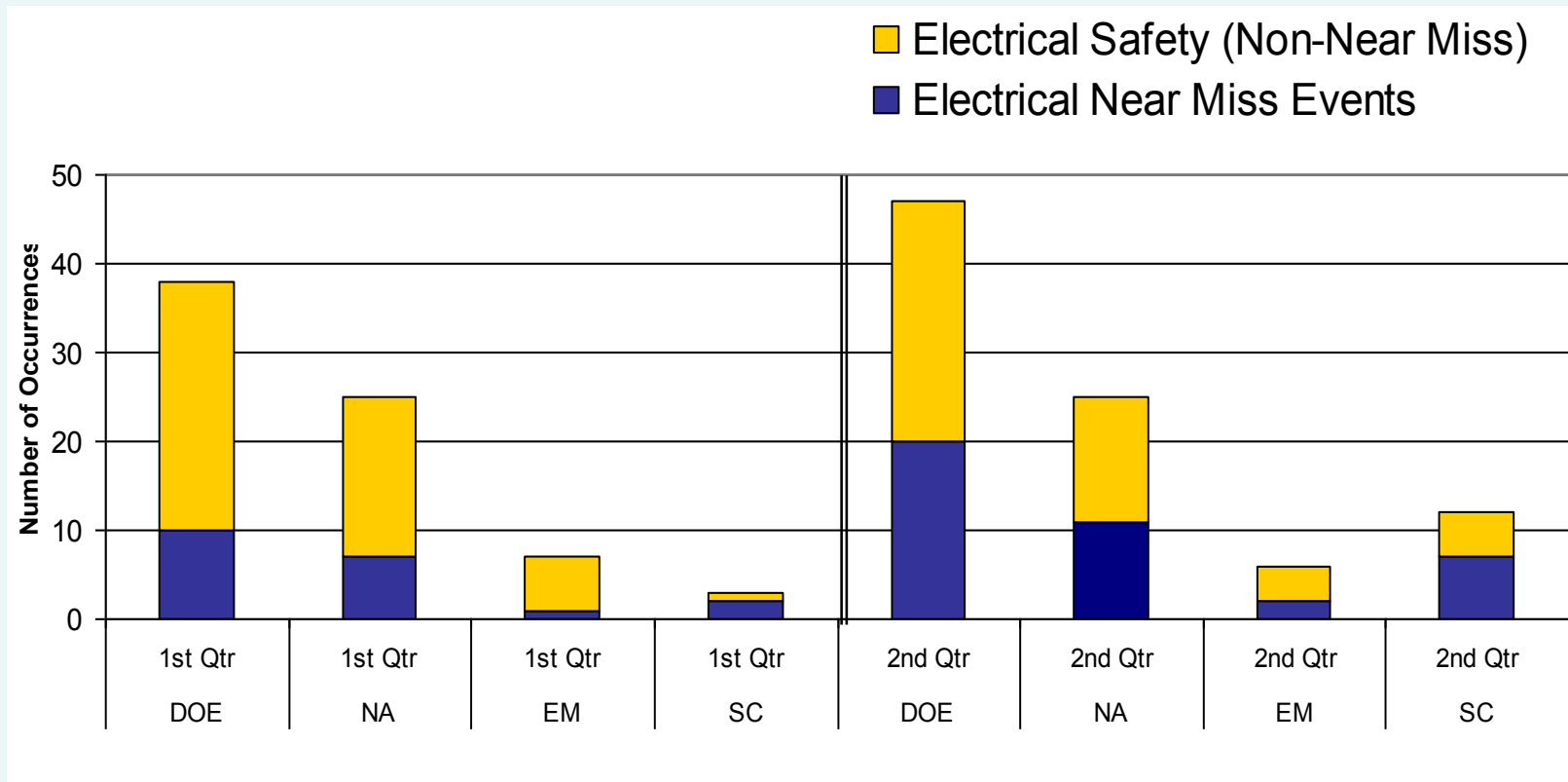
2007 Data is Thru June 30th



Electrical occurrences appear to be decreasing

DOE Comparisons.... By Quarter For CY 2007

Data is Thru June 30th



Second quarter performance declined

Summary of Electrical Safety Occurrences

Causal Factors Breakdown



Year	Electrical Intrusions				LO/TO Issues				Shocks				Electrical Burns			
	DOE	NA	EM	SC	DOE	NA	EM	SC	DOE	NA	EM	SC	DOE	NA	EM	SC
2007	11	6	3	1	18	8	6	3	14	8	0	4	1	1	0	0
2006	38	22	7	5	39	15	16	6	26	13	7	5	3	0	0	3*
2005	36	15	16	5	39	22	16	6	40	23	12	4	4	1*	1*	1*
2004	51	15	25	9	30	8	13	5	25	8	13	4	3	1*	0	1*

Notes: Data thru June 30th 2007

* Each burn due to an arc flash

Electrical intrusions & LO/TO appear to dominate

Major Causes of DOE Electrical Occurrences



Electrical Occurrences (Work Planning/Conduct of Ops)

- LO/TO Program Violations
 - LO/TO requirements not correctly identified
 - LO/TO of electrical energy source not performed properly
 - System LO/TO not controlled or managed properly
- Poor Work Planning
 - Integrated Safety Management System (ISMS) not implemented properly
 - Job Hazardous Analysis not performed or performed incorrectly
- Inadequate Zero Energy Check Program
 - Failure To perform Zero Energy check prior to starting work
 - Inadequate tools or procedures for investigating zero energy

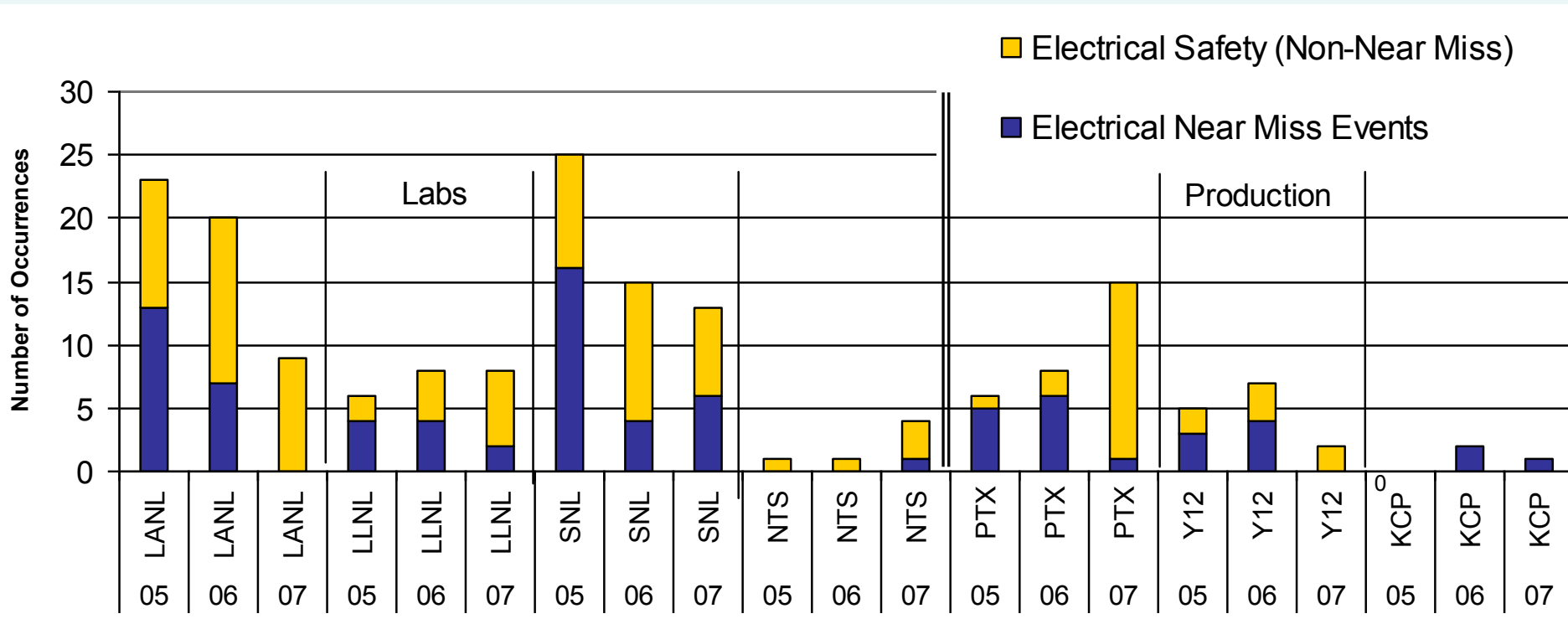
Subcontractor Involvement (Work Planning/Conduct of Ops)

- Lack of prime contractor oversight of hazardous work.
- Subcontractors not following procedural requirements.
- Tend to follow “Skill of the Craft” practices to identify hazards and in application of protective measures

NNSA Electrical Safety Site Comparisons....2005 thru 2007



Data is Thru June 30th

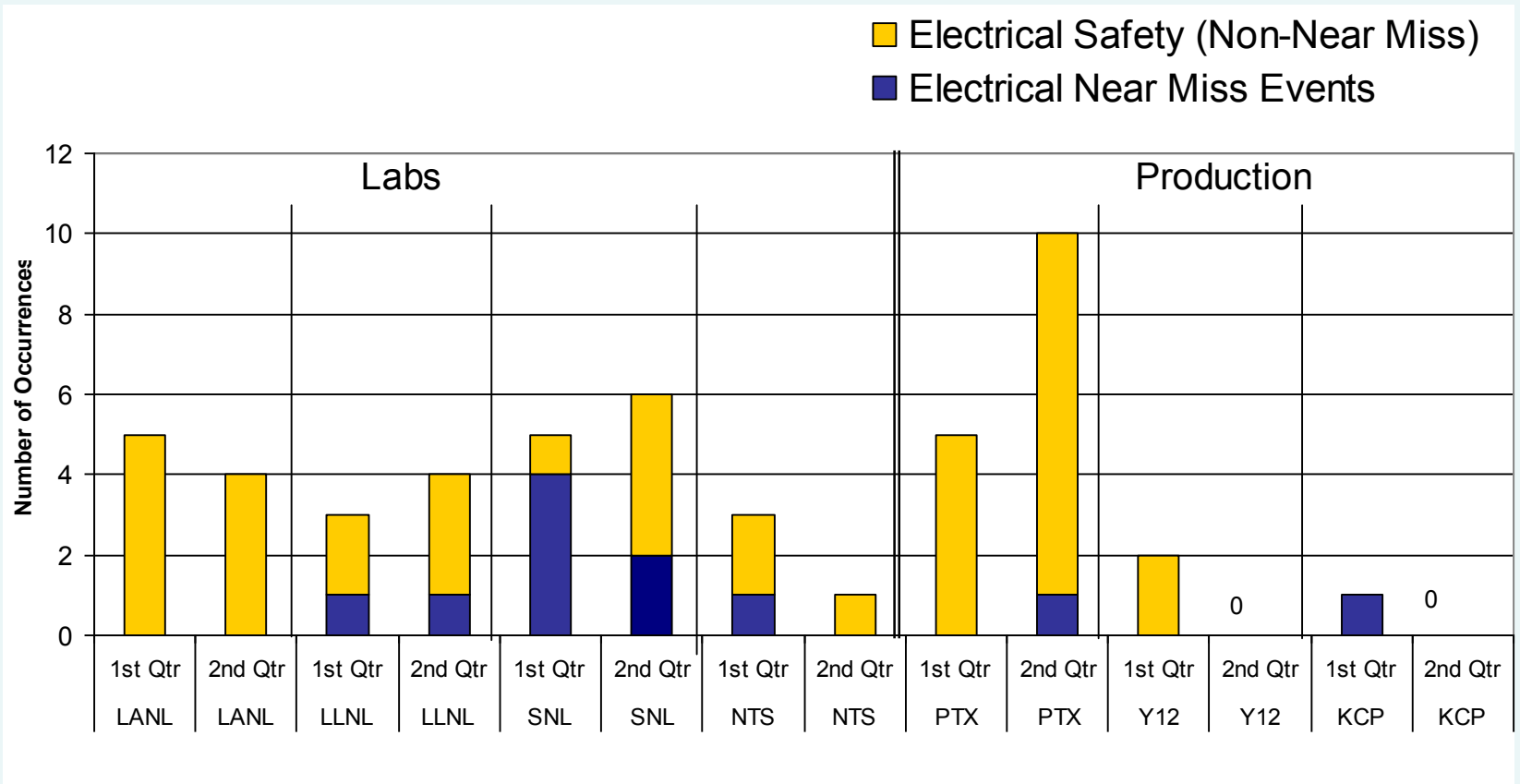


Man-Hours: LANL 22M | LLNL 15.5M | SNL 21M | NTS 3.7M | PTX 8.1M | Y12 10.6M | KCP 5M
CY 2006

Plants lower than labs; Pantex is increasing

NNSA Site Comparisons.... For CY 2007

Data is Thru June 30th



Summary of NNSA Electrical Occurrence Primary Causal Factors



Calendar Year	Electrical Occurrences	Percent (%) Subcontractor Involvement	Electrical Occurrence Primary Causal Factors			
			Inadequate Work Planning (inadequate hazard analysis, inadequate work controls)	Hazardous Energy Control (failure to perform and verify LO/TO)	Electrical Safety Compliance (procedural violations)	Other (e.g., Defective Equipment, Equipment Failures, ORPS Reoccurring Events)
2007*	40	30 %	16	7	11	6
2006	65	46%	27	10	17	11
2005	70	37%	31	15	6	18
2004	44	57%	21	6	11	6

Note: 8% of NNSA employees are subcontractors

*Thru 5-31-07

Subcontractors still a concern



- Lines of Inquiry developed to facilitate self-assessments
- D'Agostino memo, April 12, 2007, provides analysis of NNSA sites response to the Special Operations Report 2006-01 – Electrical Safety, and describes ongoing actions to improve electrical safety performance
 - Activity level work planning and control process improvements being made in response to DOE's IP for DNFSB Recommendation 2004-1 – Oversight of Complex, High-hazard Nuclear Operations.
 - Development of Site Offices oversight processes and procedures and CAS to comply with DOE O226.1 – Implementation of DOE Oversight Policy
 - Improving Electrical Safety Plans to incorporate lessons learned and best practices
- Continue to focus on electrical safety training, e.g., NTC training development underway
- Setup DOE “Center of Excellence” at LANL, e.g., repository of best practices



Backup Slides



June Electrical Safety Metrics

EFCOG

Electrical Safety Subgroup

http://www.efcog.org/wg/ism_estg/elect_events_charts.htm

Data Updated July 9, 2007

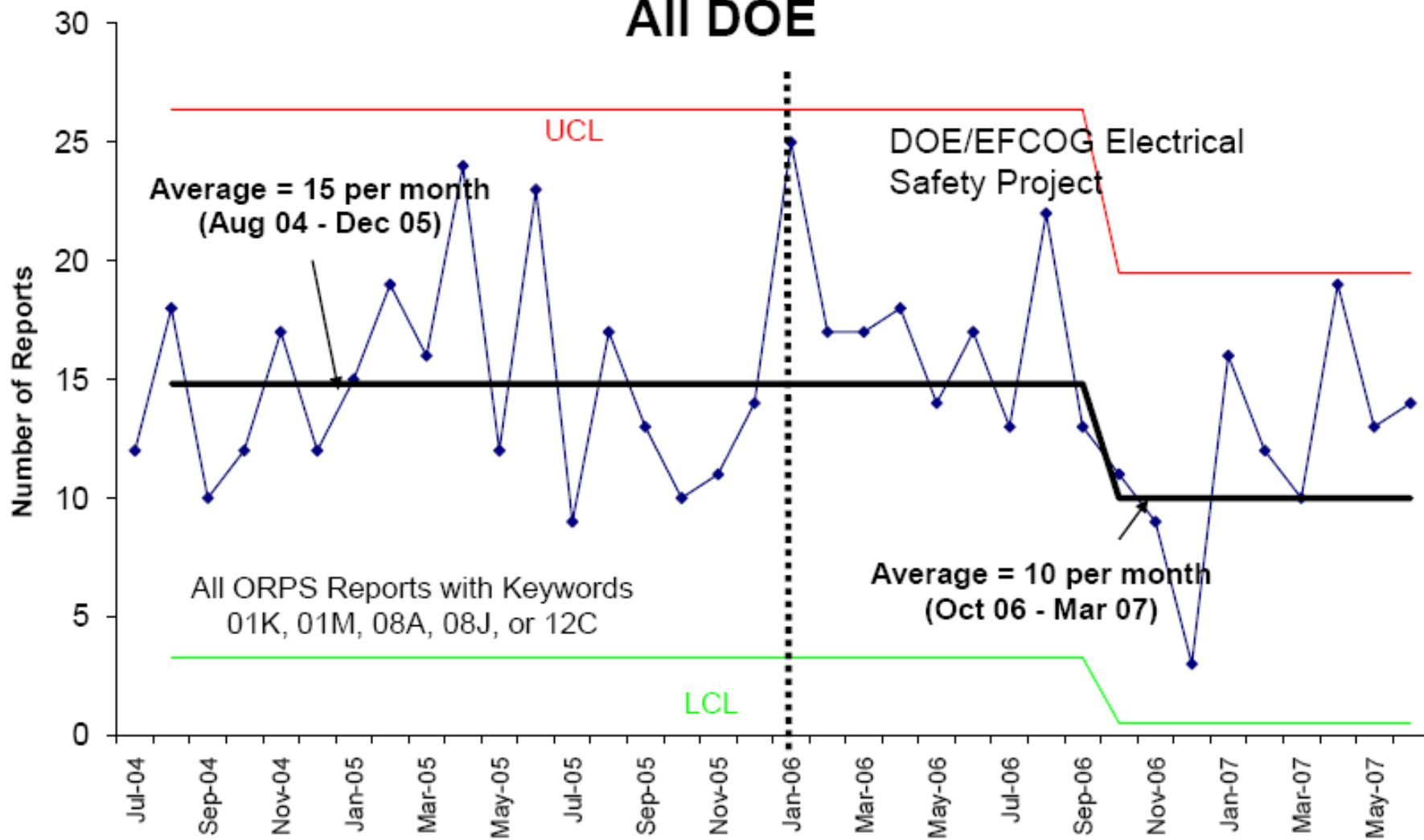


The following charts were made from Department of Energy Occurrence Reporting and Processing System (ORPS) data. The data are from Occurrence Reports with one or more of the following "HQ Keywords"

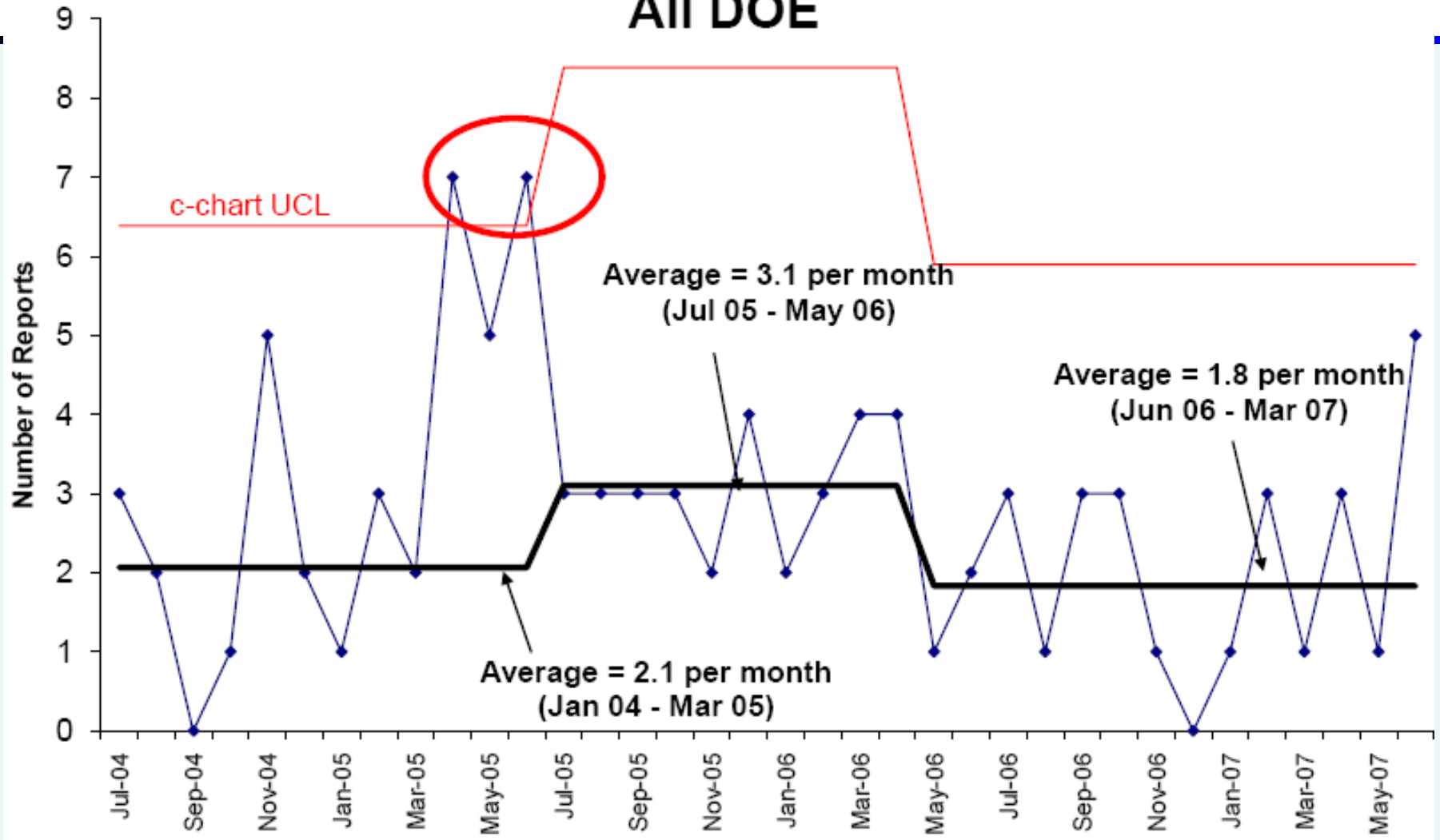
assigned: 01K - Lockout/Tagout (Electrical), 01M - Inadequate Job Planning (Electrical), 08A - Electrical Shocks, 08J - Electrical Near Miss, or 12C - Electrical Safety. Statistical Process Control (SPC) techniques were applied to determine the existence of significant improving or declining trends.

A decreasing trend in overall events did occur in late 2006, dropping from 15 per month to 10 per month. Electrical Near Misses are a primary contributor to the decrease, dropping from 9.9 per month to 4.4 per month. The NA and EM program offices are showing decreasing trends over the past year. It has been six months without an electrical shock at EM, a nearly significant decrease from past rates. Electrical near misses at EM are down from 4.5 per month to stable at 0.8 per month for more than the past year.

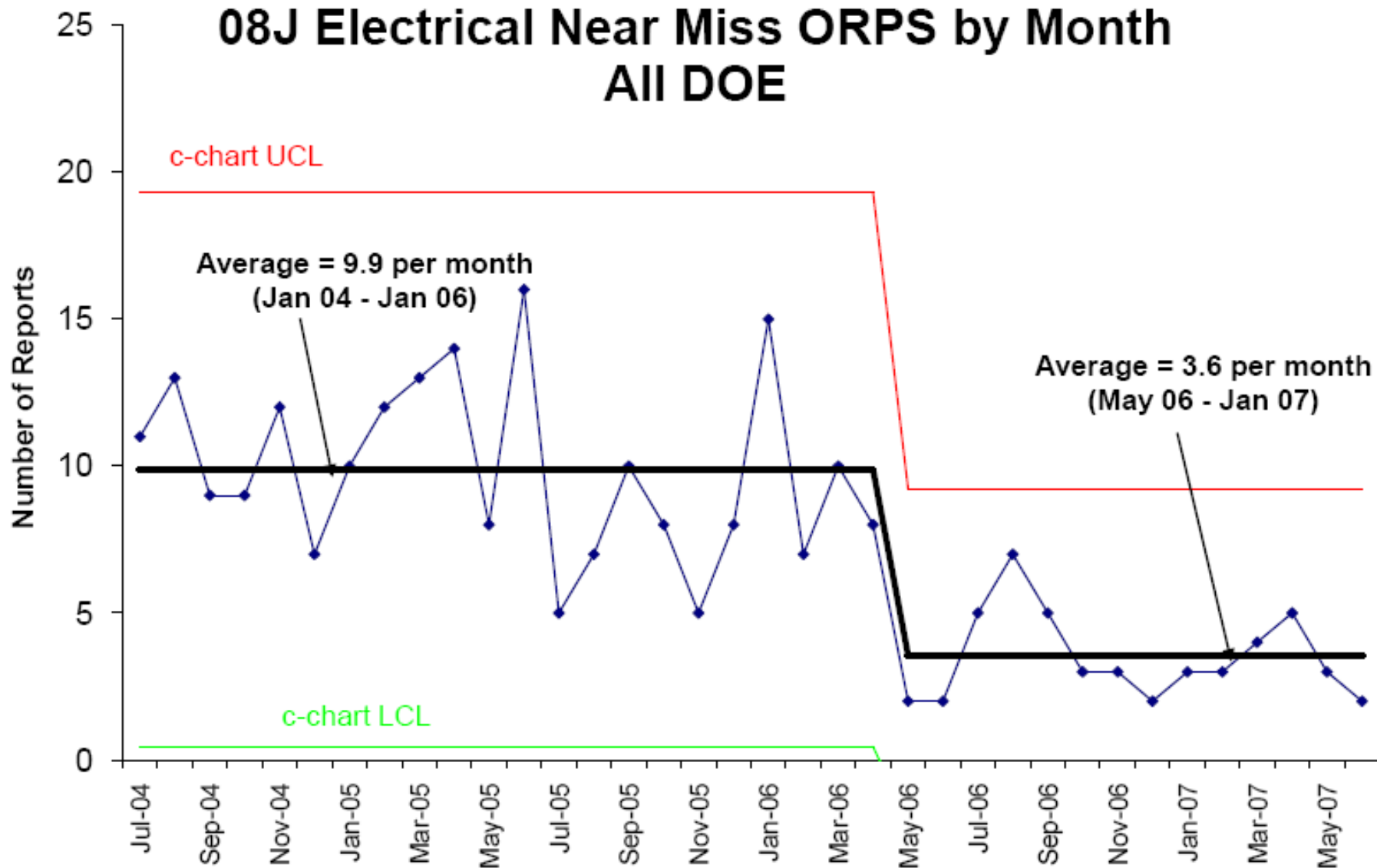
Electrical Events ORPS by Month All DOE



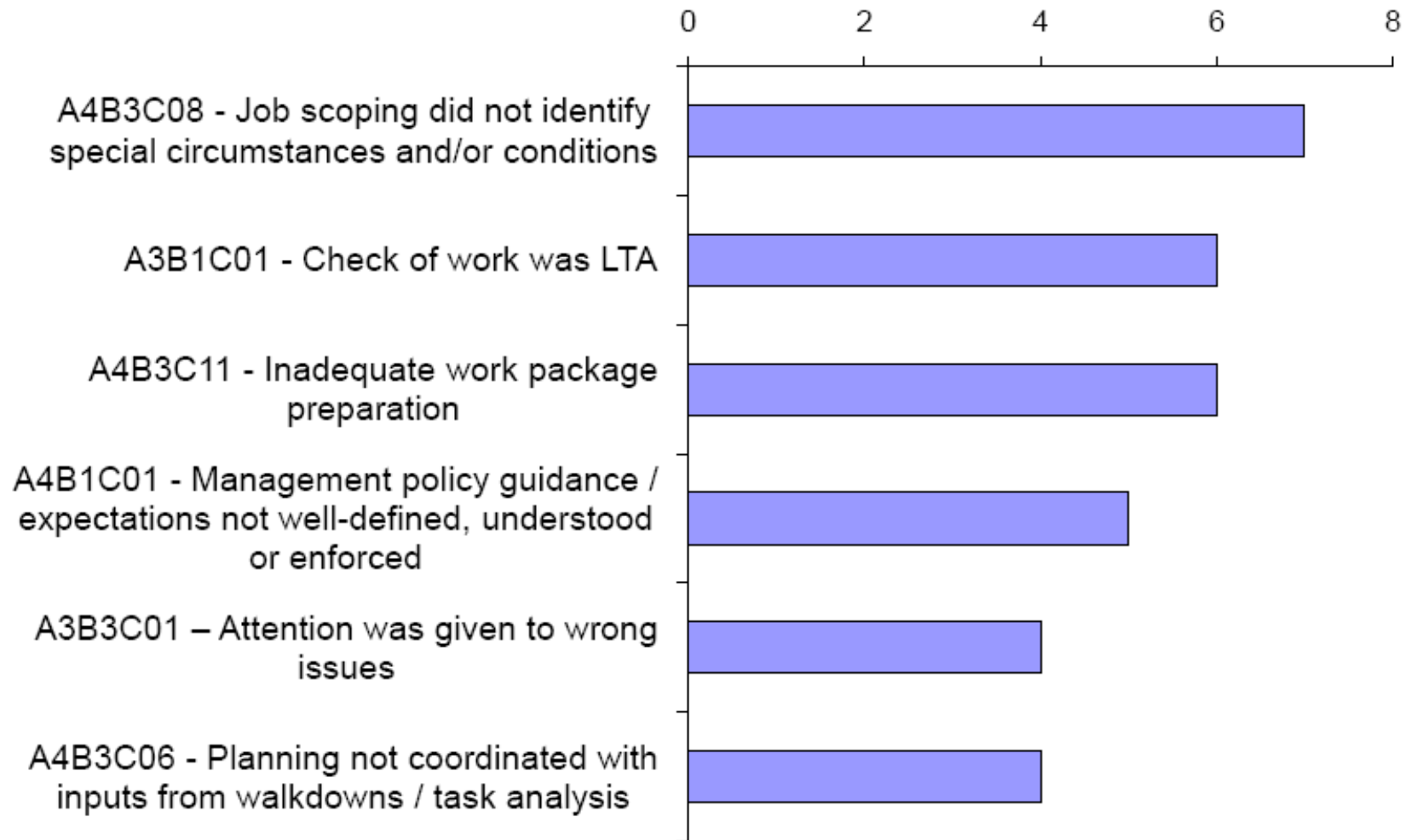
08A Electrical Shocks ORPS by Month All DOE



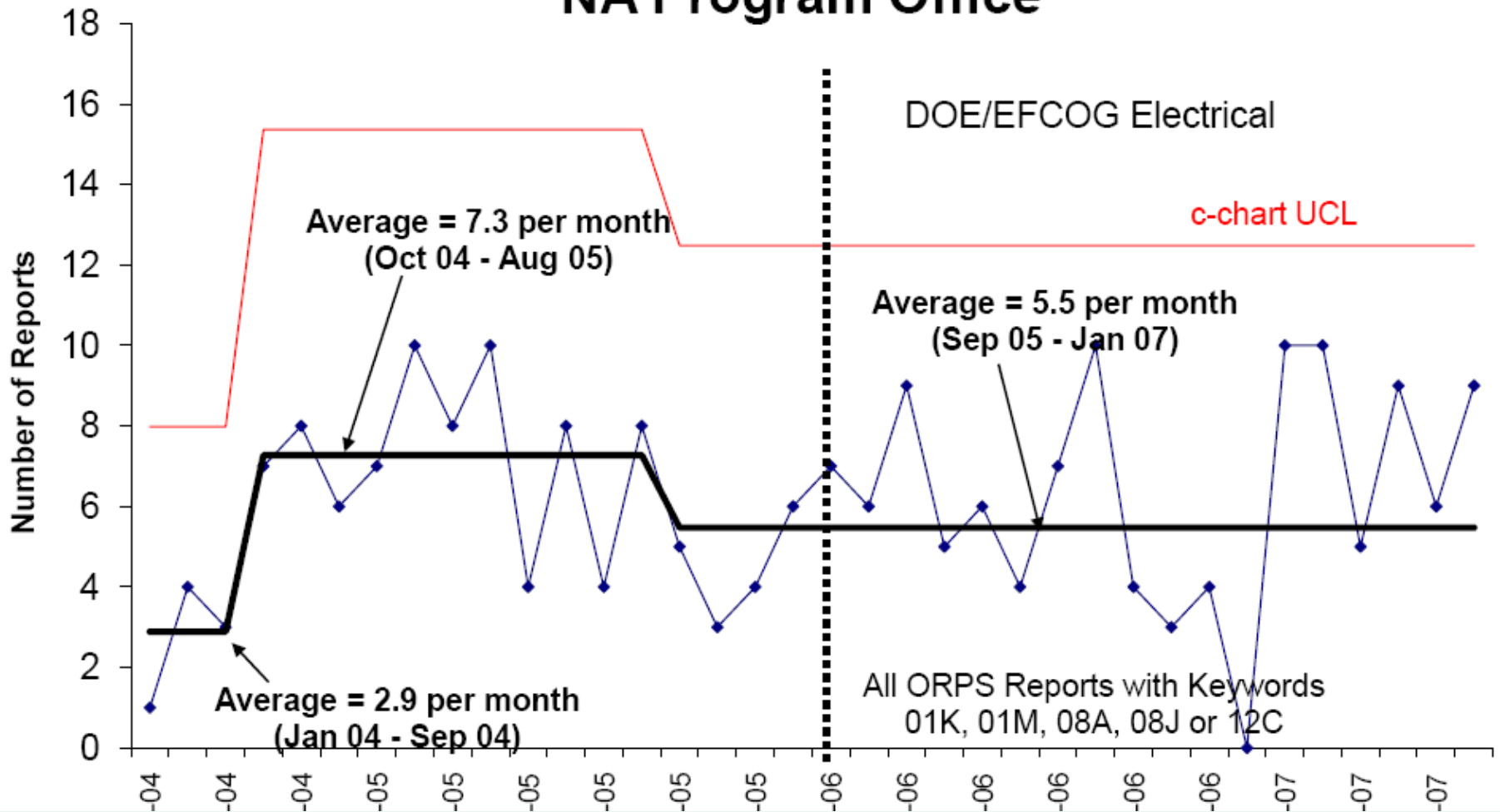
08J Electrical Near Miss ORPS by Month All DOE



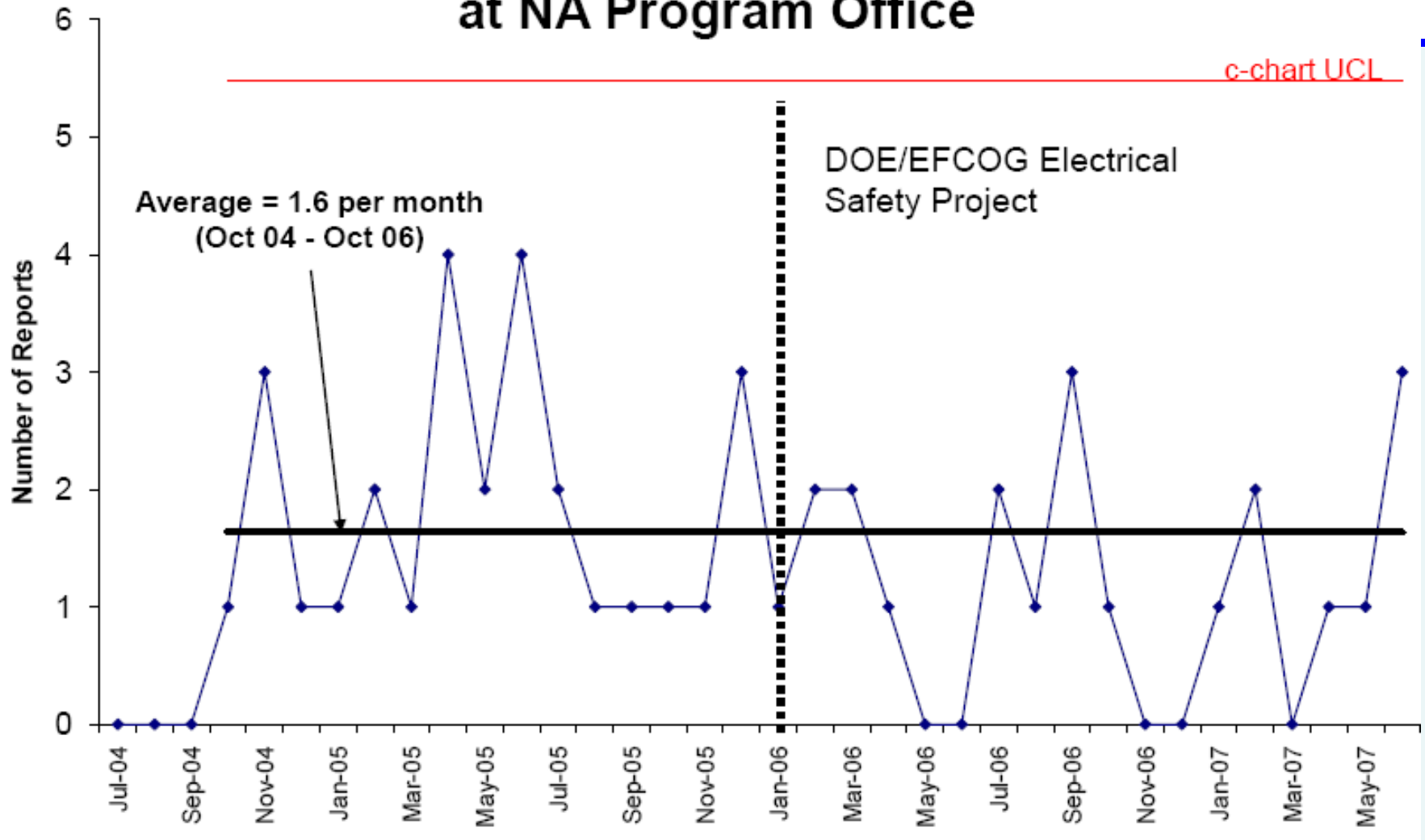
08J Electrical Near Miss - Top 6 Causes, All DOE



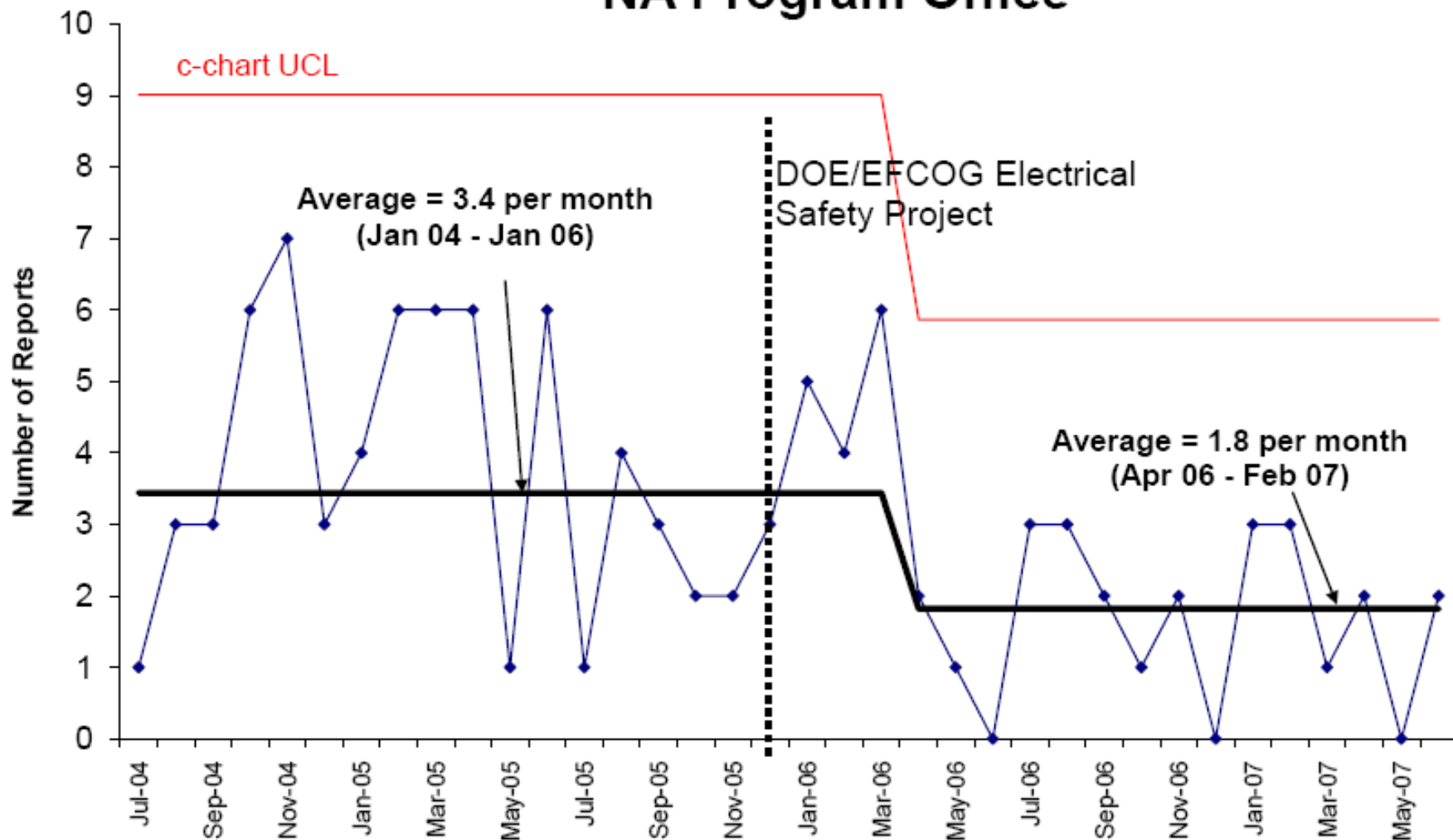
Electrical Events ORPS by Month NA Program Office



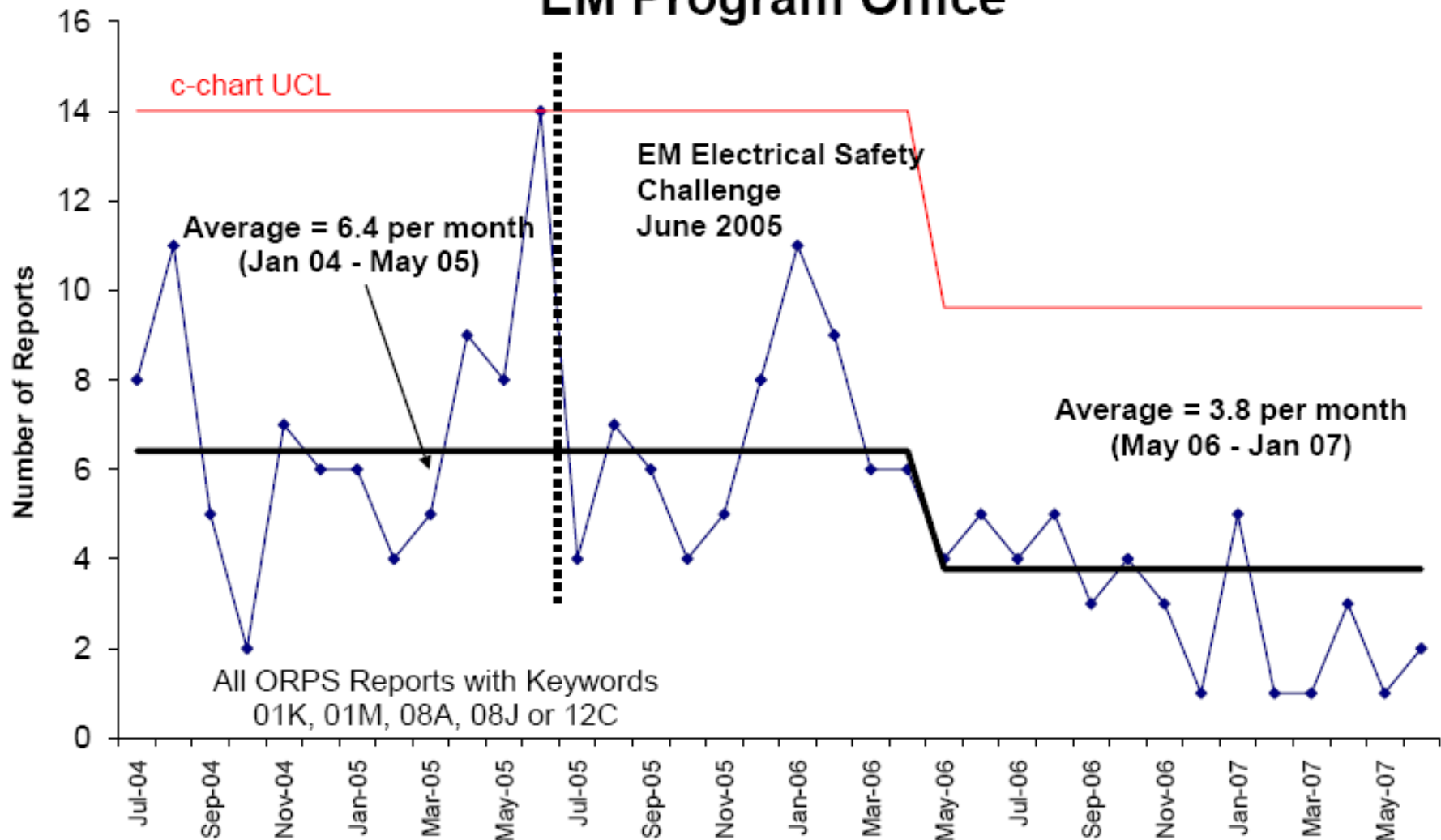
08A Electrical Shocks ORPS by Month at NA Program Office



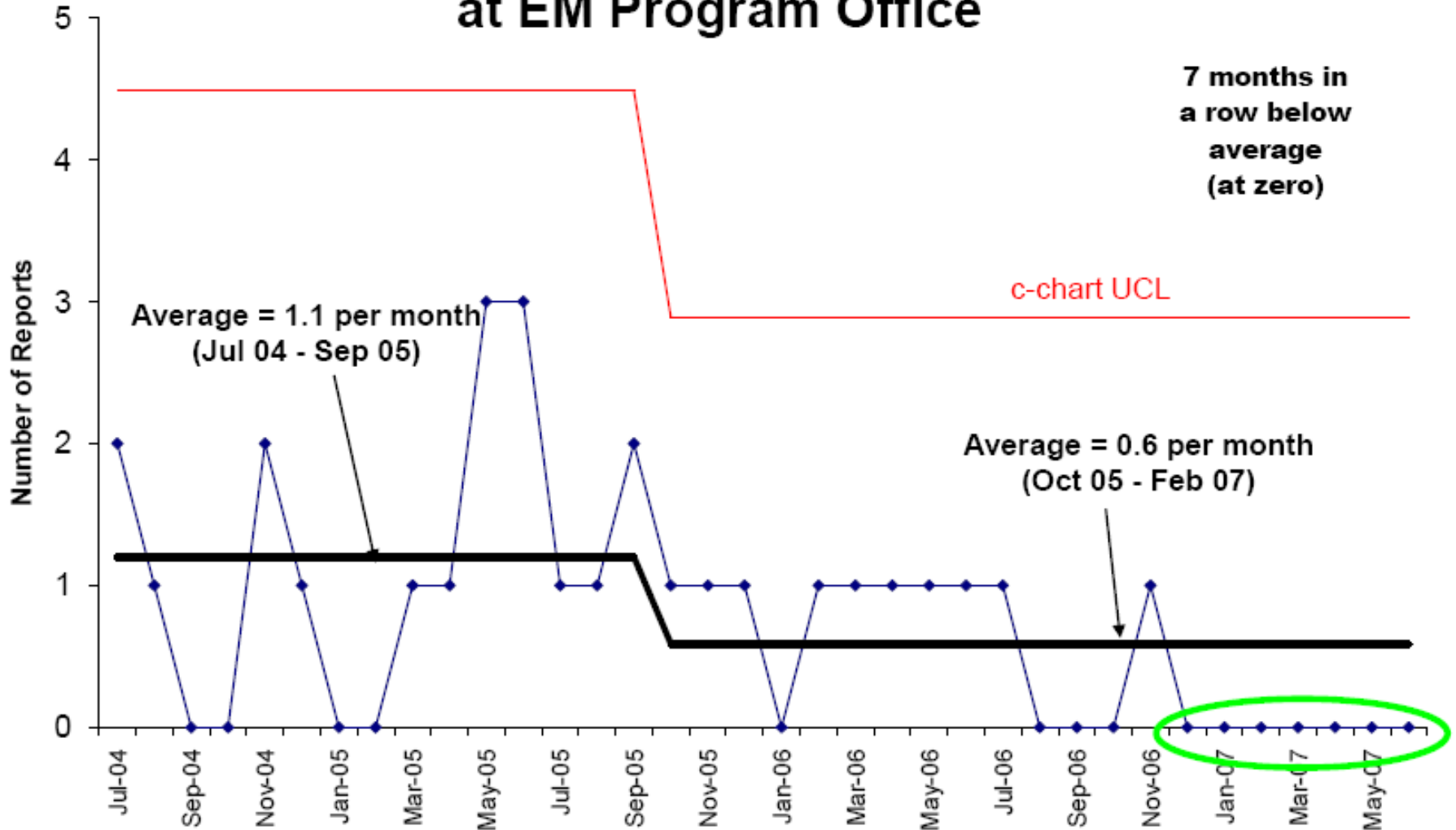
08J Electrical Near Miss ORPS by Month NA Program Office



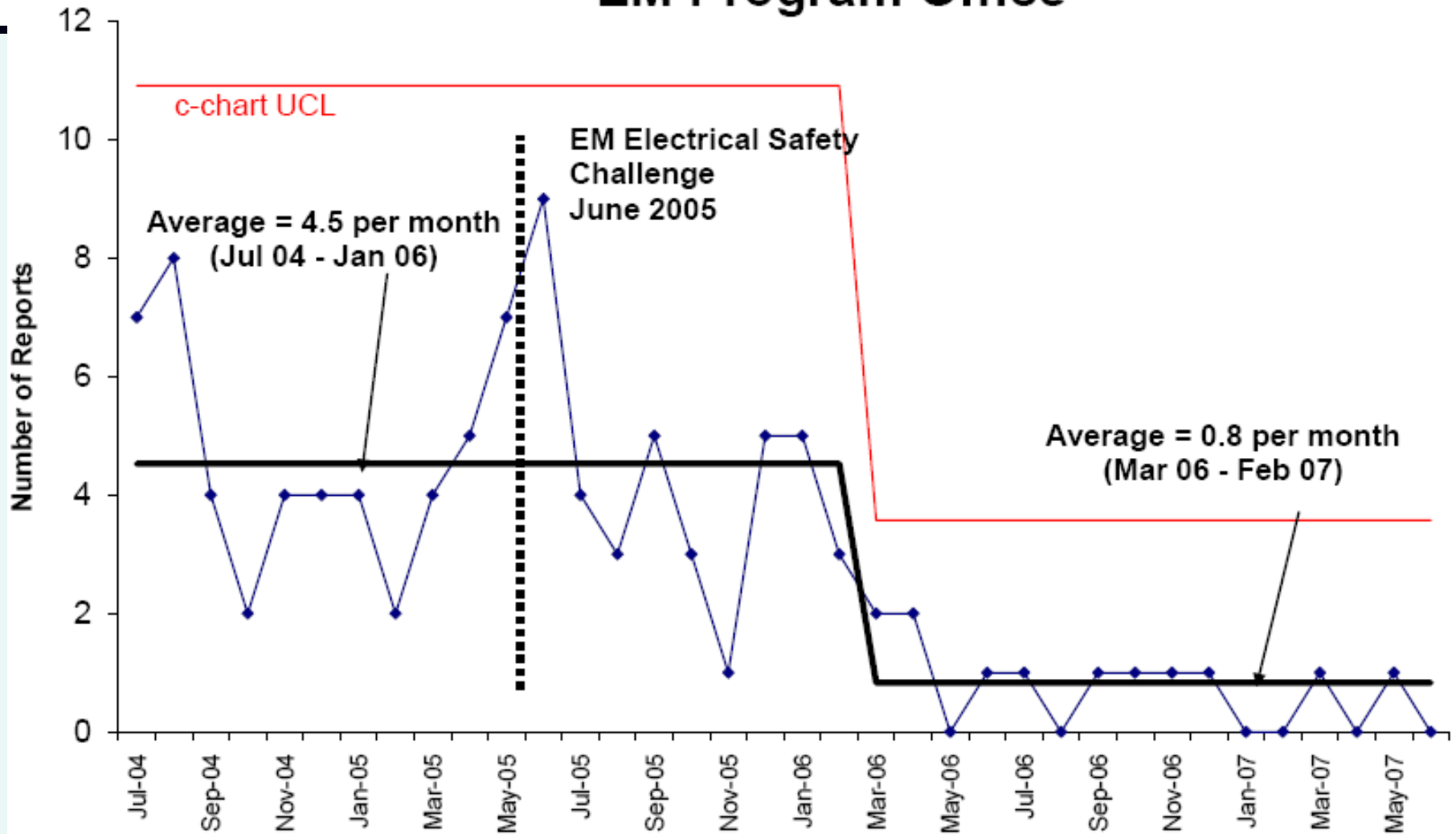
Electrical Events ORPS by Month EM Program Office



08A Electrical Shocks ORPS by Month at EM Program Office



08J Electrical Near Miss ORPS by Month EM Program Office



EXAMPLE C-CHART

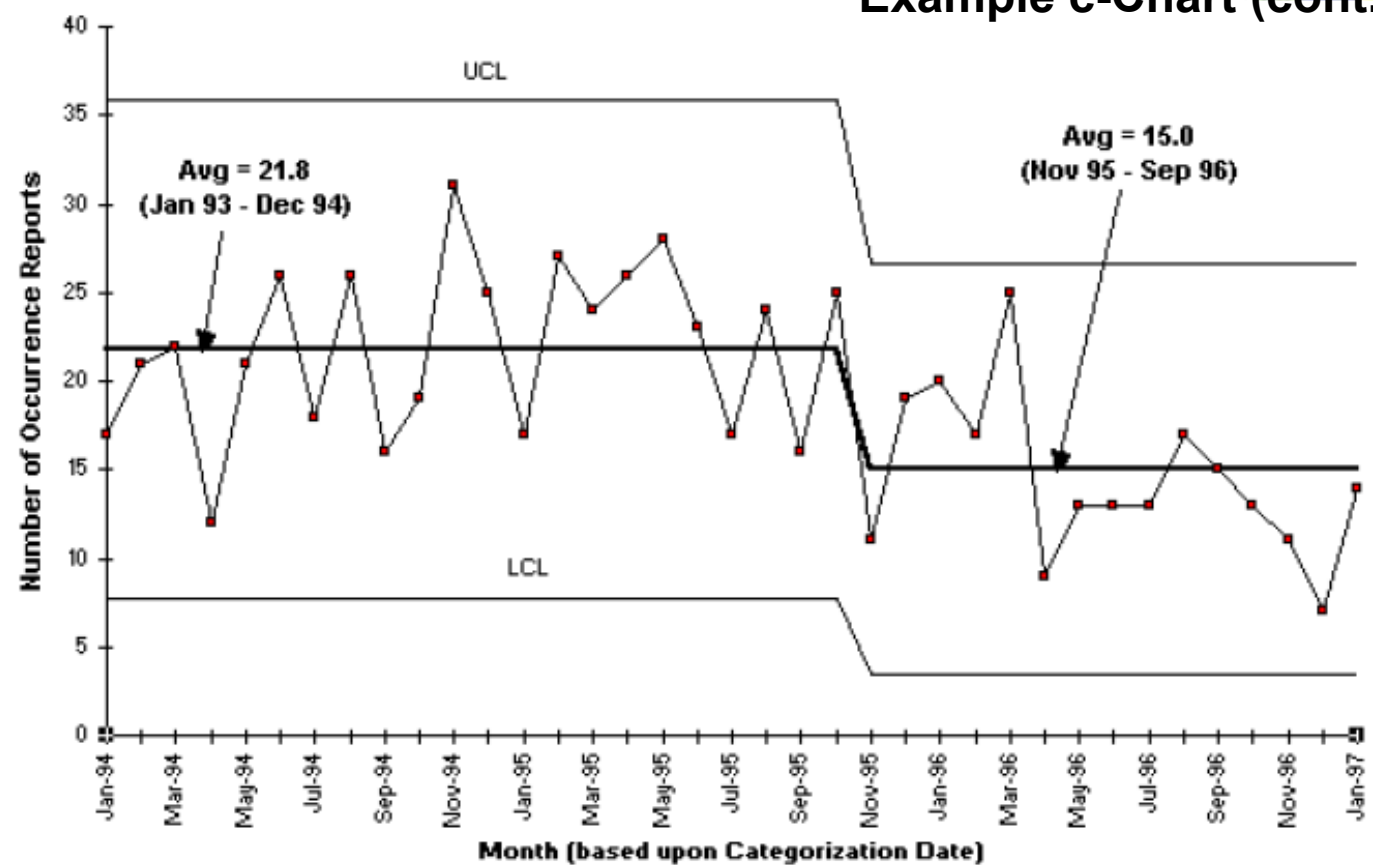
The C-chart

The chart below is an example of a C-chart. It is counting the number of occurrence reports per month. Since there are multiple dates on Department of Energy occurrence reports (discovery date, categorization date, final report date), the date used for the basis of the graph is identified on the x-axis label.

The c-chart is used when counting discrete events, as in a random arrival process. Counting events is a good example of a random arrival process, as long as each of those events are independent from each other, and overall occur at a constant rate. This is also known as a Poisson process.

In this graph, an initial 24 month baseline was established at the end of 1994 for January 1993 through December 1994. This baseline remained valid until the end of 1995. Then a shift occurred, with 10 of the next 11 points below average (starting with November 1995). A new baseline was established for November 1995 through September 1996. Note the gap in the two baselines from January 1995 through October 1995. This is acceptable. One does want to avoid overlaps between adjoining baseline averages, however.

Example c-Chart (cont.)



The current baseline (Nov 95 - Sep 96) was based on much less than 25 points. It does appear that the new data is coming in lower than the new baseline (but so far, no statistically significant difference has been detected). If a statistically significant difference does generate, perhaps the choice of November 1995 through September 1996 was insufficient. A better alternative may turn out to be to continue to 21.8 average through March 1996, and calculate a new baseline starting in April 1996. This serves to illustrate how control charts can evolve over time, and baselines with less than 25 points may prove to need to be readjusted.