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EFCOG Security Working Group

Safeguards & Security Metrics

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Executive Summary

At the May 2007 meeting, the Energy Facility Contractors Group (EFCOG) Board of Directors concurred with the Security Working Group's (SWG) initiative to develop an improved security metric methodology that would provide the status of security performance across the DOE complex. This initiative was based on the premise that our customer (DOE), along with many of the respective complex wide sites, needed an improved approach and common methodology to capture specific parameters and/or ways of quantitative and periodic assessment of security performance.

Initial discussions with two primary customers, Mr. Bill Desmond, Chief, Defense Nuclear Security and Mr. Glenn Podonsky, Chief, Office of Health, Safety and Security, identified needs for DOE to more effectively measure security performance and to identify adverse trending. Although security performance can be and is measured in a number of ways, the most visual lagging indicator for the Department is security incidents reported in accordance with the Impact Measurement Index (IMI) Tables. Additionally, use of IMI data permits analysis of the effectiveness of previously implemented corrective actions.

A scoping decision was reached between our primary customers[1] and the SWG on October 10, 2007 to focus metric development efforts on IMI data. Current practices and metrics for IMI related information was requested from the EFCOG membership on October 29, 2007 and submissions were evaluated against the customers' needs for performance measurement and trending identification. In concert with the mission of the EFCOG, the SWG has developed a security metric methodology utilizing site specific IMI data that accomplishes these end goals, thereby, providing a comprehensive, normalized lagging indicator for individual site and DOE-wide security performance status.

Although Human Performance Indicator (HPI) studies indicate that humans make five to seven errors per hour, EFCOG members are committed to establishing mission requirements and goals that are consistent with high management standards for event free performance. Event free performance can be achieved through conservative decision making, organizational learning from information rich events, and the demonstrated behaviors of a security conscious organizational culture.

[1] Mr. Podonsky was represented by Mr. Arnold Guevara, Director, Office of Enforcement

Introduction

In concert with the mission of the EFCOG, to promote excellence in all aspects of the operation, management, and integration of DOE facilities in a safe, environmentally sound, efficient and cost-effective manner, new work was proposed in the area of security metrics. The SWG felt that DOE could benefit from consistent reporting of security metrics from its sites especially in the area of security performance in relation to security incident reporting.

The task that was proposed and approved by the EFCOG in June 2007 was to define appropriate security metrics that measure the effectiveness of DOE safeguards and security programs.

As the SWG evaluated the task it became apparent that security metrics varied in consistency and meaningfulness across sites. It also became apparent that the industry needed an improved approach to capture specific parameters or ways of quantitative and periodic assessment of security processes, along with the procedures to carry out such measurement and the procedures for the interpretation of the assessment. In addition, there was an expressed DOE interest in obtaining meaningful reporting from various sites that are adhering to the same laws, Orders, and requirements.

With the emphasis on Contractor Assurance System (CAS) in new contracts entered into between DOE and M&O contractors, there was also a need to define appropriate security metrics that would feed into a CAS. Although there is some experience with implementing a CAS at an EFCOG M&O contractor site, the security elements of the CAS are not widely understood or disseminated. Metrics also provide an extension to the lessons learned capacities and the learning environment associated with root cause determination.

The SWG believes that consistent and appropriate security metrics should enable the DOE and their respective sites to question their beliefs (expectations) and to reaffirm, update, or replace their beliefs. These activities should result in a better ability to find and act on information before it becomes a major catastrophic event.

Characteristics associated with this process include:

- Ongoing scrutiny of existing expectations
- Continuous refinement and differentiation of expectations based on newer experiences
- Willingness and capability to invent new expectations that make sense of unprecedented events
- An appreciation of variable context and ways to deal with it
- Identification of new dimensions of context that improve foresight and current functionality

Some examples of security metrics initially explored included:

- Security incidents/infractions
- Protective force readiness indexes
- Protective systems readiness indexes
- Performance assurance of essential elements
- Information protection
- MC&A loss detection readiness indexes

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Methodology and Metric Attributes

IMI data is stratified across four reportable levels (IMI-1, IMI-2, IMI-3, and IMI-4) with each level further categorized into sub-level classifications (e.g., IMI-4.7). For the purposes of this study data was considered only at the four upper levels. In addition to the number of IMI incidents, this approach requires knowledge of the month the incident occurred, the number of man-hours reported by the site to Computerized Accident Incident Reporting System (CAIRS) for each month, and a working knowledge of Excel® software for the development of charts and other statistical applications. To facilitate factual illustration, IMI reported data for Pantex was used for Attachments 1 – 6. Additionally, IMI data was used for Attachment 7; however, sites are not identified.

Four of the six site charts (Attachments 1 – 4) consist of monthly events totaled for each of the four IMI levels. Literature resources for statistical applications indicate that 25 or more data points are needed in order to properly identify trends.[5] Normally, metrics are focused on fiscal year data. Using 25 to 36 rolling data points (two fiscal years plus the current fiscal year) will provide the site with accurate information instead of small groups of uncorrelated data. Through this methodology, sites can better appreciate the benefit derived from the implementation of corrective actions and can better understand their true trending picture. In addition to trending, other statistical applications can be better appreciated. For example, over 36 months, what is the mean or average experience? Are the data stable and predictable, or are there trends related to changing conditions? As control limits are set at three standard deviations above

[2] Data source for statistical analysis was Incident Tracking and Analysis Capability (ITAC) System
[3] Mr. Podonsky was represented by Mr. Arnold Guevara, Director, Office of Enforcement
[4] Data source ITAC System
[5] Shewhart, Walter A. 1931. Economic Control of Quality of Manufactured Product. D Van Nostrand Company, Inc., New York

and below the mean, the site can better understand adverse trending and key statistical anomalies, if any, can be identified and discussed. A full suite of trending rules can be utilized to detect trends.[6] Another attribute is the use of man-hours. Man-hours help normalize a site's data and better enables the site to understand exposure rates and to demonstrate success when long periods of time are associated with reduced or error free performance. The use of man-hours (which was obtained from CAIRS for our statistical applications) can assist in comparing sites across the DOE complex. Control charts with three standard deviation limits will also be utilized to tell if any site is significantly different from any other.

One of the two remaining site charts (Attachment 5) consists of monthly events totaled for all IMI occurrences. The methodology and attributes are consistent with the previous discussion.

The remaining site chart (Attachment 6) demonstrates an incident rate per 200,000 hours worked for all IMI occurrences. The monthly incident rate provides the site with an exposure correlation and would be calculated by the following equation:

Incident Rate = # of incidents (200,000 hours) / total man-hours worked

The methodology assumes that each site reports IMI incidents to the DOE from which counts of events, by IMI severity, by month can then be retrieved for each of the six charts. The DOE, in turn, can overlay data from each of the sites into one or more of the six charts. Attachment 6 has been expanded without site identification for purpose of illustration (see Attachment 7). This overlay will provide the principal customers with an improved appreciation for performance at the site and collective level.

In summary, the SWG has developed a security metric methodology utilizing site specific IMI data that accomplishes the goals of our primary customers, thereby, providing a comprehensive, normalized set of lagging indicators for individual site and DOE-wide security performance status.

[6] Details on SPC trending may be found in the Hanford Trending Primer at http://www.hanford.gov/rl/?page=1144&parent=169. The DOE Occurrence Reporting Special Interest Group has been making use of this Primer for a number of years. Further trending training is available to managers and analysts at http://www.hanford.gov/rl?page=1156&parent=1144.

Lagging and Leading Indicators

Lagging indicators are indicative of success with corrective actions. In order to achieve event free performance, organizations must utilize conservative decision making, learn from information rich events, and nurture a security conscious organizational culture. The SWG believes that the seven previously discussed metrics provide the site and the DOE with the best lagging indicators upon which to base their understanding of and insight into a site's security performance by measuring the effectiveness in its decision making, in its learning (lessons learned), and in its employee awareness to security responsibilities (organizational culture). Additionally, the Department could evaluate the effectiveness achieved from resource allocation and site assistance programs.

These lagging indicators are complementary to other tools (i.e., Incident Tracking and Analysis Capability (ITAC)/ Safeguard and Security Information Management System (SSIMS) metric reports) available to and utilized by various organizational elements within the Department.

Leading indicators are preventive in nature. Although similarities can be drawn between sites for the application of universal leading indicators, the SWG believes that uniformity is severely restrained because of site unique issues. Based on these unique features the SWG does not recommend any leading indicators for complex-wide use but believes sites should be allowed to establish these independently since the success of leading indicators will be realized in the analysis of the lagging indicator.

Security Incident Correlations

These proposed metrics have some correlation to site safety incident rates[7] (see Attachment 8), changes to policy and requirements[8], and to any other major event which distracts from the work force's ability to remain focused on preventing security incidents[9].

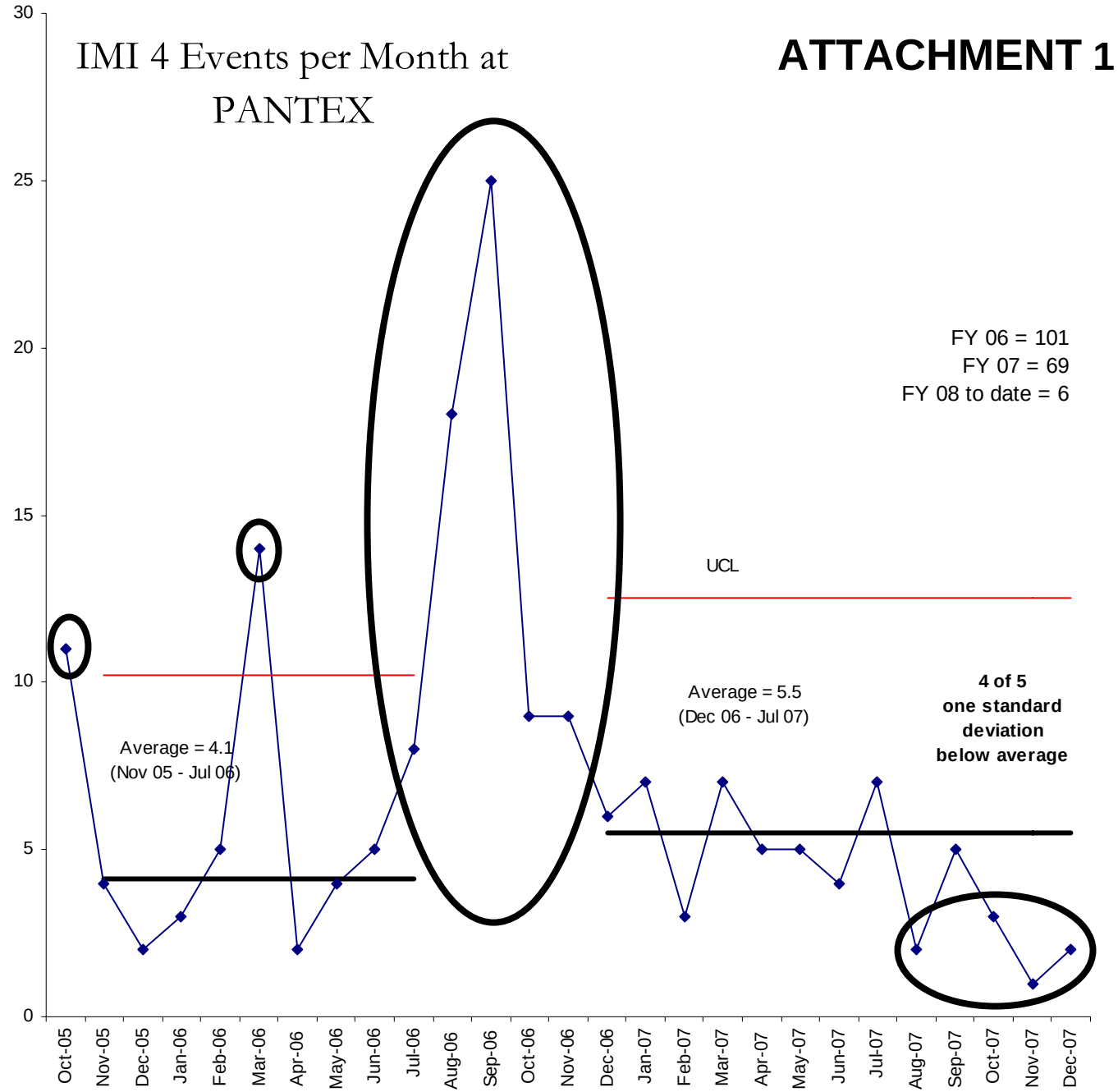
[7] Safety incident rates are categorized in ascending format as First Aid Cases, Recordable Injury, Lost Time Accident and Death. OSHA recordable input discounts first aid cases. When correlating IMI incidents in the same ascending format (IMI-4, IMI-3, IMI-2, IMI-1) one observes a corresponding incident rate perspective if you discount IMI-4 information. Hence a conclusion can be drawn that a strong organizational culture for safety is supportive and reflective of a strong security culture, and visa versa.
[8] Implementation of new policy or requirements often results in an increase or spike in incident reporting because of a near-term failure of the organization to institutionalize the policy or requirement.
[9] Major weather events, significant school functions, and major site activities have been noted as some of the more significant distracters to employees remaining focused on task and as the precursors to many of the spikes in security incidents, hence these distracters must receive management attention and mitigation in order to eliminate security incidents.

Conclusions / Recommendations

DOE approval and promulgation of these proposed metrics will provide the DOE principally, and other stakeholders concurrently, with defined safeguards and security metrics that provide a comprehensive, normalized set of lagging indicators for individual site and DOE-wide security performance status. The SWG believes that the seven previously discussed metrics provide the site and the DOE with the best lagging indicators upon which to base their understanding of and insight into a site's security performance. Additionally, the Department could evaluate the short- and long-term benefit from resource allocation and site assistance programs.

It is recommended the Department promulgate the requirement for sites to maintain site specific metrics that provide

- 25 to 36 rolling data points (monthly events)
    - Individually for each of the four IMI levels
    - Collectively for the four IMI levels
    - Collectively for the four IMI levels but normalized by man hours
    - Comparison/correlation to health and safety performance
- The Department consider modifying ITAC to provide individual and collective site comparisons for departmental use
- Hold a series of workshops/briefings on methodology for
    - Headquarters' personnel
    - Site Office and site personnel
- Workshop/briefings should include a primer on
    - Statistical analysis of process controls
    - Upper/lower control limit development
    - Trending and trend analysis methodology
    - Review of leading/lagging indicators


IMI 4 Events per Month at PANTEX
ATTACHMENT 1
FY 06 = 101
FY 07 = 69
FY 08 to date = 6
UCL
Average = 4.1
(Nov 05 - Jul 06)
Average = 5.5
(Dec 06 - Jul 07)
4 of 5
one standard
deviation
below average
30
25
20
15
10
5
0
Oct-05
Nov-05
Dec-05
Jan-06
Feb-06
Mar-06
Apr-06
May-06
Jun-06
Jul-06
Aug-06
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Jan-07
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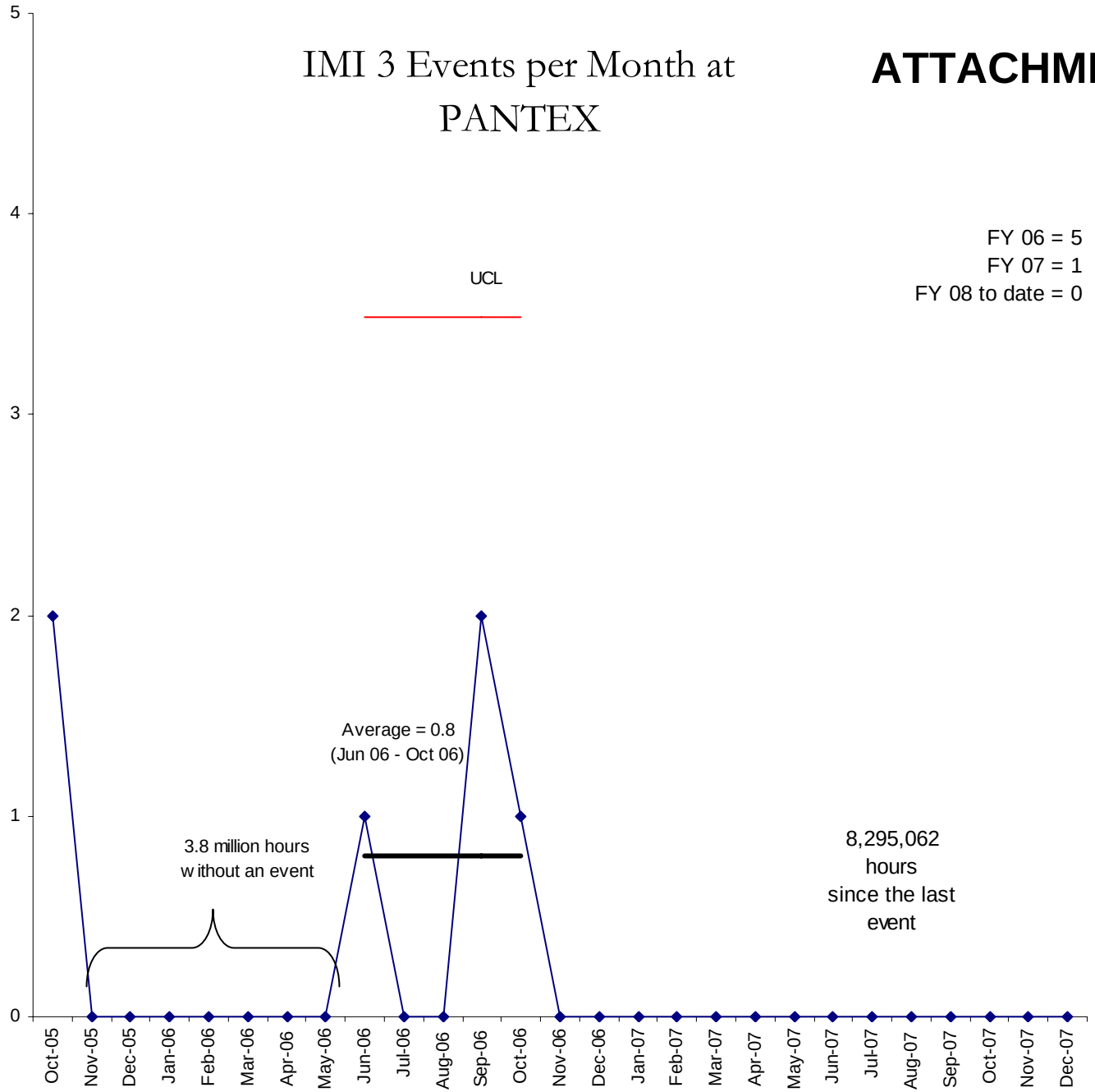
Dec-07

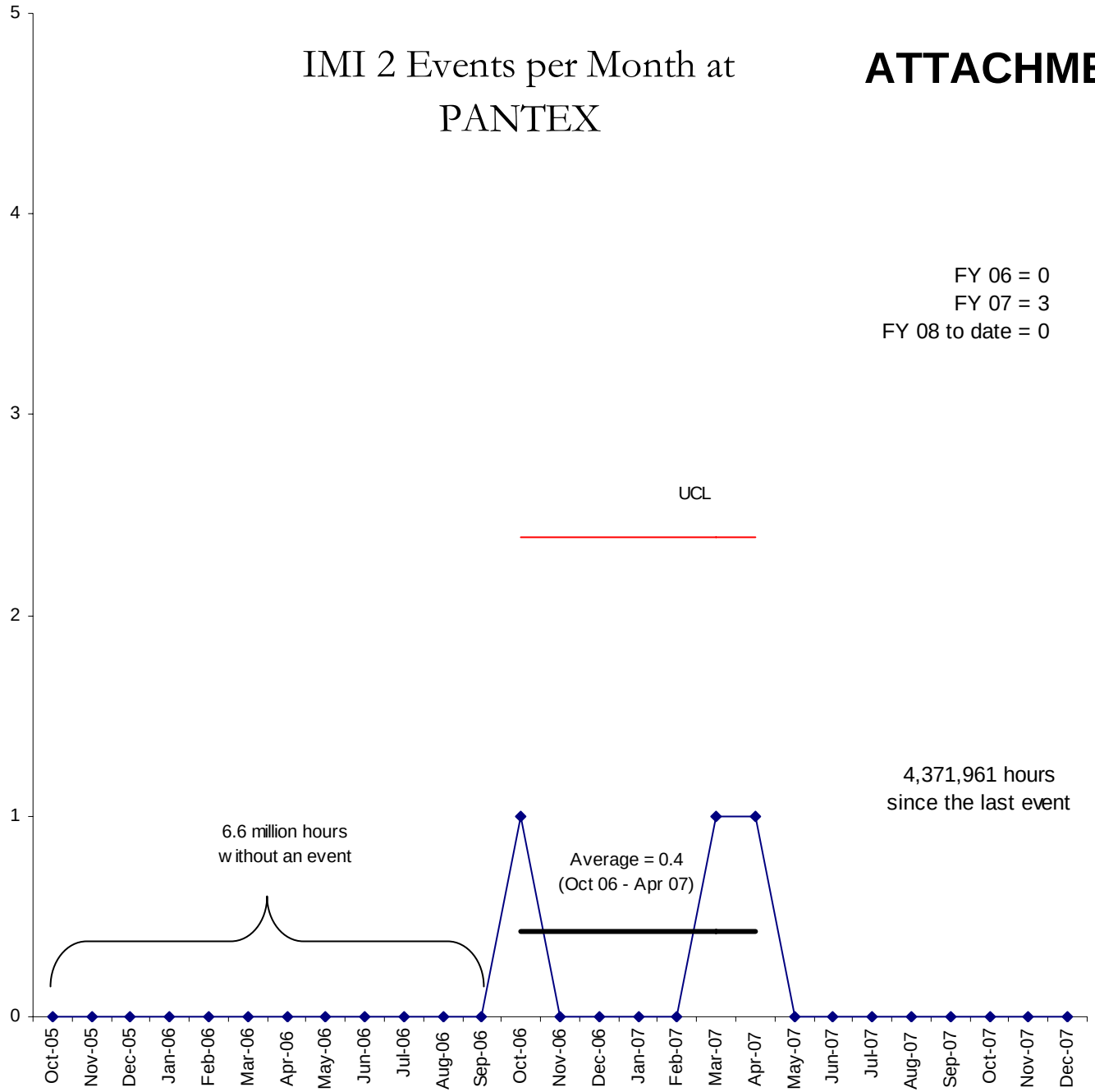
IMI 3 Events per Month at PANTEX

ATTACHMENT 2



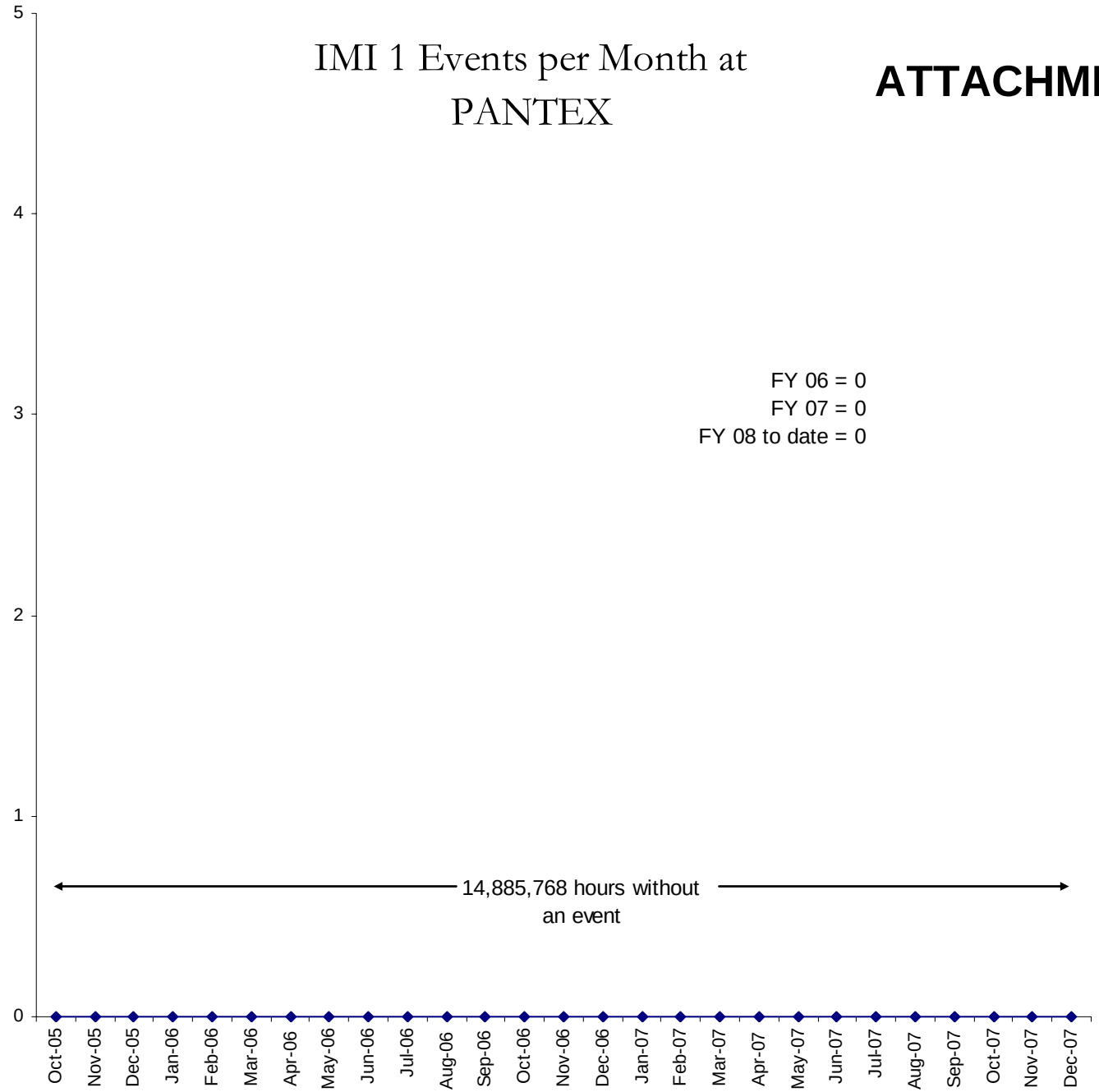
IMI 2 Events per Month at PANTEX

ATTACHMENT 3



IMI 1 Events per Month at PANTEX

ATTACHMENT 4



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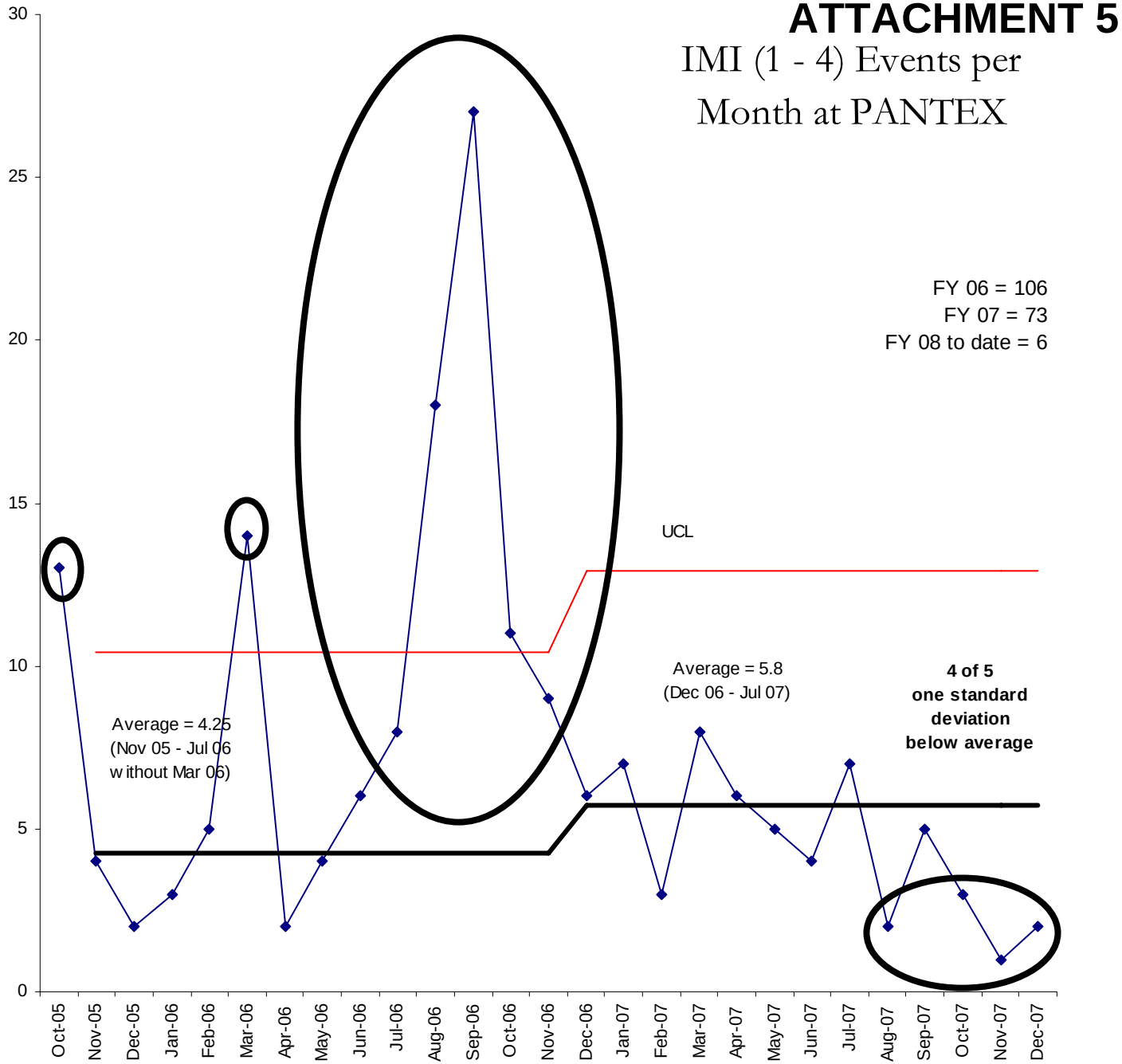
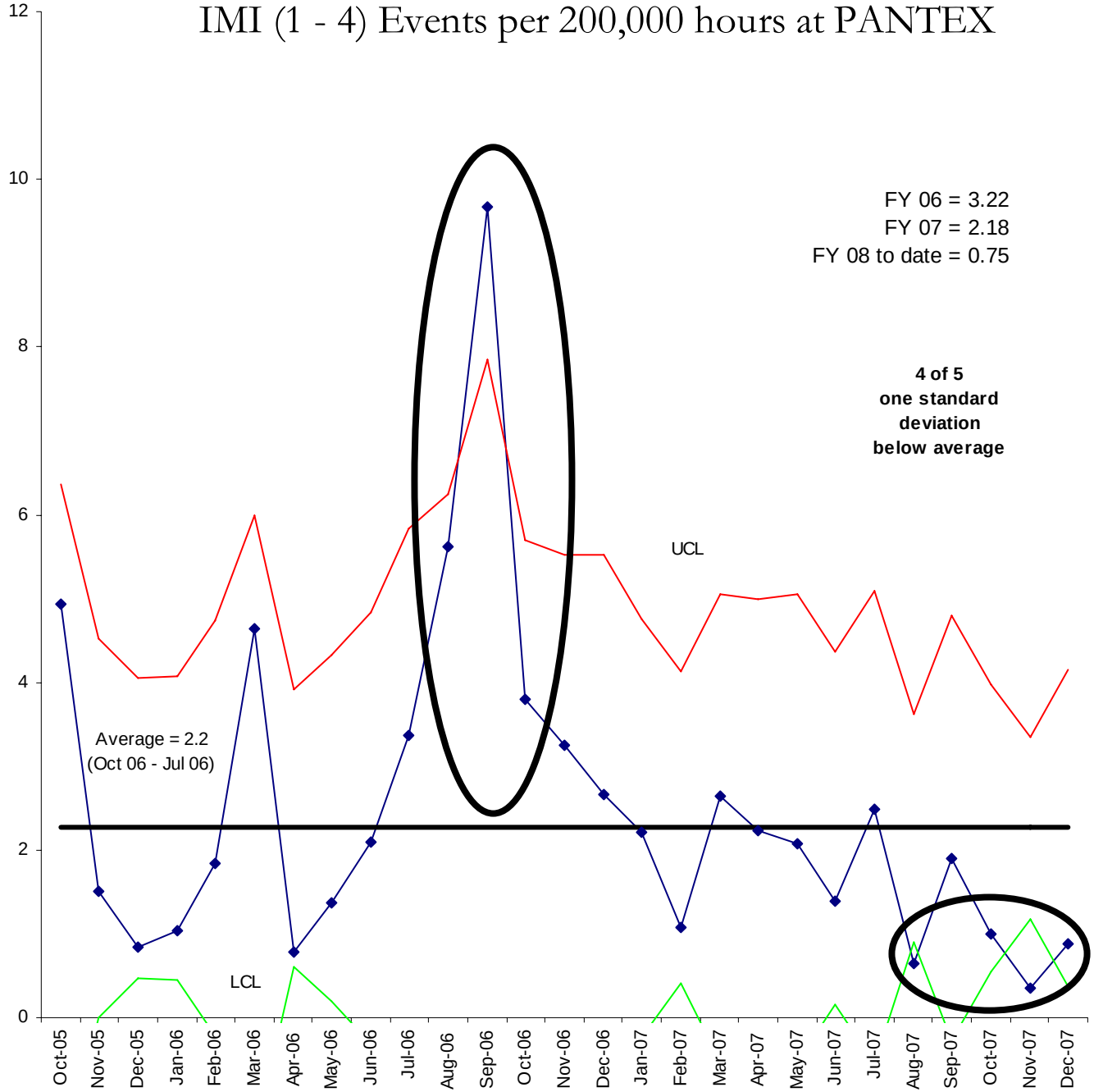
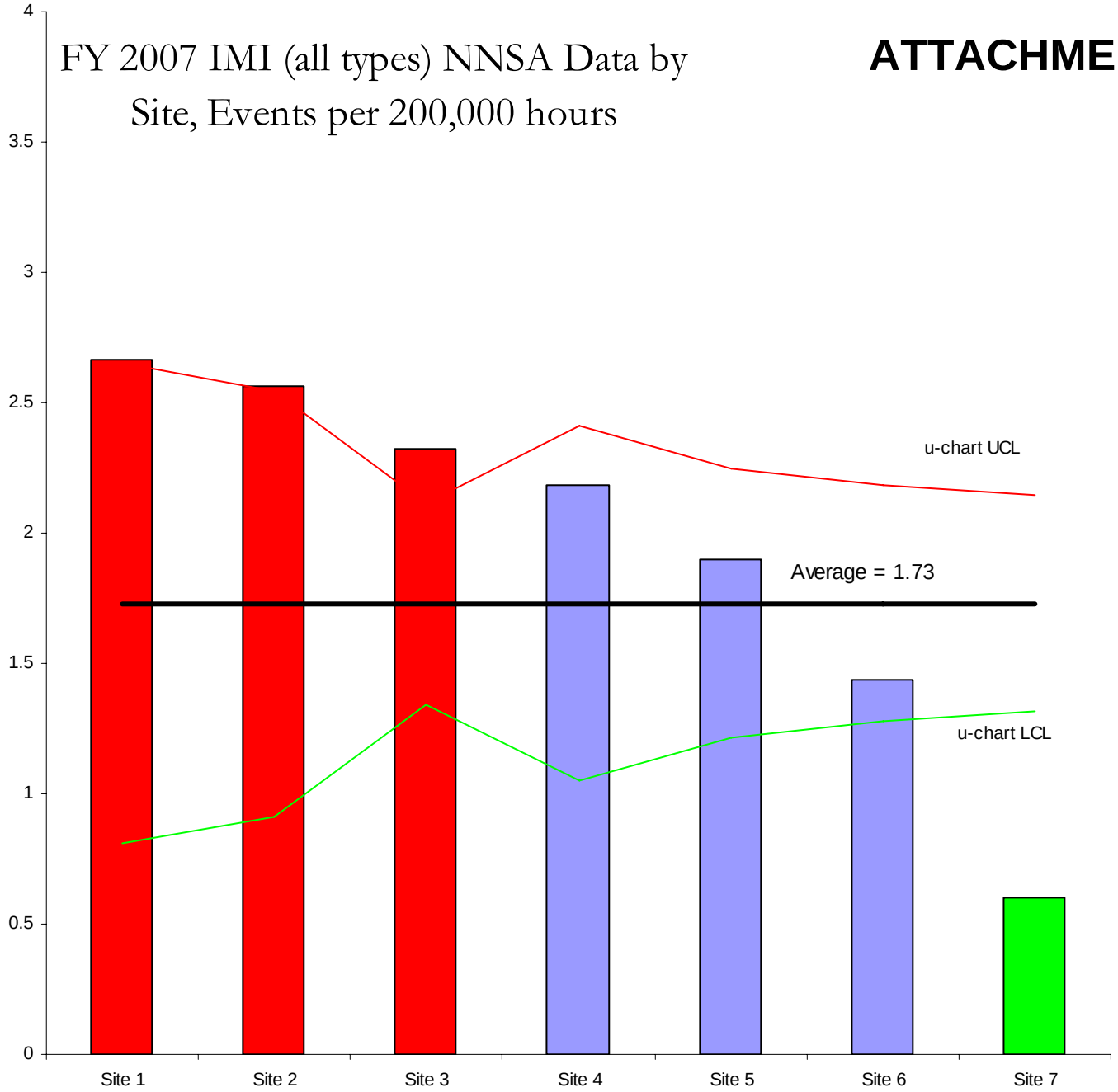


ATTACHMENT 6



ATTACHMENT 7



ATTACHMENT 8