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SAFEGUARDS AND SECURITY INTEGRATION with SAFETY ANALYSIS

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ABSTRACT

The objective of this paper is to share the Savannah River Site lessons learned on Safeguards and Security (S&S) program integration with K-Area Complex (KAC) safety basis. The KAC Documented Safety Analysis (DSA), is managed by the Washington Savannah River Company (WSRC), and the S&S program, managed by Wackenhut Services, Incorporated – Savannah River Site (WSI-SRS). WSRC and WSI-SRS developed a contractual arrangement to recognize WSI-SRS requirements in the KAC safety analysis.

Design Basis Threat 2003 (DBT03) security upgrades required physical modifications and operational changes which included the availability of weapons which could potentially impact the facility safety analysis. The KAC DSA did not previously require explicit linkage to the S&S program to satisfy the safety analysis. WSI-SRS have contractual requirements with the Department of Energy (DOE) which are separate from WSRC contract requirements.

The lessons learned will include a discussion on planning, analysis, approval of the controls and implementation issues.

INTRODUCTION

Under the direction of the Department of Energy (DOE), Washington Savannah River Company (WSRC) conducted the Design Basis Threat 2003 (DBT03) Project in the K-Area Complex (KAC) of the Savannah River Site (SRS) from Spring 2005 through September 2006. The integrated project team consisted of DOE, WSRC Project Management, Operations, Facility Management, Safeguards & Security, Engineering, Washington Safety Management Solutions (WSMS) Regulatory Programs, and Wackenhut Services, Incorporated - Savannah River Site (WSI-SRS) Security Plan and Infrastructure Division and Protective Force Operations Division.

The DBT03 Project of safeguards and security upgrades discussed in this paper was fully implemented in KAC on September 30, 2006. The following month, October 2006, the EFCOG Safety Analysis Working Group and the EFCOG Security Working Group jointly issued a topical report entitled Topical Report on Security & Safety Integration. Because the EFCOG information was not issued in time for this implementation of DBT03, the final section of this paper will compare the topical report recommendations to the elements implemented in the DBT03 Project.

Of utmost importance in project work is compliance with DOE Orders. Because the DBT03 Project integrated Safeguards and Security upgrades with the K-Area Safety Basis, not only was DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets considered, but also DOE Order 470.3A, Design Basis Threat Policy, DOE Order 470.4, Safeguards and Security Program, DOE Standard 3009, Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analysis and 10CFR830, Nuclear Safety Management Rule.

Several of the DBT03 physical modifications were completed safely under the Unreviewed Safety Question (USQ) process. The change in munitions in the Facility, however, required a page change to the K-Area Complex Documented Safety Analysis (DSA) and Technical Safety Requirements (TSR). This was followed by a change to the Authorization Agreement where the Protective Force contractor, WSI-SRS, was added as an approver.

REQUIREMENTS and GUIDANCE

Department of Energy Order 413.3 provides project management direction to DOE and their Contractors for the acquisition of capital assets with the desire that they are delivered on schedule, within budget, and fully capable of meeting mission performance and environmental safety and health standards. It was superseded by DOE Order 413.3A in July 2006, just before the DBT03 Project was completed. The Order specifies the requirements of submittals to DOE, responsibilities of project team members, and the relationship of Critical Decisions to the Acquisition Strategy. All Line Item Projects at SRS shall comply with DOE Order 413.3(A).

The DBT03 Project also complied with DOE Order 470.3A which is a classified document. The tenets of this Order and Order 470.4 had to be carefully integrated with the Safety Basis Orders. DOE Order 470.4 establishes the roles and responsibilities for the DOE safeguards and security program for both DOE and their Contractors. It includes such elements as planning and management, physical protection, protective force, information security, nuclear material control and personnel security.

The objectives of DOE Order 420.1 are to establish facility and programmatic safety requirements for DOE and the Contractor for nuclear safety design criteria, fire protection, criticality safety, and natural phenomena hazards (NPH) mitigation. DOE

Order 420.1, combined with DOE-STD-3009 and 10CFR830, provides all the requirements of safety basis analyses.

IMPLEMENTATION OF PROJECT

The DBT03 Project included physical modifications, changes in weaponry and ammunition, and changes in Protective Force helicopter flight patterns.

Several physical modifications were made to the K-Area Complex (KAC), including a protective wall around the perimeter of the Facility and upgraded entrance control facilities. These modifications were accomplished via the normal SRS method of design change packages and work packages which Construction followed to install the modification. An Unreviewed Safety Question (USQ) Screening and/or Evaluation were performed on each design and the installation work packages were also reviewed through the USQ screening process. The physical attributes were then added to Chapter 2 of the DSA via a page change. None of the newly installed structures or systems impacted any accident scenarios nor created any new events in the Hazards Analyses and therefore they were not Safety Class or Safety Significant. The modifications were also reviewed by fire protection engineers and a Project Fire Hazard Analysis was written.

One of the DBT03 modifications was the addition of Protective Force devices which were composed of layers of ceramic and plastic materials. This type of device was never before used in the Facility, and thus required fire loading and criticality evaluations. Due to the amount of plastic in the device, new criticality rules were implemented concerning the location of the device with regards to drums of special nuclear materials. The Criticality Safety Engineer also inspected each device and affixed a “Criticality Safe” label to the device once it passed inspection. (The Criticality Safety Program is a Safety Significant control described in the Technical Safety Requirements, and thus this device is now part of the program.) The fire loading was not an issue, but a description was added to the Project Fire Hazard Analysis.

DBT03 Project added several different types of weapons and ammunition around the KAC. Because the Safety Basis does not include acts of sabotage and terrorism in the scope of hazard and accident analysis, that type of event was not analyzed. However, if the weapon and ammunition are within range of the drums of stored special nuclear materials, accidental discharges must be considered as a potential event. Those weapons and ammunition which would be within range of the drums of stored special nuclear materials were tested for impacts to actual (empty) drums. The tests were witnessed by representatives of all affected parties: WSI-SRS, WSRC, WSMS and DOE. A complete report of the tests including specific data and results was written.

DBT03 Project also increased the number of WSI-SRS helicopter flights around KAC and added more landing zones. KAC had an existing frequency calculation concerning the probability of a small aircraft impact to the Facility. Obviously this calculation had to be revised to include the new data. The WSMS analyst not only reviewed the flight plans

and layout of the landing zones, but he spoke with WSI-SRS about "what if" scenarios such as what if the helicopter ran out of fuel, was in flight and high winds picked up, etc. By this extensive research, the analyst was able to revise the frequency calculation with the addition of the new details. The analyst's rigor and knowledge of the code allowed a continued result of Beyond Extremely Unlikely (BEU) for a small aircraft crash into the Facility.

RESULTS OF PROJECT

Three DBT03 items caused difficulties with the integration of Safeguards & Security with the Safety Analysis: 1) the composite ceramic/plastic devices, 2) some of the weaponry and ammunition, and 3) the increased helicopter flights and new landing zones. Action was required to ensure that the Protective Force, WSI-SRS, complied with the requirements of the Safety Analysis.

The composite device was the easiest to deal with. KAC WSI-SRS was already familiar with and complied with criticality rules, such as no moderator in drum storage areas. One more rule was added to the Criticality Safety Program, that placement of these composite devices adjacent to drums of nuclear materials is limited to those configurations which were analyzed.

A way to document the new landing zones and agreed upon helicopter flights was necessary because the frequency calculation was based on these facts. Therefore this helicopter information was added to the test results of the weaponry. It was also repeated in the KAC Modified Security Plan (MSP).

Meetings were held concerning the weaponry and agreements were made between DOE, WSI-SRS and WSRC. The MSP included specific information on which weapons and ammunition are allowed under normal circumstances. The MSP also requires WSRC Engineering/Regulatory Programs to approve any revisions to the Site Safeguards and Security Plan (SSSP) or any new KAC Modified Security Plans (MSP).

The KAC TSR now credits the administrative Safeguards and Security Program for negligible impact of an accidental discharge of a weapon and BEU frequency of a small aircraft crash into the building. The TSR references the test report that was written specifically for these weapons and helicopter flights. The test report was chosen as the reference because the MSP is based on the new DSA/TSR rules. By referencing the test report, the TSR is not specifically linked to one version of the SSSP/MSP. WSRC Engineering/Regulatory Programs signs each SSSP revision/MSP to ensure that nothing pertaining to weapons or helicopter flights change without their knowledge. In addition, the SSSP/MSP is subject to a USQ review.

Lastly, once the Safety Evaluation Report (SER) was written and issued by DOE, the Authorization Agreement (AA) needed to be rewritten and approved. Because KAC had

new flight requirements and weaponry requirements, WSI-SRS signed the AA along with DOE and WSRC.

LESSONS LEARNED

The most critical lesson learned from integrating S&S with the Safety Analysis is to ensure that enough time is allocated. When three branches of DOE and WSRC (Project Management, S&S and Regulatory Programs) are involved in a Project, assuring all parties are satisfied takes multiple revisions of documents. For example, the TSR was written in terms of "response" weapons and needed to be rewritten to cite "non-normal" weapons. This change cascaded into changes to the test report and MSP.

The test report on the weapons and ammunition was extremely valuable because it was clear, well written and descriptive. It is extremely important for any test of weaponry or ammunition to have a good plan, be witnessed by all possible parties who may be impacted, and have many photographs of results. The photographs should clearly show the results of impact.

The Contractor Operator of the facility needs to involve his legal department before the safety analysis is reviewed by DOE. The WSRC lawyers required generic wording such as "protective force" instead of WSI-SRS. They also investigated the legalities of including WSI-SRS actions in the TSR. Until DBT03, the protective force was not specifically held accountable for their actions in the DSA or TSR.

Classified discussions were required as part of the DBT03 effort. Sometimes work was delayed until the appropriate location could be reserved for these discussions. A recommendation for future Projects is to recognize that these discussions will take place, and prearrange times in the schedule for these discussions.

One shortcut used in the safety analysis was the term "unknown ignition source" in the Hazards Events. This was a fire or explosion initiator which included Accidental Discharge. By citing accidental discharge as only one specific event and combining fire and explosion events caused by unknown ignition sources, some time was saved.

There were implementation issues. Because the impact of DBT03 was so great on WSI-SRS, some of the weaponry changes were requested before the Project could be fully implemented. USQ Evaluations were performed and proved negative. This allowed WSI-SRS to carry some of the weaponry early, and to position some of the devices.

Clear communication was the key to smooth integration. It was important to inform all branches of all DOE, WSRC and WSI-SRS on paths forward. Many conversations and meetings took place. Just because two people work for the same company and the offices are on the same hallway does not mean that they talk to each other.

EVALUATION of EFCOG TOPICAL REPORT against EXPERIENCE/CONCLUSIONS

The DBT03 Project was successfully implemented with integration of Safeguards and Security and Safety Analysis.

EFCOG's Topical Report on Security and Safety Integration provides a comprehensive process to satisfy DBT and safety basis objectives for security systems. The ten key elements of the process are: Drivers and End State, Establishment of Terminology/Concept Crosswalk, Awareness Training on Project Approach, Selection of Tools and Terminology, Integrated Project Approach to Safely Deploy Security Systems, Alternative Analysis Process for System Selection, Security System Toolbox for Development, Data Capture and Data Sharing, Safety Basis and Security Document Integration, Post-Installation Readiness, Configuration Control, and Review Process for Improvements and Lessons Learned. All but two of these elements were used in the DBT03 Project.

Drivers and End State are the key regulatory drivers to be considered to ensure that both the security requirements and safety basis requirements are satisfied. Of the seven DOE orders and standards listed, only those which were drafts in 2006, DOE-STD-1189 and 10CFR851, were not used.

A Terminology/Concept Crosswalk was not formally established by the Project, but through clear frequent communication, the DBT03 Project was successfully integrated. The EFCOG report includes an appendix of important terms and concepts in a crosswalk matrix. This would have been most beneficial to the Project.

Awareness Training on Project Approach, Selection of Tools, and Terminology to more effectively transport the selected security concepts among the various sites, was not used. DBT03 Project was focused on KAC only and did not consider other DOE sites in its approach to training and procedures. However, the Integrated Safety Management System principles were incorporated into the Project Execution Plan and project interfaces were established and maintained among the organizations on site.

An Integrated Project Approach to Safely Deploy Security Systems was used in the DBT03 Project. It ensured the integration of safety, security, operations, and governmental policy. The Project commenced in Spring of 2005 with Vulnerability Analysis and Integrated Project Team meetings. WSRC has a strong corporate culture supporting integration of security and safety disciplines, so with clear communication, the Project was a success.

The Alternative Analysis Process for System Selection, "Musts" versus "Wants" and weight factors for both as discussed in the EFCOG report, did not occur. Rather personnel from Security and Safety Analysis worked together to determine the best outcome of the Project. Compromises readily occurred without the need for the Alternative Analysis Process.

The Security Systems Toolbox recommended by EFCOG was not part of the DBT03 Project. This system if in place, would be used by other DOE sites, and the Project was focused on implementation in KAC. There was no data sharing. This would have been worthwhile, however, if it were in place. For example, sharing of weapon and ammunition testing results with other DOE sites could save time and expense.

The Safety Basis and Security Documentation were fully integrated in the DBT03 Project. Although it was not a major modification, a page change was required to the DSA and TSR, along with multiple USQ screenings and evaluations. The security information was protected by referencing classified documents in the TSR, thereby allowing the TSR to remain unclassified.

Post-Installation Readiness was proven by a Management Self-Assessment of the Project before implementation. Personnel outside of KAC assessed all functional areas of the Project and deemed it ready for implementation.

Configuration Control and Review of Project for Lessons Learned are two ongoing programs at KAC, and as such, were used in the Project. All modifications to the KAC are subject to the USQ process, and Lessons Learned was important for the next phase of Safeguards and Security Upgrades, DBT05. Although the EFCOG topical report was not used for DBT03, it will be in use in the future for KAC DBT05.

REFERENCES

1. DOE-STD-3009, Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analysis

2. DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets

3. DOE Order 420.1, Facility Safety

4. DOE Order 470.3A, Design Basis Threat Policy

5. DOE Order 470.4, Safeguards and Security Program

6. 10CFR830, Nuclear Safety Management Rule