

U.S. NUCLEAR REGULATORY COMMISSION STAFF AUDIT OF THE CALVERT CLIFFS  
NUCLEAR POWER PLANT, UNIT 3 COMBINED LICENSE APPLICATION FINAL SAFETY  
ANALYSIS REPORT PART 2, SECTION 13.6, SECURITY, AND PART 8, SECURITY PLAN,  
GUARD FORCE TRAINING AND QUALIFICATION PLAN, AND SAFEGUARDS  
CONTINGENCY PLAN

Introduction

The U.S. Nuclear Regulatory Commission (NRC) staff conducted an audit of the Physical Security component, which mainly covered Safeguards Information (SGI) related to Part 2 Final Safety Analysis Report (FSAR) Chapter 13.6, "Security," and Part 8, Physical Security Plan of the Calvert Cliffs Nuclear Power Plant, Unit 3 (CCNPP) Combined License Application (COLA). The audit was conducted at the UniStar Building (Visitor's Center) at the site of CCNPP Units 1 and 2 in Lubsy, Maryland, June 28-30, 2010. The NRC staff conducted the audit in accordance with NRC Office of New Reactors (NRO) Office Instruction NRO-REG-108.

Participants

The following NRC staff members from the NRO, the Office of Nuclear Security and Incident Response (NSIR), and NRC contractors Information Systems Laboratories (ISL) and USACE Protective Design Center (USACE), participated:

Surinder Arora (NRO, Lead Project Manager)	Robert Dexter (NSIR)
Pete Lee (NSIR, Audit Team Leader)	Bruce Mrowca (ISL)
Chris Chwasz (ISL)	Albert Garrett (PNNL)
Dale Nebuda (USACE)	

The following individuals from the applicant's organization participated in the audit:

Doug Scheweers (UniStar)	Rob Poche (UniStar)
Randy Ford (AREVA)	Ray Lewis (AREVA)
Jeremy Gustafson (AREVA)	Tom Konerth (AREVA)
Ronda Pederson (AREVA)	Pedro Salas (AREVA)
Joe Mihalcik (UniStar)	Martin Owens (AREVA)
Michelle Draxton (Constellation Energy)	

Documents Reviewed

- 26-9023704-003, "Electrical Load List"
- 32-9051686-001, "Large Blast Analysis for Nuclear Island of U.S. EPR Standard Plant"
- 32-9054779-001, "Blast Analysis for EDG and USH Buildings for US EPR Standard Plant"
- 32-9118649-000, "Pressure Inside U.S. EPR Structures from External Blast"
- 51-7001785-000, "U.S. EPR Mitigative Strategies Report"
- 51-9003971-002, "RCS Depressurization System, PRA System Analysis"
- 51-9009649-002, "PRA Level 1 Success Criteria Notebook"
- 51-902137-002, U.S. EPR System Description Document: Emergency Feedwater System"
- 51-9031802-002, "U.S. EPR Safe Shutdown Equipment List"
- 51-9052817-004, "U.S. EPR Security Assessment Template"
- 51-9068533-000, "U.S. EPR Security Assessment Software Validation"

- 51-9066047-001, “U.S. EPR Relocation Strategy and Timelines”
- 51-9069785-002, “Calvert Cliffs Site Specific Assessment”
- 51-9116544-000, “U.S. EPR Aircraft Hazard Analysis”
- ANP-10295, Revision 1, “U.S. EPR Security Design Features”
- U.S. EPR FSAR, Revision 1, Chapter 19.1 - PRA Cut Set
- U.S. EPR PRA flood analysis
- U.S. EPR Design Certification Document
- U.S. EPR one-line diagrams, P&IDs
- U.S. EPR Plant layout drawings
- “Calvert Cliffs Nuclear Power Plant, Unit 3 Security Assessment”

### Audit Activities

The NRC staff performed a tour of the proposed CCNPP Unit 3 site. UniStar, supported by AREVA NP (AREVA), presented overviews of the process applied in development of target sets, the results of evaluations, and information related to the design and licensing bases for the physical protection of the proposed CCNPP Unit 3. The subjects of audit included the following: (1) UniStar’s determination and documentation of final complete and accurate target sets which must be protected against radiological sabotage due to reactor core damage and/or the loss of spent fuel pool cooling; (2) proposed internal and external security responses and the defense-in-depth for protecting identified target sets; (3) the analyses and evaluations for protecting against design basis threat (DBT) vehicle bombs; and (4) the design bases for engineered systems relied upon for physical protection.

### NRC Staff Observations

Overall, the audit provided understanding of the process applied by UniStar to evaluate and determine target sets, technical assumptions, and the results for target sets of the U.S EPR standard design that must be protected against the DBT for radiological sabotage. The audit informed and provided insights to the NRC staff on how UniStar evaluated, determined, and documented the design bases for physical protection systems that will be credited to facilitate the implementation of physical protection for the proposed CCNPP Unit 3. The audit also provided an understanding of, and insights from, supporting evaluations and technical bases for how UniStar determined the required minimum safe distance(s) that will protect the plant structures against DBT explosive threats.

### Exit Briefing

The following is a summary of observations and potential follow-up items or issues the NRC staff communicated to UniStar during the audit and reiterated at the exit briefing. The identified potential issues will be appropriately communicated in the form of NRC supplemental requests for additional information (RAIs) to ensure appropriate design and licensing bases information are on the docket to support the technical bases for appropriate regulatory findings for the CCNPP Unit 3 COLA:

#### 1. Target Sets

Overall, UniStar, with support from AREVA, provided information towards understanding of how target sets were developed, what assumptions were made, and the resulting target sets for CCNPP Unit 3. Specifically, UniStar described the process applied to

determine target sets, what source documents were used, and the bounding assumptions. Through discussions with UniStar/Areva staff and examination of documents, the audit team confirmed the minimal connectivity between safety divisions for the four-division nature of the U.S. EPR standard design. However, the NRC staff identified a need to improve the documentation of how the applicant arrived at target sets that would allow confirmation (and demonstration) that target sets are complete and accurate based on the U.S. EPR standard design and site specific information (e.g., identified target sets functions, system dependences between front line and support systems, operator actions, technical assumptions, etc.). Specifically, the NRC staff noted the following weaknesses:

- a) Not all target sets could be systematically traced back (clearly mapped) to source documents of the U.S. EPR Final Safety Analysis Report (FSAR) design certification document (e.g., U.S. EPR Vital Equipment List, equipment and system lists, Probabilistic Risk Assessment (PRA) success criteria, U.S. EPR FSAR dependencies matrix, etc.).
- b) Evaluations of target sets lacked sufficient descriptions for assumptions, initiating event(s), progressions for target element failures, time to core damage, and expected offsite consequences that characterize radiological sabotage due to core damage. The bases for success criteria were not clearly defined. In addition, documentation did not identify locations for all front line and secondary supporting systems associated with identified target sets. As a result, the NRC staff could not determine whether the resulting target sets were bounding or confirm where all target sets (systems) were located within the Vital Island and Vital Structures.
- c) Target set assumptions were not sufficiently characterized or described to demonstrate that they were bounding (e.g., Target Set 1 was not sufficiently described to explain assumptions and specificity of each safety system and function that must be unavailable to cause core damage).
- d) The system dependencies between systems identified as target elements were not shown and/or were not clearly defined to allow confirmation of whether all systems, based on the dependencies matrix, had been identified as target set elements.
- e) Operator actions were not shown as an element of target sets and/or were not described in sufficient detail to allow confirmation that all components (operator, equipment, action, locations) have been considered for applicable target sets and specifically identified as an element of a target set.
- f) Target sets did not address all key safety functions (e.g., reactivity control was not addressed) to allow the determination of whether the target sets results were complete and accurately based on the U.S. EPR standard design and site-specific information.
- g) The description of Target Set No. 1 was found inadequate and insufficient to explain how the target set combination table was used. It also lacked descriptions of assumptions and details of information of each safety system that must fail or become unavailable for loss of any safety function that leads to core damage. The NRC staff also noted potential for a single point failure that should be examined to maintain the independence of the four safety divisions provided by design.

The NRC staff plans to prepare appropriate RAIs to cover observations noted above to address how the applicant's process will comply with the process for development and identification of target sets in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 73, Section 55(f)(1), and that the resulting target set is sufficiently complete and accurate to establish what must be protected by the proposed physical protection system (i.e., detection, assessment, delays, and response) for the CCNPP Unit 3. The additional information on the docket should be sufficient for NRC staff to determine that target sets are complete and accurate based on the U.S. EPR standard design and site-specific information, along with sufficient detail of supporting technical bases to allow the flow-down of target set functions and systems, to develop detailed target sets information at the component level for operations.

## 2. Internal and External Strategy and Defense-in-Depth

Overall, the proposed defense-in-depth protection of the vital islands and structures and the plant areas of the CCNPP Unit 3, the descriptions of engineered systems for delays, and security features facilitating security responses were found sufficiently documented to describe the design bases for detailed design and the licensing bases for the flow-down to plant implementing procedures and training for operations. However, the NRC staff noted the following weaknesses:

- a) Postulated scenarios analyzed did not include the most challenging adversarial numbers and pathway, using the shortest travel distances and the use of cover, to reach target set elements described in the matrix for Target Set No. 1 (i.e., the same target set elements as postulated in Scenario 7).
- b) Design of the proposed ground level bullet resistant enclosure (BRE) did not address the performance requirements to provide an equivalent level of delays as adjacent physical barriers (i.e., delay equivalent to walls or hardened access points). Postulated scenarios did not consider alternate access to vital islands and structures by means of the ground level BRE.
- c) Design requirements did not address the potential need to provide engineered control of elevators for security events and consider elevators as alternative vertical pathways in postulated scenarios. The use of elevators are possible pathways between floors and postulated scenarios were not discussed or described to indicate whether the planned defensive posture within the vital islands and structures was sufficient and bounding. Similarly, supporting documentation and assumptions did not appear to indicate whether other available vertical pathways, such as man-passable heating, ventilation, and air conditioning (HVAC) ducts, were considered.
- d) Design descriptions for providing camera coverage within the vital islands and structures were not specifically described to indicate where coverage was provided to facilitate assessment and detection. The design document should be reviewed to ensure design requirements provide coverage for lighting and include all areas around elevator lobbies as intended by design.
- e) The evaluations and postulated adversaries pathways/scenarios did not describe in sufficient detail or the assumptions for the capabilities of spent fuel pool (SFP) structural walls and floors to withstand explosive breaching and describe the protection of pathways (delay and access) to SFP exterior structural walls, including protection of access to areas beneath the SFP.

- f) Alternatives described in the CCNPP Unit 3 Physical Security Plan have not been specifically called out in the COLA and justified as alternative in accordance with requirements in 10 CFR 73.53(r). An example can be found in Physical Security Plan (PSP) Section 14.2.
- g) Other observations and discussion included: An inconsistency between time line description by text and the map for Scenario 7; update of information in 51-9066047 that have changed with update of Topical Report (TR) ANP-10295/CCNPU3 Security Assessment (e.g., dispensable delay, spiral stairs, etc.); and design consideration, engineered design to provide opportunities for security responders to interdict along the pathway between BREs.

### 3. Blast Analyses

The NRC staff noted that supporting engineering evaluations and calculations captured technical bases, methodologies, and key assumptions that accounted for blast effects on non-structural elements (e.g., doors, windows, equipment hatches, missile doors, or other penetrations) and potential effects from the postulated DBT vehicle explosive threats. The bench- marked evaluation, using acceptable methodology for blast analysis described in Regulatory Guide (RG) 5.69, demonstrated the margin of safety between the required DBT explosive and the conservative parameter applied in finite element engineering analysis to confirm the adequacy of safe stand-off distances for protecting the vital islands and vital structures of the U.S. EPR standard plant. The waterborne explosive threat is bounded by blast analyses and supporting evaluations for land based explosive (i.e., safe stand-off distances) and is based on the key assumptions that there is a lack of water pathways associated with the site characteristics of the proposed location of the CCNPP Unit 3 (i.e., horizontal separation distance and vertical grade above the nearest body of water). The NRC staff noted that the supporting blast analyses and evaluation documents support the conclusions in CCNPP Unit 3 COLA Part 8, security plans and referenced technical report.

The NRC staff also communicated several minor discrepancies and edits in documents reviewed with UniStar staff during the audit, including Document No. 32-9051686-001, Section 3.2.2, 3.0, Table 6-1, 6-2; Document No. 32-9054779, Page 3 and Figure 4-1 of ANP-10295; Document No. 32-9118649-000, Pages 12 and 48.