Enclosure to
161-03382, dated 8/3/90

EMERGENCY LIGHTING

INDEPENDENT REVIEW

PALO VERDE
NUCLEAR GENERATING STATION

prepared for

ARIZONA PUBLIC SERVICE COMPANY
P.O. Box 52034
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prepared by

ABB IMPELL CORPORATION
1658-201

ABB Impell Report No. 01-1658-1815
Revision 1

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Pages Affected by Revision 1 to the
"Emergency Lighting Independent Review" Report
(ABB Impell Report No. 01-1658-1815)

Minor editorial changes were required to correct typographical and word processing errors. Specific pages are listed below. Please remove Revision 0 pages and insert Revision 1 pages. Refer to the Table of Contents for a matrix that lists the individual pages of the report and the corresponding revision level.

Appendix D, "Utility Survey" was replaced in its entirety. The handwritten utility responses were typed. No text changes were made.

The Appendix E, "NRC/APS Concerns" cover page was deleted. The cover page was inadvertently issued in Revision 0. Appendix E was never utilized.

Page No.	Revision
3-2	1
4-10	1
4-15	1
4-16	1
4-21	1
4-22	1
4-24	1
4-52	1
4-71	1
Appendix D	1 (Entire Appendix)
Appendix E	- Removed from Rev. 1

EXECUTIVE SUMMARY

At the request of Arizona Public Service Company, ABB Impell Corporation performed an independent review of the Palo Verde Nuclear Generating Station (PVNGS) emergency lighting system. In this role ABB Impell:

1) Determined the NRC requirements applicable to the emergency lighting system,

2) Determined on a sample basis, whether APS work done to date meets the applicable requirements,

3) Determined what selected other nuclear power plants are doing to meet requirements applicable to their emergency lighting systems, and

4) Evaluated the emergency lighting concerns raised by the NRC in Inspection Report 90-02 and by the NRC or others subsequent to January 1, 1990, and determined whether the APS discussion was responsive to those concerns.

ABB Impell reviewed the Code of Federal Regulations, NRC guidance documents, NRC Inspection Procedures, PVNGS Licensing documents and correspondence, Regulatory Commitment Tracking (RCTS and RCTS2) output, design basis documents, and industry codes and standards to ascertain the NRC requirements applicable to the emergency lighting system.

ABB Impell performed a sample-based review of the PVNGS emergency lighting system to determine whether work done to date fulfills the NRC requirements identified. The investigation by the ABB Impell review team was conducted in a manner similar to an NRC inspection. The depth of the review and the sampling methods (e.g. document review, physical verification or interview) were based upon the judgment and knowledge of the review team and were limited in scope to the NRC fire protection-related requirements for emergency lighting. Conclusions drawn by ABB Impell are based solely on the review of PVNGS documentation, limited walkdowns and information supplied in meetings.

A survey of other nuclear power plants was conducted to determine what the industry is currently doing to meet requirements applicable to emergency lighting systems.

Finally, ABB Impell reviewed the concerns identified by the Nuclear Regulatory Commission in Inspection Report 90-02 and the subsequent concerns identified by the NRC and APS personnel to ascertain the source requirement/commitment for the concern and to determine if the APS discussion was responsive to the concerns.

ABB Impell identified four issues as a result of the review of NRC requirements and APS implementation. These issues were 1) Quality Assurance Requirements, 2) Design Adequacy, 3) Lighting Placement, and 4) Maintenance. These findings have also been identified by APS through their internal review process. APS has indicated that the following actions are to be completed:

- PVNGS emergency lighting is now designated QAG, consistent with the Quality Assurance Criteria Manual. Plant procedures will be reviewed to ensure the QAG program is being fully implemented.
- Replacement of Holophane batteries is in progress. APS will obtain confirmatory vendor data from battery manufacturers which have not as yet provided necessary data.
- The action plan identified in CAR 90-014.
- The preventive maintenance program will be upgraded to ensure that lights are properly aimed.

The utility survey identified a wide range of technical positions on emergency lighting; however, the following points are of interest:

- Two of seven utilities produced evidence that temperatures other than 77° had been considered in battery sizing.
- Five of the seven utilities contacted considered emergency lights part of their augmented quality program for fire protection.
- Three of the eight utilities contacted regarding operability/reportability issues had some sort of compensatory measure for an out-of-service emergency light.

ABB Impell determined that the discussions developed by APS in response to the NRC and APS generated concerns, were generally responsive. Recommendations are provided for a number of the concerns.

In conclusion, APS has, over the years, identified the individual issues regarding emergency lighting at PVNGS. Corrective actions to address the identified issues focused on the immediate concerns with limited attention to the underlying programmatic issues.

Recent corrective actions identified/reviewed during ABB Impell's independent evaluation appear to address the broader programmatic issues. In ABB Impell's opinion, these issues represent the source of the individual deficiencies.

Completion of the APS correctives actions and the implementation of the ABB Impell recommendations in this report will establish a program for continued compliance with the fire protection emergency lighting requirements.

TABLE OF CONTENTS

Executive Summary		i
1.0	Introduction	1-1
2.0	Scope	2-1
3.0	Methodology	3-1
4.0	Results	4-1
5.0	Conclusions	5-1
6.0	References	6-1

Appendices

Appendix A - NRC Requirements	A-1
Appendix B - License Commitments	B-1
Appendix C - Performance Commitments	C-1
Appendix D - Utility Surveys	D-1

"Emergency Lighting Independent Review" Report
(ABB Impell Report No. 01-1658-1815)

TABLE OF CONTENTS

Exec. Summary	Revision	Date
i.	0	7-19-90
ii.	0	7-19-90
iii.	0	7-19-90
Table of Contents	**Revision**	**Date**
iv.	0	7-19-90
v.	1	7-24-90
vi.	1	7-24-90
vii.	1	7-24-90
viii.	1	7-24-90
1.0 Introduction	**Revision**	**Date**
1-1	0	7-19-90
2.0 Scope	**Revision**	**Date**
2-1	0	7-19-90
3.0 Methodology	**Revision**	**Date**
3-1	0	7-19-90
3-2	0	7-19-90
3-3	0	7-19-90
3-4	0	7-19-90
3-5	0	7-19-90
3-6	0	7-19-90
4.0 Results	**Revision**	**Date**
4-1	0	7-19-90
4-2	0	7-19-90
4-3	0	7-19-90
4-4	0	7-19-90

4.0 (Con't.)	Revision	Date
4-5	0	7-19-90
4-6	0	7-19-90
4-7	0	7-19-90
4-8	0	7-19-90
4-9	0	7-19-90
4-10	0	7-19-90
4-11	0	7-19-90
4-12	0	7-19-90
4-13	0	7-19-90
4-14	0	7-19-90
4-15	0	7-19-90
4-16	0	7-19-90
4-17	0	7-19-90
4-18	0	7-19-90
4-19	0	7-19-90
4-20	0	7-19-90
4-21	0	7-19-90
4-22	0	7-19-90
4-23	0	7-19-90
4-24	0	7-19-90
4-25	0	7-19-90
4-26	0	7-19-90
4-27	0	7-19-90
4-28	0	7-19-90
4-29	0	7-19-90
4-30	0	7-19-90
4-32	0	7-19-90
4-33	0	7-19-90

4.0 (Con't.)	Revision	Date
4-34	0	7-19-90
4-35	0	7-19-90
4-36	0	7-19-90
4-37	0	7-19-90
4-38	0	7-19-90
4-39	0	7-19-90
4-40	0	7-19-90
4-41	0	7-19-90
4-42	0	7-19-90
4-43	0	7-19-90
4-44	0	7-19-90
4-45	0	7-19-90
4-46	0	7-19-90
4-47	0	7-19-90
4-48	0	7-19-90
4-49	0	7-19-90
4-50	0	7-19-90
4-51	0	7-19-90
4-52	0	7-19-90
4-53	0	7-19-90
4-54	0	7-19-90
4-55	0	7-19-90
4-56	0	7-19-90
4-57	0	7-19-90
4-58	0	7-19-90
4-59	0	7-19-90
4-60	0	7-19-90
4-61	0	7-19-90
4-62	0	7-19-90
4-63	0	7-19-90
4-64	0	7-19-90
4-65	0	7-19-90
4-66	0	7-19-90
4-67	0	7-19-90
4-68	0	7-19-90

4.0 (Con't.)	Revision	Date
4-70	0	7-19-90
4-71	0	7-19-90
4-72	0	7-19-90
4-73	0	7-19-90
4-74	0	7-19-90
4-75	0	7-19-90
4-76	0	7-19-90
4-77	0	7-19-90
4-78	0	7-19-90
4-79	0	7-19-90
4-80	0	7-19-90
4-81	0	7-19-90
4-82	0	7-19-90
4-83	0	7-19-90
4-84	0	7-19-90
4-85	0	7-19-90
4-86	0	7-19-90
4-87	0	7-19-90
4-88	0	7-19-90
4-89	0	7-19-90
4-90	0	7-19-90
4-91	0	7-19-90
4-92	0	7-19-90
4-93	0	7-19-90
4-94	0	7-19-90

5.0 Concl.	Revision	Date
5-1	0	7-19-90

6.0 Referen.	Revision	Date
6-1	0	7-19-90
6-2	0	7-19-90
6-3	0	7-19-90
6-4	0	7-19-90

Appendix A	Revision	Date
A-1	0	7-19-90
A-2	0	7-19-90
A-3	0	7-19-90
A-4	0	7-19-90
A-5	0	7-19-90
A-6	0	7-19-90
A-7	0	7-19-90
A-8	0	7-19-90
A-9	0	7-19-90
A-10	0	7-19-90
A-11	0	7-19-90
A-12	0	7-19-90
A-13	0	7-19-90
A-14	0	7-19-90
A-15	0	7-19-90
A-16	0	7-19-90
A-17	0	7-19-90
A-18	0	7-19-90
A-19	0	7-19-90
A-20	0	7-19-90
A-21	0	7-19-90
A-22	0	7-19-90
A-23	0	7-19-90
A-24	0	7-19-90
A-25	0	7-19-90

Appendix B	Revision	Date
B-1	0	7-19-90
B-2	0	7-19-90
B-3	0	7-19-90
B-4	0	7-19-90
B-5	0	7-19-90
B-6	0	7-19-90
B-7	0	7-19-90
B-8	0	7-19-90

B (Con't)	Revision	Date
B-9	0	7-19-90
B-10	0	7-19-90
B-11	0	7-19-90

Appendix C	Revision	Date
C-1	0	7-19-90
C-2	0	7-19-90
C-3	0	7-19-90
C-4	0	7-19-90
C-5	0	7-19-90
C-6	0	7-19-90
C-7	0	7-19-90
C-8	0	7-19-90
C-9	0	7-19-90
C-10	0	7-19-90
C-11	0	7-19-90

Appendix D	Revision	Date
D-1-1	1	7-24-90
D-1-2	1	7-24-90
D-1-3	1	7-24-90
D-1-4	1	7-24-90
D-1-5	1	7-24-90
D-2-1	1	7-24-90
D-2-2	1	7-24-90
D-2-3	1	7-24-90
D-2-4	1	7-24-90
D-2-5	1	7-24-90
D-3-1	1	7-24-90
D-3-2	1	7-24-90
D-3-3	1	7-24-90
D-3-4	1	7-24-90
D-3-5	1	7-24-90

D. (Cont't)	Revision	Date
D-4-1	1	7-24-90
D-4-2	1	7-24-90
D-4-3	1	7-24-90
D-4-4	1	7-24-90
D-4-5	1	7-24-90
D-5-1	1	7-24-90
D-5-2	1	7-24-90
D-5-3	1	7-24-90
D-5-4	1	7-24-90
D-5-5	1	7-24-90
D-6-1	1	7-24-90
D-6-2	1	7-24-90
D-6-3	1	7-24-90
D-6-4	1	7-24-90
D-6-5	1	7-24-90
D-7-1	1	7-24-90
D-7-2	1	7-24-90
D-7-3	1	7-24-90
D-7-4	1	7-24-90
D-7-5	1	7-24-90
D-8-1	1	7-24-90
D-8-2	1	7-24-90
D-8-3	1	7-24-90
D-8-4	1	7-24-90
D-8-5	1	7-24-90

1.0 Introduction

At the request of Arizona Public Service Company, ABB Impell Corporation performed an independent third party review of the Palo Verde Nuclear Generating Station (PVNGS) emergency lighting system.

This report documents ABB Impell's evaluation of the PVNGS emergency lighting system. The project scope and review methods are discussed in Sections 2.0 and 3.0. Evaluation findings and recommendations are detailed in Section 4.0. Conclusions are drawn in Section 5.0.

Appendices A, B and C summarize requirements and APS actions relative to emergency lighting. Appendix D gives the utility survey information.

2.0 Scope

ABB Impell assumed the role of independent reviewer. In that role, ABB Impell:

- Determined the NRC requirements applicable to the emergency lighting system.
- Determined on a sample basis, whether APS work done to date meets the applicable NRC requirements.
- Determined what selected other nuclear power plants are doing to meet requirements applicable to their emergency lighting systems.
- Evaluated the emergency lighting concerns raised by the NRC in Inspection Report 90-02 and determined whether the APS discussion responded to those concerns. Evaluated the concerns raised by the NRC or by others since January 1, 1990, as documented by APS and provided to Impell, and determined whether the APS discussion responded to those concerns.

The depth of the review and the sampling techniques (e.g. document research, physical verification, or interview) are discussed in the methodology and results sections.

3.0 Methodology

The emergency lighting system Independent Evaluation was divided into four tasks. Task One was to identify the NRC requirements and licensing commitments relating to the emergency lighting system at PVNGS. Task Two was to determine by sample the extent of APS compliance with those requirements/ commitments. Task Three was an industry survey to determine other utilities' methods of compliance with emergency lighting issues. Finally, in Task Four NRC and APS concerns were reviewed. Task methodology is described below.

3.1 Task One - Identify Emergency Lighting NRC Requirements

Requirements for the emergency lighting system can be segregated into three categories: NRC Requirements--those documents relied upon in the Licensing process; Licensee commitments--those items APS committed to but were not in the original Licensing process; and Performance Guidance--documents which provide information such as codes, vendor documents, NRC Inspection Procedures, and internal APS documents. The emergency lighting requirements were divided into these categories because:

1. The level of regulatory enforcement would differ between categories,

2. The ease of revision of the commitment would differ between categories, and

3. The priority of resulting action items may differ between categories.

With these categories defined, the following documents were reviewed to determine the emergency lighting system requirements.

Category A - NRC Requirements

- 10CFR
- Technical Specifications
- Regulatory Guides
- Branch Technical Positions / Standard Review Plan
- UFSAR
- Correspondence (relied upon during the Licensing process)
- NRC Safety Evaluations and Supplements

Category B - Licensee Commitments

- Response to Generic Letters
- APS Correspondence to NRC (not identified above)
- Licensee Event Reports (LERs)
- Notice of Violation Responses
- Implementing Procedures

Category C - Performance Guidance

- NRC Inspection Procedures (for guidance)
- EERs/QDRs/CARs/MNCRs
- IE Notices
- Generic Letters (no response necessary)
- Codes (not committed to above)
- NUREGs, and other NRC Guidance Documents
- Vendor Requirements

ABB Impell independently researched these documents to determine the requirements/commitments applicable to the emergency lighting system at PVNGS.

Once the requirements/commitments were identified they were entered into the compliance tables (see Appendices A, B and C).

3.2 Task Two - Determine how APS met Requirements

To determine whether APS work done to date complies with the NRC emergency lighting system requirements and the APS commitments, ABB Impell chose a representative sample of the relevant documentation, knowledgeable APS personnel, and portions of the emergency lighting system. ABB Impell reviewed this documentation, interviewed the APS personnel, and visually examined portions of the system. ABB Impell's review was not exhaustive. The review was limited to emergency lighting provided for 10CFR50 Appendix R. Specific items reviewed and the depth of that review are detailed in Section 4 and in Appendices A, B and C.

As the review was conducted, the following information was entered into the compliance tables.

- APS Action - Results of ABB Impell's review
- Y/N Compliance - ABB Impell's opinion of APS compliance
- References - Documents reviewed, personnel discussions relied upon in the evaluation

3.3 Task Three - Industry Survey

To ascertain what selected other nuclear power facilities are doing to meet requirements applicable to emergency lighting systems, a questionnaire was developed (see Figure 3.1). Eight utilities were contacted, including two utilities with the GL 86-10 license condition. Because of the need to contact the appropriate utility personnel, the utilities chosen were current Impell clients. Due to the diverse nature of the questions, several individuals within the utility were contacted. This information can only be relied upon to identify general trends in the industry.

3.4 Task Four - Review of APS/NRC Concerns

ABB Impell reviewed the specific NRC and APS identified concerns. Each concern was reviewed to provide an engineering opinion of the regulatory requirements.

ABB Impell assessed whether the APS discussion was responsive to the concern. Independent verification of the APS statements was not performed.

EMERGENCY LIGHTING REVIEW
UTILITY SURVEY

Design Issues:

How did you determine where emergency lights were to be installed (Appendix R and others)?

_____
_____
_____

Once locations were identified, did you take into account environmental (temp, humidity, etc) concerns?

_____
_____
_____

Do you maintain battery sizing calculations for your emergency lighting units?

_____
_____
_____

Did you install your emergency lights to meet certain illumination levels? If not, what was your acceptance criteria?

_____
_____
_____

What type of emergency lights do you utilize in your plant(s)?

_____
_____
_____

Maintenance Issues:

What is included in your preventive maintenance program with respect to your emergency lighting (ie placement, electrolyte, discharge test)?

_____
_____
_____

Figure 3.1

Do you trend any of the data collected? If so, what is trended, what is it used for, and what have you found (failure rates)?

How often do you test your emergency lights? What type of test do you perform? Do you perform any maintenance or special charging prior to testing?

Configuration Management Issues:

Do you review your placement and illumination levels when installing a design modification?

Do you have specific engineering studies that support your lighting placement? Do you update these documents?

QA Issues:

Do you have any special qualifications for QA/QC inspectors reviewing/performing fire protection activities? Any special training?

What type of quality assurance requirements do you have for emergency lights?

Figure 3.1
Continued

Operability Issues:

What type of operability requirements do you have for emergency lights?

Do you have any reportability requirements for emergency lights?

Training Issues

How do you train operators on actions for a fire outside the control room?

What documents contain operator actions outside the control room?

Figure 3.1
Continued

4.0 Results/Recommendations

The results/recommendations section is divided into the following four subsections:

- 4.1 Independent Review

  The results of the independent review of the NRC requirements and how APS met the requirements are presented in this section. Other results/ recommendations of the independent review are presented in Section 4.4.

  The requirements were grouped into four general areas:

  1. Quality Assurance
  2. Design/sizing
  3. Placement
  4. Maintenance.

  For each grouping, the following is presented:

  - Requirements Analysis - A summary of the requirements
  - Review - Details of the review process (including sample size and review method)
  - Results - Findings related to the Requirements Analysis
  - Recommendations - Recommendations based on industry practice and NRC Guidance documents.

- 4.2 NRC/APS Concerns

  The results of the review of the specific NRC and APS identified concerns are presented in this section. For each concern the following is presented:

  - The original concern and the APS response
  - Requirements Analysis - A summary of the requirements
  - Analysis of APS Response
  - Results/Recommendations

- 4.3 Utility Survey

  The detailed results of the utility survey are contained in Appendix D. Summarized in this section are those issues related to the findings in Sections 4.1 and 4.4:

- Quality Assurance Requirements
- Battery Sizing
- Placement
- Preventive Maintenance
- Operability/Reportability Issues

- 4.4 Other Recommendations

Programmatic recommendations are presented in this section.

4.1 Independent Review

4.1.1 Quality Classification of Emergency Lights

4.1.1.a Requirements Analysis

- 10CFR50.48 (a) requires "each operating nuclear power plant shall have a fire protection plan that satisfies Criterion 3 of Appendix A to this part (10CFR50, Appendix A, General Design Criteria)."

- Criterion 3 of Appendix A to 10CFR50 specifies that "Structures, systems and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."

- License Conditions 2.C (7) [Unit 1], 2.C (6) [Unit 2] and 2.F [Unit 3] state, "APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, as supplemented and amended . . . "

- The Fire Protection Program referred to in these License Conditions is the "fire protection plan that satisfies Criterion 3 of Appendix A" to 10CFR50 with respect to emergency lights required by Appendix R to 10CFR50. (See original NUREG 0857 SER Section 9.5.1.9).

  Further, all elements of the Fire Protection Program, by virtue of being a License Condition, are required by the Operations Quality Assurance Criteria Manual to be subject to pertinent quality assurance criteria.

- Operations Quality Assurance Criteria Manual Criterion 2 "Quality Assurance Program," Section 2.2.3.1 states "Any activity which is required as a condition of the operating license for the PVNGS Units 1, 2 or 3 shall be subject to the pertinent criteria established in this manual."

- Section 2.2.3.2 of the Operations Quality Assurance Criteria Manual states "Activities that affect the design, installation, maintenance or operability of safety-related and important to safety structures, systems or components, as described in 2.2.4, 2.2.5, and 2.2.6 of this manual, shall be controlled in accordance with the pertinent criteria established in this manual to an extent consistent with their importance to safety." (Section 2.2.4 is related to safety-related activities and is not pertinent to emergency lights).

- Section 2.2.5 of the Operations Quality Assurance Criteria Manual, "Items Important-to-Safety," states "Items important-to-safety are those structures, systems and components which are subject to the operations quality assurance program but are not safety-related, as identified in the notes to FSAR Table 3.2-1 and Appendix I of this manual.

- Section 2.2.6, "Quality-Related Items," states "Quality-related items are those structures, systems and components that are subject to the operations quality assurance program and include items which are "Safety-Related" or "Important-to-Safety." Items classified as Important-to-Safety are defined in Appendix I of this manual. (Emergency lights are included within the scope of "Important to Safety" in Appendix I of the Operations Quality Assurance Criteria Manual, Section 2.0 "Fire Protection" because they fulfill a commitment of BTP 9.5-1, Appendix A and are described in FSAR Section 9.5).

- Section 2.2.7, "Quality-Related Activities," states "Quality-related activities are those activities associated with safety-related or important-to-safety systems, equipment or components, that, as a result of not being performed or of being performed improperly, could result in the failure to satisfy, in whole or in part, the objectives identified in Article 2.1 of this manual [2.1 "the objective is to ensure that all activities conducted during operations of PVNGS . . . are conducted . . . in compliance with applicable license and other regulatory requirements APS has committed to in the PVNGS"].

Section 2.2.7 continues, "Quality-related activities include: inspections, testing, monitoring, auditing, reviewing, records management, and other activities that are performed for the purpose of verifying or assuring that safety-related or important-to-safety, as described in Articles 2.2.5 and 2.2.6, . . . satisfy defined requirements."

Section 2.2.7 also states "Quality-related activities include: activities affecting items identified in the Notes to Table 3.2-1 of the PVNGS FSAR (e.g., radiation protection, selected portions of the fire protection and radwaste systems, and emergency plan), and classified as important-to-safety in Appendix I of this manual." (See also Criterion 3 of the Operations Quality Assurance Criteria Manual Section 3.1.)

- Section 2.0, "Fire Protection," of Appendix I to the Operations Quality Assurance Criteria Manual states " Those fire protection systems required to fulfill the PVNGS commitment to NRC Branch Technical Position APCSB 9.5-1 as described in the FSAR Section 9.5 are classified important-to-safety. Consistent with APCSB 9.5-1, the following Quality Assurance Criteria are applicable to these systems: 3, 4, 5, 7, 10, 11, 14, 15, 16, 17 and 18."

  Therefore, since the emergency lights are described in FSAR Section 9.5 and Appendix 9B as fulfilling an element of the APS commitment to BTP 9.5-1, Appendix A, the emergency lights are required by the Operations Quality Assurance Criteria Manual Appendix I, Section 2, to be classified as "Important-to-Safety." (See FSAR 9.5.1.1.1.R.)

  This is in addition to the need for the emergency lights to be within the scope of the Operations Quality Assurance Criteria Manual by virtue of being an element of the "Fire Protection Plan" which is a License Condition (Section 2.2.3.1 OQACM).

  Further, the Quality Assurance Program description in the FSAR provides evidence that fire protection program activities which have potential impact on safety-related equipment are to be subject to Quality Assurance Criteria.

- UFSAR Section 17.2 ,"Quality Assurance During the Operational Phase," in Section 17.2.0, "Introduction," states "Compliance with requirements of this operations quality assurance program is mandatory."

- UFSAR Section 17.2.2, "Quality Assurance Program," states "The Operations Quality Assurance Criteria Manual is the method by which the APS Management promulgates the criteria or requirement of the APS QA program."

- UFSAR Section 17.2.2.2, "Program Scope," states "The Operations QA program, as described in the Operations Quality Assurance Criteria Manual, shall be applied to fire protection program activities associated with those fire protection systems and equipment used or installed in areas housing safety-related equipment, and other areas where an unsuppressed fire could potentially damage safety-related structures, systems, or components. The appropriate requirements of subsections 17.2.3, 17.2.4, 17.2.5, 17.2.7, 17.2.10, 17.2.11, 17.2.14, 17.2.15, 17.2.16, 17.2.17, and 17.2.18 shall be applied to the fire protection program (refer to Question 17A.10, NRC Question 260.10)." (The UFSAR Sections referenced above coincide with the pertinent QA requirements of BTP 9.5-1 Appendix A, Section C, "Quality Assurance.")

- Question 17A.10 from UFSAR Appendix 17A states "Table 17.2-1 indicates that the fire protection QA program is met as part of the QA program under 10CFR Part 50, Appendix B. Item 16 in Table 3.2-1 of the FSAR indicates that the PVNGS QA program does not apply to the fire protection system. Clarify."

  "Response: Amended Table 17.2-1 indicates that the quality assurance program during the operational phase complies with the quality assurance program guidelines of Appendix A to (BTP) APCSB 9.5-1. Application of the QA program to fire protection program activities is described in amended paragraph 17.2.2.2." (This states that FSAR Table 17.2-1 and FSAR Section 17.2.2.2 govern the description of the application of the QA program to fire protection program activities). "Amended Table 3.2-1 indicates that pertinent requirements of 10CFR50, Appendix B, are applied to fire protection program activities during the operations phase."

- UFSAR Section 17.2.2.7, "Applicability of Codes, Standards and Regulatory Guides," states "the requirements for the Operations QA program are described in Table 17.2-1."

- UFSAR Table 17.2-1, "Quality Assurance Standards and Guides Compliance Matrix," reads, under the heading "Clarifications and Exceptions," "The Operations Quality Assurance Program complies with the Quality Assurance Program Guidelines of Appendix A to (BTP) APCSB 9.5-1." (This is a commitment to the QA requirements of Appendix A to BTP 9.5-1.)

- UFSAR Table 3.2-1, Item 16 "Fire Protection System," states, under the heading "PVNGS Quality Assurance Class," note "y" for water and CO_2 System components and note "h" for supports and hangers.

- UFSAR Table 3.2-1, note "h" states that "hangers and supports are designed to the same classification as the associated equipment or piping when the equipment is required for safety. Non-safety portions of structures, systems, or components whose failure could reduce the functioning of any safety-related structure system or component are designed and constructed such that a safe shutdown earthquake (SSE) would not cause such a failure." (Not an explicit commitment to QA requirements of BTP 9.5-1.)

- UFSAR Table 3.2-1, note "y" states "The pertinent requirements of 10CFR50, Appendix B, (i.e., those specified in Appendix A to BTP APCSB 9.5-1) are applied to operational phase activities associated with fire protection systems and equipment used or installed in areas housing safety-related equipment, and other areas where an unsuppressed fire could potentially damage safety-related structures, systems, or components." (Explicit commitment to QA requirements of BTP 9.5-1.)

- UFSAR Section 9.5.1 references Appendix 9B of the UFSAR.

- Appendix 9B of the UFSAR states "This appendix presents an evaluation of the fire protection provided for PVNGS Units 1, 2 and 3. The evaluation has been made by comparing the PVNGS fire protection features to the guidelines contained in Appendix A of the Branch Technical Position (BTP) APCSB 9.5-1 (revised February 2, 1977) and to 10CFR50, Appendix R, Part III, Sections G, J, and O (issued September 1, 1982) . . . Details of the plant design which provide that assurance are set forth in Sections 9B.2 and 9B.3 of this Appendix."

- Section 9B.3, "Comparison of Palo Verde Nuclear Generating Station to Appendix A of NRC Branch Technical Position APCSB 9.5-1," under "Compliance Summary" states . . . "Table 9B.3-1 provides a detailed comparison of the Appendix A guidelines for plants under construction and operating plants against the PVNGS position. For each case of noncompliance, the bases constituting justification for the deviation are also provided."

- UFSAR Table 9B.3-1, "Comparison of Palo Verde Nuclear Generating Station to Appendix A of NRC Branch Technical Position APCSB 9.5-1," states under Section C, "Quality Assurance Program," for Items 1 through 10 that "PVNGS complies" and no items of noncompliance are identified therein, with minor clarifications for Items 3 and 4. This provides a commitment to the Quality Assurance Requirements of Appendix A to BTP 9.5-1.

4.1.1.b Review

After review of the requirements cited above, the following issues became apparent.

1. The "original" FSAR Chapter 17.2 had indicated that all 18 QA criteria from 10CFR50, Appendix B had been adopted for application to fire protection activities.

2. The "original" FSAR Table 3.2-1 had not specified any QA requirements for the Fire Protection Systems.

3. APS has clarified this by committing to the Quality Assurance requirements of BTP APCSB 9.5-1, Appendix A (11 of 18 Appendix B to 10CFR50 Criteria) for fire protection activities and has documented this commitment in Operations Quality Assurance Criteria Manual, Appendix I (Section 2) and UFSAR Tables 17.2-1, 9B.3-1, footnote "y" of Table 3.2-1, and Section 17.2.2.2.

4. Therefore, it appears that the original intent of the Operations Quality Assurance Program was changed, with NRC concurrence, to require only 11 of the 18 10CFR50, Appendix B Quality Criteria.

   NRC acceptance of this position is consistent with BTP 9.5-1, Appendix A, the Standard Review Plan, Guidance Document "Nuclear Plant Fire Protection Functional Responsibility and Administrative Controls and Quality Assurance" dated June 14, 1977 (and referenced in 10CFR50.48) and Regulatory Guide 1.120 "Fire Protection Guidelines for Nuclear Power Plants" (for comment).

   This change, as described above, required all elements of FSAR Section 9.5 which fulfill the PVNGS commitments to NRC BTP 9.5-1, Appendix A to be classified "Important-to-Safety." (See Appendix I of the Operations Quality Assurance Criteria Manual.)

Emergency lighting is one element of the PVNGS commitment of BTP 9.5-1 which is described in UFSAR Section 9.5.1.1.1.R.

5. Procedure 81AC-0CC06, "Quality Classification for Structures, Systems, Components, Spare Parts and Activities," designates "Important-to-Safety" activities to be QAG in Appendix A, page 21 of 36. This procedure is a means of implementing the Operations Quality Assurance Criteria manual, Appendix I requirements.

   However, procedure 81AC-0CC06 is inconsistent such that one interpretation could be to limit the applicability of the BTP 9.5-1 Appendix A QA criteria to only those items explicitly delineated in Item 16 of UFSAR Table 3.2-1 (See Procedure Section 3.8.2, 3.8.3, 4.15, Appendix A - fifth paragraph, Quality Classification Matrix - Item 3, and Appendix F).

6. Limiting QA criteria applicability to only the Item 16 components is not consistent with the broader context of FSAR Sections 17.2 and 9B.3 and the Operations Quality Assurance Criteria Manual and relies on the assumption that Quality Assurance requirements are only specified in UFSAR Table 3.2-1. This assumption is not consistent with UFSAR Sections 17.2, 9.5, 9B, Operations Quality Assurance Criteria Manual - Criterion 2 and Appendix I, UFSAR Tables 9B.3-1 and 17.2-1.

   If UFSAR Table 3.2 -1, Item 16 were the sole basis for determining a Fire Protection System component's QA classification, the fire detection systems, all administrative controls (e.g. transient combustible controls, hot-work permits, fire brigades, safe-shutdown procedures) and physical fire barriers could be considered to not be"important-to-safety."

   This position is not consistent with NRC letter dated June 14, 1977 "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance (which is referenced in 10CFR50.48) which states in Attachment 6 "Quality Assurance," "These QA criteria apply to those items within the scope of the fire protection program, such as fire protection systems, emergency lighting, communication and emergency breathing apparatus as well as the fire protection requirements of applicable safety-related equipment."

7. Quality Assurance Requirements are also mandated by virtue of the Fire Protection Program being a License Condition (2.C (7), 2.C (6), 2.F) as specified in Criterion 2, Sections 2.1.b, 2.2.1.3, 2.2.3.1 and 2.2.7.1 of the Operations Quality Assurance Criteria Manual.

8. It is recognized that emergency lighting is now designated QAG (Important-to-Safety); therefore, the PVNGS classification is consistent with the BTP 9.5-1, Appendix A, the UFSAR, Section 9B and 17.2 for Emergency Lighting.

4.1.1.c Results

PVNGS emergency lighting is currently classified as QAG. This is consistent with the Operations Quality Assurance Criteria Manual, Appendix I, the UFSAR Sections 9.5, 9B and 17.2 and BTP 9.5-1.

4.1.1.d Recommendations

1. Procedure 81AC-0CC06 and related procedures should be reviewed to remove any source of confusion that structures, systems and components and activities described in FSAR Section 9.5 which implement commitments made to BTP 9.5-1, Appendix A, are important-to-safety and should be classified QAG.

2. Classify the structures, systems, components and activities which implement commitments made to BTP 9.5-1, Appendix A as QAG.

3. Implement the Operations Quality Assurance Criteria Manual for the QAG items classified above.

4.1.1.e Rationale for Quality Classification of Emergency Lights

Prior to the adoption of Appendix R, Sections III.G, J and O of 10CFR50 by APS in the FSAR, the design criteria manual did not specify the emergency lighting as important-to-safety (QAG). They were classified Quality Class S or R.

The NRC reviewed FSAR Table 3.2-1 in reasonable detail, as evidenced by questions 17A.10, 17A.50, 17A.62; therefore, a reasonable assumption could be that if the NRC wanted more of the Fire Protection System classified Important-to-Safety, than the Water and Gas Systems, it would have been entered into Item 16 of Table 3.2-1.

This argument can be carried further by reading note 7y of Table 3.2-1 to apply to only the "Fire Protection System" (Item 16 of Table 3.2-1) because it described the application of QA criteria to "operational phase activities associated with fire protection systems" (i.e. water and gas systems) "and equipment used or installed in areas housing. safety-related equipment," etc.

This argument continues in the QA Classification Procedure 81AC-0CC06 in Section 3.8.3 which states that "Items not covered by 3.8.1 or 3.8.2 above and which have project classifications reflecting Quality Class R and S and seismic categories 2, 3 and #, are NQR."

Section 3.8.1 addresses the safety-related classification. Section 3.2.1 addresses the important-to-safety classification and limits its application to "Items which are affected by the following footnotes of Table 3.2-1 . . . 7e, 7o, 7u, 7y, 7aa, 9 and 10."

Also 4.0, "Definitions and Abbreviations," of procedure 81AC-0CC06 states at Section 4.15, "Important-to-Safety," " Included in the category are items which PVNGS has made a regulatory commitment to apply a QA Program, i.e. via the footnotes to Table 3.2-1 of the FSAR." This could be construed to limit the application of a QA program to only Item 16 Fire Protection Equipment even though the first sentence of Section 4.15 invokes the Operations Quality Assurance Criteria Manual, which has a broader definition of Important-to-Safety in Appendix I.

Paragraph five of Appendix A of Procedure 81AC-0CC06 could also be used to foster the interpretation, as could Item 3 of the Quality Classification Matrix of Appendix A and Appendix F. Therefore, based on FSAR Table 3.2-1 and Procedure 81AC-0CC06 (and its predecessor, procedure ES03.02) one could conclude that emergency lighting should be classified Non-Quality-Related.

It should be noted that Quality Assurance personnel have identified the need to upgrade the Emergency Lights to QAG as evidenced by QA Audit 89-018, Checklist 89-108-13 dated August 3, 1989, Attachment A, page 1 of 2. In addition, APS Engineering concluded July 25, 1988 (Letter 167-02588) that emergency lighting should be classified QAG if "it is required to meet 10CFR50, Appendix R safe shutdown requirements."

The emergency lighting system not previously being classified as Important-to-Safety was identified by APS in July 1988.

In conclusion, emergency lighting is currently being classified as QAG and it is recommended that Procedure 81AC-0CC06 be revised to remove any source of confusion.

4.1.2 Emergency Lighting Design

4.1.2.a Requirements Analysis

- 10CFR50.48 (a) requires "each operating nuclear power plant shall have a fire protection plan that satisfies Criterion 3 of Appendix A to this part (10CFR50, Appendix A, General Design Criteria).
- License Conditions 2.C (7) [Unit 1], 2.C (6) [Unit 2], and 2.F [Unit 3] state "APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, as supplemented and amended . . . ."
- UFSAR Section 9.5.1, references Appendix 9B of the UFSAR
- Appendix 9B of the UFSAR states "This appendix presents an evaluation of the fire protection provided for PVNGS Units 1, 2 and 3. The evaluation has been made by comparing the PVNGS fire protection features to the guidelines contained in Appendix A of the Branch Technical Position (BTP) APCSB 9.5-1 (revised February 2, 1977 and to 10CFR50, Appendix R, Part III, Sections G, J and O (issued September 1, 1982)."
- Appendix R to 10CFR50 Section III.J states "Emergency lighting units with at least 8-hour battery power supply shall be provided in all areas needed for the operation of safe shutdown equipment and in access and egress routes thereto."
- UFSAR 9.5.1, "Fire Protection Systems," Section 9.5.1.1.1, Safety Design Basis, Subsection R, Safety Design Basis Eighteen states "Emergency lighting systems shall be provided in accordance with the guidance provided in NRC BTP APCSB 9.5-1 (revised February 2, 1977) and 10CFR50 Appendix R Section III.J (issued September 1, 1982) in areas needed for operation of safe shutdown equipment and in access and egress routes thereto."
- FSAR Section 9.5.1.1.1 R. Safety Design Basis Eighteen further states "The Emergency lighting fixtures shall be selected to be applicable to the areas in which they are installed . . ."

4.1.2.b Review

The emergency lighting system was reviewed to determine if the overall design was adequate to fulfill its intended function. The battery supplies for emergency lights credited for meeting the requirements described above were evaluated in particular to determine if their sizing and capacity are adequate. Emphasis was given to the requirement of FSAR Section 9.5.1.1.1 Safety Design Basis Eighteen which states "The Emergency Lighting fixtures shall be selected to be applicable to the areas in which they are installed . . ." Although no requirements for PVNGS emergency lighting give direction for evaluating temperature derating, the worst case maximum/minimum design temperatures and environments as defined in Table 9.4-2 of the UFSAR were reviewed as good engineering practice.

The review consisted of the following steps:

1. The different vendors that provide eight-hour, battery-backed emergency lighting to PVNGS were identified.

2. The installation locations of emergency lighting batteries credited for compliance with the requirements of 10CFR50 Appendix R Section III.J were determined.

3. The sizing, capacity, and suitability of the subject batteries (vendor and manufacturer's documentation) was reviewed with respect to the worst case temperature environments and outdoor applications.

Step 1) identified four vendors that supply emergency lighting to PVNGS. These vendors are Dual-Lite, Holophane, Emergi-Lite and Exide.

Step 2) determined that Dual-Lite emergency lights were installed in all fire areas of the plant, Holophane emergency lights were installed in the control and auxiliary buildings, Emergi-Lite emergency lights were installed in the MSSS and the turbine building, and the batteries for the Exide emergency lights were installed in the battery rooms of the control building.

Step 3) evaluated the available vendor and manufacturer's material to determine if the batteries were adequately sized once the design maximum/minimum temperatures of the specific installation locations were applied.

Dual-Lite: There are three manufacturers of the nickel-cadmium batteries used in Dual-Lite emergency lighting units; they are Sab-Nife, ALCAD and VARTA.

These three types of batteries have to supply a load of two 7.2 Watts lamp heads. Over a required eight hour discharge time, this computes to 19.2 amp hrs.

The manufacturer's material shows that at extreme temperatures of 122 °F the capacity of the Sab-Nife batteries will remain at or above 100%. However,at lower temperatures of 32 °F the capacity is reduced to 88% (28.16 amp hrs). This is still sufficient to provide 19.2 amp hr needed for an eight-hour discharge.

The ALCAD batteries have a capacity of 41 amp hr at an eight-hour discharge rate. The vendor curves show that at temperatures of 140 °F, 75% of the capacity will remain available. This equates to 30.75 amp hrs, which is more than sufficient to provide 19.2 amp hrs needed for eight-hour discharge. At lower temperatures of 32 °F, the curves show that 88% of the capacity is available (31.41 amp hrs). This is also more than sufficient to provide the 19.2 amp hrs required for eight-hour discharge.

A review of the manufacturer's data on VARTA batteries shows that the installed TP-30 type batteries have a 30.9 amp hr capacity for an eight hour minimum discharge. The data also shows that at temperatures of 122 °F and 32 °F the capacity is reduced to 95% (29.36 amp hrs) and 85% (26.27 Amp hrs), respectively. This remaining capacity is sufficient to provide the 19.2 amp hrs required for an eight-hour discharge time.

Holophane: The original vendor batteries supplied with Holophane UPS emergency lighting units were Globe 6VHC96 96 amp hr. However, in the course of time these batteries were exchanged for Dynasty UPS 12-300 88 amp hr; and Dynasty GC12V100 73 amp hr batteries in Units 1 and 3. After obtaining data on 1) the inverter efficiency (80.5%), 2) number of strings of batteries, 3) required discharge time of eight hours, and 4) the temperature derating of the batteries, the maximum allowable emergency lighting load was determined using the following equation.

[Derated capacity (amp hrs) x No. of strings of batteries (4) x 24VDC x 80.5%) / 8 hours = maximum allowable emergency lighting load (watts)]

The vendor for Globe 6VHC96 batteries provided a vendor curve showing that at 50 °F and at 60 °F the capacity of the battery is reduced to 85% and 90%, respectively. This is equivalent to 81.6 amp hrs and 86.4 amp hrs, respectively. From the above calculations, maximum allowable emergency lighting loads of 832 watts at 50 °F and 881 watts at 60 °F were computed. The Globe batteries may therefore not be able to support eight hour discharge for emergency lighting loads greater than the above maximum allowable limits.

No vendor material for the Dynasty batteries was obtainable. It is safe to assume, however, that since these batteries have lower capacities, their ability to provide eight-hour emergency lighting for the various load demand levels of above 800 watts would also be suspect.

Emergi-Lite: The Emergi-Lite units are provided with SAFT nickel-cadmium batteries. A review of the vendor documentation shows that for an 18 watt load the discharge time will be 9.3 hours. When compensating for high temperatures of 122 °F this time will be reduced by 10% or a total run time of over eight and one-half hours. For 32 °F the time will be reduced by 8% which would still provide enough capacity for an eight-hour discharge.

Some of these units are currently being charged at voltage levels higher than 24 VDC to meet the UL 924 criteria. This does not pose a problem since evaporation is not an issue with the sealed batteries. The Emergi-Lite will be replaced with other units under DCP 1, 2, 3 FE-QD-025.

The Emergi-Lites credited for Appendix R Section III.J are located outdoors. A review of vendor documentation showed that the enclosures are of NEMA 4X or 12 ratings. NEMA 4X cabinet which by NEMA standards is defined as:

> Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water and hose-directed water; undamaged by the formation of ice on the enclosure.

NEMA 12 by NEMA standards is defined as:

> Either indoor or outdoor use to provide a degree of protection against "Falling liquid and light splashing" per the NEMA classifications:

Exide: Since all Exide units are located in the battery rooms and the design temperature is maintained at 85 °F per the UFSAR, these batteries are expected to provide enough capacity for eight-hour emergency lighting.

These batteries are designed and tested to operate in accordance with UL Standard No. 924 and are provided with disconnect switch to disconnect the lighting circuit when the voltage reaches 87.5% of the nominal battery voltage. This should, however, have no impact on the capacity of these batteries to provide an eight-hour discharge.

A separate evaluation of the vendor documentation was also performed in the course of the review to determine the effect of temperature on the battery life of the different types of batteries discussed above.

For all the different battery types installed in the Dual-Lite units, the worst case temperature of a continuous 122 °F (which is conservative) would reduce the battery lives from 20 years to 12 years for Sab-Nife batteries, and 15 years for ALCAD batteries. No information was available for the VARTA batteries regarding life expectancy.

The effect of continuous high operating temperatures of 120 °F on the Globe 6VHC96 96 amp hr batteries for the Holophane units was determined to reduce the battery life from 10 to 1.4 years.

A reduction in battery life for the SAFT batteries installed in Emergi-Lite units from 10 to 4 years with continuously high operating temperatures of 131 °F can be expected.

The environmental issues regarding other components of the emergency light units (i.e. charging cards) should be addressed through the failure trending process.

4.1.2.c Results

The results of the review can be summarized as follows:

Dual-Lite Emergency Lighting Units - The review demonstrated that there was sufficient battery capacity available at the design temperatures to provide eight hours of emergency lighting.

Holophane UPS Emergency Lighting Units - The review determined that the original Globe 6VHC96 96 amp hr batteries are not capable of providing eight hours of emergency lighting at design temperatures of 50 °F for emergency lighting loads greater than 800 watts. There was no readily available vendor information for the replacement Dynasty UPS 12-300 88 amp hr and Dynasty GC12V100 73 amp hr. However, even without being compensated for design maximum/minimum temperatures, these batteries are incapable of providing eight hour emergency lighting to loads greater than 800 watts.

It should be noted here that a load analysis on the Holophane UPS emergency lighting was not performed. The above-mentioned loads are the maximum allowable emergency lighting loads without taking other tangibles (such as wire resistance) into account.

Emergi-Lite - The review determined that the emergency light batteries manufactured by SAFT had enough capacity to provide over eight hours of operation and were appropriate for outdoor use.

Exide - Since these batteries are located in controlled temperature environments of 85 °F, their full capacity is expected to be available.

The life expectancy of the batteries discussed above is not considered a concern since the Preventive Maintenance activities should detect any propensity for failure and the batteries replaced prior to becoming inoperable.

4.1.2.d Recommendations

1. QDR 90-0193 identifies the problems related to the replacement of Holophane emergency lighting batteries with batteries that do not have enough capacity to meet the requirements. The root cause for this specific problem has been identified.

   As part of the resolution to the above QDR, it should be noted that the emergency lighting system is now QAG and all replacement items for the system should fall under the QA requirements applicable to QAG classified systems. This program requires Quality engineering review of any replacement items. This should ensure that the original design criteria are met. APS should determine whether additional verification or documentation is required as a result of the quality classification change.

2. MNCR 90-QB-0004 and MNCR 90-QB-0005 correctly identify the problems related to insufficient capacity of the Holophane batteries to provide eight hours of emergency lighting at 50 °F and 60 °F. However, the dispositions of the above MNCRs do not address the problem directly. The disposition should state that the new replacement UPS units should be able to provide eight hours of emergency lighting for the design temperatures as specified in the UFSAR.

   This can be achieved by greater inverter efficiency in the new units and/or greater battery capacity in the batteries supplied with the units.

3. It is also recommended that all necessary vendor and manufacturer's documentation needed to verify the adequacy of any battery type installed for emergency lighting applications should be complete and maintained in a controlled manner for ease of availability (i.e. VARTA and Dynasty batteries).

4. Maintenance Procedures for batteries should be revised to provide an "Action" value for battery minimum voltage to assure that batteries are replaced before they are no longer capable of providing an eight-hour discharge under adverse conditions.

4.1.3 Emergency Lighting Placement

4.1.3.a Requirements Analysis

- 10CFR50.48 (a) requires "each operating nuclear power plant shall have a fire protection plan that satisfies Criterion 3 of Appendix A to this part (10CFR50, Appendix A, General Design Criteria).

- License Conditions 2.C (7) [Unit 1], 2.C (6) [Unit 2], and 2.F [Unit 3] stated "APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, as supplemented and amended . . . "

- UFSAR Section 9.5.1, References, Appendix 9B of the UFSAR

- Appendix 9B of the UFSAR states "This appendix presents an evaluation of the fire protection provided for PVNGS Units 1, 2 and 3. The evaluation has been made by comparing the PVNGS fire protection features to the guidelines contained in Appendix A of the Branch Technical Position (BTP) APCSB 9.5-1 (revised February 2, 1977 and to 10CFR50, Appendix R, Part III, Sections G, J and O (issued September 1, 1982)."

- Appendix R to 10CFR50 Section III.G.1.a states "One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage . . ."

- Appendix R to 10CFR50 Section III.G.3 states "Alternative or dedicated shutdown capability and its associated circuits, independent of cables, systems or components in the area, room, or zone under consideration, shall be provided: a. Where the protection of systems whose function is required for hot shutdown does not satisfy the requirement of paragraph G.2 of this section . . ."

- Appendix R to 10CFR50 Section III.J states "Emergency lighting units with at least 8-hour battery power supply shall be provided in all areas needed for the operation of safe shutdown equipment and in access and egress routes thereto."

- Engineering Studies 01, 02, 03-NS-110 - Outside the Control Room, Spurious Actuation Study, 13-NS-109 - Control Room Fire, Spurious Actuation Study, and 13-NS-112, Safe Shutdown Separation Study, specify the PVNGS safe shutdown scenario and the equipment requiring manual actions as a result of a fire in any area.

4.1.3.b Review

In accordance with Appendix R, Section III.J emergency lights "shall be provided in all areas needed for the operation of safe shutdown equipment and in access and egress routes thereto." Operator actions are part of the acceptable methods of compliance with Appendix R Sections III.G.1 and III.G.3.

Section III.G.1 requires that one train of systems necessary to achieve and maintain hot shutdown conditions from emergency control stations be free of fire damage. Section III.G.2 provides alternative methods of ensuring components are free of fire damage when redundant trains of safe shutdown equipment are located within the fire area of concern. Section III.G.3 allows the provision of alternative or dedicated shutdown when Section III.G.2 cannot be met.

There are eighteen fire areas in each unit. Of those eighteen, six have operator actions required as a result of a fire. To determine an adequate sample size, ABB Impell used APS Procedure 63DP-0QQ04, "Receipt Inspection" as guidance. This procedure recommends a sample size of 2 for a population of 2-15 items.

The emergency lights provided for operator actions as a result of a control room fire, Fire Area III, (Alternative Shutdown Appendix R, Section III.G.3) have been the subject of numerous internal APS evaluations. ABB Impell randomly selected two fire areas, I and XV, which have emergency lights provided under Appendix R Section III.G.1 and III.J as the sample to receive a detailed review.

For these two fire areas, the manual actions were identified from the Spurious Actuation Study 13-NS-110. The fire zones in which the actions would occur were determined using the emergency lighting drawings, the equipment location drawings, and FSAR drawings.

In order to ascertain if the emergency lights were installed as required, the following evaluation was then conducted:

1. Was the action identified in the Spurious Actuation Study specific?

2. Was a light provided for each manual action?

3. Were lights provided for the access/egress paths to each manual action?

4. Was the action in the fire area/fire zone of concern?
   If the action was in the fire area/fire zone of concern
   a. Would the equipment to be operated be "free of fire damage"?
   b. Was there sufficient time to extinguish the fire and then complete the action?

5. Did the operator have to travel through the fire area/fire zone of concern to complete the action?
   If the access/egress path was through the fire area/fire zone of concern
   a. Were the time frames for the action sufficient to ensure the fire was extinguished and the action completed?
   b. Were there alternative actions outside the area/zone?

ABB Impell reviewed the Spurious Actuation Study 13-NS-110 and the Pre-Fire Strategies for all actions identified for fire areas I and XV. ABB Impell reviewed Procedure 42AO-2ZZ44 "Shutdown Outside the Control Room due to Fire and/or Smoke" to ascertain any additional information regarding the actions in fire areas I and XV. Emergency lighting drawings (13-E-ZPL-001 through 004) were reviewed to determine if lights had been provided for all actions and access/egress paths.

Finally, ABB Impell conducted a walkdown of fire area XV to determine 1) the accuracy of the emergency lighting drawings, 2) the feasibility of the actions, and 3) the aiming of the lights.

The review of fire areas I and XV identified the following.

1. Numerous actions are taken within the fire area of concern. However, most actions are taken in a separate fire zone. Actions within the fire area are acceptable as long as the component to be operated can be shown to be "free of fire damage" and there is sufficient time to extinguish the fire and complete the manual action.

   The NRC brought out a similar concern in Inspection Report 90-02, Section E.4.

   Examples of actions within the zone 52D (Fire Area XV) are:

   - Open switch DS-26-08 in panel E-ZAN-C01 to ensure valve J-CHN-UV-527 is closed
   - Local manually close valve J-CHN-UV-501 after opening circuit breaker M7208 in MCC E-NHN-M72 or close manual valve CHV-771.

   Panel E-ZAN-C01 and MCC E-NHN-M72 are located in fire zone 52D. Based upon the existing analysis the action to open switch DS-26-08 has not been shown to be feasible for a fire in fire zone 52D. Nor is it likely since it will be difficult to demonstrate that a piece of electrical equipment will remain free of fire damage. However, the action to traverse zone 52D to manually close UV-527 can be proven feasible given the physical separation, time constraints for the action, and the fire loading in the zone.

   From Figure 9B-38 in the UFSAR it appears that the closure of valve CHV-771 would mitigate the consequences of the potential spurious operation of UV-501. The spurious actuation analysis further indicates that the action to close CHV-771 can take place after eight hours. QDR-90-054 indicates that lighting provided for actions greater than eight hours does not require an Appendix R light. Enhancement lights may be provided for those actions greater than eight hours. Therefore, CHV-771 is not provided with an eight-hour emergency light (nor are the access/egress routes). Additionally, APS personnel indicated that outside security lighting (routed outside the fire area of concern) would be available.

2. ABB Impell was unable to verify proper lighting for the action "to preclude loss of CST volume, ensure that the Train B condensate transfer pump is not running (Fire Zone 48, 50A, 51B)." There are no doubt a number of actions which can be taken to ensure that the condensate transfer pump is not running.

   But without a specification being identified, ABB Impell was not able to evaluate whether the action is reasonable given time constraints or that emergency lights are provided.

3. The spurious operation study contains alternate actions. Although these actions are also called out in the pre-fire strategies and in the control room shutdown procedure emergency lights are not provided. QDR 90-054 and the Essential and Emergency Lighting System Report 6/1/89, designate these actions "enhancement" actions. Examples from the review include:

   - Operator action to trip Train A Diesel (Action for fire in fire zone 20).
   - Action to trip the turbine at the turbine stand (Action for fire in the CR).

   From the documentation reviewed, it would seem that these actions are required and therefore should be provided with emergency lighting.

4.1.3.c Results

1. The operator actions identified in the review can be shown to be acceptable based on 1) alternate actions available, 2) actions required after eight hours, or 3) mechanical components shown to be free of fire damage. However, the current analysis, the existing QDR 90-054, and the Essential/Emergency Lighting Analysis do not contain this evaluation for all fire areas.

2. Based upon conversation with APS personnel, the action to "ensure the condensate transfer pump is not running" would take place in a fire zone which has emergency lighting, and therefore is acceptable.

3. Based on conversations with APS personnel, the Train A diesel may be tripped by removing DC power from the breakers which feed 4160V A bus from the A diesel. (Emergency lights are provided in this zone.) Furthermore, if the train A diesel is already running when the operators arrive to remove the DC power, they will trip the 4160V breaker first.

Therefore, emergency lighting is not required at the Train A Diesel. According to QDR-90-054 an enhancement light will be added to this area.

Based on conversation with APS personnel, the action to trip the turbine at the turbine stand is for equipment protection only because the trip of the MSIVs (at a location where emergency lighting is provided) will accomplish the same results. Therefore, emergency lighting is not required for the action at the turbine stand. According to QDR-90-054 an enhancement light will be added to the turbine stand area.

4.1.3.d Recommendations

1. The spurious actuation studies should be reviewed in detail to ensure that all manual actions are feasible. The draft action plan for closure of CAR 90-014 was reviewed and the actions appear to address the manual action issue for a fire in any fire area/zone.

   ABB Impell notes that if APS credits the action illuminated by the security lights and such lights are not eight-hour battery-backed, that a deviation request from the requirement to have eight-hour, battery-backed lighting should be requested.

2. The spurious actuation studies should be revised to clarify the specific operator actions for such vague action statements as "ensure" or "stop."

3. For alternate actions (e.g., enhancement lights) for a fire in the control room, moving the "nice to have" actions to attachments in procedure or identifying them in the procedure as optional actions would add clarity to the procedure and inform operators of these actions required for safe shutdown.

4. For those alternate actions resulting from a fire in any other fire area, APS should also consider identifying the actions in the pre-fire strategies as other actions which may be taken if time permits. This is consistent with what is done at other utilities.

5. The Diesel Generator A Actions should be clarified in the spurious actuation study and in the pre-fire strategies.

4.1.4 Emergency Lighting Aiming

4.1.4.a Requirements Analysis

- 10CFR50.48 (a) requires "each operating nuclear power plant shall have a fire protection plan that satisfies Criterion 3 of Appendix A to this part (10CFR50, Appendix A, General Design Criteria).
- License Conditions 2.C (7) [Unit 1], 2.C (6) [Unit 2], and 2.F [Unit 3] stated "APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, as supplemented and amended . . . "
- UFSAR Section 9.5.1, references Appendix 9B of the UFSAR
- Appendix 9B of the UFSAR states "This appendix presents an evaluation of the fire protection provided for PVNGS Units 1, 2 and 3. The evaluation has been made by comparing the PVNGS fire protection features to the guidelines contained in Appendix A of the Branch Technical Position (BTP) APCSB 9.5-1 (revised February 2, 1977 and to 10CFR50, Appendix R, Part III, Sections G, J and O (issued September 1, 1982)."
- Appendix R to 10CFR50 Section III.J states "Emergency lighting units with at least 8-hour battery power supply shall be provided in all areas needed for the operation of safe shutdown equipment and in access and egress routes thereto."
- Engineering Studies 01, 02, 03-NS-110 - Outside the Control Room, Spurious Actuation Study, 13-NS-109 - Control Room Fire, Spurious Actuation Study, and 3-NS-111, Safe Shutdown Separation Study specify the safe shutdown scenario and the equipment requiring manual action as a result of a fire in any area.
- NRC Inspection Procedure (IP) 64100 Section 02.03.b.1.(a) states that the inspector should verify that " . . . the lamps are properly aimed."

4.1.4.b Review

Aiming of emergency lights has been identified as a concern by APS several times (for example Monitoring Report MR90-0741 and EER 88-QD-007).

During the walkdown of fire area XV on June 21, Emergency Light SAL-72C-03-100-01 in fire zone 42B appeared to be misdirected. Although without a blackout test it was difficult to tell whether the lighting would have been adequate.

Also, the emergency lighting drawings 13-E-ZJL-001 through -003 do not adequately describe the orientation of the lamps.

4.1.4.c Results

Emergency lighting units are susceptible to repositioning. To ensure that the lights are positioned properly, aiming verification should be included as preventive maintenance or in an operator round-sheet. This would be consistent with what is done at other utilities and with NRC Inspection Procedure 64100.

Also during discussions with APS personnel, it was brought to our attention that drawing 13-E-ZPL-004 had been issued. This drawing identifies the equipment which will be operated and the lights which provide illumination. Also, ABB Impell was informed that the aiming verification is to be added to the PM program.

4.1.4.d Recommendations

Complete revision to preventive maintenance program to include emergency lighting aiming verification.

4.2 NRC and APS Concerns

In Inspection Report 90-02 the NRC identified a number of emergency lighting concerns. Subsequent to that the NRC and APS identified additional concerns. A list of 45 such concerns was provided by APS to ABB Impell. ABB Impell evaluated these concerns to determine whether the APS discussion was responsive to those concerns. The results of this task are documented as follows:

1) The NRC/APS concerns are listed.

   - Section 4.2.1 through 4.2.25 are concerns in Inspection Report 90-02.
   - Section 4.2.26 through 4.2.40 and 4.2.45 are NRC/APS concerns identified subsequent to Inspection Report 90-02.
   - Section 4.2.41 through 4.2.44 are concerns identified in APS Memo 161-03260-RAB/KLMC, dated June 5, 1990.

2) The APS discussion of each concern is also included for ease of review.

3) ABB Impell's analysis of the APS response and any results/ recommendations are provided.

4.2.1 Concern 1

"The National Electrical Code (NFPA 70-1975/ANSI C1-75), Article 400-4, required that emergency lighting fixtures and equipment be designed, tested and accepted for a specific purpose or application by a nationally recognized laboratory.

The various types of battery-powered, emergency lighting units installed to support operator actions to achieve safe shutdown in the event of a fire at Palo Verde were tested and accepted by Underwriters Laboratories, Inc., for use in environments with ambient temperatures of 77 degrees F, as specified in APS Material Requisition No. 13-EM-0-41B, referencing Underwriters Laboratory (UL) Standard No. 924."

APS Response

"The specific article of the National Electrical Code (NFPA 70-1975) which covers these emergency lighting units is Article 700.

Article 700-3 states that all equipment shall be "approved" for use on emergency lighting systems.

However, the NEC states in Article 700 that other applicable articles of this code shall apply. These emergency lighting units as "lighting fixtures" fall under Article 400, which can be used as guidance.

Article 410-4 states that fixtures installed in wet locations shall be "approved for the purpose." The following is the APS interpretation of these articles and our compliance:

a) The definition of "approved for the purpose" as defined in the NEC Article 100 is "Approved for a specific purpose, environment or application described in a particular Code requirement.

b) The definition of "approved" as defined in NEC Article 100 is "Acceptable to the authority having jurisdiction."

c) The authority having jurisdiction in our case is the NRC.

d) The BTP 9.5.1 describes an acceptable emergency light as:

'Fixed, self-contained lighting consisting of fluorescent or sealed-beam units with individual eight-hour minimum battery power supplies should be provided in areas that must be manned for safe shutdown and for access and egress routes to and from all fire areas.'

Where the BTP requires approval or testing by an outside organization it specifically states that requirement in the BTP. For instance, SCBA's require approval by the NIS SH, as specifically stated in the BTP, Section 4.d. (7).

In summary, neither BTP nor the NEC require emergency lights to be tested or approved by any outside organization to demonstrate compliance with design requirements. APS Engineering used vendor data and engineering judgment to confirm the acceptability of the units in the applications for which they were designed."

Requirement Analysis

UFSAR Section 9.5.3.1.3 Codes and Standards, States

"Design and installation of the plant lighting systems use the guidance provided by the National Electrical Code (NFPA No. 70-19075/ANSI C1-75) and the Handbook of the Illuminating Engineering Society."

Analysis of APS response

The APS response is adequate. A review of NFPA No. 79-1975/ANSI C1-75 found no requirement in any of the applicable sections of the code to perform such testing.

Results

No requirements were found in any of the referenced codes and standards to perform such testing other than that which is done by the manufacturer.

Recommendations

No further action required.

4.2.2 Concern 2

"The various battery manufacturer's literature states that the manufacturer's warranty is invalidated if the batteries are operated in ambient temperatures above 110 °F, or if the batteries are not maintained in accordance with the National Electrical Code. FSAR Table 9.4.2 specified the maximum operating space temperature for certain areas."

APS Response

"There are four emergency lighting vendors which supply Appendix "R" required lighting in various applications throughout PVNGS. These applications, including the worst case temperature environment from UFSAR Table 9.4.2, are as follows:

Vendor	Buildings	UFSAR Temperature
Dual-Lite	All Areas	122 F (Turbine Bldg) 140 F (DG Bldg/DG running)
Emergi-Lite	MSSS Breezeway	120 F (MSSS)
Holophane	Control Auxiliary	104 F (Aux Bldg)
Exide	Control Room	85 F (Battery rooms)

Dual-Lite

The Dual-Lite emergency lights are wall mounted, self-contained, battery powered emergency lighting units. These units are located in every building at PVNGS. They are used in both 8-hour and 1-1/2 hour applications.

The Dual-Lite units have two 7.2 watt heads and operate at 6-volts. This equates to a 2.4 amp load over the 8-hour discharge period or a required 19.2 amp-hour capacity at the 8-hour discharge rate.

Each emergency lighting unit has a long-life Nickel-Cadmium battery. There are three manufacturers of the batteries used in Dual-Lite units, these manufacturers are Sab-Nife, ALCAD and Varta.

The Dual-Lite warranty states that the batteries are not to be used in ambients above 110 F. However, correspondence from Dual-Lite and the battery vendors for Dual-Lite have demonstrated that adequate capacity and life is available even at the higher ambient temperatures.

Sab-Nife: The Sab-Nife batteries are model EDE-30. From vendor data, the EDE-30 has a capacity of 32 amp-hours at the 8-hour rate. From the manufacturer curves, the available capacity at 122 F and at 140 F is 100%. Hence sufficient capacity exists to supply the 19.2 amp-hour load. The battery life, also from the curves, at a continuous 122 F is 12 years.

ALCAD: The ALCAD batteries are model VB-5. These batteries are Nickel Cadmium with a 40.8 amp-hour capacity at the 8-hour discharge rate. The vendor has provided a curve that shows at 122 F, 85% capacity is available and at 140 F, 75% capacity is available. Since there is 53% margin in design capacity, the higher temperatures are not considered a problem.

At a continuous temperature of 122 F, from vendor curves, life reduction of 40% can be expected. The design service life of the battery at 80 F is 25 years. Hence, at 122 F the service life of the battery is expected to be 15 years.

Varta: Varta has their engineering offices located in Germany, therefore communication with Varta has been difficult. However, it is known that Varta batteries are also Nickel-Cadmium, similar to those supplied by the other two vendors. The capacity at 77 F at the 8-hour discharge rate is 38 amp-hours. Hence, as is the case with the other vendors, there is considerable margin between the battery design capacity and the load requirements.

Emergi-Lite

Emergi-Lite wall mounted units are used in the MSSS at the 140' elevation for the ADV's and in the Turbine Building Breezeway (the access/egress path for the MSSS).

Each Emergi-Lite unit is supplied with a sealed Polytemp Nickel-Cadmium battery manufactured by SAFT and is warranted for 15 years. These batteries are designed specifically to give long life under high temperature environments.

SAFT has recently provided APS a curve showing that at a continuous temperature of 120 F, the cell life of the battery would be four to five years. This capacity, per SAFT, would be capable of delivering 8-1/2 hours total run time at 120 F.

In addition, the Emergi-Lite chargers are temperature compensated to automatically adjust float voltages for high temperatures. This will avoid over-charging of the batteries and hence extend the life.

Holophane

In the Control Building and Auxiliary Building where a broader source of light was needed to illuminate switchgear and relay panels, a modular AC power stations are used. These power stations supply numerous fluorescent fixtures from each power station. The units each contain their own lead-acid battery enclosed in a separate compartment of the power station.

In the Auxiliary Building, these units are exposed to a worst case temperature of 104 F. Recent correspondence from the vendor has shown that at that higher temperature, continuously, with an uncompensated charger, as used at Palo Verde, the expected life of the battery is 1.4 years.

This is the absolute worst case, since we know in actual application the temperatures are not near this value continuously year round.

The Holophane batteries are maintenance free, lead-acid type batteries with a warranty based on battery temperature.

It should be noted that the capacity of these batteries would increase at higher temperatures.

Exide

The Exide units have their batteries located in the Class 1E battery rooms. Since this is a very controlled environment with an absolute maximum temperature of 85 F. The temperature concern is not a factor."

Requirement Analysis

UFSAR Section 9.5.1.1.1.R Safety Design Basis Eighteen

Batteries for emergency lighting shall be rated for a minimum of 8 hours in areas needed for the operation of safe shutdown equipment and in access and egress routes to these areas (Section 9B.2 lists zones containing emergency lighting).

Analysis of APS Response

The APS discussion is responsive to the concern except in the case of the Holophane UPS Emergency Lights. Alternate calculations and further review of vendor data indicate that the installed Globe 6VHC96 96 amp hr batteries will not support a minimum eight-hour discharge for loads greater than 832 watts at 50 °F and 881 watts at 60 °F. Furthermore, the Dynasty UPS 12-300 88 amp hr and Dynasty GC12V100 73 amp hr replacement batteries installed also may not be able to provide eight-hour, continuous emergency lighting for some of the assigned loads. Section 4.1.2 addressed the battery sizing issue.

Results

Besides the Holophane UPS emergency lighting units, all others were determined to have enough battery capacity to sustain an eight-hour discharge in the ambient design temperatures.

Recommendation

The performance of the UPS emergency lighting batteries should be reviewed for adequacy at lower temperatures. Since vendor material on the VARTA batteries is incomplete, this should be specifically addressed at a later point in time.

Disposition MNCRs 90-QB-0004 and 90-QB-0005 and include temperature derating in the design criteria. (The present disposition of the MNCRs does not include temperature derating as a criteria.)

4.2.3 Concern 3

"The battery powered emergency lighting units installed to support operator actions to achieve safe shutdown in these areas apparently were not tested and accepted for operation in the maximum space temperatures experienced in these areas."

APS Response

"Refer to Concern 1 and Concern 2 discussion."

Requirements Analysis

UFSAR Section 9.5.1.1.1.R Safety Design Basis Eighteen

The emergency lighting fixtures shall be selected to be applicable to the areas in which they are installed and shall not necessarily include or exclude sealed beam units. Selection of fixtures and bulbs shall allow normal movement during emergency conditions.

Analysis of APS Response

The APS discussion is responsive to the concern except in the case of the Holophane UPS emergency lighting units. Analysis of Concern 2 addressed this issue.

Results

Results of Concern 2 addressed this issue.

Recommendations

Recommendations of Concern 2 addressed this issue.

4.2.4 Concern 4

"The emergency lighting units that were installed in June 1989 in the MSSS, and in access and egress routes thereto, apparently have not been tested and approved for use in outdoor wet locations, or the high ambient outdoor temperature environments experienced at Palo Verde during summer months."

APS Response

The Emergi-Lite emergency lighting units are designed and tested for outdoor use by the manufacturer.

The Emergi-Lite KS series emergency lighting unit is contained in a NEMA 4X cabinet which by NEMA standards is defined as:

> Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water and hose-directed water; undamaged by the formation of ice on the enclosure.

A letter dated 5/1/89 obtained from the QC Manager of Emergi-Lite confirmed that the Emergi-Lite equipment purchased at PVNGS had been designed and tested to meet the NEMA 4X weatherability requirements.

The Emergi-Lite units contain sealed Nickel-Cadmium batteries as manufactured by SAFT America, Inc. The batteries are designed to support a wide temperature range.

The Emergi-Lite units have temperature compensated charges which adjust charging current based on battery ambient temperature. This feature helps extend the life of the battery in elevated temperatures by preventing overcharging.

These emergency lights meet the requirements of BTP 9.5.1.

These lights are not required to be tested (See Concern 1). The temperature issue is addressed in Concern 2."

Requirement Analysis

UFSAR Section 9.5.1.1.1.R Safety Design Basis Eighteen

The emergency lighting fixtures shall be selected to be applicable to the areas in which they are installed and shall not necessarily include or exclude sealed beam units. Selection of fixtures and bulbs shall allow normal movement during emergency conditions.

Analysis of APS Response

The APS discussion is responsive to the concern based on the letter from Emergi-Lite. Furthermore, vendor documentation demonstrates that all enclosures for Emergi-Lite units are of NEMA 4X and NEMA 12 rating.

Both of the above ratings are qualified for "Falling liquid and light splashing" per the NEMA classifications, which would make them suitable for wet locations. Concern 2 addressed the outdoor temperature effects.

Results

The Emergi-Lite units are suitable for use in outdoor wet locations. Also, there is no requirement for testing per NFPA 70-1975/ANSI C1-075 (Concern 1 addressed the testing issue).

Recommendation

No further action required.

4.2.5 Concern 5

"Regarding Johnson Controls Model 6VHC-96, Dynasty GC12V-100 and 12UPS-300 lead-acid and gel-cel batteries supplying power to fluorescent emergency lighting fixtures in the Auxiliary Building, the battery capacity ratings do not appear to provide the power needed to sustain eight-hour emergency lighting for loads in Units 1 and 2.

According to the licensee's Procurement Specification No. 13-EM-041B, the battery cells are required to be of the proper rating to meet 125 percent of the battery load profile requirements at a minimum battery temperature without the battery voltage dropping below 1.75 volts per cell, to ensure adequate capacity at the end of the battery's useful life in accordance with UL Standard No. 924. The end of the battery's useful life is defined in the specification as the point where the battery has reached 80 percent of its eight-hour discharge rating."

APS Response

13-EM-041B is a Purchase Order number, not a Procurement Specification, and is not the Purchase Order for the Holophane UPS batteries. The Purchase Order for the Holophane UPS is 13-EM-036A. The 125% sizing criteria for the batteries is only imposed in Specification 13-EM-050, the specification for large station batteries. The 125% sizing criteria is not applicable to the Holophane UPS batteries and was not specified when the units were purchased. The Holophane UPS batteries meet the UL 924 guidance of supplying connected load for a minimum of 8 hours with the voltage not dropping below 87.5% of rated voltage.

The current battery type configurations are as follows:

Unit 1

1EQBN001 - All batteries are GLOBE 6VHC96
1EQBN002 - 2 batteries are DYNASTY GC12V100, the rest are GLOBE 6VHC96
1EQBN003 - All batteries are GLOBE 6VHC96
1EQBN004 - 1 battery is DYNASTY UPS 12-300, the rest are GLOBE 6VHC96

Unit 2

2EQBN001 - All batteries are DYNASTY UPS 12-300
2EQBN002 - All batteries are DYNASTY GC12V100
2EQBN003 - All batteries are DYNASTY UPS 12-300
2EQBN004 - All batteries are GLOBE 6VHC96

Unit 3

3EQBN001 - All batteries are GLOBE 6VHC96
3EQBN002 - All batteries are GLOBE 6VHC96
3EQBN001 - All batteries are GLOBE 6VHC96
3EQBN002 - All batteries are GLOBE 6VHC96

The ratings for each type of battery at an 8-hour discharge rate are GLOBE 6VHC96 96 amp-hour, DYNASTY UPS 12-300 88 amp-hour, and DYNASTY GC12V100 73 amp-hour.

To calculate the required battery amp-hour capacity for an 8-hour discharge, the following formula is used.

([(Watts (load) / Inverter efficiency) / Nominal VDC] / Number of strings of batteries) x Discharge time where:

Watts (load) = rated output load
Inverter efficiency = 80.5%
Number of strings of batteries = 4
Discharge time = 8 hours

Using 900 watts (rated connected output load of 1EQBN001) as an example, the result will be:

([(900 / .805) / 24] / 4) x 8 = 93.17 amp-hour

Tabulating the amp-hour capacity using the same methodology for various output load is shown below:

Rated Load	Minimum amp-hour capacity required
400 watts	41.40 amp-hour
500 watts	51.76 amp-hour
600 watts	62.11 amp-hour
700 watts	72.40 amp-hour
800 watts	82.80 amp-hour
900 watts	93.17 amp-hour

Using the information above and the rated output load connected, each UPS can be evaluated for compliance against the minimum amp-hour capacity for the type of battery installed.

Tag Number	Rated Load	a-h required	a-h installed
1EQBN001**	900 watts	93.17 amp-hour	96 amp-hour
1EQBN002**	700 "	72.40 "	73 "
1EQBN003**	900 "	93.17 "	96 "
1EQBN004**	400 "	41.40 "	88 "
2EQBN001**	600 watts	62.11 amp-hour	88 amp-hour
2EQBN002**	700 "	72.40 "	73 "
2EQBN003**	600 "	62.11 "	88 "
2EQBN004	400 "	41.40 "	96 "
3EQBN001**	900 watts	93.17 amp-hour	96 amp-hour
3EQBN002	700 "	72.40 "	96 "
3EQBN003	900 "	93.17 "	96 "
3EQBN004**	400 "	41.40 "	96 "

* The least amp-hour capacity battery installed was assumed to be installed for all the batteries in the UPS.

** Test results provided to verify adequacy.

As shown by the calculation performed, the batteries installed in the Holophane UPS is adequate to provide 8 hours of illumination without the voltage dropping below 87.5% of rated voltage, in accordance with UL 924 guidance."

Requirement Analysis

UFSAR Section 9.5.1.1.1.R Safety Design Basis Eighteen

The emergency lighting fixtures shall be selected to be applicable to the areas in which they are installed and shall not necessarily include or exclude sealed beam units. Selection of fixtures and bulbs shall allow normal movement during emergency conditions.

Analysis of APS Response

The APS response is not responsive to the concern for low design temperatures. After reviewing vendor information and performing alternate calculations it was found that for Globe 6VHC96 batteries at 50 °F and 60 °F the capacity is reduced to 85% and 90%, respectively. This is equivalent to 81.6 amp hrs and 86.4 amp hrs respectively.

From the above calculations, for emergency lighting loads of 832 watts at 50 °F and 881 watts at 60 °F, this available capacity may not be adequate. Complete vendor material for the Dynasty batteries was not available. However, since these batteries have lower capacities their ability to provide eight-hour emergency lighting for the various emergency lighting load demand levels of above 800 watts would also be suspect.

Results

The Holophane UPS emergency lighting batteries may not be able to perform their intended function of providing eight hours of emergency lighting temperatures of 50 °F and/or 60 °F for the present loads.

Recommendation

Disposition MNCRs 90-QB-0004 and 90-QB-0005 and include temperature derating in the design criteria. (The present disposition of these MNCRs does not include temperature derating as a criteria.)

4.2.6 Concern 6

"Article 700-6 of NFPA 70-1975 and Section 37.1 of UL Standard No. 924 required that the batteries have a capacity rating to supply and maintain not less than 87.5 percent of the nominal battery voltage for the total load of the circuit supplying emergency lighting. The load profile for lighting fixtures supplied by Battery Nos. QBN001 and QBN003 in Units 1 and 3 requires 86 amp hrs. However, all of these existing batteries in Unit 1 and two of the batteries in Unit 3 are only rated for 73 amp hrs (GC12V-100) and 88 amp hrs (12UPS-300).

These batteries were replacement for the original batteries (6HVC-96) which had a 96 amp hr rating."

APS Response

"Refer to Concern 5 discussion."

Requirement Analysis

UFSAR Section 9.5.1.1.1.R Safety Design Basis Eighteen

The emergency lighting fixtures shall be selected to be applicable to the areas in which they are installed and shall not necessarily include or exclude sealed beam units. Selection of fixtures and bulbs shall allow normal movement during emergency conditions.

Analysis of APS Response

Analysis of Concern 5 addressed this issue.

Results

Results of Concern 5 addressed this issue.

Recommendation

Recommendations of Concern 5 will address this issue.

4.2.7 Concern 7

"According to the battery vendor, the optimum temperature for maximum battery efficiency is 77 degrees F. At higher and lower temperatures, the battery capacity is decreased. The original batteries (6VHC-96) were designed to operate in an optimum temperature range of 60 degrees F to 85 degrees F."

APS Response

"Refer to Concern 2 discussion."

Requirement Analysis

UFSAR Section 9.5.1.1.1.R Safety Design Basis Eighteen

The emergency lighting fixtures shall be selected to be applicable to the areas in which they are installed and shall not necessarily include or exclude sealed beam units. Selection of fixtures and bulbs shall allow normal movement during emergency conditions.

Analysis of APS Response

Analysis of Concern 5 addressed this issue.

Results

Results of Concern 5 addressed this issue.

Recommendation

Recommendations of Concern 5 will address this issue.

4.2.8 Concern 8

"According to EER No. 89-QD-034, regarding SAFT America, Inc. emergency lighting batteries installed in the MSSS, which are also designed to operate in accordance with UL Standard No. 924, the batteries are provided with a disconnect switch, which will disconnect the lighting circuit at 87.5 percent of the nominal battery voltage."

APS Response

"The Emergi-Lite batteries have a nominal voltage rating of 24 VDC. During discharge, the battery voltage is allowed to lower to 20 VDC. At 20 VDC, the charger is designed to cut-out to protect the battery from a potentially harmful deep discharge.

The EER 89-QD-034 requested a modification to the Emergi-Lite units to adjust the cut-out voltage down to a lower value or defeat this feature entirely. The emergency lighting units were cutting-out at a higher than design voltage of 23 VDC. The request of the EER was denied to avoid deep discharging of the batteries and a recommendation was made to return the charging boards, which were cutting-out at 23 VDC, to Emergi-Lite. This EER also referenced EER 89-QD-015, which essentially dealt with the same issue except it also asked for an evaluation of higher than 24 VDC charger voltages.

The time versus voltage profile that was mentioned in the EER is in reference to the discharge characteristics of the battery. As the battery discharges over time the voltage will go down to the cut-out voltage of 20 VDC.

The Emergi-Lite units have sealed Nickel-Cadmium batteries, hence electrolyte evaporation is not a problem at higher charge rates."

Requirements Analysis

UFSAR Section 9.5.3.2.2.3 Emergency Lighting.

The DC-powered lighting system is provided in the main control room (except the control room horseshoe suspended ceiling), at the remote shutdown panel room, associated local control stations, and along emergency exit routes where emergency maintenance is expected to be required. In the event of the loss of essential lighting sources, the DC emergency lighting system is energized automatically.

The DC emergency lighting units, except in the control room, the control building AC switchgear and DC equipment areas, and the auxiliary building channels A and B electrical penetration rooms, consist of fixtures that have self-contained batteries, battery chargers, and switches that automatically energize the fixtures from their batteries in the event of the loss of the AC source for their battery chargers.

In areas needed for the operation of safe shutdown equipment and in access and egress routes thereto, the batteries are designed to provide rated lighting for a minimum continuous period of eight hours.

Analysis of APS Response

The APS discussion is responsive to the NRC concern. The resolution of the subject EER for recommending a higher than 24VDC charge voltage in order to meet the UL Standard No. 924 and NFPA 70-1975/ANSI C1-075 requirements is also acceptable since electrolyte water evaporation is not a concern for sealed batteries of this type.

Results

Some of these emergency lighting batteries are currently being charged at a higher than 24 VDC voltage level. This is found to be acceptable. However, all Emergi-Lite emergency lighting units are being changed out because of reliability considerations through DCP 1, 2, 3 FE-QD-025.

Recommendation

No further action required.

4.2.9 Concern 9

"Based on the total emergency lighting load profiles (86 amp hrs) for Battery Nos. QBN001 and QBN003 in Units 1 and 2, it does not appear that the original batteries (6VHC-96) or existing batteries (12UPS-300) are capable of providing 125 percent of the battery load profile requirements at the optimum temperature for maximum battery efficiency, or at higher and lower temperatures, where the battery efficiency is lower."

APS Response

"Refer to Concern 1, 2, and 5 discussions."

Requirement Analysis

UFSAR Section 9.5.1.1.1.R Safety Design Basis Eighteen

The emergency lighting fixtures shall be selected to be applicable to the areas in which they are installed and shall not necessarily include or exclude sealed beam units. Selection of fixtures and bulbs shall allow normal movement during emergency conditions.

Analysis of APS Response

Analysis of Concern 5 addressed this issue.

Results

Results of Concern 5 addressed this issue.

Recommendation

Recommendations of Concern 5 will address this issue.

4.2.10 Concern 10

"There does not appear to be sufficient margin in the GC12-100 battery capacity to supply power to the lighting fixtures for eight hours. Further, it appears that two of the batteries installed in Unit 2 with the lower load profiles have never been tested, and one other failed the eight hour discharge test on March 6, 1990."

APS Response

"The statement '. . . two of the batteries installed in Unit 2 with the lower load profiles have never been tested. . .' is a misinterpretation of the APS self-imposed testing report. The two UPS' in question, 2EQBN002 and 2EQBN003, were unavailable for testing for not passing the monthly acceptance criteria for open circuit voltage of a battery. The defective batteries were replaced and 8-hour discharge tests were performed and all acceptance criteria met. UPS 2EQBN001 did fail its 8-hour discharge test, the batteries were replaced and the 8-hour discharge test re-performed and all acceptance criteria were met."

Requirements Analysis

UFSAR Section 9.5.3.2.2.3 Emergency Lighting.

The DC-powered emergency lighting system is provided in the main control room (except the control room horseshoe suspended ceiling), at the remote shutdown panel room, associated local control stations, and along emergency exit routes where emergency maintenance is expected to be required. In the event of the loss of essential lighting sources, the DC emergency lighting system is energized automatically.

The emergency lighting system in the control room panel area, the control building AC switchgear and DC equipment areas, and the auxiliary building channels A and B electrical penetration rooms consists of a number of fluorescent fixtures that are fed from an uninterruptible power supply (UPS) and some self-contained battery-powered emergency lighting units.

The emergency lighting fluorescent fixtures are normally fed from the essential lighting system connected from the redundant Class 1E buses through isolation transformers. In the event of loss of Class 1E AC power source, the fixture are energized through UPSs, each consisting of an inverter, a charger, and eight-hour rated batteries in area needed for the operation of safe shutdown equipment and in access and egress routes thereto.

Emergency lighting for personnel egress from other plant areas is provided by 1 1/2-hour battery units (see paragraph 9.5.3.2.2.2).

In areas needed for the operation of safe shutdown equipment and in access and egress routes thereto, the batteries are designed to provided rated lighting for a minimum continuous period of eight hours.

Analysis of APS Response

APS response does not address the entire issue. The replacement of the batteries for UPS 2EQBN001 has not yet been evaluated for adequate capacity at lower temperatures.

Results

Review of vendor documentation is missing to verify performance of batteries for eight-hour emergency lighting capability at low temperatures.

Recommendation

Verify that batteries have sufficient capacity at low design temperatures.

4.2.11 Concern 11

"At the time of inspection, it appeared that appropriate corrective actions had not implemented to preclude emergency lighting battery failures and recurrences as evidenced by emergency lighting battery failure data shown in a February 20, 1990, Failure Data Trending computer printout for the period 1988 through 1989, and a high volume of new battery usage as shown in a March 20, 1990, Procurement Materials Management Information System computer printout for the period 1986 through 1990.

During the period of May 1987 to October 1989, 70 of approximately 480 emergency lighting unit batteries had failed. Approximately 50 of the failed batteries were required to support safe shutdown. However, appropriate evaluation of the failures to determine cause and prevent recurrence apparently had not been initiated or documented."

APS Response

"There were 79 incidences involving some type of corrective action per the Failure Data Trending (FDT) database since 1987. There were only 13 battery failures for Appendix R emergency lights and 12 battery for Non-Appendix R emergency lights.

To compensate for component replacements under the PM program, the MMIS Material Activities Report dated March 20, 1990 was used to extract battery failures not identified in the FDT database for Dual-Lite supplied batteries. There were an additional 24 Appendix R battery failures and 12 Non-Appendix R battery failures. Of the 24 Appendix R battery failures, 15 were batteries used in the NEMA 4X Dual-Lite fixtures which precipitated the issuance of DCP 1, 2, 3FE-QD-022 (Emergi-Lite units). The remaining 9 Appendix R failures per MMIS and the 13 battery failures in FDT represents only a 5% failure rate for 440 Appendix R emergency lighting units for a 30 month time period..

RCF EER are generated whenever the System Engineer identifies sufficient increase in failures. RCF EER 90-QD-002 was generated based on the fourth quarter FDT report due to the increase in failures of charging cards."

Requirements Analysis

UFSAR Section
9.5.1.5.2 Administrative Procedures, Controls and Fire Team states "Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:

C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and responsible to:

- Perform fire protection preventive maintenance

UFSAR Section, 9.5.3.4 Inspection and Testing Requirements states "Normal and essential AC lighting circuits are normally energized and require no periodic testing. The emergency DC lighting system and the control room horseshoe suspended ceiling lighting system are inspected and tested periodically to ensure operability of the automatic switches and other components in the system."

Appendix A to BTP 9.5-1, Section C.8 "Corrective Action" states "Measures should be established to assure that conditions adverse to fire protection such as failures, malfunctions, deficiencies, deviations, defective components uncontrolled combustible material and nonconformances are promptly identified, reported and corrected.

And UFSAR Table 9B.3-1 says PVNGS complies.

Analysis of APS Response

The original APS response has been superseded by recent reevaluation of the failure data (QB and QD Failure Analysis Basis, Revision 1). No new response has been provided.

Results

There exists sufficient evidence to reasonably expect that corrective actions should have been initiated if the Emergency Lights were classified QAG. The lights are now QAG, but were not QAG during the period the failure data covers. APS recognized the failure history of the Emergi-Lites and is replacing them.

Recommendations

- Corrective Action documentation should be dispositioned and completed for the following failure modes:

    1. Battery failures
    2. Charging Card failures

- Ensure the Corrective Action QA criterion is implemented for the Emergency Lights.

4.2.12 Concern 12

"EER No. 87-QD-004, dated January 28, 1987, identified and documented problems associated with batteries for the emergency lighting units as follows: "High temperatures inside Containment during operation cause loss of electrolyte in all fixtures; total loss in many, varying amounts in the rest. Salt accumulates on battery posts and vent caps and is discarded during PM cleaning. Continual repeated electrolyte loss with demin water replacement will cause premature battery failure." The same batteries (Dual-Lite Model EDE-30) used for Containment emergency lighting are used for safe shutdown emergency lighting in the Auxiliary Building, Control Building and Diesel Generator Building."

APS Response

"EER 87-QD-004 identifies a concern with repeated replenishment of electrolyte by adding demineralized water to the batteries in Containment. Temperatures in containment and excessive float voltages are only some of the contributing factors of electrolyte loss. The major cause of electrolyte evaporation is the lack of quarterly PM's for the Containment emergency lighting.

For emergency lights in Containment, PM's are currently performed only once per fuel cycle (during refueling outage). Access to Containment is restricted during plant operation for the performance of other than the cycle PM's. The time between the performance of the cycle PM's can vary from 1 year to 2 years.

Varying amounts of electrolyte loss is expected with total loss of electrolyte expected if the last performance of the cycle PM's is over a year. Lights installed outside Containment are not subject to the same environment and have PM's performed on a quarterly basis.

The performance of the PM's ensures that the light will perform its intended function. No battery plates have been uncovered for units outside of Containment if quarterly PM's were performed. The only exceptions were lights that were inadvertently left out of PM's (non-Appendix R lights).

The quarterly PM's for outside Containment emergency lights are adequate to ensure that the lights are maintained in accordance with Dual-Lite's recommended maintenance criteria. The lights in Containment are not required for safe shutdown and have their cycle PM's performed during the refueling outage."

Requirements Analysis

UFSAR Section, 9.5.1.5.2 Administrative Procedures, Controls and Fire Team states, "Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:

C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and are responsible to ensure that fire protection equipment is in proper working order."

Analysis of APS Response

The APS discussion is responsive to the concern with clarification.

- Electrolyte does not evaporate, demineralized water evaporates; therefore, adding demineralized water will not dilute electrolyte.

Results

Non-Appendix R lights in containment should be of the type that does not require maintenance between fuel cycle reload.

Recommendation

Evaluate need to replace containment lights with a type which does not require mid-cycle maintenance.

4.2.13 Concern 13

"The disposition of EER No. 87-QD-004 regarding the boiling and evaporation of Containment emergency lighting battery electrolyte apparently provided for low voltage adjustment, to a reduced battery float voltage, to an unspecified value. The modification to allow adjustment of the float voltage was apparently made to Appendix R emergency lighting units installed outside the containment. It appears that the modification was made to the lighting units without using the appropriate design change and maintenance work order processes. It further appears that the EER disposition was not provided with the appropriate engineering evaluation of the effects of reduce float voltage on the battery discharge capacity during emergency use."

APS Response

"EER 87-QD-004 was not used for the adjustment of float voltages for lights outside of containment. Quarterly and cycle PM tasks for the Dual-Lite fixtures provide the instructions on adjusting the float voltages. The values used in the PM's are in accordance with the vendor's tech. manual. Modifications to the lighting units to facilitate the adjustment required by the PM tasks was authorized by EER's 85-QD-022 and 86-QD-034."

Requirements Analysis

UFSAR Section, 9.5.1.5.2 Administrative Procedures, Controls and Fire Team states, "Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:

C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and are responsible to ensure that fire protection equipment is in proper working order.

Analysis of APS Response

The APS discussion is responsive to the concern.

Results

Not applicable.

Recommendations

No further action recommended. Lights in Containment are not installed to satisfy 10CFR50, Appendix R, Section III.J Requirements, or BTP 9.5-1, Appendix A requirements. Therefore, the design control criteria of the BTP and QA program are not required to be applied. It should be noted that Emergency Lights are now classified QAG, so design control criteria will be applied since it is impractical to apply two different QA programs to the same lighting units.

4.2.14 Concern 14

"The disposition to EER No. 87-QD-004 also provided for replacement of the electrolyte in the batteries with distilled water, topped with mineral oil; again apparently without appropriate engineering evaluation of the effects of this disposition. It appears that mineral oil had also been added to lead-acid batteries installed in Appendix R applications, in addition to nickel-cadmium batteries. NRC discussions with battery vendors have indicated that all deposits of mineral oil on the plates of lead-acid batteries, and all battery cells, adversely affects battery capacity and performance, and is not approved. Given the temperature extremes in certain locations, there appears to be a high probability that mineral oil would be deposited on plates."

APS Response

"Mineral oil was not added to any lead-acid batteries used for emergency lighting, Appendix R applications. The only lead-acid batteries currently installed are for the Control Room emergency lighting system (EQDNF01 and EQDNF02). An inspection performed by EED verified that no mineral oil was added to the electrolyte in lead-acid batteries.

The cycle PM tasks for the Containment emergency lights contain the statement to add mineral oil. A review, of the PM tasks for emergency lights outside of Containment, determined that the PM's do not have a statement to add mineral oil to inhibit electrolyte evaporation."

Requirements Analysis

UFSAR Section, 9.5.1.5.2 Administrative Procedures, Controls and Fire Team states, "Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:

C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and are responsible to ensure that fire protection equipment is in proper working order.

Analysis of APS Response

The APS discussion is responsive to the concern.

Results

Not applicable.

Recommendations

No further action recommended since vendor provided recommendations to add mineral oil. To prevent future misunderstanding, obtain written confirmation of verbal recommendations provided by vendor. See Concern 13 evaluation for comments on design control issue.

4.2.15 Concern 15

"Certain batteries have demonstrated a continuing failure history (Failure Data Trending). For example, 15 percent (70 failures of approximately 480 Appendix R emergency lights installed in all three units) failed over a 30- month period (May 1987 to October 1989). The NRC is concerned that Appendix R emergency lighting preventive maintenance tasks have not been designed to optimally assure a continued capability of Appendix R lighting units to operate for the required eight hours. Furthermore, apparently, timely preventive maintenance completion has not been aggressively pursued because, in about 84 instances, the required annual capacity test and quarterly electrolyte level checks were overdue in Unit 3 as of March 23, 1990."

APS Response

"Refer to Concern 11 discussion for Failure Data Trending information.

PM's are developed based upon manufacturers' recommendations. Schedule dates are established based on the periodicity of the PM. PM's may be delayed past their due date without management approval under the following conditions:

Meets criteria for delaying specified in procedure 30AC-9MP02.

Does not exceed the grace period (25% of maintenance interval).

PM's can be delayed past their grade period with the written concurrence from the Maintenance Manager (or designee) on the Preventative Maintenance Task Disposition Report.

The grace period has been tabulated below for the different periodicity of PM's:

4W - + 7 days
12W - + 21 days
24W - + 42 days
48W - + 84 days
1Q - + 23 days
1M - + 8 days
1S - + 46 days
1A - + 92 days
1R - No firm due date, must be completed during the refueling outage (Ref. 3.7.1.2 of 30AC-9MP02)

Majority of the PM's have been performed prior to the due date or during the grace period, as allowed by procedure 30AC-9MP02. All Dual-Lite discharge PM tasks were performed prior to the overdue date (prior to end of grace period). Manpower restraint caused by having 3 units in an outage along with the Unit 3 Main Transformer event (January 1990) depleted the available manpower resources to perform emergency lighting PM tasks. Currently there are no PM tasks past their grace period (5/8/90)."

Requirements Analysis

UFSAR Section, 9.5.1.5.2 Administrative Procedures, Controls and Fire Team states, "Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:

C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and are responsible to perform fire protection preventive maintenance.

Analysis of APS Response

The APS discussion is responsive to the concern with the exception of PM testing adequacy.

Results/Recommendations

The response does not address the issue of PM frequency adjustments to detect failure trends prior to a failure and the taking of actions to correct the equipment degradation.

During discussions with the P S & C Advisor, it was learned that changes are being made in the program task that check the batteries. It was not clear that the concept of predictive maintenance, using failure data was understood.

Changes in frequency and testing methods should be made to detect degradation before it becomes a failure.

Examples are:

1. The test discharge should determine that the battery can deliver the eight hours of illumination without being limited by battery capacity. If failures are detected the frequency should be increased, and an action limit above the minimum voltage should be established. this would allow APS to prove by testing that the battery can deliver eight hours of light and cause replacement of the battery prior to failure of the test due to low voltage. The idea is not to test to find a failure, but to test to prevent the failure.

2. Electrolyte level checks should increase in frequency until the checks are detecting the low level before it goes below the low level limit.

4.2.16 Concern 16

"The licensee's EER No. 89-QD-034 documents excessive failures of MSSS- installed emergency lighting when the battery input voltage was found to be greater than the rated 21 VDC. The batteries are required to operate at 24 VDC-rated voltage.

However, the EER disposition was apparently based on the erroneous reference to a time versus voltage profile which indicated that the excessive voltage had no adverse effect on the batteries, when in fact the excessive charging voltage is a direct contributor to electrolyte evaporation."

APS Response

"Refer to Concern 8 discussion."

Requirements Analysis

Analysis of Concern 8 addressed this issue.

Analysis of APS Response

Analysis of Concern 8 addressed this issue.

Results

Results of Concern 8 addressed this issue.

Recommendation

Recommendations of Concern 8 will address this issue.

4.2.17 Concern 17

"It appears that prompt and technically sufficient evaluations and corrective actions of the considerable, observed emergency lighting deficiencies were not implemented."

APS Response

"At the completion of the installation of the Emergi-Lite units per DCP's 1, 2, 3 FE-QD-022, each Emergi-Lite unit was tested for initial acceptance. Numerous failures were noted during this testing, as stated in the inspection report. Defective boards and a bad batch of batteries were the main cause of the failures.

The defective board and bad batteries were replaced and each light was successfully tested before the DCP was closed. Subsequent failures, mainly boards, required the frequency of the PM task to be revised from a quarterly PM to a monthly task.

See APS' response to NRC Inspection Report, Notice of Violation 50-530/90-08-02, dated April 20, 1990 (102-01674) and Plant Guideline 13 for the evaluation of prioritization of corrective maintenance of the emergency lighting system.

The Emergi-Lite units will be replaced per DCP 1, 2 3 FE-QD-025, with Holophane centralized AC modular power stations (2 stations/unit)."

Requirements Analysis

UFSAR Section 9.5.3.4 Inspection and Testing Requirements, states "Normal and essential AC lighting circuits are normally energized and require no periodic testing. The emergency DC lighting system and the control room horseshoe suspended ceiling lighting system are inspected and tested periodically to ensure operability of the automatic switches and other components in the system."

UFSAR Section, 9.5.1.5.2 Administrative Procedures, Controls and Fire Team states, "Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:

C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and are responsible to perform fire protection preventive maintenance.

Appendix A to BTP 9.5-1, Section C.8 "Corrective Action" states "Measures should be established to assure that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components uncontrolled combustible material and nonconformances are properly identified, reported and corrected."

And UFSAR Table 9B.3-1 says PVNGS complies.

Analysis of APS Response

The response stated what has been done and why there were initial installation failures (Concerns 11, 12, 13, 14 and 15 related to this concern). There is no rebuttal or evidence presented in the APS discussion to respond to the allegation of insufficient technical evaluations or corrective actions.

Results/Recommendations

Results/Recommendations for Concerns 11, 12, 13, 14 and 15 addressed the concerns. Section 4.1.1 provides an analysis of the regulatory basis for classifying emergency lights QAG.

4.2.18 Concern 18

"At the time of the inspection, it appeared that the Pre-Fire Strategies Manual had not been reviewed since the original licensing of Unit 1 in December 1984 to determine the adequacy of operator actions specified to achieve post-fire safe shutdown for fires occurring outside the Control Room."

APS Response

"The Pre-Fire Strategies Manual is controlled by the Site Fire Department as it has been since its original development. Some changes were made at the direction of the Fire Protection Supervisor, but the manual was not controlled document. The first formal review and update by Engineering was performed on April 18, 1988 (1676-02213/ECS/JDO) at the request of the Site Fire Department. This action was required as part of the resolution of CAR #CE-86-0203.

The following summarizes actions taken with respect to the Pre-Fire Strategies Manual to close this CAR.

1) The manual was established as a controlled document and distributed by Document Control.

2) DCP and technical input and review checklists were revised to address impact to the manual and the Spurious Actuation Studies. These revisions were also incorporated into the new Plant Design Change Program (81DP-0DC03).

3) Procedure 01AC-0AP02 was revised, requiring annual update of the manual.

4) Engineering reviews 'Engineering Output Data' as part of the annual review.

NOTE: Last annual update by Engineering was requested on 6/8/89. Update is complete with the exception of the Spurious Actuation Evaluation Concerns Section."

Requirements Analysis

6.8.1 Written procedures shall be established, implemented and maintained covering the activities referenced below:
(f) Fire Protection Program Implementation.

6.8.2 Each program or procedure of Specification 6.8.1 shall be reviewed as specified in Specification 6.5 and approved prior to implementation. Programs, administrative control procedures, and implementing procedures shall be approved by the Vice President-Nuclear Production, or his designated alternate, who is at supervisory level or above. Programs and procedures of Specification 6.8.1 shall be reviewed periodically as set forth in administrative procedures.

However, for fire areas outside the control room, alternative shutdown is not invoked. Therefore, in accordance with the operator guidance a generic letter 86-10 Question 5.2.3 (see below) procedures are not required.

5.2.3 Alternative Shutdown Capacity

Question. Is it acceptable to develop post-fire operating procedures only for those areas where alternative shutdown is required? (For other areas standard, emergency operating procedures would be utilized in the presence of potential fire damage to a single train.)

Response. Yes. The only requirement for post-fire operating procedures is for those areas where alternative shutdown is required. For other areas of the plant, shutdown would be achieved utilizing one of the two normal trains of shutdown system. Shutdown in degraded modes (one train unavailable) should be covered by present operator training and abnormal and emergency operating procedures. If the degraded modes of operation are not presently covered, we would suggest that the operation staff of the plant determine whether additional training or procedures are needed.

Analysis of APS Response

The APS discussion addresses the concern.

Results/Recommendations

Complete Action Plan defined in CAR 90-014. Incorporate results in the Prefire Strategies.

4.2.19 Concern 19

"The Pre-Fire Strategies Manual operator actions appeared to be inconsistent with the Outside Control Room Fire Spurious Actuation Study (Studies 01-NS-110, 02-NS-110 and 03-NS-110) for Fire Zones 47A, 47B, 72, 73, 74A and 74B, regarding operator actions to interchange instrument air header pressure transmitters."

APS Response

"The Spurious Actuation Study for fires outside the Control Room has a section called 'Compensatory Measures' for each Fire Zone. These measures are not always necessarily local manual operator actions but may be Plant modifications such as installation of raceway fire barriers. The Pre-Fire Strategies Manual, which is based on the study, only describes manual operator actions.

For Fire Zones 47A and 47B, no manual actions or plant modifications are associated with interchange of instrument air header pressure transmitters.

In Zones 72, 73, and 74A of the Spurious Actuation Study a compensatory measure is called out to move the instrument air header pressure transmitters. This permanent plant modification was necessary because the "A" train transmitter was on the "B" side of the room and visa versa.

This modification was made by DCP 10J-SG-129. Hence, since no operator action is required, the Pre-Fire Strategies Manual is correct by not describing this action. The Spurious Actuation Study, however, was not revised as a result of this DCP.

For Zone 74B the compensatory measures that require an operator to take manual actions are identical between the Spurious Actuation Study and Pre-Fire Strategies Manual."

Requirements Analysis

Analysis of Concern 18 addressed this issue.

Analysis of APS Response

Response addresses the NRC concern. However, spurious actuation studies should be updated to reflect the as-built condition of the plant.

Results/Recommendations

Complete action plan for CAR 90-014. Update the Pre-Fire Strategies as appropriate.

4.2.20 Concern 20

"At the time of the inspection, it appeared that licensed and non-licensed operators were directed to perform manipulation of equipment, by the Pre-Fire Strategies Manual, to achieve post-fire safe shutdown. It was not apparent that the personnel had been trained to perform the required actions."

APS Response

"An extensive training program was developed and provided to all licensed operators that may be assigned the task of Fire Team Advisor which covered a wide range of topics including the Pre-Fire Strategies Manual. The training included workshops specifically on the Spurious Actuation Evaluation Concerns Section. Practical exercises were conducted where students performed manual actions under impaired vision to manipulate electrical breakers and valves and maintain effective communications. These exercises were conducted with full protective equipment.

The Fire Team Advisor training was an "initial" training course with no plans or actions regarding recurrent training in the future. New operators will be provided the initial training prior to being assigned duties of Fire Team Advisor.

With respect to non-licensed operators there is no specific training for Pre-Fire Strategies Manual identified actions.

Operations Procedure 4XAO-XZZ44, shutdown outside the Control Room is included in the Annual Procedure Review for all licensed operators. Job Performance Measures (JPM's) are administered for actions outside the Control Room. JPM's are administered on a common and random basis; therefore, a student could potentially receive only classroom training in a given year. All but 29 of the operator actions identified in the Pre-Fire Strategies Manual are included in Procedure 4XAO-XZZ44. These 29 actions have been reviewed by Operators and it has been determined that no specialized training is required for the operators to perform these actions.

Fire Team Advisor training was also provided during 1987, 1988 and 1989 by the Fire Department Training Officer."

Requirement Analysis

As discussed in Concern 18, pre-fire strategies are not required operator procedures, since they do not address alternate shutdown scenarios. Prefire strategies are guidelines for fire-fighting personnel and the fire team advisor. Guidance outlining the information to be provided in the prefire strategies is discussed in the June 14, 1977 letter "Nuclear Plant Fire Protection Functional Responsibilities Administrative Controls and Quality Assurance."

Analysis of APS Response

The APS response does not adequately address the licensed versus non-licensed operator issue. Also based on Letter 260-00358-WCM, credit should be taken for the walkdown of the proposed operator actions and the training to be provided to the shift supervisors. The last paragraph of the APS response for Concern 22 (Section 4.2.22) coupled with the walkdown results would be more responsive.

Recommendations

Revise APS response to include 1) a discussion of the acceptability of omitting non-licensed operators from training, and 2) a discussion of the additional shift supervisor training.

4.2.21 Concern 21

"Regarding Fire Zones 47A, 47B, 72, 73, 74A and 74B, the Pre-Fire Strategies Manual directed operators to locally operate switches land valves in areas which may not be accessible to the operators in the event of a fire. It was not clear whether operator were required to enter these areas during the fire to accomplish manual actions or to wait until the fire had been extinguished. In either case, it was not apparent that the appropriate personnel had been trained in safety and protective measures necessary to accomplish such actions."

APS Response

"During a review of the Pre-Fire Strategies Manual by the Corporate Fire Protection engineer it was discovered that a local manual compensatory action was required within a zone that was affected by the fire (QDR-0125). Hence, this manual action could not realistically be taken credit for.

The activity identified in the QDR involved two Fire Zones which required the opening of the disconnect switch within an auxiliary relay cabinet in Fire Zones 47A and 42B to prevent the spurious opening of the reactor vent valves. A review of the Spurious Actuation Study for outside the control room revealed that the Pre-Fire Strategies Manual was consistent with the Study. Both were in error. The Spurious Actuation Study has been revised by Engineering to state an alternate location for removing power to the valve and hence preventing spurious actuation. An update to the Pre-Fire Strategies Manual has been performed.

In Zones 72, 73, and 74A of the Spurious Actuation Study, a compensatory measure is called out to move the instrument air header pressure transmitters. This permanent plant modification was necessary because the "A" train transmitter was on the "B" side of the room and visa versa. This modification was made by DCP 10J-SG-129. Hence, since no operator action is required, the Pre-Fire Strategies Manual is correct by not describing this action. The Spurious Actuation Study, however, was not revised as a result of this DCP.

The Spurious Actuation Study is currently under review by the EEP Fire Protection Design Basis Review Group. As a result of this an action has been scheduled to perform a complete engineering review of the spurious actuation studies."

Requirement Analysis

Section 4.1.3 addressed this issue.

Analysis of APS Response

Analysis of Concerns 19 and 20 addressed this issue.

Results/Recommendation

Results/Recommendation of Concerns 19 and 20 will address this issue.

4.2.22 Concern 22

"For a fire inside the Control Room, the licensee's Spurious Actuation Study 13-NS-109 requires operators to provide makeup to the Essential Chilled Water System, Essential Cooling Water System and Emergency Diesel Generator Surge Tanks by providing water from the Fire Water System. It was not apparent that operators had been trained to perform these actions."

APS Response

"The manual actions associated with makeup water to the surge tanks are addressed in Procedure 4XAO-XZZ44. Appendix F, Section 2.2 and Appendix J, Section 2.0 address DG Jacket Water Surge Tank. Appendix J, Sections 3.0 and 4.0 address Essential Chilled Water Surge Tank and Essential Cooling Water Surge Tank respectively.

Operations Procedure 4XAO-XZZ44 is included in the Annual Procedure Review for all licensed operators. Job Performance Measures (JPM's) are administered for actions outside the Control Room. JPM's are administered on a common and random basis. Therefore, a student could potentially receive only classroom training in a given year.

An extensive training program was developed and provided to all licensed operators that may be assigned the task of Fire Team Advisor which covered a wide range of topics including the Pre-Fire Strategies Manual. The training included workshops specifically on the Spurious Actuation Evaluation Concerns Section. Practical exercises were conducted where students performed manual actions under impaired vision to manipulate electrical breakers and valves and maintain effective communications. These exercises were conducted with full protective equipment.

The Fire Team Advisor training was an "initial" training course with no plans or actions regarding recurrent training in the future. New operators will be provided the initial training prior to being assigned duties of Fire Team Advisor.

With respect to non-licensed operators there is no specific training for Pre-Fire Strategies Manual identified actions. None of the actions required to be performed are outside those actions normally expected to be performed by a non-licensed operator."

Requirements Analysis

Concerns 18 and 20 addressed the requirements analysis.

Analysis of APS Response

The APS discussion is responsive to the concern.

Results/Recommendations

None.

4.2.23 Concern 23

"The licensee's October 29, 1984 submittal to the NRC indicates that NUREG 0700 was used as the design basis for the control room and the remote shutdown panel emergency lighting illumination levels. NUREG 0700 requires a minimum of 10 foot candles in these areas. However, the licensee's acceptance criteria for the control room and the remote shutdown panel emergency lighting illumination levels is 6 foot candles in peripheral areas and 3 foot candles at control board instruments."

APS Response

"For inside the Control Room, APS used 6 foot candles in the horseshoe area and 3 foot candles on the panel areas. This commitment is as stated in UFSAR Section 14B. NUREG-0700 provides guidance for Control Room lighting illumination levels. The guidance provided in NUREG-0700 concerning Control Room emergency lighting is 10 foot candles. The referenced letter of October 29, 1984, states that the guidance of NUREG-0700 was used, as applicable, to perform the required DCRDR. No commitments were made in the letter concerning Control Room emergency lighting illumination levels."

Requirements Analysis

The lighting level in the control room (horseshoe area) shall be 6 footcandles (fc), and section of the control room panel area required for safe shutdown shall be 3 fc (FSAR 14B.10, Section 4.3 and 4.4).

UFSAR Section 9.5.3.1.3, Codes and Standards, states "Design and installation of the plant lighting systems use the guidance provided by the National Electrical Code (NFPA No. 70-1975/ANSI C1-75) and the Handbook of the Illuminating Engineering Society."

APS did not commit to NUREG 0700 for illumination levels for emergency lights.

NRC Generic Letter 86-10 states, in part,

"4.1 Illumination Levels

Question. What is the requisite intensity level for emergency lighting for egress route and area where shutdown functions must be performed? What are the bases for determining these levels of lighting.

Response. The level of illumination provided by emergency lighting in access routes to and in areas where shutdown functions must be performed is a level that is sufficient to enable an operator to reach that area and perform the shutdown functions. At the remote shutdown panels the illumination levels should be sufficient for control panel operators.

The bases for estimating these levels of lighting are the guidelines contained in Section 9.5.3 of the Standard Review Plan, which are based on industry standards (i.e., Illuminating Engineering Society Handbook).

Where a licensee has provided emergency lighting per Section III.J Appendix R, we would expect that the licensee verify by field testing that this lighting is adequate to perform the intended tasks."

Analysis of APS Response

Response addresses details of NRC concern and corrects errors.

Results/Recommendations

APS Response addresses the NRC concern. Broader concern of adequacy of emergency lighting illumination is addressed in Concern 24.

4.2.24 Concern 24

"Thirteen lighting level readings were taken at various locations outside the control room in Unit 3 with a photometer (Spectra Photometer Model FC-200, Serial number 476, NRC Equipment Number 000393, with the next calibration due date of 7/26/90). The locations were the stairwell outside the control room, the essential chiller surge tank level and valves, the chiller room stairwell exit, and the Emergency Diesel Generator rooms. The photometer readings ranged from 0.03 to 0.75 foot-candles with an exception of 1.3 foot-candles at the emergency diesel control panel."

APS Response

"For Appendix R lighting, APS used the guidance of Generic Letter 86-10, which states that illumination, levels shall be sufficient to perform the shutdown function. Emergency lighting has been walked down to confirm this."

Requirement Analysis

Concern #23 discusses the details of illumination requirements.

The Standard Review plan, Section 9.5.3, states "There are no general design criteria or regulatory guides that directly apply to the safety-related performance requirement of the Lighting System."

Analysis of APS Response

APS response clarifies Generic Letter 86-10 criteria was used.

Results

Response addresses the NRC concern. Acceptance criteria was that three qualified people (EED, Ops, NED) agreed lighting was acceptable; it was considered to meet the Generic Letter Criterion of "sufficient to enable an operator to reach that area and perform the shutdown functions." ABB Impell did not perform illumination testing.

Recommendations

- Clarify FSAR to adopt Generic Letter 86-10 Acceptance Criteria for access/egress and shutdown function emergency lights.
- Consider recording acceptable lighting levels to serve as baseline for the future, so walkdowns are not forced to be redone after each subjective complaint of lighting not being adequate.

4.2.25 Concern 25

"Orientation of the lamps on a lighting unit in the stairwell outside the control room were found to be not directed toward the access/egress pathway."

APS Response

"Incorrect lamp orientation noted during recent NRC inspection was an isolated occurrence due to construction work on the adjacent Unit 3 Operation Support Building. Adequate lighting for access/egress existed even though the lamps were not directed toward the access/egress pathway. Inspection team members were able to access/egress the stairwell.

Lamp orientation is verified when performing quarterly preventive maintenance (PM). Quarterly PM's provide instructions to orientate the lamps."

Requirements Analysis

Although there is no specific requirement for aiming emergency lights, NRC Inspection Procedure 64100 states " . . . verify the following (a) the lamps are properly aimed . . ." See Section 4.1.4 for additional references.

Analysis of APS Response

The APS response is responsive to the concern. Based on discussion with APS Plant Standards personnel there is a PM under development to verify that the lamps are properly aimed.

Results

APS current direction, to include lamp orientation in the PM program, addresses the broader underlying concern.

Recommendation

Complete identified action.

4.2.26 Concern 26

"Investigate the technical manuals not fully updated, is attributed to workload at DCC and/or lack of familiarity with Systems 38 (Action Item #2)."

APS Response

"The following list comprises the Technical Manual for the emergency lighting system.

Manufacturer	Manual	Approved	In-Service
Holophane	E036A-10	6/26/85	7/3/85
Exide	E050-70	5/22/89	5/23/89
Emergi-Lite	E041B-3	8/7/89	8/16/89
Dual-Lite	E041A-4	7/28/83	8/10/83

A review of System 38 indicated no outstanding updates.

There was a problem identified, however, where the technical manuals were not classified correctly within the DCC system. They were classified as installation manuals and not technical manuals.

The manuals are currently being re-classified within DCC as technical manuals."

Regulatory Analysis

Appendix A to BTP 9.5-1, Section C.2 states:

"Instructions, Procedures and Drawings
Instructions, tests, administrative controls, fire drills and training that govern the fire protection program should be prescribed by documented instructions, procedures or drawings and should be accomplished in accordance with these documents."

UFSAR, Table 9B.3-1, states that PVNGS complies.

Analysis of APS Response

The APS discussion is responsive to the concern.

Results/Recommendations

Implementation QAG criteria for the emergency lights will ensure manuals are maintained current.

4.2.27 Concern 27

"Verify validity of preconditioning batteries prior to maintenance tasks (i.e., do they defeat the purpose of the test?). Check on industry precedents in this area (Action Item #6)."

APS Response

"Preventative Maintenance tasks are not performed to determine operability, but to ensure continued operation of the battery. Addition of water to the battery and adjustment of the float voltages have a minimal affect on the capacity of the battery.

Cleaning of the battery connections have no effect on the capacity of the battery, provided that the connections are not taken apart. Cleaning of the external portion of the connector does not improve the intercell resistance reading between the battery post and the connector surface. Therefore, preconditioning of the batteries prior to maintenance tasks have little to no effect on the purpose."

Requirements Analysis

UFSAR Section, 9.5.1.5.2 Administrative Procedures, Controls and Fire Team states, "Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:

C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and are responsible to perform fire protection preventive maintenance.

Analysis of APS Response

The APS discussion is responsive to the concern.

Results

Review of at least one Vendor Technical Manual identifies preconditioning as a step prior to discharging. APS practice was consistent with the Vendor's recommendations. Discussions with P S & C Advisor indicated that this step is being removed and emergency lights will be tested in an "as-found" condition with the exception of light bulbs and obvious failure conditions. Utility survey indicates other utilities do not generally precondition batteries.

Recommendation

When PM's are revised, preventive maintenance action levels should be implemented as described in Concern 15. Confirm APS position on as-found testing. ABB Impell believes that either method of testing could be acceptable.

4.2.28 Concern 28

"Investigate "enhanced" lighting as to conformance for Appendix R post-installation. Refer QDR's 054; 0125 (Action Item #9)."

APS Response

"After the March 3, 1989, event, it was clear that there were areas in the plant where although safe shutdown lighting was not required, it may be prudent to install 8-hour lighting.

These areas were identified primarily in the operations procedure for safe shutdown from outside the Control Room. In this procedure there are numerous local manual actions mentioned which are alternative methods or contingency actions to perform, beyond the primary method relied upon for accomplishing the action.

An example of this is valve SI-HV-695. The procedure describes local manual operation at the valve or at the MCC. The 'safe shutdown' lighting was installed at the MCC, this was considered to be the primary method of control of the valve for fire in the Control Room. As an alternate, 8-hour lighting were also installed at the valve itself, but this lighting was identified as 'enhancement lighting.'

The basis for each area where lighting was installed for 'enhancement' as opposed to require by Appendix R is documented in QDR 89-054.

QDR 89-0125 has to do with a discrepancy in the spurious actuation study/pre-fire strategies manual this QDR is described in another ISSUE.

The enhancement lights are identical in design and type as the Appendix 'R' lights."

Requirements Analysis

No requirements for enhancement lights.

Analysis of APS Response

The response addresses the NRC concern.

Results

The sample review of fire areas identified questions whether enhancement lights were really required lights. These specific questions were resolved during the inspection process.

Recommendations

Recommendations in Section 4.1.3 and Appendix B addressed this issue. Ensure completion of CAR 90-014.

4.2.29 Concern 29

"Grooming batteries before running tests. Not doing on as found. Are they really operable when you do this grooming? What is the confidence the lights are going to work when called upon if not groomed in this manner? (Action Item #13)"

APS Response

"Refer to Action Item #6 discussion."

Requirements Analysis

There are no formal NRC requirements to perform "as-found" testing. The NRC has attempted to enforce "as-found" testing for containment isolation valve testing (Appendix J to 10CFR50) but clearly, with the vendor manual recommending preconditioning, there is no violation of NRC requirements for not taking "as-found" data.

Analysis of APS Response

Section 4.2.27 addressed this issue.

Results/Recommendations

See recommendations of Section 4.2.15 and Section 4.2.27.

4.2.30 Concern 30

"Given a fire in the zone which shuts down the "A" EDG combined with a loss of off-site power, essential lighting would be loss to the auxiliary building. [The Inspector] requested clarification of the Essential Lighting loading on the "B" EDG (Action Item #17)."

APS Response

"A review of Calculation 13-EC-DG-200, Rev. 2, shows that the essential lighting panel E-QBN-090 on the 'B' train class 1E AC distribution system was included as a load on the 'B' EDG. Also, EER 89-XE-022 further substantiates that the value used in the referenced calculation has been verified by Calculation 13-EC-DG-001, Rev. 0.

Therefore, the essential lighting system loads have been included into the diesel loading calculation and verified to have no impact on the 'B' EDG to perform its design function."

Requirements Analysis

10 CFR50, Appendix R, III.J Emergency Lighting.

Emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes there to.

Analysis of APS Response

The APS response addressed the NRC concern. It satisfied the separation concern between Train A and Train B essential lighting and also the concern related to enough capacity on the Train B diesel.

Results

Response satisfies NRC concerns.

Recommendation

No further action required.

4.2.31 Concern 31

"During a discussion of SIC-UV-653, [the Inspector] was informed that this valve is normally shut and the breaker for this tagged open in accordance with the locked valve and breaker control procedure. The Spurious Actuation Study states the circuits for this valve will be rerouted to preclude spurious actuation. [The Inspector] asked:

1. Has the FSAR been updated to show the different fix?

2. Has the affect of manual action (i.e., shutting the breaker) been evaluated? (Action Item #18)"

APS Response

"The spurious actuation study states that the valve SIC-UV-653 shall have its circuits rerouted to preclude spurious closing of the valve.

During normal operation this valve is normally closed and the breaker feeding the valve locked open. Upon commencement of shutdown cooling the valve is re-energized and opened.

At the time when the valve is open and the unit is in shutdown cooling the concern is spurious closing of the valve. To eliminate this concern, the circuits for this valve were rerouted. This was accomplished via DC 1, 2, 30E-RC-158,"

Requirements Analysis

10CFR50 Appendix R, Section III.G.

Analysis of APS Response

The referenced DCP 1, 2, 3OE-RC-158 reroutes the circuits associated with SIC-UV-653 out of fire zone 42C to comply with the above requirement. However, the NRC concern regarding the FSAR revision and the evaluation of the manual action to reclose the breaker for shutdown cooling mode was not addressed.

Results

The APS response as documented does not appear to fully address the NRC concern.

Recommendations

In order for the APS response to address the concerns, the following should be evaluated:

- Has the FSAR been revised to show the design change?
- And has the manual reclosing of the breaker during the subject fire scenario been evaluated.

4.2.32 Concern 32

"Zone 72/73/74 a & b Spurious Actuation states, 'Take manual control of atmospheric dump valves to preclude asymmetrical cooldown.' The NRC requested information on the intent of the statement (Action Item #20)."

APS Response

"The ADV area emergency lighting (fire zones 74A & 74B) is not required to safely shutdown the units, per the requirements of 10CFR50, Appendix R. The Spurious Actuation Study for a fire outside the Control Room, 01, 02, 03-NS-110, in fire zones 74A & 74B states that for a fire in these areas to take local manual control of the ADV's. Prior to this statement, the study also stated that the 'preferred' method for plant cooldown is a symmetric cooldown.

The emphasis should be noted on 'preferred' versus 'required.' The study goes on to state that asymmetrical cooldown should be performed if one ADV per steam generator is not available in four hours.,

Each fire zone contains two ADV's, one from each safety related train. An ADV in the unaffected fire zone can be controlled from either the Control Room or the Remote Shutdown Panel. Fire barriers and separation methods, in accordance with Appendix R, have been used to ensure the use of at least one ADV.

Therefore, the Spurious Actuation Study is clear, controlling one ADV is required but the ability to control both ADV's is preferred."

Requirements Analysis

10CFR50 Appendix R Section III.G

Analysis of APS Response

The APS response addresses the NRC concern in terms of describing the availability of asymmetric cooldown. Reference should also be made to UFSAR Table 9B.1-4, Note k which reinforces the statement made in the Spurious Actuation Study 01, 02, 03-NS-110.

Results

The response satisfies NRC concerns.

Recommendations

Reference to UFSAR Table 9B.1-4 Note k could also be made in responding to this concern.

4.2.33 Concern 33·

"Having operations go into the MSSS to relocate instrument air and close steam supply valves to the turbine driven auxiliary feed pump goes back to whether lights are required in the MSSS (Action Item #21)."

APS Response

"There are areas in the MSSS where safe shutdown emergency lights are required. For instance, the steam supply valves for the turbine driven aux feedwater pump, located on the 120' elevation of the MSSS. These valves require local, manual action. Safe Shutdown 8-hour emergency lighting is provided in this area."

Requirements Analysis

10CFR50 Appendix R, Section III.J
Emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.

Analysis of APS Response

The APS response addresses this issue. Emergency lighting that complies with the requirements of 10CFR50 Appendix R III.J is provided at the Train A turbine driven Auxiliary Feedwater pump.

Results

The APS response addressed the NRC concern.

Recommendation

No further action required.

4.2.34 Concern 34

"Basis 15 of the Spurious Actuation Study discusses an evaluation of the impact to achieve safe shutdown with postulated fires in the Aux Building, the Control Building, and the MSSS. The overall issue involves lighting in these areas (Action Item #22)."

APS Response

"Refer to Item #21 discussion."

Requirements Analysis

10CFR0 Appendix R, Section III.J
Emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.

Analysis of APS Response

The APS response satisfies the concern of the NRC for Appendix R III.J compliance in the MSSS. However, the Auxiliary Building, Control Building, Diesel Generator Building, the Turbine Building and the Yard area are not addressed in this response.

Results

The APS Response should address all areas of the plant that are required to meet the requirements of Appendix R Section III.J

Recommendations

Response should be reconstructed to address all the areas of PVNGS that are identified in 01, 02, 03-NS-110 as requiring operator action.

4.2.35 Concern 35

"Zones 47 A & B operator was required to operate a switch in the room the fire was in. From this he has asked if the pre-fire strategies have been walked down for do-ability (Action Item #23)."

APS Response

"Evidence has not been found which demonstrates that an initial walkdown was performed.

Review of the Pre-Fire Strategies Manual identified manual actions which noted equipment 'not being accessible for a fire in this Zone' (i.e., Zone 47A). Inability to perform actions due to the fire, therefore, was reviewed to some degree. Actions in two Zones, 47A and 42B, were identified to be in the room postulated on Fire (QDR-0125).

With respect to operators' ability to perform the actions, all but 29 actions are contained in Operations Procedure 4XAO-XZZ44. Do-ability of Procedure 4XAO-XZZ44 has been demonstrated at Unit 3 and through the Operator Training Program. The other 29 actions have been walked down for do-ability by Operations."

Requirements Analysis

10CFR50 Appendix R, Section III.G

Analysis of APS Response

The APS response addresses the overall NRC concern.

Results

The APS response resolves the NRC concern.

Recommendation

No further action.

4.2.36 Concern 36

"T.S. 6.8.2 and procedure 01AC-0AP02 requires reviews of pre-fire strategies. If this review was done since original license, why do the discrepancies discussed above exist? (Action Item #24)"

APS Response

"The Pre-Fire Strategies Manual became a controlled document in 1988. Procedure 01AC-0AP02 was revised to require annual review of the Pre-Fire Strategies Manual on 11-1-88. The Spurious Actuation Evaluation Concerns Section was reviewed by Engineering on April 18, 1988. The 1989 review, however, is pending completion.

The manual is currently being evaluated for incorporation into the Station Manual for better control of revisions, distribution, review, etc."

Requirements Analysis

6.8.1 Written procedures shall be established, implemented and maintained covering the activities referenced below:
(f) Fire Protection Program Implementation

6.8.2 Each program or procedure of Specification 6.8.1 shall be reviewed as specified in Specification 6.5 and approved prior to implementation. Programs, administrative control procedure, an implemented procedures shall be approved by the Vice President-Nuclear Production, or his designated alternate, who is at supervisory level or above. Programs and procedures of Specification 6.8.1 shall be reviewed periodically as set forth in administrative procedures.

Analysis of APS Response

APS response addresses the NRC concern.

Results/Recommendations

No further action required.

4.2.37 Concern 37

"Has requested:

A) Operations documented part in drills.

B) Does training discuss the fact that pre-fire strategies expect to get false signals? (Action Item #25)"

APS Response

"A) Current quarterly fire drill evaluations do not evaluate actions performed by Operations. Site Fire Department and Unit 1 Operations are jointly developing an evaluation program for operator actions. Completion of this enhancement is expected 6/1/90.

Drills associated with the Annual Technical Specification Fire Protection Audits evaluate actions performed by Operations and other support organizations such as Security and Radiation Protection.

C) The current Fire Team Advisor training program includes discussion on the effects of fire and fire suppressants on safe-shutdown capability. False signals are covered."

Requirements Analysis

Analysis of Concern 22 addressed this issue.

Analysis of APS Response

Analysis of Concern 22 addressed this issue.

Results

Results Concern 22 addressed this issue.

Recommendations

Recommendations of Concern 22 will address this issue.

4.2.38 Concern 38

"Written commitment for replacement of Emergi-Lites (Action Item #27)."

APS Response

"Scheduled completion scheduled for 6/22/90 (see attached)."

Requirements Analysis

Analysis of Concern 17 addressed this issue.

Analysis of APS Response

DCN 1, 2, 3 FE-QD-025 has been initiated to replace the Emergi-Lite units.

Results

APS discussion is responsive to the NRC concern.

Recommendation

No further action is required.

4.2.39 Concern 39

"From outside control room spurious action report, do we now believe the emergency lights should have been there (Action Item #28)."

APS Response

"See item #20 for discussion."

Requirements Analysis

10CFR50 Appendix R, Section III.J
Emergency Lighting. Emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.

Analysis of APS Response

The APS response referring to Item #20 does not address all areas needed for operation of safe shutdown equipment and access/egress routes thereto. This response addresses the MSSS building only. The appropriate response should include reference to all the buildings where operator actions and access/egress routes are credited for safe shutdown. The response should also include the adequacy of the existing emergency lighting system for compliance to 10CFR50 Appendix R, III.J as well as the ongoing work to implement measures to improve compliance.

Results

The APS response does not answer the NRC concern.

Recommendation

The APS response should reference the adequacy of the existing emergency lighting system in all areas required to comply to 10CFR50 Appendix R III.J.

4.2.40 Concern 40

"In SIMS emergency lights were upgraded to QAG a year ago.

a) No design review for upgrade
b) No procurement upgrade evaluation. This is what caused the problem with the swap of the batteries (96AH-73AH) (Action Item #41)."

APS Response.

"CAR 90-010, dated March 19, 1990, was generated to evaluate the deficiencies in the incorporation of CCE data into plant configuration documents (e.g., PM's, part selection, procurement).

A task force has been formed to evaluate similar CCE/SIMS concerns generated from meeting with Plant Standards, Procurement, EED and NED.

Complete closure of this CAR is expected by 9/1/90.

Requirements Analysis

See Section 4.1.1 for requirements analysis relative to emergency lights being classified as QAG (Important-to-Safety).

Analysis of APS Response

Response does not address why the lower amp hr (73) batteries were procured by mistake.

Results/Recommendations

Based on conversations with APS personnel, the 73 amp hr batteries being procured by mistake is part of a procurement control concern (QDR 90-0193). The particular steps for fully implementing a QAG Quality program for Emergency Lights should be the result of CAR 90-010. See Recommendation in Section 4.1.1.

4.2.41 Concern 41

Item 1: (Memo 161-03260-RAB-KLMC)

"The PM for the Holophane batteries currently permits the battery to be charged for 24 hours prior to the battery discharge test. Does APS have any basis to believe that this activity does not compromise the results of the battery discharge test itself? Would the battery have performed its required function (8 hour discharge) without this allowed method of pre-conditioning?"

APS Response

"Perform a review of the historical PM's to determine if 24 hour charging was always performed prior to discharge. Create a data base that provides the results of pre-conditioning vs. battery performance. Also perform an historical review of Dual-Lite PM's (10% sample population), including the East and West Wrap and the Diesel Building. (EED Action)"

Requirements Analysis

UFSAR Section, 9.5.1.5.2 Administrative Procedures, Controls and Fire Team states, "Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:

C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and are responsible to perform fire protection preventive maintenance.

UFSAR Section 9.5.3.4, Inspection and Testing Requirements, states "Normal and essential AC lighting circuits are normally energized and require no periodic testing. The emergency DC lighting system and the control room horseshoe suspended ceiling lighting system are inspected and tested periodically to ensure operability of the automatic switches and other components in the system."

Analysis of APS Response

Sections 4.2.15, 4.2.27, 4.2.29 of this report addressed the analysis.

Results/Recommendations

Recommendations are provided in Sections 4.2.15, 4.2.27 and 4.2.29.

4.2.42 Concern 42

Item 2: (Memo 161-03260-RAB/KLMC)
"What is APS' basis for stating that mineral oil was added to only a few battery units?"

APS Response

"Review information already compiled to support the discussion provided to the NRC. (EED Action)

Requirements Analysis

UFSAR Section, 9.5.1.5.2 Administrative Procedures, Controls and Fire Team states, "Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:

C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and are responsible to perform fire protection preventive maintenance.

UFSAR Section 9.5.3.4, Inspection and Testing Requirements, states "Normal and essential AC lighting circuits are normally energized and require no periodic testing. The emergency DC lighting system and the control room horseshoe suspended ceiling lighting system are inspected and tested periodically to ensure operability of the automatic switches and other components in the system."

Analysis of APS Response

Analysis in Section 4.2.14 addressed this issue.

Results/Recommendations

Results/Recommendations are provided in Section 4.2.14.

4.2.43 Concern 43

Item 3: (Memo 161-03260-RAB/KLM)

"The Appendix R battery failure data as provided to the NRC indicates that failures appear to have occurred, in high percentages, in specific areas of the plant. Relative to the validity of APS' statement of "low battery failures" and the NRC observation of the presented failure data - will the batteries perform their required function in these specific areas or environments?"

APS Response

"Review and correlate battery failure data as provided to the NRC. As best as possible, try to determine the ambient environments of the specific areas in which high battery failures occurred. (NED Action)"

Requirements Analysis

UFSAR Section, 9.5.1.5.2 Administrative Procedures, Controls and Fire Team states, "Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:

C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and are responsible to perform fire protection preventive maintenance.

UFSR Section 9.5.3.4, Inspection and Testing Requirements, states "Normal and essential AC lighting circuits are normally energized and require no periodic testing. The emergency DC lighting system and the control room horseshoe suspended ceiling lighting system are inspected and tested periodically to ensure operability of the automatic switches and other components in the system."

Appendix A to BTP 9.5-1, Section C.8 "Corrective Action" states "Measures should be established to assure that conditions adverse to fie protection, such as failures, malfunctions, deficiencies, deviations, defective components uncontrolled combustible material and nonconformance are properly identified, reported, and corrected.

And UFSAR Table 9B.3-1 says PVNGS complies.

Analysis of APS Response

Analysis in Section 4.2.11, 4.2.12, 4.2.13 addressed this issue.

Results/Recommendations

Sections 4.2.11, 4.2.12 and 4.2.13, respectively address the Results/Recommendations.

4.2.44 Concern 44

Item 4: (Memo 161-03260-RAB/KLMC)

"When did APS apply the Appendix B QA criteria to the Emergency Lights? UFSAR Section 17.2.2.2 states that 11 of the 18 Appendix B QA criteria (BTP 9.5-1) would be applied to the Fire Protection Program."

APS Response

"Determine what commitments have been made for the quality classification of the Emergency Lights. (QA/Licensing Action)

Review the response to CAR 90-10 on the classifications of the Emergency Lights. Is our upgrading of the lights to QAG an enhancement? Answer why and when were the Emergency Lights reclassified as QAG."

Requirements Analysis

See Section 4.1.1 of this Report for requirements analysis for emergency lights be classified as QAG (Important-to-Safety).

Analysis of APS Response

Analysis of Section 4.1.1 addressed this issue.

Results/Recommendations

Section 4.1.1 of this Report provides a discussion of Emergency Lighting classification.

4.2.45 Concern 45

The following concern was identified as a result of the NRC meetings the week June 11:

One Emergency Light out of service is considered by the NRC to be a violation of the APS License Condition.

Requirements Analysis

Unit 1 License Condition

2.C (7) Fire Protection Program (Section 9.5.1, SSER 6, SSER 7, and SSER 8)

> APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility as supplement and amended, and as provided in the SER through Supplement 8, subject to the following provisions.
>
> APS may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

Unit 2 License Condition

Fire Protection Program (Section 9.5.1, SSER 6, SSER 7 and SSER 8)

2.C (6) APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, as supplemented and amended, and as approved in the SSER through Supplement 8, subject to the following provision:

> APS may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not aversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

Unit 3 License Condition

2.F Fire Protection Program

APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, as supplemented and amended, and as approved in the SER through Supplement 11, subject to the following provision:

> APS may make changes to the approved fire protection program without approval of the Commission only if those change would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

Original SER (NUREG 0857)

9.5.1.9 Compliance with Appendix R

On May 23, 1980, the Commission issued a Memorandum and Order (CL 1-80-2) which states that: "The combination of the guidance contained in Appendix A to BTP ASB 9.501 and the requirements set forth in this rule define the essential elements for an acceptable fie protection program at nuclear power plant s docketed for Construction Permit prior to July 1, 1976, for demonstration of compliance with General Design Criterion 3 of Appendix A to 10CFR Part 50." On October 27, 1980, the Commission approved a rule concerning fire protection. The rule and its Appendix R were developed to establish the minimum acceptable fire protection requirements necessary to resolve certain areas of concern in contest between the staff and licensees of plants operating prior to January 1, 1979. Although this fire protection rule does not apply to PVNGS 1-3, the applicant has verbally committed to implement the following three issues identified in Appendix R as items to be backfitted.

1. Section III.G, Fire Protection for Safe Shutdown Capability
2. Section III.J, Emergency Lighting
3. Section III.O, Oil Collection System for Reactor Coolant Pump

Based on these commitments and the staff evaluation, the staff concludes that the PVNGS 1-3 fire protection program will meet the requirements of Appendix R to 10CFR Part 50 when the staff review has been completed.

SER 9.5.3 Lighting System

(c) Emergency Lighting
The Emergency lighting fixtures are designed to provide rated lighting for a minimum continuous period for two hours. Spare self-contained battery pack units will be readily available as required should there be a need for DC lighting in excess of two hours.

The plant lighting systems are designed so that a single failure cannot degrade the essential lighting below a safe level.

Technical Specifications, Units 1, 2 and 3

6.8 Procedures and Programs
6.8.1 Written procedures shall be established, implemented and maintained covering the activities referenced below:
(a) The applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978, and those required for implementing the requirements of NUREG-0737.

R.G. 1.33, Appendix A, Section 1, Administrative Procedures, specifies that there should be procedures for Plant Fire Protection Program.

6.9 Special Reports

6.9.3 Violations of the requirements of the fire protection program described in the Final Safety Analysis Report which would have adversely affected the ability to achieve and maintain safe shutdown in the event of a fire shall be reported in accordance with 10CFR50.73.

UFSAR Section 9.5.1, Fire Protection System

Appendix 9B, Fire Protection Evaluation Report, describes and discussed the effects that various postulated fires may have on areas of the plant which contain safety-related structures, systems and components.

9.5.1.1 Design Bases

9.5.1.1 Safety Design Bases. Safety design bases pertinent to the FPS are as follows:

Safety Design Basis Eighteen Emergency lighting systems shall be provided in accordance with the guidance provided in NRC Branch Technical Position APCSB 9.5-1 (revised February 2, 1977) and 10CFR0, Appendix R, Section III.J (issued September 1, 1982), in areas needed for operation of safe shutdown equipment and in access and egress routes thereto.

5.0 Lighting and Communication (FSAR Appendix 9B, Table 9B.3-1, Section D.5)

Lighting and two-way voice communication are provided. See subsections 9.5.2 and 9.5.3 and Appendix 9A responses to Questions (A.767 and 9A.125).

(a) Fixed emergency lighting consists of sealed beam units with minimum 8 hour battery power supplies in all areas needed for operation of safe shutdown equipment and in access and egress routes, thereto. Emergency lighting for personnel egress from other plant areas is provided by 1 1/2 hour battery units. See Section 9B.2 for specific zones containing emergency lighting.

(b) Suitable sealed beam battery-powered portable hand lights are provided for emergency use.

UFSAR 9.5.1.4.B Post-Operational Testing

Equipment out of service including fire suppression, detection and barriers is controlled through the administrative program and appropriate remedial actions taken. As conditions warrant, remedial actions include compensatory measures to ensure an equivalent level of fire protection in addition to timely efforts to make repairs and restore equipment to service.

UFSAR 9.5.3.1.1 Safety Design Bases

Safety design bases applicable to the lighting system are as follows:
B. Safety Design Basis Two. The lighting system, comprised of normal, emergency, and essential subsystems, shall be designed so that a single failure of any subsystem or electrical component of a subsystem, assuming loss of off-site power, cannot terminate the system's ability to illuminate areas occupied during a rector shutdown or emergency.

UFSAR 9.5.3.2.2.3 Emergency Lighting

Spare, self-contained battery pack units will be readily available to areas as required should there be a need for DC lighting in excess of eight hours.

UFSAR 9.5.3.3 Safety Evaluation

The safety evaluations are numbered to correspond to the safety design bases and are as follows:
B. Safety Evaluation Two. If the normal (preferred) sources to a Class 1E bus fails, the associated diesel generator is started automatically. During the diesel starting period, the emergency lighting system provides illumination. Lighting in the control room and remote shutdown area is automatically restored during diesel generator sequencing. In the event that AC power is lost, illumination in the control room (except for the control room horseshoe suspended ceiling) and remote shutdown area is provided by the DC emergency lighting system consisting of self-contained emergency lighting fixtures. In the control room panel area, upon loss of AC power, the DC emergency lighting system is energized automatically. Additionally, the UPS will supply power to selected fluorescent fixtures. In the control room suspended ceiling area, UPSs (each consisting of an inverter, charger, and separately installed eight-hour rated battery) supply power to fixtures upon loss of AC power.

A single failure analysis is provided in Table 9.5-6.

Question 9A.2 (NRC Question 430.5)

Identify the vital area and hazardous area where emergency lighting is needed for safe shutdown of the reactor and the evacuation of personnel in the event of an accident. Tabulate the lighting system provided in your design to accommodate those areas so identified. Include the degree of compliance to Standard Review Plan 9.5.1 regarding emergency lighting requirements in the event of a fire.

Response. The lighting system needed for safe shutdown of the reactor and evacuation of personnel consists of the essential lighting system and the emergency lighting system.

Table 9.5.5 identified areas where lighting is needed to accomplish safe shutdown of the reactor and evacuation of personnel. Paragraphs 9.5.3.2.2.2 and 9.5.3.2.2.3 describe the power supplies for the essential and emergency lighting systems.

PVNGS compliance with Appendix A of NRC Branch Technical Position APCSB 9.5-1 is identified in FSAR Section 9B.3, Table 9B.3-1, Item D.5.

UFSAR Appendix 9B, Table 9B.3-1, Section B.5 under following heading:
Application Docketed but Construction Permit not Received as of 7/1/76

(a) Successful firefighting requires testing and maintenance of the fire protection equipment, emergency lighting, and communication, as well as practice as brigades for the people who must utilize the equipment. A test plan that lists the individuals and their responsibilities in connection with routine tests and inspections of the fire detection and protection systems should be developed. The test plan should contain the types, frequency, and detailed procedures for testing. Procedures should also contain instructions on maintaining fire protection during those periods when the fire protection system is impaired or during periods of plant maintenance, e.g., fire watches or temporary hose connections to water systems.

PVNGS Position and Basis for Noncompliance Items, heading for column in Table 9B.3-1.

(a) PVNGS complies by developing a test plan that lists the individuals and their responsibilities in connection with routine plant tests and inspections of the plant fire protection system.

The test plan contains the types, frequency, and detailed procedures for testing. The procedure contain instructions on maintaining fire protection during those periods when the fire protection system is impaired or during periods of plant maintenance.

Section C.8 of UFSAR Table 9B.3-I, BTP Statement Column
8. Corrective Action
Measures should be established to assure that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components uncontrolled combustible material and nonconformances are promptly identified, reported, and corrected.

8. Corrective Action, of UFSAR Table 9B.3-1, PVNGS Position Column
PVNGS complies.

Section D.5. of UFSAR Table 9B.3-1, BTP Statement Column
5. Lighting and Communication
Lighting and two-way voice communication are vital to safe shutdown and emergency response in the event of fire. Suitable fixed and portable emergency lighting and communication device should be provided to satisfy the following requirements:

(a) Fixed emergency lighting should consist of sealed beam units with individual 8-hour minimum battery power supplies.

(b) Suitable sealed beam battery powered portable hand lights should be provided for emergency use.

5. Lighting and Communication, of UFSAR Table 9B.3-1, PVNGS Position Column
Lighting and two-way communication are provided. See subsections 9.5.2 and 9.5.3 and appendix 9A responses to Questions 9A.76 and 9A.125.

(a) Fixed emergency lighting consists of sealed beam units with minimum battery power supplies in all areas needed for operation of safe shutdown equipment and in access and egress routes, thereto. Emergency lighting for personnel egress from other plant areas is provided by 1-1/2 hour battery units. See section 9B.2 for specific zones containing emergency lighting.

(b) Suitable sealed beam battery powered portable hand lights are provided for emergency use.

Analysis of APS Response

Written response not provided.

Results

Central to the argument as to whether the License Condition is violated by one emergency light being out of service is what the License Condition says and what is described in the FSAR relative to the fire protection program.

The License Condition states that "APS shall maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report . . . as provided in the SER . . ."

The Requirements Analysis section above identifies the pertinent FSAR and SER Sections which describe the "approved fire protection program" with respect to emergency lighting.

It is clear that the Emergency Lights meet single failure criteria, with loss of off-site power, that spare self-contained battery pack units are part of the design basis, and that PVNGS provides the battery pack units consistent with Appendix A, to BTP 9.5-1 Section D.5 (b). Also, BTP 9.5-1, Appendix A, Section B.5 (a) stresses the need for emergency lighting to combat fires, and Section D.5 defines the "defense-in-depth" approach of having both fixed and portable emergency lighting available. The Fire Protection Program includes both fixed and portable lights to assist in mitigating plant fires. Therefore, a single light being out of service does not alone defeat the safety function of having light available to perform the operator actions for safe shutdown or place the plant outside the envelope of the Fire Protection Program.

The NRC guidance has, in the past, been ambiguous in that the Regulatory Guide 1.120 "Fire Protection Guidelines for Nuclear Power Plants," Rev. 1 (for comment) dated November 1977 and in BTP 9.5-1 "Guidelines for Fire Protection for Nuclear Power Plants does not specifically mention emergency lights, communication or self contained breathing apparatus as part of the "Fire Protection Program." Based on a narrow reading of the definition of "Fire Protection Program" in RG 1.120, Rev. 1 (1977) and BTP 9.5-1 an argument could have been made that since the License Condition uses the same phrase "Fire Protection Program," then an emergency light failure does not constitute a License Condition Violation.

It should be noted that PVNGS personnel have instituted "Night Orders" to inform operators and describe compensatory actions when the fixed emergency lighting components are not operable. These actions fulfill the functional intent of Appendix A to BTP 9.5-1, the UFSAR and therefore the "Fire Protection Program" requirements of the License Condition.

If an interpretation consistent with the stated concern were uniformly implemented, then emergency lighting would have enforcement liabilities greater than Safety-Related Systems such as Reactor Protection, High/Low Pressure Injection, which have permissible out-of-service times stated in the Technical Specifications. This would have the effect of redirecting Licensee personnel attention from issues of major plant safety concern to issues of enforcement, not directly related to routine, abnormal and emergency plant operational safety.

This clearly was not the NRC intent in the proposal to delete the Fire Protection Systems from the Technical Specifications as documented in Generic Letter 88-12.

Recommendations

APS should formalize the compensatory actions for fixed emergency lights in an approved procedure consistent with the review and approval requirements of Technical Specification 6.8.1 and 6.5.

4.3 Utility Survey

The detailed results of the utility survey are contained in Appendix D. Summarized in this section are those issues related to the issues identified in Sections 4.1 and 4.2.

- Battery Sizing
- Preventive Maintenance
- Quality Assurance Requirements
- Operability/Compensatory Measures
- Aiming of Emergency Lights
- Illumination Levels
- Training

4.3.1 Battery sizing

Of the seven utilities asked the questions relating to battery sizing, two utilities stated that temperatures were taken into account in sizing the batteries. The remaining utilities indicted that they understood that temperature had an effect on battery capacity and life expectancy. However, they anticipated any degradation to be identified during regularly scheduled maintenance activities.

4.3.2 Preventive Maintenance

Of the seven utilities asked the maintenance questions, all had some sort of testing program in place. The majority of the utilities have an annual discharge test in addition to a more frequent visual examination. None of the seven contacted did any pre-conditioning of the batteries prior to testing.

4.3.3 Quality Assurance Requirements

Of the seven utilities contacted, two did not consider emergency lighting included in the fire protection augmented quality assurance program.

4.3.4 Operability/Compensatory Measures

Eight utilities were contacted regarding this issue. Two of the eight hold GL 86-10 license conditions similar to PVNGS. One utility has defined operability requirements for not only emergency lighting systems but also for safe shutdown equipment which is not currently in the technical specifications. The other utility does not have any special reportability/compensatory measures in place for emergency lighting. Although this utility does take credit for hand-held portable units.

One facility has technical specifications for its emergency lighting system. Another facility has an action statement in its maintenance procedure to provide a portable light if the permanent light is being removed for maintenance.

The remaining four utilities have no specific compensatory measures for the loss of an emergency lighting unit.

4.3.5 Aiming of Emergency Lights

One utility has operators verify aiming as part of their weekly round sheets. All the remaining seven utilities contacted verify aiming as part of their monthly, quarterly or semiannual visual examinations.

4.3.6 Illumination Levels

This question produced varied responses. All utilities responded that the emergency lighting provided was done so in accordance with the guidelines of GL 86-10. Some utilities did, however, have quantitative illumination criteria for specific areas (for example, the control room, the remote shutdown panels, and some committed to NFPA 101 for egress routes.).

4.3.7 Training

Five of the eight utilities maintain separate procedures for fires outside the control room. Each of these utilities provides some type of refresher training for these procedures. The other three utilities believe their shutdown for a fire outside the control room is encompassed by existing Emergency Operating Procedures.

4.4 Other Recommendations

In addition to the findings identified in the Sections 4.1 and 4.2, a number of other recommendations have been identified. These recommendations are considered clarifications or enhancements.

4.4.1 Periodic Review of PM Facsimiles

As noted in Appendix A, 30DP-9WP07, 3.1.2, references 30AC-9MP02 to determine the review schedule for PM facsimiles. 30AC-9MP02 does not contain this information.

4.4.2 UFSAR Clarifications

4.4.2.a Section 9.5.1.5.2 of the UFSAR states "The Fire Protection Department has responsibility for operations and operational testing of fire protection equipment including the detection system." PVNGS has as Preventive Maintenance program that includes scheduled inspection of emergency lighting. UFSAR clarification may be in order.

4.4.2.b Table 9.5-6 indicates no effect on normal lighting for loss of off-site power. Normal lighting is lost on loss of off-site power; therefore Table 9.5-6 should be revised. Also, some non-Appendix R "Emergency" Lighting is powered from local normal lighting sources (SAR Change 3156), so Table 9.5-6 should reflect this change.

4.4.3 Emergency Lighting for other Design Basis Accidents

Standard Review Plan Section 9.5.3, "Lighting Systems," states "The systems are reviewed with respect to the following considerations: . . . (2) the capacity of the emergency lighting system to provide adequate lighting during all plant operating conditions, including fire, transients and accident conditions." The standard review plan also states, "The PSB will use the following criteria to assess the systems design capability...(2) the emergency lighting system(s) will provide adequate emergency lighting in all areas, from on-site power sources, required for fire fighting, control and maintenance of safety-related equipment, and the access routes to and from these areas..."

Section 9.5.3.2.2.3 of the UFSAR states "The DC-powered emergency lighting system is provided in the main control room (except the control room horseshoe suspended ceiling) at the remote shutdown panel room, associated local control stations, and along emergency exit routes where emergency maintenance is expected to be required."

Emergency lights at PVNGS were provided for both the fire scenario and other plant event conditions. The review focused on the emergency lights that are provided for safe shutdown for a fire postulated in any area of the plant. APS should review the criteria for placement of emergency lights for other events to ensure they are adequate.

4.4.4 The UPS emergency lighting system meets the eight-hour battery supply and placement requirements as stated in 10CFR50 Appendix R, III.J (assuming recommendations identified in Section 4.1.2.d are implemented). However, documentation does not exist to demonstrate that a fire scenario in one area will not cause a loss of emergency lighting in any unaffected area needed for safe shutdown operation.

NRC Inspection Procedure IP64100, states "If the emergency lights are powered from a central battery or batteries, then the distribution system must contain protective devices such that a fire in one area will not cause the loss of emergency lighting in any unaffected areas needed for safe shutdown operations."

From ABB Impell's review, it did not appear that protective devices were installed in the UPS lighting circuits. APS should consider reviewing the UPS backed lighting systems for this concern.

5.0 Conclusion

As documented in this report ABB Impell performed an independent review of the PVNGS emergency lighting system. In the course of this review ABB Impell found that the major issues regarding emergency lighting had been formally identified by APS.

- Emergency Lighting Battery Sizing - identified in LER 86-59
- Emergency Lighting Placement - identified in LER 89-12-01
- Emergency Lighting QA Classification - identified in APS Letter 167-02588-MFH/JAB, dated July 25, 1988 and in QA Audit Report 89-018
- Emergency Lighting Maintenance in LER 86-59 and in internal APS Memo 191-00012-RRB, dated April 13, 1987

Corrective actions to address the identified issues focused on the immediate concern(s) with limited attention to the underlying programmatic issues.

Recent corrective actions identified/reviewed during ABB Impell's independent evaluation appear to address the broader programmatic issues. In ABB Impell's opinion, these issues represent the source of the individual deficiencies.

Completion of the APS correctives actions and the implementation of the ABB Impell recommendations in this report should establish a program for continued compliance with the fire protection emergency lighting requirements.

6.0 References

Documents Reviewed

6.1 ANSI N18.7, 1973 (Security Lighting)
6.2 APS Corrective Action Report CAR 90-0014
6.3 APS Corrective Action Report (CAR) C83-175D dated 11/16/83
6.4 APS Corrective Action Report (CAR) C83-179D dated 11/10/83
6.5 APS Corrective Action Report 90-0010 dated 03/19/89
6.6 APS Internal Draft Response Documents for Inspection 90-08
6.7 APS Letter ANPP-34128-EEVB/WFQ/PGN dated November 29, 1985
6.8 APS letter ANPP-32277-EEVB/WFQ dated March 29, 1985
6.9 APS letter ANPP-32212-EEVB/WFQ dated March 25, 1985
6.10 APS Letter 102-01287-WFC dated June 3, 1989
6.11 APS letter ANPP-30709-EEVB/TFQ/DKN dated October 2, 1984
6.12 APS letter ANPP-32398-EEVB/WFQ dated April 15, 1985
6.13 APS letter ANPP-30859-TFQ/JYM dated October 16, 1984
6.14 APS letter ANPP-30747-EEVB/MAJ dated October 5, 1984
6.15 APS letter ANPP-31378-EEVB/WFQ dated December 7, 1984
6.17 APS letter ANPP-31195-WFQ/TFQ dated November 21, 1984
6.18 APS letter ANPP-30760-TFQ/KLM dated October 5, 1984
6.19 APS letter ANPP-30664-TDS/TRB dated September 26, 1984
6.20 APS letter ANPP-30761-EEVB/KLM dated October 5, 1984
6.21 APS letter ANPP-29422-JWR/GAS dated May 4, 1984
6.22 APS letter ANPP-21405-ACR/WFQ dated July 15, 1982
6.23 APS letter ANPP-17952-JMA/WFQ dated May 12, 1982
6.24 APS Letter ANPP-33765-EEVB/JRP dated October 22, 1985
6.25 APS Letter 102-01355-WFC-TDS dated August 7, 1989
6.26 APS Letter 102-01280-JGH-TDS dated May 26, 1989
6.27 APS Letter 102-01294-WFC-TDC dated June 8, 1989
6.28 APS Letter ANPP-30986-TFQ/MAJ dated October 29, 1984
6.29 APS Letter 102-01685-WFC-TRB dated March 16, 1990
6.30 APS Letter ANPP-32397-EEVB/WFQ dated April 15, 1985
6.31 APS Letter 192-00250-JGH/TRB/JHT dated September 2, 1987
6.32 APS Letter 102-01446-WFC dated October 2, 1989
6.33 APS Letter 102-01674-WFC/TRB/JJN dated April 20, 1990
6.34 APS Letter 192-00526-JGH/TDS/DAJ dated September 22, 1989
6.35 APS Letter ANPP-00130-JGH/TDS/JHT/96.03 dated January 9, 1987
6.36 APS Material Nonconformance Report 90-QD-0001 dated 03/16/90
6.37 APS Memo 161-03229-RAB/KLMC dated May 18, 1990
6.38 APS Memo 161-03260-RAB/KLMC dated June 5, 1990
6.39 APS Memo 107-00673-LM-LGP dated June 5, 1987
6.40 APS Memo ANPM-27886-WLH/KH-98.33 dated July 30, 1986
6.41 APS Memo 260-0358-WCM, dated May 16, 1990
6.42 APS Memo from L.E. Mitchell to Distribution dated July 1, 1986
6.43 APS Memo 063-00357-RAB dated May 29, 1987
6.44 APS Memo 191-00012-RRB dated April 13, 1987

6.45 APS Memo 167-02213/ECS/JD dated April 18, 1988
6.46 APS Memo 260-00071-WCM dated May 1, 1989
6.47 APS Memo ANPM-16702-JTB/SLK dated June 30, 1983
6.48 APS Memo 207-00165-PJW, dated May 26, 1989
6.49 APS Memo 223-00229-CDC dated November 30, 1989
6.50 APS Memo 201-02000-FFD dated April 23, 1990
6.51 APS Memo ANPM-02041-DJW-92.11 dated January 12, 1987
6.52 APS Memo ANPM-02069-DJW-BAM-92.11 dated February 6, 1987
6.53 APS Memo 023-02356-WEC/PCM dated September 28, 1987
6.54 APS Memo ANPM-02087-DJW-RAM-92.11 dated February 20, 1987
6.55 APS Memo 167-05727-ECS/JWF dated December 29, 1989
6.56 APS Memo 255-00098-GWW/RAF dated December 14, 1989
6.57 APS Quality Assurance Audit Report - Audit No. 89-018
6.58 APS RCTS and RCTS (2) Search for Lighting Commitments dated 06/11/90
6.59 AS Memo 065-00441-JFM dated December 7, 1989
6.60 Calculation 13-EC-DG-200, ANPP Diesel Generator Load Calculation, CCN 3
6.61 Code of Federal Regulations, 10CFR50.48 and Appendix R to 10CFR50
6.62 Component Classification Evaluation (CCE) Emergency Lighting dated 03/31/89
6.63 DCP Number 1, 2, 3-FE-QD-025-0
6.64 DCP Number 1, 2, 3-FE-QD-022
6.65 Drawing 13-E-ZJL-001
6.66 Drawing 13-E-ZJL-002
6.67 Drawing 13-E-ZPL-001
6.68 Drawing 13-E-ZPL-002
6.69 Drawing 13-E-ZPL-003
6.70 Drawing 13-E-ZAL-205
6.71 Drawing 13-E-ZAL-207
6.72 Drawing 13-E-ZAL-302
6.73 Drawing 13-E-ZAL-303
6.74 Drawing 13-E-ZPL-004
6.75 EAR 89-1433, Chemical Laboratory Lighting, dated 07/20/89
6.76 EER 90-QD-002, Failure Trending
6.77 EER 87-QD-004, Containment Lights, dated 01/28/87
6.78 EER 85-QD-022, Lights Access Holes, dated 10/09/85
6.79 EER 86-QD-034, Lights Access Holes, dated 11/03/83
6.80 EER 89-QD-015, Light Voltage Criteria, dated 07/27/89
6.81 EER 89-XE-022, Lighting Power Loads, dated 04/19/89
6.82 EER 89-QD-034, "Brown-out" Circuits, dated 12/06/89
6.83 EER 86-QD-029, Seismic Mounting, dated 07/11/86
6.84 EER 87-QD-010, Battery Testing, dated 04/10/87
6.85 EER 86-QD-022, Seismic Mounting, dated 05/30/86
6.86 EER 89-QD-011, Chemical Laboratory Lighting, dated 06/28/89
6.87 "Essential and emergency lighting system Report" dated June 1, 1989
6.88 FR 3QD-049, Lighting Survey, dated 01/23/87

6.89 IEEE Standard 485-1978
6.90 IES Lighting Handbook, 1975 Application Volume
6.91 License Condition 2.C (7) Unit 1
6.92 License Condition 2.C (6) Unit 2
6.93 License Condition 2.F Unit 3
6.97 Licensee Event Report 86-59 dated January 9, 1987, with 6.98 Monitoring Licensee Event Report 89-12, Supplement 1 dated 6.99 September 22, 1989
6.100 Material Nonconformance Report MNCR 90-QB-0004
6.101 Material Nonconformance Report MNCR 90-QB-0005
6.102 NFPA 70-1975/ANSI C1-75
6.103 NRC Branch Technical Position APCSB 9.5-1, Appendix A
6.104 NRC Letter Civil Penalty and Notice of Violated dated September 1, 1989
6.105 NRC Enforcement Manual dated 03/23/90
6.106 NRC Generic Letter 86-10 dated April 24, 1986
6.107 NRC Inspection and Enforcement Manual, Procedure 81062
6.108 NRC Inspection and Enforcement Manual, Procedure 64150
6.109 NRC Inspection and Enforcement Manual, Procedure 64100
6.110 NRC Letter Confirmatory Action Letter dated March 28, 1989
6.111 NRC Letter Inspection Report 90-02 dated April 24, 1990
6.112 NRC Letter Inspection Report 90--08 dated March 21, 1990
6.113 NRC Letter Inspection Report 86-37 (Units 1 and 2) dated January 26, 1987
6.114 NRC Letter "Nuclear Plant Fire Protection Functional NRC Letter Inspection Report 87-01 (Units 1 and 2) dated March 13, 1987
6.115 NRC Letter dated July 7, 1989
6.116 NRC Letter Inspection Report 87-07 (Unit 3) dated March 25, 1987
6.117 NRC Letter Inspection Report 87-17 (Unit 1) dated July 24, 1987
6.118 NRC Regulatory Guide 1.33, Rev. 2, dated February 1978
6.119 NUREG-0857 "Safety Evaluation Report Relating to the Operation of Palo Verde Nuclear Generating Station, Units 1, 2 and 3, Original Issue November 1981 with Supplements through Supplement No. 12
6.120 Palo Verde Maintenance Standards - Sort for "QB" and "QD" System
6.121 Pre-Fire Strategies 01AC-0AP02
6.122 Preventive Maintenance Task #045717
6.123 Preventive Maintenance Task #033713
6.124 Preventive Maintenance Task #044920
6.125 Preventive Maintenance Task #016056
6.126 Preventive Maintenance Task #048680
6.127 Preventive Maintenance Task #045391
6.128 Procedure 41AO-1ZZ44
6.129 Procedure 42AO-2ZZ44
6.130 Procedure 43AO-3ZZ44
6.131 Procedure 14AC-0FP01, "Fire System Impairment," dated 10/02/89
6.132 Procedure 30AC-9ZZ01 "Work Control" dated 11/1/89
6.133 Procedure 30AC-9MP02 "Preventive Maintenance," dated 05/16/90
6.134 Procedure 30DP-9NP07 "Preventive Maintenance Writer's Guide" dated 10/05/89
6.135 Procedure 70PR-0AP01 "System Engineer Program," dated 11/01/88

6.136 Procedure 93GT-0ZZ47 "Emergency Wall Mounted Lights," dated 05/3/86
6.137 Procedure 81AC-0CC06
6.138 Purchase Order Number 10407-13-EM-041B
6.139 Purchase Order Number 10407-13-EM-036A
6.140 PVNGS Fire Protection QA Review No. 13-MS-A32
6.141 QDR No. 90-0054 Response dated 02/28/90
6.142 Quality Deficiency Report No. 90-0054 dated 02/06/90
6.143 Quality Deficiency Report QDR 90-0193
6.144 Report No. MR90-0741 dated 03/22/90
6.145 Report of NRC Meeting ANPP Management, June 5, 1989
6.146 Responsibilities, Administrative Controls and Quality 6.147 Assurance" dated June 14, 1977
6.148 Standard Review Plan, NUREG-0800 Section 9.5.3
6.149 Supplement dated September 2, 1987
6.150 Tasks, dated 6/13/90
6.151 Technical Specifications 6.5, 6.8, 6.9, Units 1, 2 and 3
6.152 Unit 1, WCC PM Work Orders Exceeding Grace Period, dated 6/11/90
6.153 UFSAR Sections 9.5.1, 9.5.3, 3.2, Appendix 9B, Appendix 9A, 9.4.2, 14.2, Appendix 14B, 17.2, Appendix 17A, 10.3.2, 10.4.9
6.154 Vendor Technical Manual E036A-10, Rev. 2, dated 06/21/85
6.155 Vendor Technical Manual E050-70, Rev. 8, dated 09/13/88
6.156 Vendor Technical Manual E041B-3
6.157 Vendor Technical Manual E041A-4

APPENDIX A

NRC REQUIREMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
CODE OF FEDERAL REGULATIONS 10CFR50.48 **50.48 Fire Protection** (a) Each operating nuclear power plant shall have a fire protection plan that satisfies Criterion 3 of Appendix A to this part. This fire protection plan shall describe the overall fire protection program for the facility, identify the various positions within the licensee's organization that are responsible for the program, state the authorities that are delegated to each of these positions to implement those responsibilities, and outline the plans for fire protection, fire detection and suppression capability, and limitation of fire damage. The plan shall also describes specific features necessary to implement the program described above, such as administrative controls and personnel requirements for fire prevention and manual fire suppression activities, automatic and manually operated fire detection and suppression systems, and the means to limit fire damage to structures, systems, or components important to safety so that the capability to safety shut down the plant is ensured.[3] (b) Appendix R to this part establishes fire protection features required to satisfy Criterion 3 of Appendix A to this part with respect to certain generic issues for nuclear power plants licensed to operate prior to January 1, 1979. Except for the requirements of Sections III.G, III.J, and III.O, the provisions of Appendix R to this part shall not be applicable to nuclear power plants licensed to operate prior to January 1, 1979, to the extent that fire protection features proposed or implemented by the licensee have been accepted by the NRC staff as satisfying the provisions of Appendix A to Branch Technical Position BTP APCSB 9.5-1[4] reflected in staff fire protection safety evaluation reports issued prior to the effective date of this rule, or to the extent that fire protection features were accepted by the staff in comprehensive fire protection safety evaluation reports issued before Appendix A to Branch Technical Position BTP APCSB 9.5-1 was published in August 1976. With respect to all other fire protection features covered by Appendix R, all nuclear power plants licensed to operate prior to January 1, 1979, shall satisfy the applicable requirements of Appendix R to this part, including specifically the requirements of Sections III.G, III.J, and III.O. (c) Nuclear power plants licensed to operate after January 1, 1979, shall complete all fire protection modifications needed to satisfy Criterion 3 of Appendix A to this part in accordance with the provisions of their licenses.	APS compliance with this Regulation is detailed in FSAR Section 9.5.1, Appendix 9B and Section 9.5.3 discussion herein. Also, NRC SER (NUREG-0857) documents APS Correspondence which commits to implementing Sections III.G, J and O of Appendix R to 10CFR50.	See FSAR discussion.	

[3] Basic fire protection guidance for nuclear power plants is contained in two NRC documents:
- Branch Technical Position Auxiliary Power Conversion System Branch BTP APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," for new plants docketed after July 1, 1976, dated May 1976.
- Appendix A to BTP APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976," for plants that were operating or under various states of design or construction before July 1, 1976, dated August 23, 1976.

[4] Clarification and guidance with respect to permissible alternatives to satisfy Appendix A to BTP APCSB 9.5-1 has been provided in four other NRC documents.
- "Supplementary Guidance on Information Needed for Fire Protection Evaluation," dated October 21, 1976.
- "Sample Technical Specification," dated May 12, 1977.
- "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Control and Quality Assurance," dated June 14, 1977.
- "Manpower Requirements for Operating Reactors," dated May 1, 1978.

A Fire Protection Safety Evaluation Report that has been issued for each operating plant states how these guidelines were applied to each facility and identifies open fire protection issues that will be resolved when the facility satisfies the appropriate requirements of Appendix R to this part.

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	NRC REQUIREMENTS APS ACTION	Y/N COMPLIANCE	REFERENCES
APPENDIX R - FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES OPERATING PRIOR TO JANUARY 1, 1979			
I. Introduction and Scope This appendix applies to licensed nuclear power electric generating stations that were operating prior to January 1, 1979, except to the extent set further in 50.48(b) of this part. With respect to certain generic issues for such facilities it sets forth fire protection features required to satisfy Criterion 3 of Appendix A to this part.[1] Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions." When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boil-off. The phrases "important to safety," or "safety-related," will be used throughout this Appendix R as applying to all safety functions. The phrase "safe shutdown" will be used throughout this appendix as applying to both hot and cold shutdown functions. Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions does not per se impact public safety, the need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents. Three levels of fire damage limits are established according to the safety functions of the structure, system, or component:	APS compliance with this Appendix of the Regulation is detailed in FSAR Section 9.5.1, 9.5.3, Appendix 9B discussion herein. Also, NRC SER (NUREG-0857) documents APS Correspondence which commits to implementing Sections III.G, J, O of Appendix R of 10CFR50.	See FSAR discussion.	

[1] Clarification and guidance with respect to permissible alternatives to satisfy Appendix A to BTP APCSB 9.5-1 has been provided in four other NRC documents:

"Supplementary Guidance on Information Needed for File Protection Evaluation," dated October 21, 1976;

"Sample Technical Specification," dated May 12, 1977;

"Nuclear Plant Fire Protection Functional Responsibilities, Administrative Control and Quality Assurance," dated June 14, 1977;

"Manpower Requirements for Operating Reactors," dated May 11, 1978.

A Fire Protection Safety Evaluation Report that has been issued for each operating plant states how these guidelines were applied to each facility and identifies open fire protection issues that will be resolved when the facility satisfies the appropriate requirements of Appendix R to Part 50.

NRC REQUIREMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES

Safety Function	Fire Damage Limits
Hot shutdown	One train of equipment necessary to achieve hot shutdown from either the control room or emergency control station(s) must be maintained free of fire damage by a single fire, including an exposure fire.[1]
Cold Shutdown	Both trains of equipment necessary to achieve cold shutdown may be damaged by a single fire, including an exposure fire, but damage must be limited so that at least one train can be repaired or made operable within 72 hours using on-site capability.
Design Basis Accidents	Both trains of equipment necessary for mitigation of consequences following design basis accidents may be damaged by a single exposure fire.

[1] *Exposure Fire.* An exposure fire is a fire in a given area that involves either in situ or transient combustibles and is external to any structures, systems, or components located in or adjacent to that same area. The effects of such fire, e.g. smoke, heat or ignition) can adversely affect those structures, systems, or components important to safety. Thus a fire involving one train of safe shutdown equipment may constitute an exposure fire for the redundant train located in the same area, and a fire involving combustibles other than either redundant train may constitute an exposure fire to both redundant trains located in the same area.

The most stringent fire damage limit shall apply for those systems that fall into more than one category. Redundant systems used to mitigate the consequences of other design basis accidents but not necessary for safe shutdown may be lost to a single exposure fire. However, protection shall be provided so that a fire within only one such system will not damage the redundant system.

APPENDIX R TO 10CFR50

APS Compliance with this section of the Regulation is detailed in FSAR Section 9.5.1, Appendix B, and 3.5.3 discussions.

See FSAR discussions.

III. Specific Requirements

J. Emergency Lighting. Emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.

STANDARD REVIEW PLAN NUREG-0800

NRC relies on Standard Review Plan in developing Safety Evaluation Reports to support the licensing of the facility. Licensee does not necessarily issue a commitment to adhere to the review guidelines. Rather, the NRC staff confirms that the Licensee design is acceptable, based on it meeting the Standard Review Plan Acceptance Criteria. Therefore, there is no APS Implementing Commitment.

9.5.3 LIGHTING SYSTEMS

Review Responsibilities

Primary - Power Systems Branch (PSB)
Secondary - None

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
I. Areas of Review The PSB reviews the normal and emergency or supplementary plant lighting systems. The systems are reviewed with respect to the following considerations: (1) the capability of the normal lighting system(s) to provide adequate lighting during all plant operating conditions and (2) the capability of the emergency lighting system to provide adequate lighting during all plant operating conditions, including fire, transients and accident conditions, and the effect of the loss-of-off-site power on the emergency lighting system.	No APS action required since this is an NRC staff review requirement.	See FSAR discussion section below for conclusions on fire-related emergency lighting requirements. NRC has concluded that the APS design is acceptable in the SER NUREG 0857) and its supplements.	
II. Acceptance Criteria Acceptability of the design of the normal and emergency lighting systems, as described in the applicant's safety analysis report (SAR), is based in part on the degree of similarity of the systems design with those for previously reviewed plants with satisfactory operating experience. There are no general design criteria or regulatory guides that directly apply to the safety-related performance requirements for the lighting system. The PSB will use the following criteria to assess the systems design capability: (1) the normal lighting system(s) is acceptable if the integrated design of the system(s) will provide adequate station lighting in all areas, from off-site power sources, required for normal plant operation, control and maintenance of equipment and plant access routes; (2) the emergency lighting system(s) is acceptable if the integrated design of the system(s) will provide adequate emergency station lighting in all areas, from on-site power sources, required for fire fighting, control and maintenance of safety-related equipment, and the access routes to and from these areas; and (3) the lighting systems designs will be acceptable if they conform to the Illuminating Engineering Society (IES) Lighting Handbook as related to systems design and illumination levels recommended for industrial facilities.			
APPENDIX A, BRANCH TECHNICAL POSITION 9.5-1 (APPLICATIONS DOCKETED PRIOR TO 7/1/76)			
5. Lighting and Communication (Appendix A to BTP 9.5-1) Lighting and two-way voice communication are vital to safe shutdown and emergency response in the event of fire. Suitable fixed and portable emergency lighting and communication devices should be provided to satisfy the following requirements: (a) Fixed emergency lighting should consist of sealed beam units with individual eight-hour minimum battery power supplies. (b) Suitable sealed beam battery-powered portable hand lights should be provided for emergency use.	See discussion provided in FSAR Section of this Appendix. Communications are not within the scope of this Report. Lighting and two-way voice communication are provided. See Subsections 9.5.2 and 9.5.3 and Appendix 9A response to Questions (A.76 and 9A.125).	YES - Communications are not within the scope of this Report.	

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
NRC GENERIC LETTER 86-10 DATED 4/24/86 ENCLOSURE 2 "APPENDIX R QUESTIONS AND ANSWERS" SECTION 4.			
4.1 Illumination Levels *Question.* What is the requisite intensity level for emergency lighting for egress routes and areas where shutdown functions must be performed? What are the bases for determining these levels of lighting? *Response.* The level of illumination provided by emergency lighting in access routes to and in areas where shut-down functions must be performed is a level that is sufficient to enable an operator to reach that area and perform the shutdown functions. At the remote shutdown panels the illumination levels should be sufficient for control panel operators. The bases for estimating these levels of lighting are the guidelines contained in Section 9.5.3 of the Standard Review Plan, which are based on industry standards (i.e., Illuminating Engineering Society Handbook). Where a licensee has provided emergency lighting per Section III.J Appendix R, we would expect that the licensee verify by field testing that this lighting is adequate to perform the intended tasks.	Generic Letter 86-10 is an NRC Guidance document. It is included here because APS utilized this guidance in determining acceptable illumination levels. This document includes the following disclaimer: "These interpretations represent staff positions, and should not be considered as official agency interpretations issued by the General Counsel. 10CFR50.3 "Interpretations" states that "no interpretation other than by the General Counsel will be recognized to be binding on the Commission." Example procedure 93GT-0ZZ47, Section 1.4.3 verified adequacy. Recent DCP Acceptance Criteria, discussed hereafter, required walkdowns by EED, Operations and NED personnel to determine adequate illumination.	YES	93LGT-0ZZ47
UNIT 1 LICENSE CONDITION **.2.C.(7) Fire Protection Program (Section 9.5.1, SSER 6, SSER 7, and SSER 8)** (a) APS shall maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility through Amendment No. 14, and as provided in the SER through Supplement 8, subject to provisions (b) and (c) below. (b) APS may make no change in features of the approved fire protection program which would decrease the level of fire protection in the plant without prior approval of the Commission. To make such a change APS must submit an application for license amendment pursuant to 10CFR50.90. (c) APS may make changes to features of the approved fire protection program which do not decrease the level of fire protection without prior Commission approval, provided: (i) Such changes do not otherwise involve a change in a license condition or technical specification or result in an unreviewed safety question (see 10CFR50.59), and (ii) Such changes do not result in failure to carry out the fire protection program approved by the Commission prior to license issuance. APS shall maintain, in an auditable form, a current record of all such changes including an analysis of the effects of the change on the fire protection program and shall make such records available to NRC inspectors upon request. All changes to the approved program made without prior Commission approval shall be	UFSAR 9.5.1, 9.5.3, Appendix 9A and 9B, Administrative Procedures which implement the Fire Protection Plan and functional/system procedures, which verify components are capable of performing their functions, all serve to fulfill this License Condition. The specifics of APS Compliance/Actions to the emergency lighting portion of the fire protection program is delineated in the detailed discussions of the FSAR Sections and the Spurious Actuation Study Review Results hereafter and in Appendix B to this Report.	YES	

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
reported annually to the Director of the Office of Nuclear Reactor Regulation, together with supporting analyses.			
UNIT 2 LICENSE CONDITION			
Fire Protection Program (Section 9.5.1, SSER6, SSSER 7 and SSER8)	UFSAR 9.5.1, 9.5.3, Appendix 9A and 9B, Administrative Procedures which implement the Fire Protection Plan and functional/system procedures, which verify components are capable of performing their functions, all serve to fulfill this License Condition. The specifics of APS Compliance/Actions to the emergency lighting portion of the fire protection program is delineated in the detailed discussions of the FSAR Sections and the Spurious Actuation Study Review Results hereafter and in Appendix B to this Report.	YES	
2.C.(6) APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, as supplemented and amended, and as approved in the SSER through Supplement 8, subject to the following provision: APS may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.			
UNIT 3 LICENSE CONDITION			
2.F APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, as supplemented and amended, and as approved in the SER through Supplement 11, subject to the following provision: APS may make changes to the approved fire protection program without approval of the Commission only if those changes would not adversely affect the ability to achieve and maintains safe shutdown in the event of a fire.	UFSAR 9.5.1, 9.5.3, Appendix 9A and 9B, Administrative Procedures which implement the Fire Protection Plan and functional/system procedures, which verify components are capable of performing their functions, all serve to fulfill this License Condition. The specifics of APS Compliance/Actions to the emergency lighting portion of the fire protection program is delineated in the detailed discussions of the FSAR Sections and the Spurious Actuation Study Review Results hereafter and in Appendix B to this Report.	YES	
NUREG-0857 ORIGINAL SAFETY EVALUATION REPORT, PALO VERDE NUCLEAR GENERATION STATION UNITS 1, 2 AND 3, NOVEMBER 1981			
9.5.1.4 Emergency Lighting			
Eight-hour battery pack emergency lights are required for areas of the plant necessary for safety shutdown. The applicant has installed self-contained eight-hour battery pack emergency lighting in all areas of the plant which must be manned to bring the plant to a safe cold shutdown and in access and egress routes to and from these fire areas.	No APS Action required. This documents NRC understanding of PVNGS.	N/A	
Based on the above information, the staff concludes that the emergency lighting meets the requirements of Appendix A, Section D.5.a to BTP ASB 9.5-1 and, also the provisions of Section III.J of Appendix R to 10CFR Part 50 and is therefore acceptable.	This requirement to have lights for cold shutdown appears to be modified by later SER Supplements relating to Emergency Lights.		

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
NUREG 0857 SAFETY EVALUATION REPORT, SUPPLEMENT 6, DATED OCTOBER, 1984			
9.5.1.4 Emergency Lighting In Amendment 3 to the Fire Protection evaluation, the applicant committed to provide 8 -hour, battery-powered, emergency-lighting units in all areas needed for operation of safe-shutdown equipment. During the site audit, the staff noticed that an emergency light was not installed in the emergency cooling water (ECW) pump room (zone 34). By letter dated June 15, 1983, the applicant committed to provide 8-hour, battery-powered emergency lights in the above area before the time of fuel load. With this commitment, the ECW pump room will conform with Section D.5 of BTP APCSB 9.5-1 and is therefore acceptable.	No APS Action required. This documents NRC understanding of PVNGS.	N/A	
SUPPLEMENT 8 OF NUREG 0857, MAY 1985			
9.5.1.4 Emergency Lighting The SER stated that eight-hour, battery-powered, emergency lights are provided in all areas of the plant necessary for safe shutdown. By letter dated April 15, 1985, the applicant confirmed that this design concept includes the access and egress routes to these areas. This is in accordance with the technical requirements of Section III.J of Appendix R to Title 10 of the Code of Federal Regulations Part 50 (10CFR50). It is therefore acceptable.	This will confirm an April 8, 1985, telephone call from Mr. D.K. Neal of my staff to Mr. D.J. Kubicki, NRC Fire Protection Reviewer. The purpose of the telephone call and this letter is to clarify that the 8-hour emergency lights are installed in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto. Emergency lighting of personnel egress from other plant areas is provided by 1 1/2-hour battery units referenced in NFPA 101, Life Safety Code. Mr. Kubicki indicated that this position is consistent with SER Supplement No. 6 which stated that "the applicant committed to provide 8-hour battery powered emergency lighting units in all areas needed for operation of safe shutdown equipment."	N/A	ANPP Letter "ANPP-32397 dated April 15, 1985, from E.E. VanBrunt, Jr. to Mr. George W. Knighton, Chief Licensing Branch No. 3, Division of Licensing, NRR United States Nuclear Regulatory Commission #32398
NUREG-0857 SAFETY EVALUATION REPORT, PALO VERDE NUCLEAR GENERATING STATION UNITS 1, 2 AND 3, SUPPLEMENT 5, NOVEMBER 1983			
9.5.1.6 Fire Protection for Safe Shutdown Capability In Section 9.5.1.6 of the SER, the staff stated that the applicant had conducted a study of the safe shutdown capability for PVNGS 1-3. In addition, the staff stated that the entire alternate shutdown system was under review. Subsequently, the applicant provided additional information in those two areas. The following dis-	Describes NRC understanding of how Alternative Shutdown is to be accomplished. This relates to where emergency lights are to be placed.	N/A	

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
cussion provides the staff's evaluation of the information submitted. *Safe Shutdown Capability.* In Amendment 3 to the Fire Protection Evaluation Report, the applicant provided information concerning fire protection for the safe shutdown capability in accordance with the requirements of Appendix R. The applicant's safe shutdown analysis states that systems needed for hot shutdown and cold shutdown consist of redundant trains, and that one of the redundant trains needed for safe shutdown would be free of fire damage by providing separation, fire barriers, and/or alternative shutdown capability. For hot shutdown, at least one train from each of the following shutdown systems would be available: (1) the auxiliary feedwater system, and (2) the main steam atmospheric dump valves. For cooldown/cold shutdown, at least one train from each of the following shutdown systems would be available: (1) pressurizers auxiliary spray valves, (2) charging system, and (3) low pressure safety injection system. The safe shutdown analysis consider components, cabling and support equipment for systems identified above which are needed to achieve shutdown. The support equipment included the diesel generators, the essential spray pond system, essential cooling water system, essential chilled water system, and necessary ventilation systems. Based on the above evaluation, the staff concludes that the systems to be utilized for safe shutdown under fire events are acceptable and that the methodology, used to assure adequate protection of safe shutdown systems in accordance with Section III.G of Appendix R, is acceptable. The staff further concludes that PVNGS 1-3 complies with the requirements of Section III.G of Appendix R and the safe shutdown capability is therefore acceptable.	Note: One Train ADVs for hot shutdown. No ADVs for cooldown/cold shutdown.		
NUREG-0857 ORIGINAL SAFETY EVALUATION REPORT, PALO VERDE NUCLEAR GENERATING STATION UNITS 1, 2 AND 3, NOVEMBER 1981. **9.5.1.9 Compliance with Appendix R** On May 23, 1980, the Commission issued a Memorandum and Order (CL 1-80-2) which states that: "The combination of the guidance contained in Appendix A to BTP ASB 9.5-1 and the requirements set forth in this rule define the essential elements for an acceptable fire protection program at nuclear power plants docketed for Construction Permit prior to July 1, 1976, for demonstration of compliance with General Design Criterion 3 of Appendix A to 10CFR Part 50." On October 27, 1980, the Commission approved a rule concerning fire protection. The rule and its Appendix R were developed to establish the minimum acceptable fire protection requirements necessary to resolves certain areas of concern in contest between the staff and licensees of plants operating prior to January 1, 1979. Although this fire protection rule does not apply to PVNGS 1-3, the applicant has verbally committed to implement the following three issues identified in Appendix R as items to be backfitted: 1. Section III.G, Fire Protection for Safe Shutdown Capability 2. Section III.J, Emergency Lighting 3. Section III.O, Oil Collection System for Reactor Coolant Pump Based on these commitments and the staff evaluation, the staff concludes that the PVNGS 1-3 fire protection	Source document for APS Commitment to Appendix R, Section III.J, Emergency Lighting. Discussion of APS actions are provided under the FSAR commitments described hereafter.	N/A	

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
program will meet the requirements of Appendix R to 10CFR Part 50 when the staff review has been completed.			
NUREG-0857 SAFETY EVALUATION REPORT, PALO VERDE NUCLEAR GENERATING STATION UNITS 1, 2 AND 3 SUPPLEMENT 5, NOVEMBER 1983			
9.5.3 Lighting System			
The lighting system for PVNGS 1-3 is designed to provide adequate lighting in all areas of the station and consists of normal and essential AC lighting systems and an emergency DC lighting system. The design is based on illumination levels that equal or exceed those recommended by the Illuminating Engineering Society for central stations.	Discussion of APS Actions to implement these NRC SER Commitments is described in the FSAR Section hereafter.	N/A	
(c) *Emergency Lighting.* The DC-powered emergency lighting system is provided in the main control room, at the remote shutdown panel room, associated local control stations, and along emergency exit routes where emergency maintenance is expected to be required. In the event of the loss of essential lighting sources, the DC emergency lighting system is energized automatically. The DC emergency lighting units consist of fixtures that have self-contained batteries, battery chargers, switches that automatically energize the fixtures from their batteries in the event of the loss of the AC source for their battery chargers. These units are fed from the same supply as the essential lighting and function upon loss of power to that system.			
The emergency lighting fixtures are designed to provide rated lighting for a minimum continuous period of two hours. Spare self-contained battery pack units will be readily available as required should there be a need for DC lighting in excess of two hours.	Two hour requirement changed to eight hour requirement in III.J of Appendix R and the BTP 9.5-1. See final paragraph of this SER Section. Also, discussion of subsequent SER Supplements.	N/A	
The plant lighting systems are designed so that a single failure cannot degrade the essential lighting below a safe level.			
The plant lighting systems are tested upon installation and provisions are installed for testing the DC emergency system.			
The scope of the review of the lighting system for PVNGS 1-3 included assessment of all components necessary to provide adequate lighting during both normal and emergency operating conditions, the adequacy of the power sources for the normal and emergency lighting systems, and verification of functional capability of the lighting system under all conditions of operation.			
The basis for acceptance in the staff review was conformance of the design bases and criteria, and design of the lighting systems and necessary auxiliary supporting systems to the acceptance criteria in Part II of SRP Section 9.5.3. Other bases for acceptance were conformance to industry standards, and the ability to provide effective lighting in all areas of the PVNGS 1-3 under all conditions of operation.			
Based on the above information, the staff concludes that the various lighting systems provided at PVNGS1-3 are in conformance with the above-cited standards, criteria and design basis, can perform their design function, and are therefore acceptable.			
Special requirements needed for the emergency lighting system to satisfy Appendix A to BTP ASB 9.5-1 "Fire Protection for Nuclear Power Plants," will be reviewed separately during the fire protection audit of PVNGS 1-	NRC did perform review as documented in SER Supplements 6 and 8 for FSAR Section 9.5.1.4 of this Appendix.		

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
3. Additional requirements may be imposed to further improve the capability of the lighting system resulting from the fire protection audit.			
TECHNICAL SPECIFICATION 6.8.1 (UNITS 1, 2 AND 3)			
6.8 Procedures and Programs	See details under Regulatory Guide 1.33 below.	See details under Regulatory Guide 1.33 below.	
6.8.1 Written procedures shall be established, implemented and maintained covering the activities referenced below:			
(a) The applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978, and those required for implementing the requirements of NUREG-0737.			
REGULATORY GUIDE 1.33, REV. 2, FEBRUARY 1978, APPENDIX A			
1. ADMINISTRATIVE PROCEDURES			
1. Plant Fire Protection Program	Written procedures for Preventive Maintenance of emergency lighting have been established, implemented and are being maintained. Light aiming is currently not covered by procedure. However, verifications have recently been performed and APS personnel have initiated actions to provide periodic inspection of light aiming. Also, QA have performed inspections to ensure lights are aimed properly. See Drawing 13-E-ZPL-004 for recent work performed to support which plant components/areas are to be illuminated by the emergency lights.	YES - With completion of Action	See also NRC Inspection Procedure in Appendix C of this Report.
9.0 Procedures for Performing Maintenance			
(a) Maintenance that can affect the performance of safety-related equipment should be properly pre-planned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances. Skills normally possessed by qualified maintenance personnel may not require detailed step-by-step delineation in a procedure.			
(b) Preventive maintenance schedules should be developed to specify lubrication schedules, inspections of equipment, replacement of such items as filters and strainers, and inspection or replacement of parts that have a specific lifetime such as wear rings.	Each Preventive Maintenance Facsimile has a due date and frequency assigned.		
TECHNICAL SPECIFICATION 6.8.1 (UNITS 1, 2 AND 3)			
6.8.1 Written procedures shall be established, implemented and maintained covering the activities referenced below: (f) Fire Protection Program Implementation	Written procedures for Fire Protection Program Implementation exist and are maintained (see Recommendation 4.2.45).	YES	See Section 6 for Procedures Reviewed.

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
TECHNICAL SPECIFICATION 6.8.2 (UNITS 1, 2 AND 3)			
6.8.2 Each program or procedure of Specification 6.8.1 shall be reviewed as specified in Specification 6.5 and approved prior to implementation. Programs, administrative control procedures, and implementing procedures shall be approved by the Vice President-Nuclear Production, or his designated alternate, who is at supervisory level or above. Programs and procedures of Specification 6.8.1 shall be reviewed periodically as set forth in administrative procedures.	30AC-9MP02 establishes the review process for PM Facsimiles.	YES	
	30DP-9WP07 3.1.2 identifies that 30AC-9MP02 defines the review schedule for PM Facsimiles. 30AC-9MP02 does not contain this information. See Recommendation 4.4.1.	YES	
TECHNICAL SPECIFICATION 6.9			
6.9 Special Reports			
6.9.3 Violations of the requirements of the fire protection program described in the Final Safety Analysis Report which would have adversely affected the ability to achieve and maintain safe shutdown in the event of a fire shall be reported in accordance with 10CFR50.73.	APS has submitted reports of lighting design deficiencies in the past (LER 86-59 and 89-12). Recent findings, however, may involve further reports, or supplements, to previously submitted reports.	YES	LER 86-59 LER 89-12
TECHNICAL SPECIFICATION 6.5.3.5 (UNITS 1, 2 AND 3)			
Audits			
6.5.3.5 Audits of unit activities shall be performed under the cognizance of the NSG. These audits shall encompass:			
(f) The fire protection programmatic controls including the implementing procedures at least once per 24 months by qualified licensee QA personnel.	Audits performed. Detailed review of adequacy not performed.	YES	See Section 6 of this Report.
(g) The fire protection equipment and program implementation at least once per 12 months utilizing either a qualified off-site licensee fire protection engineer or an outside independent fire protection consultant. An outside independent fire protection consultant shall be used at least every third year.	Audits performed. Detailed review of adequacy not performed.	YES	
UFSAR 9.5.1 SAFETY DESIGN BASIS			
9.5.1 FIRE PROTECTION SYSTEM			
Appendix 9B, Fire Protection Evaluation Report, describes and discussed the effects that various postulated fires may have on areas of the plant which contain safety-related structures, systems, and components.	The discussion of the details of APS Actions is provided in Appendix B of this Report, where the Spurious Actuations Study Results have	YES - See Appendix B of this Report.	

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
9.5.1.1 Design Bases	(continued) been reviewed on a sampling basis. The Fire Areas were reviewed and deficiencies were identified as described therein.		
9.5.1.1.1 Safety Design Bases. Safety design bases pertinent to the FPS are as follows:			
A. *Safety Design Basis One.* The fire protection system shall be designed to minimize, consistent with other safety requirements, the effects of fires on structures, systems, and components important to safety, in accordance with 10CFR50, Appendix A, General Design Criterion 3, Fire Protection, and Appendix R, Part III, Sections G, J and O.	Appendix R, Sections G and O, were not within the scope of this Evaluation. The review of APS Actions to implement Section J of Appendix R is described below.	IIIJ - YES, based on details provided in Appendix B of this Report.	
C. *Safety Design Basis Three.* Fire protection system components shall be designed to preclude their structure failure due to seismic loading which could cause loss of function to safety-related systems or components, in compliance with 10CFR50, General Design Criterion 3, Fire Protection.	Emergency lighting has undergone fairly recent review to upgrade seismic mounting. Not reviewed in detail during this Evaluation.	YES	
R. *Safety Design Basis Eighteen.* Emergency lighting systems shall be provided in accordance with the guidance provided in NRC Branch Technical Position APCSB 9.5-1 (revised February 2, 1977) and 10CFR50, Appendix R, Section III.J (issued September 1, 1982), in areas needed for operation of safe shutdown equipment and in access and egress routes thereto.	All areas needed for safe shutdown have emergency lights. See Appendix B of this Report.	YES - Based on details provided from sample review of safe shutdown, action required in Spurious Actuation Study.	
The emergency lighting fixtures shall be selected to be applicable to the areas in which they are installed and shall not necessarily include or exclude sealed beam units. Selection of fixtures and bulbs shall allow normal movement during emergency conditions.	Adequacy of lights for environment reviewed. Instances of inadequate sizing identified (Halophanes). See Section 4.1.2 of this Report.	NO - Based on detailed discussion of temperatures affects on battery sizing in Appendix B of this Report, and FSAR Table 9.4-2 herein.	
Batteries for emergency lighting shall be rated for a minimum of 8 hours in areas needed for the operation of safe shutdown equipment and in access and egress routes to these areas (Section 9B.2 lists specific zones containing emergency lighting).	Adequacy of lights for environment reviewed. Instances of inadequate sizing identified (Halophanes).		
The emergency lighting fixtures may or may not normally be lighted but shall automatically energize upon loss of essential AC, in areas where essential lighting is provided, or upon loss of normal AC, in areas where essential lighting is not provided.	Lights do illuminate on loss of AC power. All are powered from essential buses. Provide Reference to UFSAR Section 9.5.3.2.2.3.	YES - SARCN No. 3156	
The emergency lighting system is described in subsection 9.5.3.	See Section 9.5.3 for emergency lights compliance discussion.	YES	
Applicable codes and regulations of the State of Arizona, the National Fire Codes of the National Fire Protection Association (NFPA), and applicable sections of Title 29, Chapter XVII, Part 1910, Occupational Safety and Health Standards of the Code of Federal Regulations, as set forth in the Federal Register, Volume 37, Number 202, dated October 18, 1972, have been used as guidance in developing the plant fire protection system design.	See April 15, 1985, APS Letter from E.E. Van Brunt, Jr. to NRC G.W. Knighton (ANPP Letter 32398). APS utilized Generic Letter 86-10 illumination criteria for manual actions of safe shutdown equipment and access and egress thereto.		Generic Letter 86-10

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
UFSAR SECTION 9.5.1.4 INSPECTION AND TESTING REQUIREMENTS			
9.5.1.4.B Post-Operational Testing			
The PVNGS fire protection systems and equipment are tested and inspected at regular intervals. The NFPA codes, standards, and recommended practices are used as guidance in determining content and frequency of the periodic tests and inspections.	Emergency lights are not a system specifically identified as requiring post-operational testing, but APS has developed several types of Preventive Maintenance tasks which inspect and test the emergency lights. Tasks are scheduled via the PM program using SIMS.	YES	
The following fire protection features are subjected to periodic tests and/or inspections: • Fire suppression water system • Spray and sprinkler systems • Carbon dioxide systems • Fire hose stations • Yard fire hydrants • Halon systems • Fire barriers (walls, fire doors, penetration seals, fire dampers) • Fire detection instrumentation • Fire pumps			
Scheduling of tests and inspections is the responsibility of the fire protection supervisor.			
Equipment out of service including fire suppression, detection and barriers is controlled through the administrative program and appropriate remedial actions taken. As conditions warrant, remedial actions include compensatory measures to ensure an equivalent level of fire protection in addition to timely efforts to make repairs and restore equipment to service.	Fire Protection Impairment Procedure 14AC-0FP01 includes fire suppression, detection and barriers. Emergency Lights are not included in the scope of this procedure. See Recommendation 4.2.45.	YES	
No changes are made to the test and inspection procedures without ensuring compliance with the provisions of the facility operating license condition.	10CFR50.59 Review necessary. Programmatic issue not within scope of this Evaluation.	N/A	
UFSAR SECTION 9.5.1.5.2 ADMINISTRATIVE PROCEDURES, CONTROLS AND FIRE TEAM			
9.5.1.5.2 Administrative Procedures, Controls and Fire Team			
Direction for maintaining the performance of the fire protection systems and personnel at PVNGS is provided by station procedures. These procedures outline the methods to be used by the station staff for fire protection and require the following:	Generic Administrative Controls and Fire Team Issue were not in scope of this Evaluation.	N/A	(Note: Maintenance responsible for inspection and ensuring equipment is in working order.)
A. Procedures shall be issued designating plant staff positions responsible for firefighting, training, inspection and maintenance of equipment.	Procedures for maintenance of lights exist.	YES	
B. Employees shall be knowledgeable in the utilization of fire protection equipment within their normally assigned work area.	Generic Administrative Controls and Fire Team Issue were not in scope of this Evaluation.	N/A	

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
C. Scheduled inspections of firefighting equipment shall be conducted to ensure its availability and reliability. The maintenance managers have responsibility for maintenance of fire protection equipment and are responsible to: • Inspect the station property for fire hazards and ensure that fire protection equipment is in proper working order • Remove or remedy fire hazards noted and repair or replace any faulty fire protection equipment. • Test the fire detector components • Perform fire protection preventive maintenance The Fire Protection Department has responsibility for operations and operational testing of fire protection equipment including the detection system.	Discipline Supervisors reporting to their respective managers are responsible for the Preventive Maintenance activities conducted in their respective areas.	YES	30AC-9MP02 (2.8)
	PVNGS maintains a Preventive Maintenance Program that includes scheduled inspections of emergency lighting. UFSAR clarification may be in order. See Section 4.4.2.	YES	30AC-9MP02

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
UFSAR TABLE 9.4-2 "INSIDE DESIGN CONDITIONS"			

UFSAR TABLE 9.4-2

INSIDE DESIGN CONDITIONS

HVAC System	Space Temperatures Maximum (F)	Space Temperatures Minimum (F)
Control room	80[a]	70
Computer area	80[a]	70
ESF switchgear	77	60
ESF equipment rooms	77	60
Battery rooms	85	60
Cable spreading	122	40
Auxiliary building (excluding ESF equipment room and access control area)	104[d]	50
Access control area	80	70
ESF pump room	104/120[b]	50
Containment building	120/100[c]	50/70[c]
Fuel building	104	50
Radwaste building	104	50
Turbine building		
Below operating deck	122	50
Above operating deck	122	40
Diesel generator building		
Diesel generator room	140/120[e]	50
Diesel generator control room	122	50
Essential spray pond pump house	120	35

[a] Relative humidly 40% to 60%
[b] 104 F for normal operation 120 F allowable for up to four hours followed by a decay to 104 F over a 24-hour period
[c] 50-120 F for normal operation; 70-100 F for refueling; 20 to 90% relative humidity
[d] During a normal plant shutdown, the shutdown heat exchanger rooms and adjacent valve galleries shall be maintained at a maximum temperature of 122F.
[e] 120 F during normal operation; 140 F during testing and essential operation of the diesel generator.

	Batteries are sized adequately for the environment to which they are exposed.	YES	
	Exception: Halophane batteries in Auxiliary Building are not sized adequately for the environment to which they are exposed.	NO	

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
UFSAR SECTION 9.5.3			
9.5.3 Lighting Systems			
This subsection discusses the unit and station lighting systems.			
9.5.3.1 *Design Bases.* The lighting, including essential and emergency subsystems, associated with safety-related equipment is protected from winds, floods, missiles, and pipe ruptures to the extent that protection provided for specific ESF equipment also provides protection for the lighting system. Protection from wind and tornado effects is discussed in Section 3.3. Flood design is discussed in Section 3.4. Missile protection is discussed in Section 3.5. Protection against the dynamic effects associated with the postulated rupture of piping is discussed in Section 3.6. Environmental design is discussed in Section 3.11.	Protection of Emergency Lights from Design Basis events were not reviewed.	N/A	
9.5.3.1.1 Safety Design Bases			
Safety design bases applicable to the lighting system are as follows:			
A. *Safety Design Basis One.* Structures supporting the components of essential lighting and emergency lighting systems, which serve the main control room and the remote shutdown room, shall be designed to retain structural integrity during and after a safe shutdown earthquake.	Recent support modifications have been reviewed on sample basis.	YES	See Section 6 of this Report
B. *Safety Design Basis Two.* The lighting system, comprised of normal, emergency, and essential subsystems, shall be designed so that a single failure of any subsystem or electrical component of a subsystem, assuming loss of off-site power, cannot terminate the system's ability to illuminate areas occupied during a reactor shutdown or emergency.	See discussion at FSAR Table 9.5-6.	YES	
9.5.3.1.3 Codes and Standards			
Design and installation of the plant lighting systems use the guidance provided by the National Electrical Code (NFPA No. 70-1975/ANSI C1-75) and the Handbook of the Illuminating Engineering Society.	National Electrical Code does not specify illumination levels. The guidance of Generic Letter 86-10 was used for emergency lights.	YES - FSAR clarification is in order.	
9.5.3.2 System Description			
9.5.3.2.1 *General Description.* Unit lighting is divided into three subsystems: normal, essential and emergency. The normal system is supplied from non-Class 1E AC buses. The essential system is connected to Class 1E AC buses. The emergency lighting system, consisting of batteries, battery chargers and lamps, is fed from the same supply as the essential lighting and function upon loss of AC power. Refer to Table 9.5-5 for a list of areas, requiring operator access to achieve safe shutdown in the event of fire, served by both the essential and emergency lighting systems.			UFSAR Table 9.5-5 is not included in this Appendix for ease of presentation.

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
UFSAR 9.5.3.2.2 "COMPONENT DESCRIPTION"			
9.5.3.2.2 Component Description			
9.5.3.2.2.3 Emergency Lighting. The DC-powered emergency lighting system is provided in the main control room (except the control room horseshoe suspended ceiling), at the remote shutdown panel room, associated local control stations, and along emergency exit routes where emergency maintenance is expected to be required. The DC emergency lighting units, except in the control room, the control building AC switchgear and DC equipment areas, and the auxiliary building channels A and B electrical penetration rooms, consist of fixtures that have self-contained batteries, battery chargers, and switches that automatically energize the fixtures from their batteries in the event of the loss of the AC source for their battery chargers. The emergency lighting system in the control room panel area, the control building AC switchgear and DC equipment areas, and the auxiliary building channels A and B electrical penetration rooms consists of a number of fluorescent fixtures that are fed from an uninterruptible power supply (UPS) and some self-contained battery-powered emergency lighting units. The emergency lighting fluorescent fixtures are normally fed from the essential lighting system connected from the redundant Class 1E buses through isolation transformers. In the event of loss of Class 1E AC power source, the fixtures are energized through UPSs, each consisting of an inverter, a charger, and eight-hour rated batteries in areas needed for the operation of safe shutdown equipment and in access and egress routes thereto. Emergency lighting for personnel egress from other plant areas is provided by 1 1/2-hour battery units (see paragraph 9.5.3.2.2.2). Self-contained battery-powered emergency lighting fixtures located in non-safe shutdown areas of the plant that are not provided with essential lighting are fed from the normal lighting system. These fixtures will energize upon loss of normal lighting in the area. All other DC emergency lighting systems will be energized automatically upon loss of essential lighting services. In areas needed for the operation of safe shutdown equipment and in access and egress routes thereto, the batteries are designed to provide rated lighting for a minimum continuous period of eight hours. Spare self-contained battery pack units will be readily available to areas as required should there be a need for DC lighting in excess of eight hours. For other areas needed for personnel egress, the batteries are designed to provide emergency lighting for a minimum continuous period of 1 1/2 hours.	All Safe Shutdown DC Emergency Lights energize on loss of essential lighting sources. One and one-half hour lights were not verified by this inspection.	YES	SAR Change No. 3156 SAR Change No. 3156
UFSAR SECTION 9.5.3.4 "INSPECTION AND TESTING REQUIREMENTS	PVNGS has developed PM Tasks which inspect and test the emergency DC lighting system.	YES	
9.5.3.4 Inspection and Testing Requirements Normal and essential AC lighting circuits are normally energized and require no periodic testing. The emergency DC lighting system and the control room horseshoe suspended ceiling lighting system are inspected and tested periodically to ensure operability of the automatic switches and other components in the system.			
TABLE 9.5-6			

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES

UFSAR, TABLE 9.5-6, LIGHTING SYSTEMS SINGLE FAILURE ANALYSIS

LIGHTING SYSTEM SINGLE FAILURE ANALYSIS

Name	Failure/ Malfunction	Effect On Normal Lighting	Effect On Essential Lighting	Effect On Emergency Lighting
On-site power	Auxiliary transformer short circuit	Complete loss--automatic transfer to start-up source	None	None
13.8 kV balance of plant bus	Short circuit	Half lost	None	None
Off-site power	Total loss	None	Total loss--restored after diesels are started and loaded	Automatic energization of emergency lighting, deenergized after diesels started and loaded
4.16 kv engineered safety features bus	Short circuit	None	Half lost	Automatic energization of half of DC lighting
480V engineered features	Short circuit	None	Half lost	Automatic energization of half of DC lighting
480V essential lighting transformer	Short circuit	None	Half lost	Automatic energization of half of DC lighting
480V essential lighting bus	Short circuit	None	Half lost	Automatic energization of half of DC lighting
125V-DC Class 1E bus	Short circuit	None	None	None-self-contained battery units energized

YES - Table need the corrections indicated. Corrections do not relate to Emergency Lights.

Normal lighting is lost on loss of off-site power (table should be revised).

Non-safe shutdown emergency lights where essential lights are not provided are fed from normal lighting sources in the area. This should be clarified.

SAR Change 3156

UFSAR APPENDIX 9A, QUESTION 9A.2

Question 9A.2 (NRC Question 430.5)

Identify the vital area and hazardous area where emergency lighting is needed for safe shutdown of the reactor and the evacuation of personnel in the event of an accident. Tabulate the lighting system provided in your design to accommodate those areas so identified. Include the degree of compliance to Standard Review Plan 9.5.1 regarding emergency lighting requirements in the event of a fire.

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
Response			
The lighting system needed for safe shutdown of the reactor and evacuation of personnel consists of the essential lighting system and the emergency lighting system.	Not verified by this inspection. Inspection focus was for emergency lighting for fire-related events.		
Table 9.5-5 identifies areas where lighting is needed to accomplish safe shutdown of the reactor and evacuation of personnel. Paragraphs 9.5.3.2.2.2 and 9.5.3.2.2.3 describe the power supplies for the essential and emergency lighting systems.	Not verified by this inspection. Inspection focus was for emergency lighting for fire-related events.		
PVNGS compliance with Appendix A of NRC Branch Technical Position APCSB 9.5-1 is identified in FSAR Section 9B.3, Table 9B.3-1, Item D.5.		YES	
UFSAR, APPENDIX 9B			
9B.1.3.3 Method of Assuring Safe Shutdown Capability			
As shown in Table 9B.1-3 there are a number of functions, which if maintained assure safe shutdown operation. For PVNGS, many of these functions can be performed by two independent, redundant trains which are separated from a common fire by rated physical boundaries and/or by separation distances which make the spread of fire improbable. Either of these trains is capable of performing the safe shutdown function. Where fully redundant capability is not provided, alternate success paths which may involve systems having similar, but not identical, capabilities are used to assure that the safe shutdown function capabilities can, indeed, be performed. This capability to accomplish the safety functions is maintained both with and without off-site power.			Table 9B.1-4 and Figures 9B-40 through 9B-51, Figures 9B-52 and 9B-53 not provided to simplify this document, but are none-the-less NRC requirements because they demonstrate APS means of compliance with 10CFR50, Appendix R, Section III.J. Also, Section 9B.2 "Fire Hazards Analysis" is not included in this document, but is an NRC requirement because it provides the detailed requirement to address emergency lighting (Appendix R, III.J on an Area/Zone Basis.
A list of safe shutdown equipment by individual tag number is provided in Table 9B.1-4. A list of all equipment available for every success path is not provided in Table 9B.1-4. However, for each postulated fire the equipment listed provides at least one success path which can be maintained.			
Figures 9B-40 through 9B-51 are simplified process and instrumentation diagrams (P & IDs) depicting the flow paths which accomplish the safe shutdown functions. Figures 9B-52 and 9B-53 are simplified electrical one-line diagrams showing the train A and train B on-site power availability, respectively.			

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
UFSAR TABLE 9B.1-3 (DESCRIBES SYSTEMS RELIED UPON FOR ASSURING SAFE SHUTDOWN).	Based on this table and Answer to Question 9A.85, only Emergency Lights were planned to be at the ADVs. See comments at Question 9A.85. Essential Lights were installed instead. Both now exist.		

TABLE 9B.1-3

SAFETY FUNCTION SUCCESS PATHS

Safety Functions	Success Paths: Purpose	Preferred	Alternate
Reactivity control	Shut down reactor to reduce heat production	CEAs (followed by boration	Boration
RCS inventory control	Keep core covered	Charging	Charging (alternate path)
RCS pressure control	Maintain subcooled margin	Pressurizer heaters and auxiliary spray	Charging and pressure decay (without heater operation)
Core heat removal	Transfer heat from core to coolant	Reactor coolant pumps	Natural circulation
RCS heat removal	Transfer heat from coolant to secondary	RCS temp >350: motor-driven AFW and steam bypass control	Essential AFW and ADVs
		RCS temp <350: shutdown cooling	Shutdown cooling
Maintenance of vital auxiliaries	Maintain operability of necessary support systems	Off-site power, normal HVAC, normal cooling and chill water, normal and essential lighting and communications	On-site power, essential HVAC, essential cooling and chill water, Emergency lighting and communications

	Even with discussion of use of ADVs for cold shutdown in Section 9B.2.12.c, this table, like the SER supplement 5 (Nov. 1983) credits shutdown cooling and not ADVs for cold shutdown. Also, Appendix R to 10CFR50, III.J relates to "Emergency Lighting" for operation of "safe shutdown equipment" which is that one train must be protected for hot shutdown and one train returned to service for cold shutdown in 72 hours. Recognizing that Remote Control from the Alternate Shutdown panel was provided for the ADVs, the LER 89-12 statement that eight hour (Appendix R) lights were not required at the AVDs for manual actions for safe shutdown, has a substantial basis in fact. See Note "K" of Table 9B.1-4. This note directs an asymmetric cooldown if two ADVs are not available within four hours. Also emergency lights are intended for eight hour Actions, not 72 hour Actions (Cold Shutdown). So, no emergency lights are required at the ADVs to comply with 10CFR50, Appendix R, Section J, although a commitment is made here to provide them. Emergency Lights were provided for the control station of the ADVs.	YES	

influences the design, material selection, manufacture or fabrication, inspection, assembly, erection and construction of the safety-related fluid systems and components. Safety class designations per ASSI N 18.2, Quality Group Classifications per Regulatory Guide 1.26 and 10CFR50.55a, and the appropriate codes and standard for all plant components are delineated in Table 3.2-1 and are shown on the applicable piping and instrumentation diagrams. For operational phase activities, including preoperational, initial start-up and operational testing, system classification is in accordance with Regulatory Guide 1.26 and 10CFR50.55a as indicated in Table 3.2-1 and footnote (fl).

UFSAR TABLE 3.2-1 "QUALITY CLASSIFICATION OF STRUCTURES, SYSTEMS AND COMPONENTS"

16. Fire Protection System

Water system components	note (y)
Gas CO_2 and Halon 101) system components	note (y)
Support and hangers	note (h)

NOTES TO TABLE 3.2-1 OF UFSAR.

Table 3.2-1 notes:

(h) Hangers and supports are designed to the same classification as the associated equipment or piping when the equipment is required for safety. Nonsafety portions of structures, systems or components whose failure could reduce the functionality of any safety-related structure, system, or component are designed and constructed such that a safe shutdown earthquake (SSE) would not cause such failure.

(y) The pertinent requirements of 10CFR50, Appendix B (i.e., those specified in Appendix A to BTP APCSB 9.5-1) are applied to operations phase activities associated with fire protection systems and equipment used or installed in areas housing safety-related equipment, and other areas where an unsuppressed fire could potentially damage safety-related structures, systems, or components.

(fl) For operational phase activities, including preoperational initial start-up and operational testing, system classifications in accordance with Regulatory Guide 1.26 and 10LCFR50.55a. The following is a list of clarifications to the Regulatory Guide 1.26 column that will be used during operation phase activities.

NRC REQUIREMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES

APPENDIX B

LICENSEE REQUIREMENTS

LICENSEE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
LER 86-59 DATED 1/9/87 AND SUPPLEMENTED BY LETTER DATED 9/2/87			
Supplement to LER 86-059-00 This LER is being submitted in accordance with Palo Verde Unit 1 Facility Operating License No. NPF-41, Section 2.F which requires an LER to be submitted, when any of the requirements of Section 2.C of the License have not been met. Section 2.3 Part 7 requires that all provisions of the approved fire protection program, as described in the Final Safety Analysis Report for the facility and as provided in the Safety Evaluation Report, be maintained. On December 14, 1986, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) operating at 100 percent power when it was determined that a portion of the emergency lighting (FG) in Unit 1 was not maintained in accordance with the above requirements. Periodic Preventive Maintenance (PM) tests are performed on the Modular AC Power Station emergency lighting batteries. These tests are performed to assure that the emergency lights will have sufficient battery power when they are needed. To perform the tests, the emergency lights are operated on battery power for a period of eight hours. Readings of the battery voltage are taken every one-half hour for the eight-hour period. On December 10, 1986, several Preventive Maintenance tests were completed on the emergency lighting Modular AC Power Station batteries (FG) (BTRY). The batteries in three out of the four safe shutdown areas with modular power stations did not pass the PM tests. An Engineering Evaluation had determined that the original acceptance criteria was inadequate and that new criteria was needed. The new criteria was implemented in the PM tests. The original acceptance criteria required that the emergency lights stay lit, and that the battery voltage did not drop below a low voltage cutout point. A review of the original performances in Unit 1 of the eight-hour battery discharge tests conducted in May and August 1985 revealed that the uninterruptible power supplies did maintain emergency lighting for eight hours as required by 10CFR50, Appendix R, Section III.J. However, the new acceptance criteria required the batteries to maintain a higher voltage than what was required during the first eight-hour discharge tests. The more stringent acceptance criteria was instituted to ensure that sufficient light levels are sustained for eight hours, and to ensure that sufficient voltage would be available as the battery voltages degrade over a long period of time. Slight voltage degradation over long time periods is a normal characteristic of batteries On September 23, 198,. during preoperational testing in Unit 2, it had been discovered that the Modular AC Power Station batteries for the emergency lighting fixtures in the safe shutdown areas would not pass the preoperational acceptance criteria. An Engineering Evaluation Request (EER) had been issued on October 5, 1985, to evaluate the adequacy of the batteries to supply power for eight hours. The evaluation determined that extra batteries should be installed to provide extra capacity for the uninterruptible power supplies. The installation of the extra batteries was planned prior to the performance of the PM tests on the modular power station batteries in Unit 1; however the batteries had not yet been installed.	Description of Event, no verification performed by this inspection. Issues raised in this LER are: 1. Battery capacity (see Section 4.1.2 of this Report) 2. Light aiming (see Section 4.1.4 of this Report) 3. PM acceptance criteria (see Section 4.2, Maintenance Concerns)	N/A	

LICENSEE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES

LER 86-59 (CONTINUED)

Further investigation of the event revealed that on August 13, 1985, during preoperational testing of the emergency lighting system in Unit 2, it had also been discovered than the emergency lights for both trains of the Remote Shutdown Panels (JL) were positioned in a manner that may not have provided adequate lighting to the instrumentation portion of the panels. An Engineering Evaluation was initiated on August 13, 1985, to evaluate the ability of the mispositioned emergency lights to provide adequate lighting to the safe shutdown panels.

The safe shutdown panels have two types of eight-hour emergency lighting systems installed. The first system is a modular AC power station with several batteries that provide power to fluorescent light fixtures (component identifier LF). This system provides emergency lighting to several fluorescent light fixtures in the remote shutdown panel room. The battery-powered fluorescent light fixture was positioned at the back of the panel so that it would not shine directly on the instrumentation side of the panel. However, the light fixture was able to provide some illumination of the panel. The second system, an eight-hour rated, battery-powered seal beam wall unit, also provided illumination of the panel. This system met the minimum requirements of 10CFR50 Appendix R; however, the engineering evaluation concluded that the modular AC power station powered emergency lights located in both remote shutdown panel rooms should be relocated so that more light would be provided to the front of the shutdown panels.

This event affected only the emergency lighting system, no other systems, secondary functions or structures were inoperable at the start of the event, or affected by the event. No operator actions affected the course of this event and there were no automatically or manually initiated safety system responses that occurred as the result of this event.

As a prudent measure, the emergency lighting for the control room and panel area outside the control room was tested in Units 1 and 3 to ensure adequate illumination. The test results were satisfactory. Testing in Unit 2 is expected to be completed by October 15, 1987.

The conditions believed to be attributable to two factors: (1) the implementation of new acceptance criteria which is more conservative than required by 10CFR50, Appendix R, Section III.J as described above, and (2) potentially inadequate preventive maintenance programs for non-Technical Specification, Operating License components.

As corrective action the installation of the extra batteries, the moving of the emergency lights, and subsequent testing was completed in Unit 1 on January 2, 1987. It took approximately 23 days since the PM tests were conducted in Unit 1 until the modifications were completed. The modifications were also completed in Units 2 and 3. To prevent recurrence, an annual eight-hour illumination test will be conducted to ensure the system continues to fulfill the requirements of the Final Safety Analysis Report.

Revision 0 of this LER stated an Interdepartmental Event Investigation (IEI) would be conducted to determine why the original acceptance criteria did not take into account degradation of the batteries over time. The initial review of this event by the responsible organization could not determine an exact cause because of the time lapse between the generation of the initial acceptance criteria and the subsequent identification of the deficiency in Unit 1 during the PM test.

LICENSEE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
LER 86-59 (CONTINUED) However, it is recognized that had the design change implemented in Unit 2 been implemented in Unit 1 in a timely manner, compliance with the operating license would have been expected to be maintained as demonstrated in Unit 2. It had been previously recognized that the existing design change prioritization process was cumbersome and in some cases confusing. Although the administrative control procedure for Design Changes was adequate, enhancements to the procedures affecting design changes have been implemented to simplify the overall process. Additionally, a review was conducted to ensure there were no outstanding Design Changes which could adversely affect the operation of the plant. Based upon the extent of the remedial actions and actions taken to prevent recurrence, no further actions are deemed necessary at this time. An evaluation was conducted to ensure that there are programs established to ensure continued functionality for components that are non-Technical Specification components, but that are required by the facility operating license. No deficiencies were identified. Emergency lighting (8-hour rated, battery-powered, sealed beam wall units) and alternate self-contained lighting units were available if needed; therefore this event had no impact on the health and safety of the public. No similar events have been reported previously.			
LICENSE EVENT REPORT (LER) 89-12-01 DATED 9/22/89 Summary On May 10, 1989, Palo Verde Units 1 and 3 were in refueling outages, and Palo Verde Unit 2 was in Mode 5 (COLD SHUTDOWN) when APS determined that emergency lighting in Unit 2 did not meet PVNGS design bases or 10CFR50 Appendix R requirements. Twenty-four (24) areas were identified which require the installation of or modification to lighting in order to be able to perform required safe shutdown activities assuming a fire in the control room concurrent with a loss of off-site power. A similar condition was determined to also exist in Units 1 and 3. The cause of this event was that the original emergency lighting design was developed in 1984 using operating procedures and studies which were not complete and not approved, inadequate engineering guidance for conducting the walkdowns, and inadequate verification that emergency lighting requirements were met. As corrective action, design changes utilizing approved methodologies were developed to upgrade the emergency lighting. Unit 2 has completed installation of the redesigned emergency lighting. Units 1 and 3 will install the redesigned lighting prior to restart from their current refueling outages. There have been no previous similar events reported pursuant to 10CFR50.73. This report is also being provided pursuant to Technical Specification 6.9.3.	Need for emergency lighting for fires in other safe-shutdown areas not addressed by this LER. Installation of identified lights, in conjunction with closure of CAR 90-014 demonstrates compliance with 10CFR50, Appendix R, Section III.J.	N/A	Details of 24 areas and reasons for providing emergency lighting provided in pages 2 of 10 through 7 of 10 of the LER 89-12-01 are not included in this document, for simplicity of presentation.

LICENSEE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
LICENSEE EVENT REPORT 89-12-01 (CONTINUED)			
Corrective Actions			
(a) *Immediate.* Immediate corrective action was taken to prepare appropriate documentation for installing emergency lighting in Unit 2.	Description of Events, no verification performed by this inspection.	N/A	
(b) *Action to Prevent Recurrence.* As action to prevent recurrence, APS engineering and operations department personnel have performed comprehensive lighting system walkdowns in Units 1, 2 and 3. Emergency lighting has been appropriately installed and/or modified in Unit 2 to correct the lighting system deficiencies described in Section I.B. Appropriate emergency lighting will be installed and/or modified to correct the lighting deficiencies prior to restarting Units 1 and 3 from the current shutdowns.			
As described in Section I.I, an investigation of this event was conducted in accordance with the PVNGS Incident Investigation Program. Based upon the results of this investigation, the following corrective actions were developed:			
(1) A sample review of previous regulatory-related verification walkdowns performed by engineering will be completed to determine if any were completed without a required procedure and acceptance criteria. Appropriate actions will be taken based upon the results of these walkdowns.			Walkdown results
(2) The Design Criteria Manual will be revised to more clearly state the requirement that emergency lighting is required to be adequate for operating Safe Shutdown equipment as well as providing access/egress lighting.			Design Criteria's Manual
(3) 81DP-4CC05, "Design and Technical Document Control," will be revised to specifically require a technical review to ensure adequate illumination associated with Safe Shutdown equipment when incorporating changes to the emergency lighting system.			Procedure 81DP-4CC05
The above changes are expected to be implemented by May 30, 1990.			
REPORT OF NRC MEETING WITH ANPP MANAGEMENT HELD AT PVNGS ON JUNE 5, 1989. TRANSMITTED TO APS BY NRC LETTER DATED JULY 7, 1989. EXCERPTS OF ANPP SLIDES USED IN PRESENTATION TO NRC AND THESE REPRESENT VERBAL COMMITMENTS			
• Upgrade emergency lighting in ADV area to 10CFR50 Appendix R standards. • Perform preventive maintenance. • Test to new eight-hour design requirements • Within ADV area enhance redundant essential lighting to support manual operation • Implement Revised Relamping Program			

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES

NOTICE OF VIOLATION RESPONSE ASSOCIATED WITH INSPECTION REPORT 89-13 (UNITS 1, 2 AND 3) DATED OCTOBER 2, 1989 (LETTER #102-01446)

VIOLATION III.A AND III.C

Corrective Steps Taken and Results Achieved

1. Upon completion of the Incident Investigation Report (IIR) of this event on May 19, 1989, the commitment was made to install eight-hour emergency lights at the ADVs and several other locations identified in the IIR.

2. Eight-hour emergency lights were installed and tested at the Unit 2 ADVs and such other locations prior to its restart, have been installed and are currently being tested at Unit 3. The installation of such lights has been initiated at Unit 1.

3. Promptly after the March 3, 1989, Unit 3 event, a comprehensive investigation of the emergency and essential lighting systems was launched. The report of this investigation was completed on June 1, 1989. As reported in Licensee Event Report (LER) 89-012 (NPF-41), this investigation found that the emergency lighting was deficient in 24 identified areas of Unit 2. Comparable deficiencies were also found in Units 1 and 3. The reasons for such emergency lighting deficiencies are set forth in LER 89-012.

4. Test Procedure 93GT-0ZZ47, Preoperational Generic Test Package, Unit 1, 2 and 3, is not amenable to correction. However, a proper procedure was used for testing eight-hour emergency lights installed at the ADVs and other locations identified in the IIR of March 3, 1989, event in Unit 2. This procedure will be used in Unit 1 and Unit 3.

5. The PM task for Units 1, 2 and 3 prescribing an eight-hour discharge test has been designated for application to the eight-hour emergency lights at the 140 foot elevation of the MSSS.

NOV RESPONSE 89-13 (CONTINUED)

Corrective Steps to be Taken to Avoid Further Violations

(a) Testing of eight-hour emergency lighting at the ADVs and other locations in Unit 3 will be completing prior to the restart of the unit.

(b) The installation of eight-hour emergency lights at the ADVs and other locations in Unit 1 is in progress and will be completed and lights tested prior to restart of the unit.

(c) Corrective actions to address the deficiencies identified in LER 89-012 are set forth in detail in the LER. In summary, these actions include a review of a sample of previous regulatory-related verification walkdowns, revision of the Design Criteria Manual, and revision of the procedure on "Design and Technical Document Control.

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
Full compliance has been achieved in Unit 2 and will be achieved in Unit 3 upon completion of the testing of eight-hour emergency lights currently in progress. Unit 1 will achieve full compliance prior to restart. Preventive Maintenance of the eight-hour emergency lights installed at the 140 foot level of the MSSS will conform to the requirements for such lights. The programmatic corrective steps described in LER 89-012 are scheduled for completion by May 30, 1990. **NOV RESPONSE 89-13 (CONTINUED)** VIOLATION III.B **Corrective Steps Taken and Results Achieved** 1. The MSSS lighting fixtures have been inspected and tested in Unit 2 and will be inspected and tested in Units 1 and 3 prior to start-up from their respective current refueling outages. 2. As described in the response to Violation I.C, a complete review of the preventive maintenance program has been completed and the improvements implemented or scheduled. The revised preventive maintenance program includes a change in the procedural controls governing the waiving of preventive maintenance tasks. The revised controls require that unit specific preventive maintenance tasks can only be waived with the written concurrence of the Unit Plant Manager; a second, consecutive waiver also required the written approval of the Unit Plant Manager. The same policy applies for Central Maintenance preventive maintenance tasks on units specific systems. Central Maintenance preventive maintenance tasks on common systems require the written concurrence of the Director of Nuclear Production Support. As described in response to Violation I.A, the APS Executive Vice President, Nuclear, has initiated action to assure timely implementation of corrective actions. Full compliance was achieved in Unit 2 upon completion of inspection and testing. Units 1 ad 3 will be inspected and tested prior to restart of the respective unit. **NOTICE OF VIOLATION RESPONSE ASSOCIATED WITH INSPECTION REPORT 90-08, DATED APRIL 20, 1990 (LETTER #102-10674).** **Corrective Steps Taken and Results Achieved** The Director of Operations and Maintenance has promulgated a plant guideline providing additional guidance regarding the prioritization of work. Corrective maintenance for the operability of Emergency lights will be treated as priority 2 (i.e., work should commence within 24 hours). This guideline will remain in effect until the scheduling process is reviewed to verify that non-production equipment is being properly prioritized.	These changes have been made to the Preventive Maintenance Procedure	YES	30AC-9MP02 (2.11, 2.12, 2.13)

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES

Date When Full Compliance was Achieved

On February 16, 1990, work was completed on the inverter. Full compliance was achieved on February 26, 1990, when the ballast was replaced on emergency light 3EQBN002-G.

LICENSEE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
SAMPLE INSPECTION OF FIRE AREAS TO CONFIRM ADEQUACY OF EMERGENCY LIGHTING FOR ACTIONS SPECIFIED IN THE SPURIOUS ACTUATION STUDY			- 13-NS-100 - Pre Fire Strategies - UFSAR Appendix 9B - APS Memorandum ID #285-00370-RLR/LAJ, "The Essential and Emergency Lighting Report" June 1, 1989. - 10CFR50 Appendix R, III.J - Drawings 13-E-ZJL-001 13-E-ZJL-002 13-E-ZPL-001 13-E-ZPL-002 13-E-ZPL-003 13-E-ZAL-205 13-E-ZAL-207 13-E-ZAL-302 13-E-ZAL-303 13-E-ZPL-004
REQUIRED OPERATOR ACTIONS FOR A FIRE IN FIRE AREA I		YES	
To overcome spurious uncontrolled RCS depressurization, stop charging flow and open circuit breaker DS-09-07 at auxiliary relay cabinet E-ZAA-C03 to close J-CHA-HV-205.	At ZAA-C03, change normal LTG to ESS/EM feed from N003. Will correct by QD-023 E-QBN-003-A E-QBN-003-B E-QBN-003-C E-QBN-003-D		
To maintain RCS inventory and pressure control, open circuit breaker M3520 at MCC E-PHA-M35.	Same as above		
To preclude loss of CST volume, open the Train A condensate transfer pump circuit breaker (M3308) at MCC E-PHA-M33.			
Open switch DS-21-08 in auxiliary relay cabinet E-ZAA-C06 to ensure closure of vent valve J-RCA-HV-106, to isolate the Train A RCGVS vent paths.	E-QBN-003-I SAL-72D-03-120-24 Remote Heads		
Local manually reopen J-CHA-HV-524.	Need additional emergency lighting. Corrected by QD-023. SAL-71A-01-088-18		
To preclude or overcome the consequences of ESFAS for Train A components, disable the Train A diesel generator at the local control panel.	13-NS-110 / F.Z.20 states that this action is vital for preventing spurious actuation for Train A components. However, this has not been identified as one of the areas in LER 89-12-01. Per discussion on 6/25/90, operator action will remove. Power is removed from DC breaker controls which feed 4160V "A" train bus. In the event that the DG is already running, the additional operator action needs to be identified.	YES	

LICENSEE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
REQUIRED OPERATOR ACTIONS FOR FIRE AREA I (CONTINUED)			
Open the normal and alternate feed breakers to E-PBA-S03 in switchgear E-NAN-S03 (normal supply) and E-NAN-S04 (alternate supply).	Emergency lighting for E-NAN-S03 and E-NAN-S-04 was not evaluated in Study 06/01/90. STL-74C-07-100-03 STL-74C-07-100-04	YES	
To prevent steam generator overfilling, manually trip the Train A auxiliary feedwater pump turbine at the turbine.	Additional emergency lights needed for pump lever. Potential enhancement. SCL-72A-14-081-13		
To prevent mismatched steam generator levels, carefully monitor steam generator levels and auxiliary feedwater flow until at least one of the four Train A auxiliary feedwater regulating or block valves is local manually closed after opening its MCC circuit breaker.	Additional Emergency lights needed for operation of AFB-V021. Potential Enhancement for Major project. SCL-72A-14-081-12 SCL-72A-14-081-02		
Deenergize the Train A switchgear E-PBA-S03 breaker control power by opening circuit breaker 72-D2104 at DC distribution panel E-PKA-D21, and open switch DS-21-08 in auxiliary relay cabinet E-ZAA-C06 to ensure closure of vent valve J-RCA-HV-106, to isolate the Train A RCGVS vent paths.	Need to move emergency lighting in front of DC control center. Will correct by QD-023. Located in the fire area of concern. SAL-72D-07-120-01 Remote Heads E-QBN-002-G E-QBN-003-I		
REQUIRED OPERATOR ACTIONS FOR A FIRE IN FIRE AREA XV		YES	See Section 4.1.3 of this Report.
To preclude or overcome the consequences of a spurious SIAS, ensure that the Train A and B HPSI pump breakers are tripped and deenergize the breaker control power.	Emergency lighting Unit breaker number not called out. E-QBN-002-D E-QBN-001-B		
To prevent mismatched steam generator levels, carefully monitor steam generator levels and auxiliary feedwater flow until at least one of the four Train B auxiliary feedwater regulating or block valves is locally manually closed after opening its MCC circuit breaker.	SCL-72A-14-081-12 SCL-72A-14-081-02		
To preclude or overcome the consequences of a spurious CSAS, stop the Train A and B containment spray pumps and rack out their breakers and ensure that the containment spray header isolation valves are closed.	Method of ensuring isolation valves are closed is not specified. SAL-71A-01-088-17		
To overcome spurious uncontrolled depressurization, stop charging flow and open circuit breaker 72-D2209 at DC distribution panel E-PKB-D22 to close J-CHB-HV-203.	E-QBN-001-F		
Open switch DS-21-08 in auxiliary relay cabinet E-ZAB-C06 to ensure closure of vent valve J-RCB-HV-105 to isolate the Train B RCGVS vent paths.	SAL-72C-03-100-01 E-QBN-004-E E-QBN-004-D		

LICENSEE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
REQUIRED OPERATOR ACTIONS FOR A FIRE IN FIRE AREA XV (CONTINUED)		YES	See Section 4.1.3 of this Report.
To prevent steam generator overfilling, manually trip the Train A auxiliary feedwater pump turbine at the turbine.	Additional emergency lights needed for pump lever. SCL-72A-14-081-13		
To overcome spurious uncontrolled depressurization, stop charging flow and open circuit breaker 72-D2109 at DC distribution panel E-PKA-D21 to close J-CHA-HV-205.	E-QBN-002Q		
To maintain RCS inventory and pressure control, open circuit breaker M3520 at MCC E-PHA-M35.	Located in fire area of concern. E-QBN-003-A E-QBN-003-B E-QBN-003-C E-QBN-003-D		
Open switch DS-21-08 in auxiliary relay cabinet E-ZAA-C06 to ensure closure of vent valve J-RCA-HV-106, to isolate the Train A RCGVS vent paths.	Located in fire area of concern. E-QBN-003-I		
To maintain RCS inventory and pressure control, open circuit breaker L35C2 at load center E-PGA-L35 (MCC E-PHA-M35 not accessible for fire in this zone).	E-QBN-002-B E-QBN-002-C E-QBN-002-D SJL-D80-02-100-03 SJL-D80-02-100-10		
Local manually reopen J-CHA-HV-524.	Located in fire area of concern. Add emergency lighting on south end of the west wraparound upper level to operate SSN-V819 and CH-HV-524 on east wall of wraparound. Corrected by QD-023. SAL-71A-01-088-18		
To ensure the ability to decrease RCS pressure, open circuit breaker 72-D4216 at DC distribution panel E-NKN-D42 to fail valve J-CHE-PDV-240 into the closed position.	This action was not evaluated for adequate emergency lighting in the emergency lighting Study 6/1/89. Not on Drawing 13-E-ZPL-004. SAL-72C-03-100-01		
To ensure the ability to establish the Train A borated water gravity feed flow path to the charging pumps, open breaker D4222 in DC distribution panel E-NKN-D42 to ensure valve J-CHN-HV-532 is open and locally manually open valve J-CHE-HV-536 after opening breaker L34B3 in load center E-PGB-L34. (Note: Auxiliary relay cabinet E-ZAN-C01 and MCC E-NHN-M72 are located in Fire Zone 52D. Valve J-CHE-HV-536 is located in Fire Zone 36.)	Actions for E-NKN-D42 and J-CHE-HV-536 not evaluated in emergency lighting Study 6/1/89. Valve J-CHE-HV-536 located in fire area of concern. SAL-72C-03-100-01 SAL-71A-01-070-12		

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
REQUIRED OPERATOR ACTIONS FOR A FIRE IN FIRE AREA XV (CONTINUED)		YES	
Open breaker L34B3 in load center E-PGB-L34.	SJL-D79-01-100-03 SJL-D79-02-100-04 E-QBN-001-A E-QBN-001-B E-QBN-001-C		
To ensure the ability to prevent inadvertent boron dilution, open switch DS-26-08 in auxiliary relay cabinet E-ZAN-C01 to ensure valve J-CHN-UV-527 is closed.	Located in fire area/zone of concern. E-QBN-003-G		
Local manually close valve J-CHN-UV-501.	Located in fire area of concern. SAL-72D-03-120-08		
Open circuit breaker M7208 in MCC E-NHN-M72.	Located in fire area of concern. SAL-72D-03-120-05 E-QBN-004-G		
Close manual valve CHV771. (Note: E-ZAN-C01 and E-NHN-M72 are located in Fire Zone 52D. Valve J-CHN-UV-501 is located in Fire Zone 50B, and valve CHV771 is located in the yard.)	Actions to be performed (E-ZAN-C01, El-NHN-72 and J-CHN-UV-501) are in fire area XV. CHN771 is located in yard and not part of the lighting evaluation 6/1/89. Per discussion on 6/25/90, Security Lights (Diesel Backed) are provided in yard. Credit taken for them. Walkdowns confirm lighting is adequate.	Security lighting	
To ensure the ability to decrease RCS pressure, open circuit breaker DS-16-10 at auxiliary relay cabinet E-ZAN-C02 to fail valve J-CHE-PDV-240 into the closed position.	Located in fire area of concern. E-QBN-003-G SAL-72D-07-120-01		
To ensure reactor shutdown, open CEDM MG sets power supply breakers L03C4 and L10C4 at load centers E-NGN-L03 and E-NGN-L10, respectively.	Located in fire area of concern. E-QBN-003-E SAL-72D-03-120-22 SAL-72D-03-120-11		
To preclude loss of CST volume, ensure that the Train B condensate transfer pump is not running (Breaker M3424/E-PHB-M34).	The specific operator action to ensure the pump not running is not called out, i.e. whether it is tripping a breaker or a control room action. E-QBN-004-C		
To preclude loss of CST volume, close the Train B condensate transfer pump manual discharge valve. The pump circuitry is subject to fire damage and access to breaker is not available.	Valve number not listed in UFSAR, or 13-NS-110. This action also not evaluated in emergency lighting Study dated 6/1/89.	N/A	

APPENDIX C

PERFORMANCE GUIDANCE

PERFORMANCE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
NRC INSPECTION AND ENFORCEMENT MANUAL INSPECTION PROCEDURE 64100			
(a). Verify that the plant emergency lighting capabilities meet the following requirements of Section III.J of Appendix R.			
1. Required Areas for Emergency Lighting (a) Control room (unless specifically excluded as a requirement through exemption or deviation) (b) Other critical area(s) and access routes which require illumination to allow manual safe shutdown equipment operation or the monitoring of safe shutdown indications	See discussion at FSAR Section 9.5.3.2.2.3. See discussion at FSAR Section 9.5.3.2.2.3 and spurious Actuation. Study Results in Appendix B of this Report..	See discussion provided in FSAR Section herein, and Spurious Actuation Study Results in Appendix B of this Report.	
2. If the emergency lights are powered from a central battery or batteries, then the distribution system must contain protective devices such that a fire in one area will not cause a loss of emergency lighting in any unaffected areas needed for safe shutdown operations.	See Recommendations in Section 4.4 of this Report.		
3. Review the manufacturer's information to verify that battery power supplied are rated with at least an 8-hour capacity.	See discussion at FSAR Section 9.5.1.1.1.4 (Safety Design Basis 18).		
b. In addition to the regulatory requirements of III.J, the following areas should be reviewed: 1. Tour the plant and inspect the emergency lights installed in areas required for post-fire shutdown and in the access routes to those areas. By requesting the licensee to perform an emergency lighting test for selected plant areas, verify the following: (a) The lamps are properly aimed. (b) The batteries are being properly maintained, including: • charge rate indication (lamp or meter) • specific gravity indication is within specification (c) Sufficient illumination is provided to permit access for the monitoring of safe shutdown indications and/or the proper operation of safe shutdown equipment.	(a) Currently no task checks this. The PS & C Advisor stated this is under development and they are waiting for changes to drawings that identify the equipment to be illuminated. (b) Included in PM tasks. (c) Illumination was not independently verified. However, APS follows Generic Letter 86-10 guidance and has recently performed walkdowns.	YES	
2. Review the preventive maintenance surveillance procedure used for periodic checks of the emergency lights and verify that the maintenance frequencies and procedures are as specified by the manufacturer.	2. Reviewed three different task types and vendor manuals (E036A-10, E050-70, E041B-3 and E041A-04) and interviewed P S & C Advisors--minimum vendor suggested maintenance appears to be addressed in PM tasks.		

PERFORMANCE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
APS LETTER 102-01287-WFC JUNE 3, 1989 TRANSMITTED ESSENTIAL AND EMERGENCY LIGHTING SYSTEM REPORT TO NRC FOR REVIEW, NOT APPROVAL, REPORT DATED 6/1/89.			
Emergency Lighting System			
LIGHTING REPORT DATED 6/1/89 (CONTINUED)			
Essential Lighting System			
Emergency Lighting (Enhanced). To perform the review of the enhanced emergency lighting, the operations procedures (Reference 4 and 5) and the design documents (Reference 1, 2 and 3) were used to determine desirable locations for emergency lighting. This list is compiled on Table Two of the Report. This equipment was then located by area and shown on Attachment of the Report.			
CONCLUSIONS AND ACTION PLAN			
Based on the walkdown results of Unit 2 and the drawing review, there were areas where emergency lighting was determined to be needed to perform safe shutdown activities. Lighting will be improved in these areas prior to the restart of the units.	Completion of this action plan was not independently verified.		
When manual operation of the ADVs was required, it was apparent that lighting on the 140' elevation of the MSSS needed to be improved. However, this lighting is not required by design basis since local control of the ADVs is not mandated to safely shut down the unit. Since recent events have shown that it is highly desirable to have improved lighting in these areas, design basis 8-hour emergency and essential lights will be installed prior to restart.			
In other areas where the non-design basis discrepancies exist, they will be evaluated as part of a major project which will perform a comprehensive review of all lighting, including normal lighting. Priority will be placed on area where more critical operational activities are determined to be necessary such as the "A" train diesel generator. The lighting in these areas will be modified as required when the evaluation of each area is completed. This project was planned prior to the Unit 3 sequence of events and is scheduled to be started in July of 1989 and completed by July 1992. Priority areas will be completed by July 1991.			
In the interim, additional portable battery-powered lanterns will be provided in the control room and at the remote shutdown panel to provide an added degree of confidence.			
A walkdown of the safe shutdown procedure (Reference 4) will be similarly performed on Units 1 and 3 and any additional deficiencies corrected prior to restart of the respective units.			
To reflect this report's reevaluation of the PVNGS lighting requirements, the documents referenced within the			

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES

report will be updated for consistency.

The preventive maintenance program has been determined to be adequate for lighting with some corrective actions to assure maintenance is performed regularly without waiver and lamps are replaced by group rather than individually as they burn out. The factor which caused the waiver of maintenance on Emergency lighting had been corrected prior to the Unit 3 event.

LIGHTING REPORT DATED 6/1/89 (CONTINUED)

REFERENCES

1. Outside the Control Room, Spurious Actuation Study 01, 02, 03-NS-110.
2. Control Room Fire, Spurious Actuation Study 13-NS-109.
3. Letter V-CE-30368, June 11, 1984, "List of Equipment Required for Safe Shutdown during Fire in the Control Room."
4. Operations Procedure 42AO-2ZZ44, "Shutdown Outside the Control Room due to Fire and/or Smoke."
5. Operations Procedure 42AO-2ZZ27, "Shutdown Outside the Control Room."
6. Code of Federal Regulations, 10CFR Part 50 Appendix R.
7. UFSAR Section 9.5.3, Appendix 9B.
8. Design Criteria, Sections "QD" and "QB."
9. System Description, Sections "QD" and "QB."
10. Drawings 13-E-ZPL-001, 002, 003, "Power Block Safe Shutdown Emergency Lights."

DCP 1, 2, 3-FE-QD-025 ACCEPTANCE CRITERIA

ACCEPTANCE CRITERIA

Prerequisites

DCP acceptance criteria complies with Generic Letter 86-10 guidance. YES

(a) Testing shall be done after dusk.
(b) All normal and essential lighting in affected areas shall be deenergize.
(c) Power station shall be verified operable using vendor instruction manual.
(d) Walkdown team shall include as a minimum an Operator, EED System Engineer and NED engineer.

Criteria

(a) Power stations, upon a loss of essential lighting panel power, shall be capable of supporting the lighting load on batteries alone for a minimum of eight hours.
(b) Illumination level shall be, as determined by walkdown team, adequate to (1) safely egress/access affected

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
paths, (2) perform necessary tasks to operate ADVs and (3) read ADV operation procedure at 140' elevation of the MSSS building. (c) Walkdown and acceptance of design shall be documented in a formal manner and submitted to NED for record retention and closure of the DCP at a later date.			
NRC GENERIC LETTER NO. 86-10, "IMPLEMENTATION OF FIRE PROTECTION REQUIREMENTS"			
D. Quality Assurance Requirements Applicable For fire protection systems the licensee should have and maintain a quality assurance program that provides assurance that the fire protection systems will be designed, fabricated, erected, tested, maintained and operated so that they will function as intended. Fire protection systems are not "safety-related" and are therefore not within the scope of Appendix B to 10CFR Part 50, unless the licensee has committed to include these systems under the Appendix B program for the plant. NRC guidance for an acceptable quality assurance program for fire protection systems, given in Section C.4 of Branch Technical Position CMEB 9.5-1 Rev. 2 dated July 1981, has generally been used in the review and acceptance of approved fire protection programs for plants licensed after January 1, 1979. For plants licensed prior to January 1, 1979, similar guidance was referenced in footnotes 3 and 4 to 10CFR50.48. They are contained in BTP APCSB 9.5-1 and Appendix A thereto and in "Nuclear Plant Fire Protection Functional Responsibilities, administrative Control and Quality Assurance dated June 14, 1977.			
"NUCLEAR PLANT FIRE PROTECTION FUNCTIONAL RESPONSIBILITY, ADMINISTRATIVE CONTROLS AND QUALITY ASSURANCE" NRC GUIDANCE LETTER DATED JUNE 14, 1977			
Quality Assurance The Quality Assurance (QA) program should assure that the requirements for design, procurement, installation, testing and administrative controls for the fire protection program for safety-related areas approved by NRC are satisfied. The Quality Assurance provisions for fire protection should apply to activities performed after the effective date of the adoption of said provisions. The QA program should be under the management control of the QA organization. This control consists of (1) formulating and/or verifying that the fire protection QA program incorporated suitable requirements and is acceptable to the management responsible for fire protection, and (2) verifying the effectiveness of the QA program for fire protection through review, surveillance, and audits. Performance of other QA program functions for meeting the fire protection program requirements may be performed by personnel outside the QA organization. The QA program for fire protection should be part of the overall plant QA program. These QA criteria apply to those items within the scope of the fire protection programs, such as fire protection systems, emergency lighting, communication and emergency breathing apparatus, as well as the fire protection requirements of applicable safety-related equipment.	This document provides the historic content of the Fire Protection Issue and the NRC safety review of how utilities should implement the various facets of Fire Protection within their facilities. This guidance document addresses clarifications of Appendix A to Branch Technical Position (BTP) 9.5-1 and Regulatory Guide 1.120, for the following areas: "Fire Protection Organization," "Fire Brigade Training," "Control of Combustible Materials," Control of Ignition Sources," "Fire Fighting Procedures," and "Quality Assurance." Only Attachment 6 "Quality Assurance" is included in this document, because the other areas do not relate to emergency lighting. Emergency lighting is included by the NRC as part of the scope of the		Transmitted to Rancho Seco by letter dated August 4, 1977. (Referenced for Guidance in 10CFR50.48)

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
Fire Protection Program			
Applicants/Licensees can meet the fire protection quality assurance (QA) program criteria of Appendix A to BTP 9.5-1 or Regulatory Guide 1.120 by either: 1) Implementing those fire protection QA criteria as part of their QA program under 10CFR Part 50 Appendix B, where such a commitment is made. It is not necessary to submit a detailed description of the fire protection QA program or its implementation for NRC review; or			
NRC LETTER DATED 6/14/77 (CONTINUED)			
2) Providing for NRC review a descriptions the fire protection QA program and the measures for implementing the program. Supplemental guidance is provided below on acceptable measures for implementing each of the fire protection QA program criteria of Appendix A to BTP 9.5-1 or Regulatory Guide 1.120.	In response to NRC Question 17A.10 (UFSAR Appendix 17A) APS committed to a QA Program consistent with BTP 9.5-1, Appendix A. APS did not commit to all 18 criteria of 10CFR50, Appendix B.	NO - Not all elements of Fire Protection are QAG.	UFSAR 17A, Question 17A.10 and 17A.50
Design Control and Procurement Document Control Measures should be established to assure that the applicable guidelines of the Regulatory Guide 1.120 or approved NRC alternatives are included in design and procurement document and that deviations therefrom are controlled. These measures should assure that: (a) Design and procurement document changes, including field changes and design deviations, are subject to the same level of controls, reviews and approvals that were applicable to the original document. (b) Quality standard are specified in the design documents such as appropriate fire protection codes and standards, and deviations and changes from these quality standard are controlled. (c) New designs and plant modifications, including fire protection systems, are reviewed by qualified personnel to assure inclusion of appropriate fire protection requirements. These reviewed should include items such as: (1) Design reviews to verify adequacy of wiring isolation and cable separation criteria. (2) Design reviews to verify appropriate requirements for room isolation (sealing penetrations, floors, and other fire barriers). (d) A review and concurrence of the adequacy of fire protection requirements and quality requirements stated in procurement documents are performed and documented by qualified personnel. This review should determine that fire protection requirements and quality requirements are correctly stated, inspectable and controllable; there are adequate acceptance and rejection criteria; and the procurement document has been prepared, reviewed and approved in accordance with QA program requirements. **Instructions, Procedures and Drawing** Inspections, tests, administrative controls, fire drills and training that govern the fire protection program should be prescribed by documented instructions, procedures or drawings and should be accomplished in accordance with these documents. The following provisions should be included.			

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES

(a) Indoctrination and training programs for fire prevention and fire fighting are implemented in accordance with documented procedures.

(b) Activities such as design, installation, inspection, test, maintenance and modification of fire protection systems are prescribed and accomplished in accordance with documented instructions, procedures and drawings.

NRC LETTER DATED 6/14/77 (CONTINUED)

(c) Instructions and procedures for design installation, inspection, test, maintenance, modification and administrative controls are reviewed to assure that proper inclusion of fire protection requirements, such as precautions, control of ignition sources and combustibles, provisions for back-up fire protection of the activity requires disabling a fire protection system, and restriction on material substitution unless specifically permitted by design and confirmed by design review.

(d) The installation or application of penetration seals and fire retardant coatings is performed by trained personnel using approved procedures.

Control of Purchased Material, Equipment and Services

Measures shall be established to assure that purchased material, equipment and services conform to the procurement documents. These measures should include:

(a) Provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor, inspections at suppliers, or receiving inspections.

(b) Source or receiving inspection, as a minimum for those items whose quality cannot be verified after installation.

Inspection

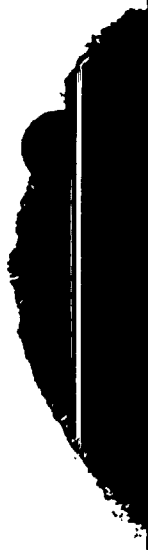
A program for independent inspection of activities affecting fire protection should be established and executed by or for the organization performing the activity to verify conformance to documented installation drawings and test procedures for accomplishing activities. This program should include.

(a) Inspections of (1) installation, maintenance and modification of fire protection systems; and (2) emergency lighting and communication equipment to assure conformance to design and installation requirements.

(b) Inspection of penetration seals and fire-retardant coating installations to verify the activity is satisfactorily completed.

(c) Inspections of cable routing to verify conformance with design requirements.

(d) Inspections to verify that appropriate requirements for room isolation (sealing penetrations, floors and



other fire barriers) are accomplished during construction.

(c) Measures to assure that inspection personnel are independent from the individuals performing the activity being inspected and are knowledgeable in the design and installation requirements for fire protection.

(f) Inspection procedures, instructions and checklists which provide for the following:
(1) Identification of characteristics and activities to be inspected
(2) Identification of the individuals or groups responsible or performing the inspection operation
(3) Acceptance and rejection criteria
(4) A description of the method of inspection

NRC LETTER DATED 6/14/77 (CONTINUED)

(5) Recording evidence of completing and verifying a manufacturing, inspection or test operation
(6) Recording inspector or data recorder and the results of the inspection operation.

(g) Periodic inspections of fire protection systems, emergency breathing and auxiliary equipment, emergency lighting and communication equipment to assure the acceptable condition of these items.

(h) Periodic inspection of materials subject to degradation such as fire stops, seals, and fire retardant coatings to assure these items have not deteriorated or been damaged.

Test and Test Control

A test program should be established and implemented to ensure that testing is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. The tests should be performed in accordance with written test procedures; test results should be properly evaluated and acted on. The test program should include the following:

(a) ***Installation Testing.*** Following construction, modification, repair or replacement, sufficient testing is performed to demonstrate that fire protection systems, emergency lighting and communication equipment will perform satisfactorily in service and that design criteria are met. Written test procedures for installation tests incorporate the requirements and acceptance limits contained in applicable design documents.

(b) ***Periodic Testing.*** The schedules and methods for periodic testing are developed and documented. Fire protection equipment, emergency lighting and communication equipment are tested periodically to assure that the equipment will properly function and continue to meet the design criteria.

(c) Programs are established for QA/QC to verify testing of fire protection systems and to verify that test personnel are effectively trained.

(d) Test results are documented, evaluated and their acceptability determined by a qualified responsible individual or group.

Inspection, Test and Operating Status

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES

Measures should be established to provide for the identification of items that have satisfactorily passed required tests and inspections. These measures should include provisions for:

(a) Identification by means of tags, labels or similar temporary markings to indicate completion of required inspections and tests, and operating status.

NRC LETTER DATED 6/14/77 (CONTINUED)

Nonconforming Items

Measures should be established to control items that do not conform to specified requirements to prevent inadvertent use of installation. These measures should include provisions to assure that.

(a) Nonconfirming, inoperative, or malfunctioning fire protection systems, emergency lighting and communication equipment are appropriately tagged or labeled.

(b) The identification, documentation, segregation, review disposition and notification to the affected organization of nonconforming materials, parts, components or services are procedurally controlled.

(c) Documentation identifies the nonconfirming item, describes the nonconformance and the disposition of the nonconforming item and includes signature approval of the disposition.

(d) Provisions are established identifying those individuals or groups delegated the responsibility and authority for the disposition and approval of nonconfirming items.

Corrective Action

Measures shall be established to ensure that conditions adverse to fire protection such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible material and nonconformance are promptly identified, reported and corrected. These measures should assure:

(a) Procedures are established for evaluation of conditions adverse to fire protection (such as nonconformance, failures, malfunctions, deficiencies, deviations and defective material and equipment) to determine the necessary corrective action.

(b) In the case if significant or repetitive conditions adverse to fire protection, including fire incidents, the cause of the conditions is determined and analyzed, and prompt corrective actions are taken to preclude recurrence. The cause of the condition and the corrective action taken are promptly reported to cognizant levels of management for review and assessment.

Records

Records should be prepared and maintained to furnish evidence that the criteria enumerated above are being

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
met for activities affecting the fire protection program. The following provisions should be included. (a) Records are identifiable and retrievable and should demonstrate conformance to fire protection requirements. The records should include results of inspections, tests, reviews and audits; nonconformance and corrective action reports; construction, maintenance and modification records; and certified manufacturers' data. (b) Record retention requirements are established.			
NRC LETTER DATED 6/14/77 (CONTINUED) **Audits** Audits should be conducted and documented to verify compliance with the fire protection program, including design and procurement documents, instructions, procedures and drawings, and inspection and test activities. The following provisions should be included: (a) Audits are periodically performed to verify compliance with the administrative controls and implementation of quality assurance criteria including design and procurement, instructions, procedures and drawings, and inspection and test activities. These audits are performed by QA personnel in accordance with preestablished, written procedures or checklists and conducted by trained personnel not having direct responsibilities in the areas being audited. (b) Audit results are documented and then reviewed with management having responsibility in the area audited. (c) Follow-up action is taken by responsible management to correct the deficiencies revealed by the audit. (d) Audits are performed annually to provide an overall assessment of conformance to fire protection requirements.			
ILLUMINATING ENGINEERING SOCIETY HANDBOOK 1972 (IES 1972) Section 9 figure 9-80, "Levels of Illumination Currently Recommended," page 9-83 control room's level of illumination for emergency lighting recommended 3 fc.	This document was only used as a guidance. The horseshoe area has an illumination level of 6 foot candles, and the panel area of 3 foot candles in the control room. The remote shutdown area also has an illumination level of 3 foot candles.	YES	Procedure 93GT-0ZZ47

PERFORMANCE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
UL 924 "EMERGENCY LIGHTING AND POWER EQUIPMENT," SEPTEMBER 1980			
Section 34.1 "a storage battery shall be capable of supplying and maintaining the maximum total associated in the marking but in no case less than 1 1/2 hours and not less than 87.5% rated battery voltage."	Emergency lighting units are designed and tested by manufacturer to this standard.		Vendor Manuals
NFPA 7-D1975/ANSI C1-075 NATIONAL ELECTRIC CODE - 1975			
Article 700 - Emergency Systems 700-1 Scope Emergency systems are those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction. These systems are intended to automatically supply illumination and/or power to designated areas and equipment in the event of failure of the normal supply or in the event of accident to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life.	The emergency lighting units installed meet these requirements and those set forth by the authority having jurisdiction (NRC).		Vendor Manuals. See Section 4.1.2 of this report. Appendix A of this report.
700-12 GENERAL REQUIRMENTS (a) Storage Battery. A storage battery of suitable rating and capacity to supply and maintain at not less than 87 1/2 percent of system voltage the total load of the circuits supplying emergency lighting and emergency power for a period of at least 1 1/2 hours. Batteries, whether of the acid or alkali type, shall be designed and constructed to meet the requirements of emergency service and shall be compatible with the charger for that particular installation. For a sealed battery, the container shall not be required to be transparent. However, for the lead acid battery which requires water additions, transparent or translucent jars shall be furnished. Automotive-type batteries shall not be used. An automatic battery charging means shall be provided.	The emergency lighting units installed meet these requirements and those set forth by the authority having jurisdiction (NRC).		Vendor Manuals. See Section 4.1.2 of this report. Appendix A of this report.

PERFORMANCE COMMITMENTS

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
ARTICLE 400 - Lighting Fixtures, Lampholders, Lamps, Receptacles and Rosettes 410-4. Fixtures in Specific Locations (a) Wet and Damp Locations. Fixtures installed in wet or damp locations shall be so installed that water cannot enter or accumulate in wireways, lampholders, or other electrical parts. All fixtures installed in wet locations shall be marked. "Suitable for Wet Locations." All fixtures installed in lamp locations shall be marked, "Suitable for Wet Locations" or "Suitable for damp Locations."	The emergency lighting units installed meet these requirements and those set forth by the authority having jurisdiction (NRC).		Vendor Manuals. See Section 4.1.2 of this report. Appendix A of this report. Emergency lighting units installed in outdoor locations are marked with the NEMA rating of the enclosure by the famufacter.

APPENDIX D

UTILITY SURVEY

EMERGENCY LIGHTING REVIEW
UTILITY SURVEY 1

I. DESIGN ISSUES

How did you determine where emergency lights were to be installed (Appendix R and others)?

Walkdown information regarding performance of alternative remote shutdown procedures.

Hot shutdown equipment/spurious operations equipment for any fire in the plant.

Once locations were identified, did you take into account environmental (temp, humidity, etc.) concerns?

No.

Do you maintain battery sizing calculations for your emergency lighting units?

No. Eight-hour qualified emergency lighting units were purchased from a supplier. Qualification paperwork was obtained and is retained.

Did you install your emergency lights to meet certain illumination levels? If not, what was your acceptance criteria?

Quantified illumination level criteria was not used. Lights were placed to allow for direct illumination of equipment requiring manual operation and on local indication panels. Access/egress paths were lit using judgment on what constituted sufficient lighting. Blackout study was used to visually verify acceptable illumination levels.

What type of emergency lights do you utilize in your plant(s)?

Exide

One security light in yard area.
Note: NRC discovered this light on an inspection. The light was not battery packed, but instead was fed from the security diesel. The utility filed an additional exemption request. No violation issued.

II. MAINTENANCE ISSUES

What is included in your preventive maintenance program with respect to your emergency lighting (i.e., placement, electrolyte, discharge test)?

Six months full discharge.

Monthly functional.

Do you trend any of the data collected? If so, what is trended, what is it used for, and what have you found (failure rates)?

No.

How often do you test your emergency lights? What type of test do you perform? Do you perform any maintenance or special charging prior to testing?

No maintenance or special charging.

III. CONFIGURATION MANAGEMENT ISSUES

Do you review your placement and illumination levels when installing a design modification?

Yes. Safety review criteria involves question regarding emergency lighting interface. For example, if safe shutdown equipment was added, the review question would create an open item of lighting for post fire shutdown.

Do you have specific engineering studies that support your lighting placement? Do you update these documents?

No. Walkdowns and blackout testing have confirmed adequacy of emergency lighting.

IV. QA ISSUES

Do you have any special qualifications for QA/QC inspectors reviewing/performing fire protection activities? Any special training?

No.

What type of quality assurance requirements do you have for emergency lights?

QA - Nuclear Grade.

V. OPERABILITY ISSUES

What type of operability requirements do you have for emergency lights?

No compensatory measures. No specified time to repair/replace failed unit.

Do you have any reportability requirements for emergency lights?

No.

VI. TRAINING ISSUES

How do you train operators on actions for a fire outside the control room?

One walkthrough.
Yearly "reader" of EOP for Emergency Remote Shutdown.

What documents contain operator actions outside the control room?

EOP 1.2 OHP 4023.001.001 Rev. 8

EMERGENCY LIGHTING REVIEW
UTILITY SURVEY 2

I. DESIGN ISSUES

How did you determine where emergency lights were to be installed (Appendix R and others)?

Analysis by Fire Area of equipment and access/egress routes.
Matrix exists in Fire Hazard Analysis.

Drawings.

Once locations were identified, did you take into account environmental (temp, humidity, etc.) concerns?

No.

Do you maintain battery sizing calculations for your emergency lighting units?

No.

Did you install your emergency lights to meet certain illumination levels? If not, what was your acceptance criteria?

No for App R lights. Utilized operator opinion.

For egress lights, use life safety code NFPA 101.

What type of emergency lights do you utilize in your plant(s)?

The utility utilizes the Emergency AC lights, the emergency DC system, and individual battery units to meet the requirements of Appendix R III.J. The battery units are Teledyne.

A deviation request was granted for utilization of non-battery backed lights.

II. MAINTENANCE ISSUES

What is included in your preventive maintenance program with respect to your emergency lighting (i.e., placement, electrolyte, discharge test)?

Surveillance procedures for emergency lighting on a 6 mos basis. Information from vendor manual tested such as electrolyte level, beam placement, indication lights and voltage level. 1 yr - discharge.

The utility also runs a PM every 2 mos. The PM notes that if an App R BOL has to be removed for repair then a temporary lantern should be placed in the area. The PM also indicates that the BOL should not be removed for > 1 wk.

Recent concern - Purchase specification indicates that the Battery operated lights are good for 7 yrs. Determining what to do now.

Do you trend any of the data collected? If so, what is trended, what is it used for, and what have you found (failure rates)?

No.

How often do you test your emergency lights? What type of test do you perform? Do you perform any maintenance or special charging prior to testing?

See above. No preconditioning.

III. CONFIGURATION MANAGEMENT ISSUES

Do you review your placement and illumination levels when installing a design modification?

Recently created an electrical group desktop instruction to review for Appendix R. Lighting was included.

Do you have specific engineering studies that support your lighting placement? Do you update these documents?

Calculations - justifying where lights are to be placed.
Drawings - indicating placement.

Yes, these are controlled drawings.

IV. QA ISSUES

Do you have any special qualifications for QA/QC inspectors reviewing/performing fire protection activities? Any special training?

What type of quality assurance requirements do you have for emergency lights?

Lights are purchased commercial grade. However, lights are listed as QA classification "G" in the Q list - FP systems are subject to a "graded" QA program.

V. OPERABILITY ISSUES

What type of operability requirements do you have for emergency lights?

See PM Section. No requirements for surveillance tests.

Do you have any reportability requirements for emergency lights?

No reportability issues.

VI. TRAINING ISSUES

How do you train operators on actions for a fire outside the control room?

Emergency procedure (fire emergency) for fire anywhere in plant - guidance document - assume normal/abnormal operating procedures still pertain, fire procedure for additional information.

Training - every year as part of emergency procedures - discuss what is provided in fire emergency procedures.

What documents contain operator actions outside the control room?

See above.

EMERGENCY LIGHTING REVIEW
UTILITY SURVEY 3

I. DESIGN ISSUES

How did you determine where emergency lights were to be installed (Appendix R and others)?

Documented in station modification, generated as a result of App R analysis.

Once locations were identified, did you take into account environmental (temp, humidity, etc.) concerns?

Yes. Not specifically in purchase order; however, engineer reviewed manufacturer's spec and selected lights which would meet the 8 hr criteria given the temperature considerations.

Do you maintain battery sizing calculations for your emergency lighting units?

No answer.

Did you install your emergency lights to meet certain illumination levels? If not, what was your acceptance criteria?

Not asked.

What type of emergency lights do you utilize in your plant(s)?

Dual Lite.

II. MAINTENANCE ISSUES

What is included in your preventive maintenance program with respect to your emergency lighting (i.e., placement, electrolyte, discharge test)?

Inspection, cleaning and aiming.

Do you trend any of the data collected? If so, what is trended, what is it used for, and what have you found (failure rates)?

Not trending any more. Initially there were significant problems. Maintaining float voltage higher than needed. Corrected problem not seeing significant failures.

How often do you test your emergency lights? What type of test do you perform? Do you perform any maintenance or special charging prior to testing?

Monthly - routine inspection, cleaning and aiming (use azimuths for aiming).

Annual - full discharge for 8 hrs.

III. CONFIGURATION MANAGEMENT ISSUES

Do you review your placement and illumination levels when installing a design modification?

Not asked.

Do you have specific engineering studies that support your lighting placement? Do you update these documents?

Not asked.

IV. QA ISSUES

Do you have any special qualifications for QA/QC inspectors reviewing/performing fire protection activities? Any special training?

Not asked.

What type of quality assurance requirements do you have for emergency lights?

Non safety-related.

Initial indications are that augmented QA was not applied to emergency lights.

V. OPERABILITY ISSUES

What type of operability requirements do you have for emergency lights?

None. Provide hand held battery powered lights as back-up.

Do you have any reportability requirements for emergency lights?

No.

VI. TRAINING ISSUES

How do you train operators on actions for a fire outside the control room?

Lesson plan exists for CR Fire.

What documents contain operator actions outside the control room?

Procedure for alternative shutdown areas only (CR and Relay Room).

All other shutdown scenarios are encompassed by "abnormal operating procedures."

EMERGENCY LIGHTING REVIEW
UTILITY SURVEY 4

I. DESIGN ISSUES

How did you determine where emergency lights were to be installed (Appendix R and others)?

Systems/Electrical Analysis determined equipment which required a manual action to mitigate the consequences of a fire. Lights were not provided for actions greater than 8 hrs.

Once locations were identified, did you take into account environmental (temp, humidity, etc.) concerns?

First time question was asked, utility representative said he wasn't sure but that he didn't think there was anything.

Second phone call indicated that the utility had found a specification which called out an acceptance test for elevated temperatures.

Do you maintain battery sizing calculations for your emergency lighting units?

Battery sizing was specified in the purchase order.

Acceptance test of batteries conducted upon receipt.

Did you install your emergency lights to meet certain illumination levels? If not, what was your acceptance criteria?

Unit 1 FSAR commitment to meet .3 - .5 foot candles. This commitment was added during a recent FSAR Update. This commitment is being clarified to reference a foot-candle level for the Control Room and the 86-10 guidance for remaining manual actions (access/egress).

Unit 2/3 acceptance criteria used was operator acceptance of the illumination levels.

What type of emergency lights do you utilize in your plant(s)?

EXIDE - Lead calcium-sealed.
LITE ALARM
DUAL LITE
HALOPHANE

II. MAINTENANCE ISSUES

What is included in your preventive maintenance program with respect to your emergency lighting (i.e., placement, electrolyte, discharge test)?

Annual 8-hour discharge test.

Quarterly visual - orientation, push button, electrolyte level.

Maintenance PM (18 mos) float voltage.

Do you trend any of the data collected? If so, what is trended, what is it used for, and what have you found (failure rates)?

Emergency Preparedness tracks lighting failures (failure defined as failure to illuminate for 8 hours).

20 - 40% failures. Unit 1 mostly outdoor lights.

How often do you test your emergency lights? What type of test do you perform? Do you perform any maintenance or special charging prior to testing?

See above. No preconditioning.

III. CONFIGURATION MANAGEMENT ISSUES

Do you review your placement and illumination levels when installing a design modification?

Yes. Checklists include questions on blocking lights and on new actions.

Do you have specific engineering studies that support your lighting placement? Do you update these documents?

a) Yes.
b) Yes.

IV. QA ISSUES

Do you have any special qualifications for QA/QC inspectors reviewing/performing fire protection activities? Any special training?

What type of quality assurance requirements do you have for emergency lights?

U1 - NSR FP

U2/3 - 3 FPS or 4 FPS

V. OPERABILITY ISSUES

What type of operability requirements do you have for emergency lights?

U1 - Emergency Lighting (App R) is in the Technical Specifications 7 days to repair or an LER is issued.

U2/3 - No operability requirements.

Do you have any reportability requirements for emergency lights?

U1 - see above.

U2/3 - none

VI. TRAINING ISSUES

How do you train operators on actions for a fire outside the control room?

Walkthrough for a fire in the control room, plus requalification once per training cycle.

Procedures for outside control room are abnormal operating instructions -> once through training - reading as required.

What documents contain operator actions outside the control room?

Abnormal Operating Instructions.

Differentiate between operator actions which are necessary or "enhancements" by placing enhancements in attachments.

EMERGENCY LIGHTING REVIEW
UTILITY SURVEY 5

I. DESIGN ISSUES

How did you determine where emergency lights were to be installed (Appendix R and others)?

Time and manpower study for all fire areas.

Once locations were identified, did you take into account environmental (temp, humidity, etc.) concerns?

Do not correct for design temperature.

Do you maintain battery sizing calculations for your emergency lighting units?

No. Utilize IEEE Standards. Spec'd 8-hr lights.

Did you install your emergency lights to meet certain illumination levels? If not, what was your acceptance criteria?

No specific criteria. However, when NRC performed walkdowns (lights were disabled) with utility personnel, NRC asked the operators' opinion of the lighting adequacy.

However on lighting placement drawings a ft-candle "radius of illumination" for access/egress & equipment illumination is called out. Acceptance tests were subjective based on operator opinion.

What type of emergency lights do you utilize in your plant(s)?

EXIDE

Portable lighting units (4). Exemption request exists for use of portables in yard. Instructions in Emergency Fire Procedures (also part of operator training).

II. MAINTENANCE ISSUES

What is included in your preventive maintenance program with respect to your emergency lighting (i.e., placement, electrolyte, discharge test)?

Quarterly - internals for acid leakage (had a problem w/and leakage in previous tests).

Weekly - operators perform aiming verification

Annual - discharge 8 hrs.

Do you trend any of the data collected? If so, what is trended, what is it used for, and what have you found (failure rates)?

10 - 14%

How often do you test your emergency lights? What type of test do you perform? Do you perform any maintenance or special charging prior to testing?

See above. No specific pre-conditioning.

III. CONFIGURATION MANAGEMENT ISSUES

Do you review your placement and illumination levels when installing a design modification?

Checklist includes line item regarding obstruction, design, addition, modification which would affect emergency lighting.

Do you have specific engineering studies that support your lighting placement? Do you update these documents?

Time and manpower and location drawings.

Yes, they are updated.

NRC REQUIREMENTS			
NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
UFSAR APPENDIX 9B.3 "COMPARISON TO APPENDIX A TO BRANCH TECHNICAL POSITION APCSB 9.5-1." 9.B.3 COMPARISON OF PALO VERDE NUCLEAR GENERATING STATION TO APPENDIX A OF NRC BRANCH TECHNICAL POSITION APCSB 9.5-1 **9.B.3.1 Compliance Summary** The review of the fire protection program at PVNGS against the guidelines set forth in Appendix A to BTP APCSB 9.5-1 has played an integral part in the overall evaluation. Table 9B.3-1 provides a detailed comparison of the Appendix A guidelines for plants under construction and operating plants against the PVNGS position. For each case of noncompliance, the bases constituting justification for the deviation are also provided.	<u>UFSAR Quality Assurance Sections</u> Quality Assurance classification requirements are derived from Appendix A to BTP 9.5-1 and APS commitments thereto in FSAR and DACM. APS Quality Classification Procedure 81AC-0CC06 "Quality Classification for Structures, Systems, Components, Spare Parts and Activities," has introduced some confusion in how fire protection components should be classified. This has resulted in emergency lighting being classified improperly as NQR in the past. The emergency lighting is now classified as QAG.	YES - Currently. Previously, Emergency Lights were not QAG (ITS) so the classification did not fulfill the APS commitment to Appendix A of BTP 9.5-1, Section C or the Operations Quality Assurance Criteria Manual, Appendix I and Section 2.	Table 9B.3-1 (not included in this document to simplify presentation. This table, however, does document the detailed compliance/deviation from the BTP.)
UFSAR SECTION 17.2.2.1 The Operations Quality Assurance Criteria Manual is the method by which the APS management promulgates the criteria or requirement of the APS QA program.			
UFSAR SECTION 17.2.2.2 The operations QA program, as described in the Operations Quality Assurance Criteria Manual, shall be applied to fire protection program activities associated with those fire protection systems and equipment used or installed in areas housing safety-related equipment, and other areas where an unsuppressed fire could potentially damage safety-related structures, systems, or components. The appropriate requirements of subsections 17.2.3, 17.2.4, 17.2.5, 17.2.7, 17.2.10, 17.2.11, 17.2.14, 17.2.15, 17.2.16, 17.2.17 and 17.2.18 shall be applied to the fire protection program (refer to Question 17A.10, NRC Question 260.10).			
UFSAR SECTION 17.2.2.4 Implementation of the operations QA program was achieved at least 90 days prior to fuel loading for each unit.			
UFSAR SECTION 17.2.2.7 The requirements for the operations QA program are described in Table 17.2-1.			

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	NRC REQUIREMENTS APS ACTION	Y/N COMPLIANCE	REFERENCES
UFSAR TABLE 17.2-1, "QUALITY ASSURANCE STANDARDS AND GUIDES COMPLIANCE MATRIX" UFSAR Table 17.2-1 QUALITY ASSURANCE STANDARDS AND GUIDES COMPLIANCE MATRIX Standard: Appendix A Guidelines for Fire Protection to (BTP) APCSB for Nuclear Power Plants 9.5-1 Clarifications and Exceptions: The Operations Quality Assurance Program complies with the Quality Assurance Program Guidelines of Appendix A to (BTP) APCSB 9.5-1			
UFSAR APPENDIX 17A, QUESTION 17A.10 **Question 17A.10** (NRC Question 260.10) Table 17.2-1 indicates that the fire protection QA program is met as part of the QA program under 10CFR Part 50, Appendix B. Item 16 in Table 3.2-1 of the FSAR indicates that the PVNGS QA program does not apply to the fire protection system. Clarify. *Response:* Amended Table 17.2-1 indicates that the Quality Assurance program during the operations phase complies with the quality assurance program guidelines of Appendix A to (BTP) APCSB 9.5-1. Application of the QA program to fire protection program activities is described in amended paragraph 17.2.2.2. Amended Table 3.2-1 indicates that pertinent requirements of 10CFR50, Appendix B, are applied to fire protection program activities during the operations phase.			
OPERATIONS QUALITY ASSURANCE CRITERIA MANUAL, CRITERION 2 "QUALITY ASSURANCE PROGRAM," SECTION 2.2.1.3 The Operations Quality Assurance Program shall comply with . . . other Regulatory Guides and Standards shown in Table 17.2-1.	Quality Assurance Manual See discussion provided in Section 4.1.1 of this Report. Emergency lighting was not considered "Important-to-Safety" in the past. However, the emergency lighting is now considered to be important-to-safety (QAG) so Quality Assurance Criteria are being implemented.	YES	
OPERATIONS QUALITY ASSURANCE CRITERIA MANUAL CRITERION 2 "QUALITY ASSURANCE PROGRAM," SECTION 2.2.3.1 Any activity which is required as a condition of the operating license for the PVNGS Units 1, 2 or 3 shall be subject to the pertinent criteria established in this manual.			

NRC REQUIREMENT / APS IMPLEMENTING COMMITMENT	APS ACTION	Y/N COMPLIANCE	REFERENCES
SECTION 2.2.3.2 Activities that affect the design, installation, maintenance or operability of safety-related and important to safety structures, systems or components, as described in 2.2.4, 2.2.5, and 2.2.6 of this manual, shall be controlled in accordance is the pertinent criteria established in this manual to an extent consistent with their importance to safety.			
SECTION 2.2.5, "ITEMS IMPORTANT-TO-SAFETY" Items important-to-safety are those structures, systems and components which are subject to the operations quality assurance program but are not safety-related, as identified in the notes to FSAR Table 3.2-1 and Appendix I of this manual.			
SECTION 2.2.6, "QUALITY-RELATED ITEMS" Quality-related items are those structures, systems and components that are subject to the operations quality assurance program and include items which are "Safety-Related" or "Important-to-Safety." Items classified as Important-to-Safety are defined in Appendix I of this manual.			
SECTION 2.2.7, "QUALITY-RELATED ACTIVITIES" Quality-related activities are those activities associated with safety-related or important-to-safety systems, equipment or components, that, as a result of not being performed or of being performed improperly, could result in the failure to satisfy, in whole or in part, the objectives identified in Article 2.1 of this manual [2.1 "the objective is to ensure that all activities conducted during operations of PVNGS . . . are conducted . . . in compliance with applicable license and other regulatory requirements APS has committed to in the PVNGS"].			
APPENDIX I TO "OPERATIONS QUALITY ASSURANCE CRITERIA MANUAL," SECTION 2.0 "FIRE PROTECTION" Those fire protection systems required to fulfill the PVNGS commitment to NRC Branch Technical Position APCSB 9.5-1 as described in the FSAR Section 9.5 are classified important to safety. Consistent with APCSB 9.5-1, the following Quality Assurance Criteria are applicable to these systems 3, 4, 5, 17, 10, 11, 14, 15, 16, 17 and 18.			
UFSAR SECTION 3.2.2 "SYSTEM QUALITY GROUP CLASSIFICATION" Refer to CESSAR Section 3.2.2 for classification of C-E-supplied equipment. Fluid systems or portions of fluid systems and their pressure-retaining components important to safety are classified in accordance with ANSI N 18.2. The safety classes defined in these criteria are used as guides in designating codes, standards, and quality requirements for the safety-related fluid systems and components. This classification system	See discussion provided for USFSAR Quality Assurance-Related Sections above.		

IV. QA ISSUES

Do you have any special qualifications for QA/QC inspectors reviewing/performing fire protection activities? Any special training?

What type of quality assurance requirements do you have for emergency lights?

Lights are purchased commercial grade. Emergency lights are part of the fire protection Quality Assurance Program. See attached excerpt from the utility QA Program.

V. OPERABILITY ISSUES

What type of operability requirements do you have for emergency lights?

None.

Do you have any reportability requirements for emergency lights?

No. However, as part of the removal of fire protection tech specs, the utility will be developing "fire protection operating specifications." Currently they are planning to provide an emergency lighting spec, which will read . . . "with 1 or more lights out of service repair within 7 days or replace. Provide temporary EBL until repair completed."

VI. TRAINING ISSUES

How do you train operators on actions for a fire outside the control room?

There are specific procedures (Emergency Fire Protection Procedures) for a fire in every fire area.

Annually - walkdown only for major changes.

What documents contain operator actions outside the control room?

See above.

EMERGENCY LIGHTING REVIEW
UTILITY SURVEY 6

I. DESIGN ISSUES

How did you determine where emergency lights were to be installed (Appendix R and others)?

Manual action list from SSA, Cable Separation Analysis and Spurious Operation Analysis. Two walkdowns were conducted by two plant operators. Operators evaluated whether they could see to perform the required actions.

Once locations were identified, did you take into account environmental (temp, humidity, etc.) concerns?

No.

Do you maintain battery sizing calculations for your emergency lighting units?

No other than the information provided in the vendor manuals.

Did you install your emergency lights to meet certain illumination levels? If not, what was your acceptance criteria?

Plant operator's ability to perform the action under emergency lighting conditions.

Control Room - used the illuminating Engineers Handbook standards of 2-10 ft-candles.

What type of emergency lights do you utilize in your plant(s)?

DC Backed Lighting and Teledyne 8-hr self contained lights.

II. MAINTENANCE ISSUES

What is included in your preventive maintenance program with respect to your emergency lighting (i.e., placement, electrolyte, discharge test)?

Follow vendor manual recommendations (will be going to refueling outage frequency)

- electrolyte level
- functional discharge test
- lamp test

Do you trend any of the data collected? If so, what is trended, what is it used for, and what have you found (failure rates)?

No.

How often do you test your emergency lights? What type of test do you perform? Do you perform any maintenance or special charging prior to testing?

Not tested.

III. CONFIGURATION MANAGEMENT ISSUES

Do you review your placement and illumination levels when installing a design modification?

Post-modification.

Do you have specific engineering studies that support your lighting placement? Do you update these documents?

a) No.
b) No.

IV. QA ISSUES

Do you have any special qualifications for QA/QC inspectors reviewing/performing fire protection activities? Any special training?

QC Inspector training program that covers specific fire protection related activities.

What type of quality assurance requirements do you have for emergency lights?

FP Quality Assurance - emergency lighting is under this program.

V. OPERABILITY ISSUES

What type of operability requirements do you have for emergency lights?

No LCO - Handled like any corrective maintenance activity.

Do you have any reportability requirements for emergency lights?

When it was discovered that the emergency lighting did not meet the design basis as specified in FSAR, the following actions were taken: (1 hr.) notification of NRC, followed with LER. Performed JCO and established fire watches in areas where a fire could initiate the manual actions that were not illuminated by emergency lights.

VI. TRAINING ISSUES

How do you train operators on actions for a fire outside the control room?

Annual basis which involves
a) walkdown (timed),
b) classroom.

What documents contain operator actions outside the control room?

AOP - 6 "Fire"

EMERGENCY LIGHTING REVIEW
UTILITY SURVEY 7

I. DESIGN ISSUES

How did you determine where emergency lights were to be installed (Appendix R and others)?

The following was reviewed for an Appendix R evaluation:

1. Those locations in the main control room that are required for safe shutdown in response to a fire outside the main control room.
2. Those locations remote from the main control room that are required for safe shutdown in response to a main control room fire.
3. Those egress areas from the main control room to the remote control locations.

Normal emergency lighting is backed up by the emergency diesels and supplies about 15% of normal plant lighting. In addition, 1 1/2 hour battery packs are provided for egress from the plant.

Once locations were identified, did you take into account environmental (temp, humidity, etc.) concerns?

No, since all locations are within environmentally controlled areas - no exterior lighting for Appendix R.

Do you maintain battery sizing calculations for your emergency lighting units?

No.

Did you install your emergency lights to meet certain illumination levels? If not, what was your acceptance criteria?

Yes. For Appendix R lighting:

1. Egress areas meet NFPA 101, i.e., not less than 1 foot candle.

2. Panel areas shall have "sufficient" (not necessarily 10 foot candles) lighting to perform the required operator actions in response to a fire that requires the initiation of reactor safe shutdown. The lighting levels are determined empirically from tests.

Normal emergency lighting is included as (~ 15%) part of the normal lighting which is used to meet various illumination levels depending on the area (~ 20-30 foot candles).

What type of emergency lights do you utilize in your plant(s)?

For Appendix R:

1. Main control room: the emergency diesel generator supplied lighting can be annually transferred to the critical 8 hour DC batteries.

2. Egress areas have 8 hour battery packs.

3. Remote locations have 8 hour battery packs.

Incandescent, fluorescent, HID (mercury vapor, & 10% tungsten halogen)

II. MAINTENANCE ISSUES

What is included in your preventive maintenance program with respect to your emergency lighting (i.e., placement, electrolyte, discharge test)?

Discharge test, illumination, general condition.

ppm 10.25.63

Do you trend any of the data collected? If so, what is trended, what is it used for, and what have you found (failure rates)?

No.

How often do you test your emergency lights? What type of test do you perform? Do you perform any maintenance or special charging prior to testing?

Annually for lighting installed for Appendix R.

Discharge test, visual inspection, battery level.

None.

III. CONFIGURATION MANAGEMENT ISSUES

Do you review your placement and illumination levels when installing a design modification?

Only when adding safe shutdown equipment.

Do you have specific engineering studies that support your lighting placement? Do you update these documents?

No.

IV. QA ISSUES

Do you have any special qualifications for QA/QC inspectors reviewing/performing fire protection activities? Any special training?

No.

What type of quality assurance requirements do you have for emergency lights?

None. Commercial grade.

V. OPERABILITY ISSUES

What type of operability requirements do you have for emergency lights?

Do you have any reportability requirements for emergency lights?

VI. TRAINING ISSUES

How do you train operators on actions for a fire outside the control room?

Covered by normal emergency procedures per GL86-10.

What documents contain operator actions outside the control room?

For a fire outside the control room - existing emergency procedures symptomatical.

EMERGENCY LIGHTING REVIEW
UTILITY SURVEY 8

(Only contacted for reportability, compensatory action issues)

I. DESIGN ISSUES

How did you determine where emergency lights were to be installed (Appendix R and others)?

N/A

Once locations were identified, did you take into account environmental (temp, humidity, etc.) concerns?

N/A

Do you maintain battery sizing calculations for your emergency lighting units?

N/A

Did you install your emergency lights to meet certain illumination levels? If not, what was your acceptance criteria?

N/A

What type of emergency lights do you utilize in your plant(s)?

N/A

II. MAINTENANCE ISSUES.

What is included in your preventive maintenance program with respect to your emergency lighting (i.e., placement, electrolyte, discharge test)?

N/A

Do you trend any of the data collected? If so, what is trended, what is it used for, and what have you found (failure rates)?

N/A

How often do you test your emergency lights? What type of test do you perform? Do you perform any maintenance or special charging prior to testing?

N/A

III. CONFIGURATION MANAGEMENT ISSUES

Do you review your placement and illumination levels when installing a design modification?

N/A

Do you have specific engineering studies that support your lighting placement? Do you update these documents?

N/A

IV. QA ISSUES

Do you have any special qualifications for QA/QC inspectors reviewing/performing fire protection activities? Any special training?

N/A

What type of quality assurance requirements do you have for emergency lights?

N/A

V. OPERABILITY ISSUES

What type of operability requirements do you have for emergency lights?

This utility has the GL 86-10 license condition. The FSAR for the utility in turn contains Fire Protection Operability Requirements. The operability requirements for emergency lighting are:
- - - with one more more operable lights,
1) restore within 24 hrs
2) verify action can be lit without the inop. light
3) require operations personnel to carry hand held units

Plant almost always opts for choice 3.

Do you have any reportability requirements for emergency lights?

No specific reporting

VI. TRAINING ISSUES

How do you train operators on actions for a fire outside the control room?

N/A

What documents contain operator actions outside the control room?

N/A .

1989 PVNGS Plant Change Package (PCP) 50.59 Report

PCP Number	Description	Summary
84-01-FH-007	This PCP added two ninety-degree elbow fittings to the 1/4" and 3/8" pneumatic hoses to the CEA handling and cutting tools to eliminate bending/kinking of the plastic air lines. This condition impaired the operability of the 4- and 12-finger CEA handling tools and the CEA cutter tool (MZCNV01, MXCNV02, and MZCNV10, respectively).	This PCP did not introduce an unreviewed safety question. The change is a minor modification to the air connection only and improves the operability of the fuel handling tools. No other equipment or system is affected.
84-03-LO-002	This change was previously reported for Units 1 and 2 in the 1988 50.59 report.	
85-01-AF-036 85-02-AF-036	This PCP changed the Auxiliary Feedwater (AFW) pumps sealing system from packing to mechanical seals.	This PCP did not introduce an unreviewed safety question. The pump manufacturer offers a choice of either a packing or a mechanical sealing system. Both are qualified and acceptable to the manufacturer. Bypass leakage is reduced through use of the mechanical sealing system.
85-01-CH-037	This change raised the lo-lo level switch setpoint of the boric acid concentrator flash tank to 4% from 0%. Due to loop error and dead band the 0% lo-lo level setpoint could not be maintained.	This change did not introduce an unreviewed safety question. The change was to process equipment only and did not affect any safety related or important to safety equipment. The increased setpoint will enhance system reliability by more realisticly reflecting instrumentation accuracy.
85-01-FH-018	This PCP replaced the existing clevis on the spent fuel handling machine hoist with a longer clevis. This change was made to ensure UFSAR compliance.	This PCP did not introduce an unreveiwed safety question. The change ensures that the minimum water coverage of 9' over the spent fuel assemblies is met.
85-01-RC-045	This change removed pipe support 13-RC-018-H-013 from the pressurizer spray line. The support was interfering with the thermal expansion of the line.	This change did not introduce an unreviewed safety question. The removal of the support was necessary to allow thermal expansion of the piping without inducing additional pipe stress. The pipe support was reviewed and found to be adequate without the support present.
85-01-RJ-041	This change added jumpers wires to the core monitoring	This change did not introduce an unreviewed safety question.

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1989 PVNGS Plant Change Package (PCP) 50.59 Report

PCP Number	Description	Summary
	computer to ensure CEA up/down counter pulses and rod bottom contact signals are available to the plant monitoring computer.	Neither the core monitoring computer nor the plant monitoring computer are safety related or important to safety. The addition of the jumper wires will ensure the any time the CEA input card for the core monitoring computer is removed the signal for CEA position will still be supplied to the plant monitoring system computer. This change makes the two computer systems independent and provides the operator with redundant CEA position indication for plant control.
85-02-AS-021 85-03-AS-021	This change added a tail piece to auxiliary steam ASN-PSV-334 to direct its discharge away from areas in which personnel may be present.	This change did not introduce an unreveiwed safety question. The addition of the tailpiece to the auxiliary steam system relief valve improves personnel safety and does not affect any safety related or important to safety equipment.
85-02-QA-018 85-03-QA-018	This change added six electrical outlets in the radwaste control room for frisking station, computer equipment, and clock.	This change did not introduce an unreviewed safety question. The receptacles do not interface with any safety related or important to safety equipment.
85-03-HF-017	This change eliminates an alarm point from the plant computer data base. The alarm was deleted during a previous plant change but the computer data base was not changed.	This change did not introduce an unreviewed safety question. The removal of the alarm from the data base will eliminate a spurious alarm in the control room.
85-03-IA-008	This PCP separated the service air header from the existing Instrument Air System to allow the use of the Service Air System for breathing air purposes. A separate compressor was installed with associated air receivers, valves, and piping in the Service Air piping.	This PCP did not introduce an unreviewed safety question. This change does not affect plant normal operation, shutdown, or safe shutdown. Failure of the Service Air System does not render the Fire Protection Preaction Sprinkler System or the hydrogen recombiners inoperable. There are no connections to other quality-related systems. This PCP is complete with the exceptions of W/Os 315720 and 315721, the installation and calibration of the CO2 and oxygen sensors, respectively. The system may safely operate for service air, but not for breathing air purposes.

1989 PVNGS Plant Change Package (PCP) 50.59 Report

PCP Number	Description	Summary
85-03-PK-015	This change modified the alarm circuits of the battery chargers to prevent nuisance alarms in the control room.	This change did not introduce an unreviewed safety question. The alarm circuit does not affect operation of the battery chargers. The reduction in nuisance alarms in the control room will better enable operators to focus on plant operation.
85-03-SG-044	This change was previously reported for Units 1 and 2 in the 1988 50.59 report.	
85-03-SG-067	This change was previously reported for Units 1 and 2 in the 1988 50.59 report.	
85-AO-AS-019	This change rerouted the drain from the auxiliary boiler steam drum water level guage to a new steam drain hub. The purpose of the change was to move the drain away from the boiler operators location.	This change did not introduce an unreviewed safety question. Rerouting of the piping in the area of the auxiliary will not affect any equipment important to safety or safety related. The auxiliary boiler does not perform any part in safe shutdown of the unit or in mitigation of an accident. The change also improves personnel safety by removing the sight glass discharge away from the operator.
85-AO-SK-002	Safeguards	Safeguards
86-01-CH-030 86-03-CH-030	This change was previously reported for Unit 2 in the 1988 50.59 report.	
86-01-CH-030 86-03-CH-030	This change was previously reported for Unit 2 in the 1988 50.59 report.	
86-01-DG-012	The change spliced a cable in the lower cable spreading room to repair damage to the cable. The cable was for the Safety Equipment Status System (SESS) and was not maintaining continuity because of the damage. The splice reworked the cable to its original specifications.	This change did not introduce an unreviewed safety question. The splice was in control grade cabling and restore the accuracy of the indication. No safety related or important to safety systems were affected.

1989 PVNGS Plant Change Package (PCP) 50.59 Report

PCP Number	Description	Summary
86-01-MT-020	This PCP installed dowels to the Differential Expansion Detector (DXD) bracket at the high pressure turbine and updated the DXD assembly and control rotor clearances to the latest drawing revision per G.E. ECN T352-355. This change facilitates line-up of the bracket when removed and reinstalled.	This PCP did not introduce an unreviewed safety question. The turbine generator serves no safety function and has no safety design bases (UFSAR Section 10.2.1.1).
86-02-HJ-014 86-03-HJ-014	This PCP added an extractor fan in the machine room of Elevator No. 1 for each power block unit to comply with Elevator Code, ANSI Std. A17.1, Section 101.5(b).	This PCP did not introduce an unreviewed safety question. The change does not affect the functions of the power block or of the elevator machinery. The change does not affect important to safety equipment.
87-03-RC-041	This change was previously report for Units 1 and 2 in the 1988 50.59 report.	
88-03-SA-001	This PCP replaced MDR-style Potter & Brumfield BOP ESFAS relays K124, 147, 128, 202, 203, 204, 205, 225, 226, 227, 232, 233, 234, 235, and 236 in support of the B Train Diesel Generator operability declaration. This constitutes partial closure of the PCP.	This PCP did not introduce an unreviewed safety question. The new relays are a fit, form, and function replacement for the old style relays. The overall risk of existing design basis events or different design basis events is the same or lower because the unanalyzed failure mode of the original relays is removed (FSAR Chapter 15).

Site Modification 50.59 Report

Site Modification Number	Description	Safety Evaluation Summary
1,2,3-SM-EC-002	This modification changed the setpoint of the essential chiller refrigerant low temperature safety from 37 +/-3 degrees to 34 +/-1 degree. The purpose of the modification was to prevent low refrigerant temperature trips when the trip was not required for equipment protection.	This modification did not introduce an unreviewed safety question. The reduced trip setpoint provides equipment protection while improving equipment reliability by eliminating unecessary trips. The operation and safety function of the chiller is unaffected.
1,2,3-SM-QF-017	This modification installed cellular telephones in each unit, the Emergency Operations Facility, and the Technical Support Center. The purpose of the cellular phones was to augment the emergency communications system.	This modification did not introduce an unreviewed safety question. The cellular phones do not interface with any important to safety or safety related equipment. The use of cellular phones improves communication by providing a means of communication not connected to the site phone system.
1,2-SM-QK-001	This site modification replaced the two existing Honeywell model TC100C smoke detectors with Hochiki model SLG-24F photoelectric detectors for detectors AS1818 and AS1820 only, at the Spray Pond Pump House. This modification was performed to eliminate the need for a continuous fire watch due to spurious alarms caused by buildup of dust in the ionization smoke detectors.	This modification did not introduce an unreviewed safety question. The photoelectric detector senses combustion byproducts just as the ionization detector does. This change provides a more reliable system of fire detection.
1-SM-CD-002	This modification installed a lateral restraint on the suction head of the condensate pumps. The purpose of the restraint was to prevent cracking in the area where the suction column attaches to the discharge head. Cracking had been experienced in one of the Unit 1 pumps.	This modification did not introduce an unreviewed safety question. The change will improve the reliability of the condensate pumps. The condensate pumps are balance of plant equipment and do not perform any safety function.
1-SM-CD-006	This modification is the same as described for 2-SM-CD-011 except that a different model of upgraded valve was used. Description and summary are the same.	
1-SM-CM-003	This modification lowers the setpoint of the waste water holdup tank low level alarm to below the pump shutoff switch setpoint. Thus eliminating a nuisance alarm in the control	This modification did not introduce an unreviewed safety question. The change does not affect system operation and the system is not required for safe shutdown. This change

Site Modification 50.59 Report

Site Modification Number	Description	Safety Evaluation Summary
	room every time the tank is pumped down.	does not affect any other equipment important to safety or safety related.
1-SM-CP-002	This modification lowered the differential pressure setpoints of the containment purge air filtration unit alarms. The purpose of the change was to eliminate nuisance alarms in the control room. the original alarm setpoints were derived for a design containment purge air flow of 2200 cfm. The actual air flow is approximately 1100 cfm.	This modification did not introduce an unreviewed safety question. The purpose of the switches is to indicate a clogged filter or fan failure. The switches will perform that function with the new setpoints. The previous setpoints rendered the alarm unreliable. Thus the setpoint change restores the alarm to its intended function.
1-SM-CP-003	This modification added two 18" x 15" access panels in ductwork inside containment to provide maintenance access to valves J-CPA-UV-2B and J-CPB-UV-3A.	This modification did not introduce an unreviewed safety question. The access panels meet the same specifications as the duct into which they are installed and do not degrade its structural integrity. The panels do not interfere with the operation of any equipment important to safety or safety related.
1-SM-DG-008	This modification adds additional switches to the diesel generator control panel to allow emergency start testing of the diesel per Technical Specification 4.8.1.1.2.a.4.	This modification did not introduce an unreviewed safety question. The additional switches were installed in accordance with the original specifications for diesel generator wiring. Except during testing the switches do not affect the operation or function of the diesel. During testing the diesel would not start upon reciept of a loss of offsite power auto start signal. However, this time period is very short and does not constitute a significant increase in diesel generator inoperability.
1-SM-ED-010	This modification installed travel stops on the high energy drain lines which discharge into the condenser. The purpose of the travel stops is to prevent excessive flow from these valves from damaging condenser tubes. The travel stops limit flow to 110% of the design flow.	This modification did not introduce an unreviewed safety question. The modification only affects balance of plant equipment and minimizes the possibility of a condenser tube leak due to erosion and flow induced vibration.
1-SM-ED-011	This modification replaced the main turbine moisture	This modification did not introduce an unreviewed safety

Site Modification 50.59 Report

Site Modification Number	Description	Safety Evaluation Summary
	separator reheater drain tank manway gaskets with seal welded diaphragms to eliminated gasket leakage.	question. The drain tanks are balance of plant equipment and the modification did not affect plant operation. The seal welded diaphragms will perform an equivalent function to the gaskets with much less chance of leakage.
1-SM-NA-002	This site modification disabled Non-class IE 13.8 kV power system switchgear cooling fan alarms to reduce nuisance alarms in the control room until installation of air conditioning units with reliable annunciation.	This modification did not introduce an unreviewed safety question. Disabling the switchgear cooling fan alarms did not affect any safety related equipment.
1-SM-QH-002	This modification added a new anode bed and two new electrodes for cathodic protection of the diesel fuel storage tank.	This modification did not introduce an unreviewed safety question. The change improves the cathodic protection of the diesel fuel storage tank and does not affect operation of any system.
1-SM-SB-011	This modification installed 2 hz low pass filters in the RCS low flow channels. The purpose of the modification was to reduce the process noise in the channels to prevent spurious low flow pretrips and trips.	This modification did not introduce an unreviewed safety question. The change did not affect the channel function and the overall response time of the channel is still below that assumed in the safety analysis. The addition of the filters will prevent spurious pretrips and trips.
1-SM-SQ-029	This modification changed the checksource circuitry of the BETA scintillation detectors in the radiation monitoring system to eliminate a ground loop.	This modification did not introduce an unreviewed safety question. The modification does not affect any of the circuits required for the monitor to perform its function of detecting radiation and providing an output at its high alarm setpoint.
1-SM-ZT-004	This modification replaced existing solid doors in the turbine building with doors with integral windows. The purpose of the replacement was to prevent personnel collosions in high traffic areas.	This modification did not introduce an unreviewed safety question. The new doors are located in the turbine building which houses no safety related or important to safety equipment. The new doors will perform the same function as the old doors but with the added convience of personnel being able to check for other personnel on the other side of the door prior to opening it.

Site Modification 50.59 Report

Site Modification Number	Description	Safety Evaluation Summary
2,3-SM-DG-007	This modification renames annunciator windows to correspond to the relay titles which cause the alarms and to use the same nomenclature as the main control board legends.	This modification did not introduce an unreveiwed safety question. The changes made were to engraving on annunciator windows to assist the operator in determining the cause of the annunciator. No changes were made to system operation.
2,3-SM-DG-018	This modification reoriented the diesel generator starting air compressor relief valves from the horizontal to vertical position. The purpose of the modification was to improve the valves reliability by prevention of crud buildup in the seating area.	This modification did not introduce an unreviewed safety question. The relief valves are part of the diesel generator starting air compressor which is not safety related or important to safety. The reorientation of the valves does not impact system operation or performance and should result in improved lifetime and reliability of the valves.
2,3-SM-RM-015	This site modification changed alarm setpoints for Control Room Panel B07. The RCP alarm and trip setpoints were the same, which did not allow any margin of time for operator response. Also, the main turbine and feedwater pump setpoints are a source of nuisance alarms.	This modification did not introduce an unreviewed safety question. The recorders, and their associated alarm setpoints, do not serve a safety related function. Plant protection system setpoints are independent of these recorder alarm setpoints, thus this modification would have no impact on safe shutdown.
2,3-SM-SI-025	This site modification revised the limit switch (rotor 1) setting of ECCS throttle valves 13J-SIC-HV-321 and 13J-SID-HV-331 to allow approximately 600 gpm flow through the valves. This change allows sufficient valve stroke for the operator to manually throttle these valves at 2 to 3 hours into the LOCA scenario, balancing the hot and cold leg flows, instead of relying on the automatic function of the limit switch arrangement.	This modification did not introduce an unreviewed safety question. This change affects only the type of operation of the flow control valve. The repositioned limit switch still performs the pump runout protection function. The new design meets the original design intent and total pump flow is not reduced since system resistance is not decreased.
2,3-SM-ZA-002	This modification relocates an existing ladder in the auxiliary building between elevation 88' and 104' at column lines A4 and A7 to conform to OSHA 29 CFR 1910.27(c)(6) safety requirements.	This modification did not introduce an unreviewed safety question. The relocation of the ladder had no affect on safety related or important to safety systems.

Site Modification 50.59 Report

Site Modification Number	Description	Safety Evaluation Summary
2-SM-CD-011	This modification changed out the throttle valves used to fill and pressurize the condensate and feedwater systems. The original valves were 6" diameter globe valves rated at 300 pounds, the replacement valves are 2" diameter globe valves rated at 1500 pounds. The previously installed valves had a history of failure and mechanical problems. The new valves will withstand the service conditions and greatly exceeds the specifications of the originally installed valves.	This modification did not introduce an unreviewed safety question. The valve replacement was evaluated by Engineering and the new valve exceeded all the requirements for the intended service. The valves are located in balance of plant systems which do not affect safety related or important to safety systems or components.
2-SM-DG-019	This modification added hour meters to record the run time of diesel generator starting air compressors. The purpose of the modification is to track maintenance intervals.	This modification did not introduce an unreviewed safety question. The diesel generator starting air compressors are not safety related or important to safety equipment. The addition of the run time meter will allow accurate scheduling of maintenance interval to ensure equipment reliability.
2-SM-EC-002	This modification changed the setpoint of the essential chiller low refrigerant safety switch to 34 +/-1 degrees from 37 +/-3 degrees. The purpose of the change was to eliminate unecessary trips on low refrigerant temperature.	This modification did not introduce an unreviewed safety question. The new trip setpoint will provide the same equipment protection and will improve the reliability of the essential chiller by eliminating unnecessary trips.
2-SM-NG-001	This site modification replaced a length of Non-class IE 480V power switchgear cable (between two manholes) that was exhibiting grounding and spliced the replacement cable to the existing end connections.	This modification did not introduce an unreviewed safety question. The replacement cable caused no change in system configuration and, except for the splices, introduced no modifications from the original installation.
2-SM-NH-002	This site modification replaced discontinued G.E. ground fault relays and their associated components with available Westinghouse components in MCC buckets dedicated for supplying non-class 1E 480 VAC power to welding receptacles for cooling water pumps used for ILRT tests.	This modification did not introduce an unreviewed safety question. The change does not alter the design function to provide ground fault interruption in the event of equipment failure.

Site Modification 50.59 Report

Site Modification Number	Description	Safety Evaluation Summary
2-SM-SI-011	This site modification added approximately one foot of 3/8" stainless steel tubing into the tops of the pipe caps for vent valves PS1AV080, PS1AV083, PS1BV091, PS1BV093, PS1BV825, PS1BV824, PS1AV836, PS1BV837, PS1AV833, PS1AV866, PS1BV834, and PS1BV867. This modification was performed to eliminate a contamination problem due to the position of the vent lines.	This modification did not introduce an unreviewed safety question. The additional weight added does not affect system operability and the changes are made to the piping downstream of the block valve which is outside the system pressure boundary.
2-SM-SQ-031	This site modification rerouted the 24 VDC power supply at the flow transducers for radiation monitors 13-SQN-RU-142, -144, and 13-SQB-146 by bypassing the input to the inverter board in the electronic enclosure.	This modification did not introduce an unreviewed safety question. The change does not affect the design functions of the monitors except to allow them to operate through their fully designed ranges.
2-SM-SV-002	This modification changed the circuit cards in the Vibration and Loose Parts Monitoring System to eliminate excessive spurious alarms.	This modification did not introduce an unreviewed safety question. The system is not safety related or important to safety and the changes to the cards do not affect the ability of the system to perform its intended function.
2-SM-ZM-002	This modification provided removable handrails and notched some "I" beams in the main steam support structure. The purpose of the modification was to provide access for maintenance on the main steam and feedwater isolation valves.	This modification did not introduce an unreviewed safety question. The beams were evaluated and determined to be acceptable for their design loading with the notches. Thus the function of the beams was unaffected. The removable handrail will also perform its function.
3-SM-FH-009	This site modification changed the setpoints of the hoist load weighing system on the refueling machine from those established for initial fuel loading under dry conditions to those applicable to refueling under flooded conditions to account for the buoyant forces of the flooded fuel pool.	This modification did not introduce an unreviewed safety question. The change in setpoints brought the hoist load weighing system into conformance with normal operating conditions and introduced no change in system configuration, design, or function.
3-SM-HJ-001	This site modification installed a balancing volume damper and diffuser plate in the HVAC supply duct Train B in the Control Room to correct excessive noise levels from the exit	This modification did not introduce an unreviewed safety question. Seismic analysis was performed to evaluate the addition of the damper (CCN#4 to Calculation No.

Site Modification 50.59 Report

Site Modification Number	Description	Safety Evaluation Summary
	of high velocity air as noted in NRC Inspection Report 50-528/85-12. The change also provided increased cooling to the north cabinet area.	13-CC-ZS-010) and was found acceptable. The total design flow of air to the Control Room is not altered by this modification.
3-SM-IA-004	This site modification installed test connections on the instrument air dryers to confirm the design and determine if the dryers are performing in accordance with specifications. The site modification also installed intake silencers on each instrument air compressor.	This modification did not introduce an unreviewed safety question. This modification was performed due to excessive vibration and moisture in the instrument air lines and introduces no changes in safety related equipment or systems.
3-SM-MA-010	This modification increased the isophase bus cooling flow of the main generator vent ports to provide the design flow of 100 cfm. This was necessary to prevent overheating and premature aging of the main generator bushing gasket material.	This modification did not introduce an unreviewed safety question. The modification did not affect any safety related or important to safety components. The modification will improve the reliability of the isophase bus cooling system and main generator bushings.
3-SM-MB-001	This site modification interchanges two plant computer input connections (related to generator field temperature) to correct an as-constructed to the as-designed condition.	This modification did not introduce an unreviewed safety question. The modification brings the as-constructed plant condition into conformance with the as-designed plant condition and did not involve safety related equipment.
3-SM-NC-002	This site modification rewired wire terminations for flow switch 13JNCN-FSL0613 in order to cause valve J-CHB-UV-523 to close on loss of power. This is the desired position for this valve in a loss-of-power scenario.	This modification did not introduce an unreviewed safety question. The wiring change corrects the desired behavior of the switch and its associated valve in a loss-of-power situation. This change will not have impact on the mitigation of any accident.
3-SM-RC-013	This site modification changed the piping configuration from a socket weld to a butt weld configuration for the RCP seal pressure sensing lines. This weld configuration allows for greater pipe flexibility, and less mass and stress concentration.	This modification did not introduce an unreviewed safety question. The new piping configuration will improve its ability to withstand the vibrations to which it will be subjected.
3-SM-RJ-018	This modification eliminated computer point QFYS1 from the	This modification did not introduce an unreviewed safety

Site Modification 50.59 Report

Site Modification Number	Description	Safety Evaluation Summary
	Unit 3 data base. This point identification is applicable only to Unit 1.	question. This was a software change only to remove an unused data point from the Unit 3 computer data base.
3-SM-RJ-019	This site modification revised the Core Operating Limit Supervisory System (COLSS) package running on the Plant Monitoring System (PMS) through implementation of the CCIP/TMIP upgrades, correction of typos in the PMS COLSS line printer reports, removal of obsolete/useless coding, and making the first four elements of the data base array for radial peaking factors (AB1) addressable. The change removed two Block F two-element arrays from the list of addressable constants to make room for the four AB1 array elements.	This modification did not introduce an unreviewed safety question. The COLSS software program is not required for plant safety since it only monitors information and does not initiate any direct safety-related function.
3-SM-SG-007	This site modification installed Rosemont 1151GP-9 transmitters to replace Foxboro E11GM-ISAE2-ELSP to bring Unit 3 into conformance with Units 1 and 2.	This modification did not introduce an unreviewed safety question. The transmitters provide the main steam pressure input to the steam bypass control system. They are not safety-related and do not provide input to a plant safety system.
3-SM-SI-007	This modification changed the bolting material and gasket material for the bottom cover plate of valves SIHV657 and SIHV658. The purpose of the change was to replace the bolting material with a material more readily available and to replace the originally specified asbestos gasket material with one which did not present a health hazard.	This modification did not introduce an unreviewed safety question. An engineering evaluation was performed which determined the replacement materials would meet or exceed the original material specifications.
3-SM-SP-008	This modification raised the spray pond high level alarm from 14'-2.4" to 14'-8" to allow clearing of the alarm during normal operation.	This modification did not introduce an unreviewed safety question. The new high level alarm setpoint is within the bounds of the analysis performed for the spray pond. The higher level allowed with the new alarm setpoint provides more water for a heat sink. The new setpoint will prevent nuisance alarms in the control room when no actual detrimental condition exists.

Site Modification 50.59 Report

Site Modification Number	Description	Safety Evaluation Summary
3-SM-SP-009	This site modification installed syphon breakers on the Essential Spray Pond (ESP) filter pump piping in order to prevent draining of the ESP to below a T/S minimum level in the case of filter pump line breakage. This is due to the fact that the filter pump piping is below the T/S minimum elevation (corresponding to a T/S volume) and is not seismically qualified. The syphon breaker is a 2" stainless steel line attached to each filter pump's suction line.	This modification did not introduce an unreviewed safety question. The modification will improve the reliability and availability of the ESP. Further, the change did not impact any portion of the ESP system which was important to safety.
3-SM-SV-004	This site modification incorporated several wiring changes in the Loose Parts and Vibration Monitoring System. The purpose of the wiring changes was to ensure wiring consistent with vendor supplied documentation. It also provided wiring consistent among PVNGS units. In addition, the changes cleared a false alarm associated with the system.	This modification did not introduce an unreviewed safety question. The wiring changes were necessary to ensure a configuration consistent with vendor documentation. The Loose Parts and Vibration Monitoring System provides no equipment control function, therefore, these changes will not affect the system's function in mitigating the consequences of an accident.
3-SM-XM-002	This modification added supports to reactor coolant system and safety injection system vent and drain lines. The modification also removed blind flanges and replaced them pipe caps to minimize the "overhung" weight and the potential for piping/weld failure due to vibration.	This modification did not introduce an unreviewed safety question. Although the lines meet code requirements without modification, minimizing the unsupported weight and adding new supports will reduce the probability of vibration induced failure. This in turn will reduce the possibility of leakage from the RCS.
3-SM-ZC-008	This modification added safety cages to the equipment hatch platform ladders. The purpose of the cages was to improve personnel safety.	This modification did not introduce an unreviewed safety question. The safety cage was installed as a Seismic Category 9 structure. This means the cage was evaluated as not having a detrimental affect on important to safety or safety related equipment in the event of an earthquake. The cage does not affect the operation of any system or component.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
1-88-HA-069	This temporary modification replaced the existing Alnor flow switch (1J-HAN-FSL-0129) with a McDonnell & Miller sail switch to energize the heaters for the 140' elevation Auxiliary Building. Alnor does not provide spare parts and no longer manufactures this flow switch.	This temporary modification did not introduce an unreviewed safety question. The flow switch, the associated duct work and the duct heaters are all "S" class. Failure of the "S" class systems does not change the safety design bases (UFSAR Chapter 9.4.2.1).
1-88-NG-059	This temporary modification supplied temporary non-Class 1E 480 VAC power to load center AENGNL48 from AENGNL45D2 to provide power during the outage of bus 1ENAPNS06.	This temporary modification did not introduce an unreviewed safety question. The change affects only the non-Class 1E 480 VAC power system referenced in UFSAR Section 8.3.1.1.1 and does not affect any safety related equipment per UFSAR Section 3.2.1.
1-88-SV-067	This temporary modification raised alarm setpoint 01KSVNYSH-0005A to greater than 0.5 ft-lbs to reduce false alarms caused by channel 5 loose parts.	This temporary modification did not introduce an unreviewed safety question. VLMS does not perform any control functions and does not interface with any safety system or component.
1-89-AR-046	This temporary modification installed heat tracing circuitry, controllers, insulation and associated hardware on process sampling line RU-141 to eliminate excessive moisture found in RU-141 and particulate and iodine filters.	This temporary modification did not introduce an unreviewed safety question. The modification brings RU-141 back into conformance with specification 997-505 and increases its reliability. The margin of safety is increased by eliminating moisture and ensuring the ability to obtain more representative dry samples.
1-89-CH-045	This temporary modification defeated the charging pump low lube oil pressure alarm.	This temporary modification did not introduce an unreviewed safety question. The function of the alarm can be accomplished by visual inspection of the local pressure indicator. The alarm is not described in the Technical Specifications and is not required for charging pump operability.
1-89-CP-076	This temporary modification removed the manual actuator handwheel, lockwasher, and hex nut from the operator	This temporary modification did not introduce an unreviewed safety question. Removal of the handwheels

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	assembly on containment isolation valves CPA-UV4A/4B and CPB-UV5A/5B. Seismic qualification of the manual actuator handwheel was not performed during the design process.	does not affect the safety-related function of the valves. The valves are actuated by pneumatic operators during normal operation. Removal of the handwheels also ensures that the manual operators cannot be engaged during normal operation, and restores the actuators to the seismicly qualified configuration.
1-89-FW-73	This temporary modification installed four Impro seals as replacements for the existing oil deflectors to eliminate oil leak from the main feedwater pump inboard bearing housings.	This temporary modification did not introduce an unreviewed safety question. The operation of the feedwater system is not altered by this change. The feedwater system is not required for safe shutdown.
1-89-IA-077	This temporary modification installed a backup compressed gas bottle with regulator, relief valve, and tubing tied in at 1PIANVOOH. The purpose of this modification was to provide an N2 supply to maintain pressure to keep the transfer canal gate seal inflated if check valves or piping failed during the planned Instrument Air System outage.	This temporary modification did not introduce an unreviewed safety question. The Instrument Air System is not required for safe shutdown. Substitution of N2 for instrument air creates no possibility of a malfunction/accident different from types previously considered (FSAR 9.3.1., 15A.55).
1-89-MA-053	This temporary modification added a digital fault recorder to monitor SSO relay behavior by recording key analog variables in the SSO relay signal processing circuitry. This modification is a restart requirement from the March 1989 SSO trip of Unit 3.	This temporary modification did not introduce an unreviewed safety question. Neither the digital fault recorder nor the SSO is safety-related.
1-89-MA-079	This temporary modification changed the voltage input signal for the Torsional Vibration Monitoring System (TVMS) simulation data by substituting Vab generator voltage for Vca for Channel #16 in the Digital Fault Recorder (DFR). The purpose of the 079 modification was to exploit the possibility of eventual TVMS function replacement by DFR-collected data for better TVMS analysis.	This temporary modification did not introduce an unreviewed safety question. Changing the DFR input voltage for Channel #16 does not otherwise alter the DFR configuration as installed in 1-89-MA-053. Neither the SSO nor the digital fault recorder are safety-related.
1-89-NA-002	This temporary modification provided non class 1E 13.8kv	This temporary modification did not introduce an

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	power from 1E-NAN-S06J to non class 1E loads normally fed from 1E-NAN-S05J during an outage of 1E-NAN-S05.	unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NA-003	This temporary modification provided 13.8kv non class 1E power from 1E-NAN-S05K to the loads off 1E-NAN-S06J/S06B during an outage of 1E-NAN-S05.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NA-003	This temporary modification provided non class 1E power from a portable diesel generator to non class 1E equipment AE-NGN-L47 during an outage of 1E-NAN-S05.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NG-006	This temporary modification provided 480v non class 1E power from 1E-NGN-L10B3 to non class 1E loads off 1E-NGN-L03kD2 during an outage of 1E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NG-014	This temporary modification provided temporary non class 1E 480VAC power to 1-E-NHN-M0401 from 1-E-NGN-L0904 during an outage of 1-E-NAN-S02.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
1-89-NG-015	This temporary modification provided temporary non class 1E power from load center 1ENGNL03D4 to motor control center supply bus 1E NHN-M2801 during the outage of the normal supply bus E-NAN-S02.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Sect. 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
1-89-NG-019	This temporary modification provided non class 1E power from 1-E-NGN-L01E4 to 1-E-NGN-L18 during an outage of 1-E-NAN-S02.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NG-024	This temporary modification provided non class 1E 480v power from NGN-L43 to NGN-L44 during an outage of 1-E-NAN-S05.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NG-025	This temporary modification provided 480v non class 1E power from NGN-L44 to NGN-L43 during an outage of 1-E-NAN-S06.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NG-050	This temporary modification provided 480VAC non class 1E power from 1-E-NGN-L1402 to loads off of 1-E-NGN-L1502 during an outage of 1-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
1-89-NG-068	This temporary modification provided a temporary power supply from 1E-NGN-L09B3 to 1E-NGN-L04C2 to operate Cask Handling Crane 1M-ZFN-602 during the power outage on 1-E-NGN-L04.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1 It does not affect safety-related equipment per UFSAR Section 3.2.1.
1-89-NG-083	This temporary modification provided temporary power from Non-Class 1ENNGNL0502 to Non-Class bus 1ENHNM5001 during an outage on bus 1ENANS02.	This temporary modification did not introduce an unreviewed safety question. No safety related power systems or safety related equipment was affected by this change. The modification was evaluted by engineering for personnel and equipment protection.
1-89-NG-085	This temporary modification provided temporary power from 1ENGNL01E4 to load center bus 1ENGNL18 during an outage of normal supply bus 1ENANS02.	This temporary modification did not introduce an unreviewed safety question. This change only affected Non-Class 1E electrical power (referenced in Section 8.3.1.1.1 of UFSAR), temporarily feeding Non-Safety related equipment. Engineering evaluated the change with respect to safety of personnel and equipment and downstream breaker considerations.
1-89-NG-110	This temporary modification provided 480VAC non class 1E power from 1-E-NGN-L10D4 to 1-ENGN-L17 during an outage of 1-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NH-003	This temporary modification provided 480VAC non class 1E power from NHN-M0426 to a vendor skid mounted control panel to support decontamination activities for the Unit 1 and 3 outages.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
1-89-NH-008	This temporary modification provided 480VAC non class 1E power from 1-E-NHN-M5001 to 1-E-NHN-M0301 during an outage of 1-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NH-009	This temporary modification provided non class 1E power (480/120VAC) to non class 1E equipment off 1-E-NHN-M1716A and D1733/34 during an outage of 1-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NH-011	This temporary modification provided 120VAC non class 1E power from NHN-D2015 to loads off of 1-E-NHN-D1009 during an outage of 1-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NH-013	This temporary modification provided non class 1E power from 1-E-NHN-M1421 to loads off 1-E-NHN-M2708 during an outage of 1-ENAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NH-016	This temporary modification installed temporary cable to provide 480VAC non-Class 1E power from E-NHN-M0301 to 1E-NHN-M5001 to supply various specified loads of E-NHH-M50 during the 1ENANS02 bus outage.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
1-89-NH-017	This temporary modification provided temporary non-Class 1E power from "space" cubicle 1ENHNM0708 to output lugs of non-Class 1E cubicle 1ENHNM2214 to maintain power to battery charger E-NKN-H18 during the outage of normal supply bus 1ENANS02.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
1-89-NH-018	This temporary modification provided temporary 480V and 120V construction power to loads of 1ENHN-M3002 and NHN-D3010 to supply N2 pumps GAN-P01A and B and associated control panel during the outage of the NAN-S02 bus.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
1-89-NH-020	This temporary modification provided temporary 480V non-Class 1E power from cubicle E-NHN-M2517 to cubicle E-NHN-M2602 to maintain access control area normal AHU fan M-HAN-A02.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
1-89-NH-049	This temporary modification provided non class 1E power from 1-E-NHN-M7115 to loads off of 1-E-NHN-M1317 durng an outage of 1-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NH-054	This temporary modification provided non class 1E power from 1-E-NHN-M7107 to 1-E-NHN-M1318 during an outage of 1-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NH-056	This temporary modification provided 120VAC non class 1E	This temporary modification did not introduce an

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	power from 1-E-NHN-D19 to 1-E-NHN-D15 during an outage of 1-E-NAN-S01.	unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety.
1-89-NH-070	This temporary modification provided non class 1E power to non class 1E equipment (refueling purge outlet damper 1MCPNM05A) during an outage of 1-E-NAN-S02.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
1-89-NH-071	This temporary modification provided power from non class 1E panel 1ENHND20 52-21 to non class 1E panel 1ENHND10 52-12 during an electrical bus maintenance outage.	This temporary modification did not introduce an unreviewed safety question. The modification affects no safety related equipment per UFSAR Section 3.2.1 or safety related power systems per UFSAR Section 8.3.1.1.1. Consideration was made for the safety of personnel and equipment based upon ground fault protection and downstream breaker coordination.
1-89-NH-082	This temporary modification provided temporary non-class power from 1ENHNM0708 to load 1ENHN2214 during outage of supply bus 1ENANS02.	This temporary modification did not introduce an unreviewed safety question. This change affected no safety related power systems nor safety related equipment. The change was evaluated for safety of personnel and equipment based upon ground fault protection and downstream breaker coordination.
1-89-NH-084	This temporary modification provided temporary Non-Class power form 1ENHNM2517 to loads fed from Non-Class 1ENHNM2602.	This temporary modification did not introduce an unreviewed safety question. This change did not affect any safety related equipment or safety related power systems. Engineering evaluated the change with respect to personnel safety, equipment protection, and downstream breaker coordination.
1-89-PH-033	This temporary modification installed cable from E-NHN-M1001	This temporary modification did not introduce an

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	to the input terminal of E-PHB-M3425 to provide temporary non-Class 1E 480VAC power to Class 1E Battery Charger E-PKB-H16. Power was supplied to maintain functional use only of E-PKB-H16 in support of plant maintenance activities during the outage of normal supply bus E-PBB-S04.	unreviewed safety question. The change provides temporary non-Class 1E power to Class 1E equipment and aids the functional operations of the plant during refueling Mode 6. Operability of safety systems is maintained as specified in Technical Specification 3.8.1.2; no procedural changes are required as opposite train and offsite power are available. The probability of an accident as previously evaluated in UFSAR Chapter 15 is decreased as this modification increases Control Room monitoring parameters while in Mode 6.
1-89-PH-034	This temporary modification installed cable from E-NHN-H1001 to E-PHB-M3626. The purpose was to supply temporary non-Class 1E 480VAC power to maintain "functional use" of Vital Distribution Panel E-PNB-V26 to support plant maintenance activities during the outage of normal supply bus E-PBB-S04.	This temporary modification did not introduce an unreviewed safety question. The change provides temporary non-Class 1E power to Class 1E equipment and aids the functional operations of the plant during refueling Mode 6. Operability of safety systems is maintained as specified in Technical Specification 3.8.1.2; no procedural changes are required as opposite train and offsite power are available. The probability of an accident as previously evaluated in UFSAR Chapter 15 is decreased as this modification increases Control Room monitoring parameters while in Mode 6.
1-89-PH-042	This temporary modification provided temporary power to Non-Class equipment off 1EPHAD3123 from a local receptacle to support outage of its normal supply bus 1EPBAS03.	This temporary modification did not introduce an unreviewed safety question. This change provided temporary electrical power to Non-Class equipment needed to support plant conditions during the outage time of the associated Class 1E power supply.
1-89-PH-043	This temporary modification provided non class 1E 480v power from a construction source to loads off 1-E-PHB-M3628B, M3827, and M3406 to maintain "functional use only" of class equipment SQND08, SQBRU145, and RE146.	This temporary modification did not introduce an unreviewed safety question. The class 1E equipment affected by this modification was declared inoperable while this modification was installed, and was restored to their normal power source prior to being declared

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
		operable. Consideration was made for personnel and equipment safety based upon ground fault protection and downstream breaker coordination.
1-89-PK-061	This temporary modification provided electrical jumpers around battery cells 8 and 9 in 1EPKDF14 due to inservice cell failure. The battery will now have 58 versus 60 cells in service.	This temporary modification did not introduce an unreviewed safety question. Engineering Evaluation Report (EER 89-PK-042) identifies that at the design four hour discharge rate, loss of two cells will not decrease the battery capacity below 102%, which is greater than the 80% capacity required by the Technical Specifications.
1-89-QB-027	This temporary modification provided power from Non-Class 1ENGNLO3B3 to Non-Class 1E equipment 1EQBNDJ91 during outage of supply bus 1EPGAS03 to maintain essential, emergency lighting and fire protection panels.	This temporary modification did not introduce an unreviewed safety question. This change only affects Non-Class 1E electrical power referenced in Section 8.3.1.1.1 of UFSAR, temporarily feeding Non-Safety related equipment. Consideration was made for personnel safety, equipment safety, and downstream breaker coordination.
1-89-QB-029	This temporary modification installed cables from NGN-L053B to the input bus of essential lighting panel E-QBN-D90 to provided temporary 480 VAC non-Class 1E power during the outage of supply bus PGB-S04.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
1-89-QB-030	This temporary modification provided non class 1E 480v construction power to class equipment (lighting voltage regulator) off 1-E-PHB-M3217 during an outage of 1-E-PBB-S04.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this modification was declared inoperable while the modification was installed, and was returned to the normal power source prior to being declared operable.
1-89-SG-036	This temporary modification installed "t" connections and valves in place of the elbows in the air supply lines to the atmospheric dump valve (ADV) pneumatic piston actuator. The purpose of the modification was to allow monitoring of the	This temporary modification did not introduce an unreviewed safety question. The "t" connections and valves installed met the same specifications as the elbows they replaced. The installation did not affect

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	force required to open the ADV.	operability of the ADV or increase the probability of its failure to perform its safety function.
1-89-SG-037	This temporary modification is the same as 1-89-SG-036 except is installed on a different atmospheric dump valve.	
1-89-SG-038	This temporary modification is the same as described for 1-89-SG-036 except it is installed on a different atmospheric dump valve.	
1-89-SG-039	This temporary modification replaced two existing tubing elbows with two tees and two manual shut-off valves on the operator for valve 1JSGAHV0179. The purpose was to add connections to measure differential pressure across the atmospheric dump valve operator.	This temporary modification did not introduce an unreviewed safety question. No changes to process or control functions have been made (UFSAR Sections 7.4.1.1.7 and 10.3.2.2.4). The probability of failure for the tee and valve is the same as for the existing tubing, fittings, and valves.
1-89-SP-026	This temporary modification connected a temporary tank to the hypochlorite metering pump suction to provide for use of the hypochlorite injection system during the relocation of the permanent tank from underground to above ground.	This temporary modification did not introduce an unreviewed safety question. Procedures 410P-1SP01 and 02 were appropriately modified to accommodate this change. Any excess chlorine is evaporated by the spray ponds in spray mode. This modification ties in to the normal suction header and uses the normal pumps and piping system to add hypochlorite to the ponds. Full polyspheres are not postulated as tornado-generated missiles,and when empty, they fall within the envelope of the existing analysis (13-NS-108). Malfunctions of the spray pond pumps or other safety-related equipment are not affected by the change.
1-89-SP-059	This temporary modification added a sulfuric acid injection system consisting of tank, metering pumps, piping, and supports for pH control in spray ponds "A" and "B."	This temporary modification did not introduce an unreviewed safety question. This modification improves pH control of the spray ponds per Technical Specification 6.8.4.f. Tank volume is less than in the previously

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
		existing system, which reduces accident consequences to less than those for the original design. The modification is within the bounds of existing tornado and postulated missile analyses. The tank support is designed to not topple in the 2g SSE per seismic response spectra in Vol. IV of the Design Criteria Manual. Tank fragments in the pond would not interfere with PUMP NPSH.
1-89-SQ-064	This temporary modification energized heat tracing in monitor RE-0142 to keep piping heated while in standby, thus preventing condensation on initial startup.	This temporary modification did not introduce an unreviewed safety question. This modification increases the reliability of RE-0142 by eliminating moisture and ensuring a more representative sample for analysis.
1-89-SQ-091	This temporary modification insulated the housing on detector 1JSQNRU0141 from plant ground by wrapping the detector housing with a single layer of Scotch 33 electrical tape at all points where detector housing contacts grounded material and added additional tape under the screw clamp of the detector to ensure that the clamp does not ground the detector. The isolated detector housing was connected to signal ground. This modification was carried out to reduce spurious high readings on the detector channel(s).	This temporary modification did not introduce an unreviewed safety question. There is no effect on the operation of the detectors under either normal or accident conditions. This change reduces susceptibility of the monitor to spurious high readings.
1-89-SS-047	This temporary modification installed in Unit 1 is described and summarized as temporary modification 3-89-SS-042.	
1-89-TC-078	This temporary modification installed local temperature indicators for motor bearings and electrically disconnected the motor space heater and oil immersion heater at motor 1MTCNP01A. The temporary replacement motor to 1MTCNP01A was not an exact replacement and ancillaries incompatible with PVNGS design could not be connected.	This temporary modification did not introduce an unreviewed safety question. The change affects only ancillary devices and their hook-up, not the operation of the motor itself. Turbine water cooling system motors are not equipment important to safety.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
2-88-SC-017	This temporary modification added temporary power and A/C to panel 2JSCNE01 to prevent overheating and dirt accumulation.	This temporary modification did not introduce an unreviewed safety question. The change involves only non-Class 1E 480 VAC power as referenced in UFSAR Section 8.3.1.1.1. It does not affect any safety related equipment per UFSAR Section 3.2.1. Per Section 10.4.6.3, there is no safety basis for the Condensate Demineralizer.
2-88-SC-017	This temporary modification installed in Unit 2 is described in temporary modification description 3-88-SC-015.	
2-88-SQ-23	This temporary modification added a heating blanket on the RU-141 process inlet (from condenser stack to RU-141 inlet valve on 176' elevation of the Turbine Building).	This temporary modification did not introduce an unreviewed safety question. The change reduces moisture and increases reliability of sampling.
2-89-AF-051	This temporary modification replaced the ASTM 316 stainless stem subcomponent in valve 2JAFBHV031 with a stem of ASTM-479 Grade 410 (heat treated) material.	This temporary modification did not introduce an unreviewed safety question. The material change was discussed with the vendor and was evaluated by Engineering as having no impact and as being acceptable for this application. There is no impact on the Auxiliary Feedwater System as described in FSAR 10.4.9. As there is no change to the design intent, there is no impact to any accident analysis.
2-89-AF-053	This temporary modification replaced the ASTM 316 stainless stem subcomponent in valve 2JAFBHV030 with a stem of ASTM-479 Grade 410 (heat-treated) material.	This temporary modification did not introduce an unreviewed safety question. The material change was discussed with the vendor and was evaluated by Engineering as having no impact and as being acceptable for this application. There is no impact on the Auxiliary Feedwater System as described in FSAR 10.4.9. As there is no change to the design intent, there is no impact to any accident analysis or to single-failure criteria bounding the worst case scenario for this stem.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
2-89-CD-009	This temporary modification removed a spool piece containing a leaking valve (CDNHV252) from the condensate system and replaced it with blind flanges until the valve could be repaired.	This temporary modification did not introduce an unreviewed safety question. The installation of the blind flanges allowed the system to function with the spool piece and valve removed. The valve's function is to bypass a pressure regulating valve and it is not normally required to be operated. Neither the valve nor the condensate system perform any safety related or important to safety function.
2-89-CP-045	This temporary modification installed shear pins between the movable thrust collar and the stationary bottom covers for both 42" CP Containment Isolation Valves of both penetrations. This modification was performed to ensure operability of the valves in Modes 1 - 4 by preventing opening of the valves and by ensuring that the disks remain properly aligned.	This temporary modification did not introduce an unreviewed safety question. This modification ensures performance of the safety functions of the valves during a design basis accident (UFSAR Chapter 15) and ensures that the valves will not be operated while this temporary modification is installed. Pressure integrity of the valves is unaffected.
2-89-HC-037	This temporary modification installed a blind flange at the discharge of cooling fan 2MHCNA01B for the 2MHCNA01A ACU to function to cool the Steam Generator #1 bay.	This temporary modification did not introduce an unreviewed safety question. The new structure added to the containment normal HVAC, as described in FSAR 9.4.6., is Seismic Category IX. This category precludes damage to other safety-related equipment. Containment normal cooling is not postulated to initiate any accident event (FSAR Chap. 15), nor is it required to provide any safety-related function (FSAR 9.4.6., 15). The modification does not affect the capacity of ACU-A to cool containment to maintain 120 F per Technical Specification basis 3.6.1.5.
2-89-IA-044	This temporary modification installed a Beta sequence of events recorder and associated cables to monitor relays and pressure switches on breathing air compressor 2MIANC02. .The purpose of this modification was to gather data to determine	This temporary modification did not introduce any unreviewed safety question. The breathing air system is not important to safety and is not covered in the FSAR.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	the cause of low lube oil tripping of the compressor. 2MIANC02 had tripped numerous times on low lube oil pressure but troubleshooting after the trips did not uncover any abnormalities.	
2-89-MA-041	This temporary modification changed the voltage input signal for Torsional Vibration Monitoring System (TVMS) simulation data by substituting Vab generator voltage for Vca for Channel #16 in the Digital Fault Recorder (DFR). The purpose of the C41 modification was to exploit the possibility of eventual TVMS function replacement by DFR-collected data for better TVMS analysis.	This temporary modification did not introduce an unreviewed safety question. Changing the DFR input voltage for Channel #16 did not otherwise alter the DFR configuration as installed in 2-89-MA-017. Neither the DFR nor the SSO are safety-related.
2-89-NA-036	This temporary modification installed a jumper to defeat a non-safety alarm (NA72) which was caused by the new line-up of the 13.8kv electrical system. To prevent a loss of the main generator from affecting more than two reactor coolant pumps, two reactor coolant pumps were being powered from off-site power and two were being powered from the main generator. This alignment caused alarm (NA72) to be in an alarm state continuously. To eliminate the false annunciator indication the alarm was jumpered out.	This temporary modification did not introduce an unreviewed safety question. The modification involved the alarm annunciator for non class 1E power systems. Defeating the alarm eliminates an unnecessary alarm in the control room and does not affect system operation.
2-89-PK-001	This temporary modification jumpered out damaged cell #20 of 2EPKDF14 by installing 3/0 cables between cells 19 and 21.	This temporary modification did not introduce an unreviewed safety question. Calculations performed in EER 89-PK-002 indicate that at the design two-hour discharge rate, loss of one cell does not decrease battery capacity below that recorded in the acceptance test. This is above the 80% required by the technical specifications.
2-89-RR-025	This temporary modification provided a temporary link from the RRACS computer to a microcomputer with graphics capability to allow trend graphs of ALARA and dose related data.	This temporary modification did not introduce an unreviewed safety question. RRACS is not safety related or important to safety equipment. This modification provided enhanced capability to monitor the RRACS data and

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
		interpret it.
2-89-SB-027	This temporary modification provided a fixed position (fully withdrawn) input to Control Element Assembly Calculator #2 for Control Element Assembly #9, a shutdown CEA. A dummy signal was provided on rod 9 to indicate fully withdrawn position to compensate for defective rod position transmitter 2J-SFC-ZT-0009B. COLSS addressable constant NKEOL4 was changed to 0.135 to reserve adequate DNBR margin and compensate for the RSPT inoperability.	This temporary modification did not introduce an unreviewed safety question. The penalty applied to COLSS addresseable constant EPOL4 assures necessary redundancy in the protective function of CEAC #2. The COLSS margin requirements have been conservatively evaluated to accommodate the limiting safety event of full length CEA drop. Technical specification requirements for operator action following this event have already been evaluated to be adequate. If COLSS is out of service (above 20% power), CEAC #2 will be declared inoperable and required actions as defined in the technical specifications will be taken.
2-89-SE-046	This temporary modification added a jumper wire across the normally closed operate contact for each linear power subchannel input at the Linear Calibrate Switch (3 locations on switch). The purpose of this modification was to allow power operation without the potential of a unit trip due to excessive contact resistance of the switch in the operate position.	This temporary modification did not introduce an unreviewed safety question. Normal (operate position) mode is unaffected, and the use of built-in test instrumentation or electronics operation (CESSAR/FSAR 14.2.12.1.27/9, UFSAR Table 14.2-1/1) is not prevented. Installation of the jumper wire ensures the availability of a signal from the excore detector to the Plant Protection System and Core Protection Calculator during their Operational Modes requirements (Technical Specification 3/4.3). The margin of safety is improved by the reduction in the possibility of a loss of detector signal (Technical Specification Bases 3/4.2, 3/4.3, Amendment 28).
2-89-SE-047	This temporary modification is the same as modification 2-89-SE-046.	
2-89-SE-048	This temporary modification is the same as modification 2-89-SE-046.	

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
2-89-SE-049	This temporary modification is the same as modification 2-89-SE-046.	
2-89-SG-011	This temporary modification is the same as 1-89-SG-036 except it is installed on one of the Unit 2 atmospheric dump valves.	
2-89-SG-012	This temporary modification is the same as 1-89-SG-036 except it is performed on one of the Unit 2 atmospheric dump valves.	
2-89-SG-013	This temporary modification is the same as 1-89-SG-036 except it is performed on one of the Unit 2 atmospheric dump valves.	
2-89-SG-014	This temporary modification is the same as 1-89-SG-036 except it is performed on an atmospheric dump valve in Unit 2.	
2-89-SQ-002	This temporary modification added heat tracing to the process sample line of the condenser off gas radiation monitor RU-141. The purpose of the heat tracing was to prevent condensation in the sample line and assure a representative sample was delivered to the monitor.	This temporary modification did not introduce an unreviewed safety question. The heat tracing did not affect the function of the radiation monitor except to ensure a representative dry sample of the condenser off gas was recieved at the monitor. The heat tracing was powered from non class 1E power and affected no safety related or important to safety or safety related systems.
2-89-SQ-004	This temporary modification isolated the detector housings of radiation monitor RU-141 from the plant ground and connected them to the signal ground to reduce the spurious high readings.	This temporary modification did not introduce an unreviewed safety question. The modification did not affect the calibration or operation of the radiation monitor. The modification is intended to reduce the radiation monitors susceptiblity to spurious high readings thereby reducing the probability of equipment malfunction.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
2-89-SQ-005	This temporary modification isolated the detector housings of radiation monitor RU-143 from the plant ground and connected them to the signal ground to reduce spurious high readings.	This temporary modification did not introduce an unreviewed safety question. The relocation of the ground did not affect the operation or calibration of the detector as described in UFSAR Sections 11.5.2.1.1.7 and 11.5.2.1.6.2. The new ground will reduce the radiation monitors susceptibility to spurious high readings thereby reducing the probability of equipment malfunction.
2-89-SQ-024	This temporary modification changed the logic on heat tracing RE-0142 to maintain it in a continuously energized condition. The purpose of the modification was to minimize moisture in the associated radiation monitor sample line.	This temporary modification did not introduce an unreviewed safety question. The change did not affect operation of the radiation monitor or equipment required for safe shutdown. Continuously energizing the heat tracing will produce a more reliable radiation monitor indication by minimizing the moisture in sample line.
2-89-SQ-026	This temporary modification installed heat tracing circuits on the process sample, supply, and return lines for RU-142 to ensure that sample temperature remains above the dew point. This change was made to prevent condensate from collecting in the particulate and iodine filter chambers and the gas sample chamber of RU-142. The power supply for the heat tracing is independent from the power supply for the PASP Grab Sample Cart.	This temporary modification did not introduce an unreviewed safety question. Installation of heat tracing circuitry increases the reliability of RE-0142 to obtain representative samples by eliminating moisture.
2-89-SS-016	This temporary modification installed in Unit 2 is described and summarized in temporary modification 3-89-SS-042.	
3-88-CM-022	This temporary modification added a reinforcing plate to the acid inlet nozzle of the chemical waste neutralizing tank.	This temporary modification did not introduce an unreviewed safety question. The chemical waste neutralizing tank performs no important to safety or safety related function. The addition of the reinforcing plate will improve system reliability and has no detrimental affects.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
3-88-CW-018	This temporary modification replaced the stainless steel drive shaft in cooling tower fan 3MCWNA02M with a carbon fiber drive shaft to eliminate starting imbalance problems caused by shaft growth induced by direct sunlight.	This temporary modification did not introduce an unreviewed safety question. The carbon fiber drive shaft has a coefficient of thermal expansion that is essentially zero. The new drive shaft is identical in dimension, installation, and operation to the stainless steel shaft. There are no changes to the operation, response, or reaction of the CW System to plant conditions. The system has no safety design basis, is not required for safe shutdown, and does not interface with important to safety systems.
3-88-MA-010	This temporary modification utilized a window air conditioning unit to provide ducting for closed loop cooling circulation through the main transformer control cabinet to reduce internal temperature.	This temporary modification did not introduce an unreviewed safety question. The system is non-safety related. The added cooling increases system reliability and reduces generation downtime caused by nuisance trips of overload relays and breakers.
3-88-QF-017	This temporary modification lifted field input connectors C01-P01, -P05, -P07, -P10, -P12, and C02-P04, -P07, -P10, and P14 from the input/output card file backplanes in cooling tower #3's remote multiplexer, 3ENGNQ03. This modification was performed to minimize tripping of main feeder breakers and cooling tower fans because of erroneous signals from the multiplexer.	This temporary modification did not introduce an unreviewed safety question. Local control of cooling tower fans is available, rather than remote control, during the modification. The Circulating Water System has no safety function as defined by FSAR Section 10.4.5.1.1. The plant multiplexer system is not evaluated in the FSAR.
3-88-SC-014	This temporary modification installed a threaded sch. 40 carbon steel spool piece including associated fittings in place of damaged condensate demineralizer acid dilution water flow meter 3-J-SCN-FISL-0244. Spare parts or replacement flow meter were not available.	This temporary modification did not introduce an unreviewed safety question. The installation of the spool piece allows regeneration of the demineralizers for power ascension. The affected portions of the Condensate Clean Up System have no safety function (FSAR Section 10.4.6.1). No quality-related structures, components, or systems are impacted.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
3-88-SC-015	This temporary modification installed A/C on panel 3JSCNE01 to avoid dirt accumulation and overheating of circuit boards.	This temporary modification did not introduce an unreviewed safety question. The change involves only non-Class 1E 480 VAC power as referenced in UFSAR Section 8.3.1.1.1. It does not affect any safety-related equipment per UFSAR Section 3.2.1. As referenced in UFSAR Section 10.4.6.3, the condensate demineralizer has no safety basis.
3-88-SC-015	This temporary modification installed an air conditioning unit for panel 3JSCNE01. The purpose of the modification was to avoid overheating of circuit boards and accumulation of dirt if doors are left open for cooling.	This temporary modification did not introduce an unreviewed safety question. The condensate demineralizer panel in which the air conditioning unit was installed is balance of plant equipment which performs no important to safety or safety related function. The power supply for the air conditioning unit was non class 1E and affected no class 1E power systems.
3-88-SQ-021	This temporary modification installed heat tracing and insulation on the process sample lines, supply, and return for RU-141 to maintain sample flow temperature above the dew point. This modification was implemented to eliminate moisture which prevented the proper monitoring of the condenser/gland seal exhaust prior to atmospheric release.	This temporary modification did not introduce an unreviewed safety question. This change enhances the ability to obtain representative samples of condenser off-gas. The modification is external to RU-141 and does not change its function.
3-89-AF-112	This temporary modification replaced the ASTM 316 stainless stem subcomponent in valve 3JAFBHV030 with a stem of ASTM-479 Grade 410 (heat treated) material.	This temporary modification did not introduce an unreviewed safety question. The material change was discussed by the vendor and evaluated by Engineering as having no impact and as being acceptable for this application. There is no impact on the Auxiliary Feedwater System as described in FSAR 10.4.9. As this change did not introduce a change in design intent, there is no impact to any accident analysis or to single-failure criteria bounding the worst case scenario for this stem.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
3-89-AF-123	This temporary modification installed an additional recirculation flowpath for 3MAFA-P01 to eliminate pressure pulsations during mimimum recirculation flow operation.	This temporary modification did not introduce an unreviewed safety question. Engineering evaluated the modification and determined it did not affect safety related requirements of the auxiliary feedwater pump.
3-89-AR-041	This temporary modification installed heat tracing circuitry, controllers, insulation, and associated hardware on process sampling line RU-141 to eliminate excessive moisture found in RU-141 and particulate and iodine filters.	This temporary modification did not introduce an unreviewed safety question. The modification brings RU-141 back into conformance with specification 997-505 and increases the reliability of RU-141 and the margin of safety by eliminating moisture and ensuring more representative dry samples.
3-89-CH-100	This temporary modification replaced a drain valve on the boric acid concentrator concentrate transfer pump with a pipe cap. The purpose of the modification was to temporarily replace a leaking valve until a replacement could be procured.	This temporary modification did not introduce an unreviewed safety question. The pipe cap performs the function of the valve and has the same pressure rating. Use of the pipe cap in place of the leaking valve will minimize contamination and liquid radwaste. The boric acid concentrator performs no safety related or important to safety function.
3-89-CP-057	This temporary modification installed jumpers to defeat the intelocks of 3MCPNM02A, M02B, M05A, and M05B. The purpose of the modification is to allow containment purge system operation during an outage of the "A" train electrical bus.	This temporary modification did not introduce an unreviewed safety question. The modification was only allowed to be installed during the time containment integrity was not required (i.e. modes 5 and 6 with no movement of fuel allowed).
3-89-CP-074	This temporary modification wired shut damper CPN-M05-A to prevent short cycling of the exhaust air when only one containment purge fan is running. The modification was necessary due to a class bus outage which would not allow correct positioning of the damper.	This temporary modification did not introduce an unreviewed safety question. The modification was only allowed to be installed when containment integrity was not required (i.e. Modes 5 and 6 when no fuel movement is taking place).
3-89-CP-096	This temporary modification removed the manual actuator	This temporary modification did not introduce an

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	handwheel, lockwasher, and hex nut from the operator assembly on containment isolation valves CPA-UV4A/4B and CPB-UV5A/5B. Seismic qualification of the manual actuator handwheel had not been performed in the design process.	unreviewed safety question. Removal of the handwheel does not affect the performance of the safety-related portion of the pneumatic operator during normal operation. It ensures that the manual operator cannot be engaged during normal operation, and restores the actuator to the "as-tested" configuration.
3-89-FH-086	This temporary modification added a jumper and handswitch across the contacts of the containment side fuel transfer upender horizontal limit switch. The limit switch had failed and could not be replaced due to plant conditions.	This temporary modification did not introduce an unreviewed safety question. The limit switch and the upender are not referenced in the basis of Technical Specification 3/4.9.6 "Refueling Machine" or any of the other subsections of 3/4.9 "Refueling Operations." The fuel transfer equipment will be operated in accordance with its design, except that a visual verification of upender horizontal positioning will be performed and the failed limit switch bypassed.
3-89-FP-009	This temporary modification spliced cables 3EFP03NC1RE and 3EFP03NC1RA to a temporary cable to provide continued power and control to and from 3-J-FPN-E04C for equipment functionality during the implementation of 3-SM-ZR-003.	This temporary modification did not introduce an unreviewed safety question. The equipment affected is not declared operable during the duration of the TMR installation. The cable reroute avoids the work area and maintains the same electrical continuity as the original design.
3-89-FP-015	This temporary modification spliced additional cable for power and control to 3-J-FPN-E04C to maintain the equipment functional during installation of site modification 3-SM-ZR-003.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this modification was declared inoperable while the modification was installed.
3-89-FP-016	This temporary modification spliced additional cable for power and control to 3-J-FPN-E01C to maintain the equipment functional during installation of Site Modification 3-SM-ZR-003.	This temporary modification did not introduce an unreviewed safety question. The equipment was functional but was declared inoperable while this temporary modification was installed.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
3-89-FW-048	This temporary modification installed a new type of oil seal on the inboard bearing housing of the main feedwater pumps. The purpose of the new seal was to eliminate oil leakage associated with the previous seal design.	This temporary modification did not introduce an unreviewed safety question. The new seal meets the same specifications and will perform the same function as the previously installed seal. The change does not affect pump performance or reliability. The main feedwater pumps are not required for safe shutdown or mitigation of the consequences of an accident.
3-89-IA-039	This temporary modification provided an alternate cooling water supply to the instrument air compressors during a turbine cooling water system outage.	This temporary modification did not introduce an unreviewed safety question. The instrument air system is not important to safety. The modification did not affect any important to safety or safety related systems or components.
3-89-IA-060	This temporary modification provided an air supply line downstream of containment isolation valve IAA-UV002 during an "A" train electrical outage. The purpose of the modification was to maintain the air supply to containment for maintenance and opertions with valve IAA-UV002 closed due to being deenergized.	This temporary modification did not introduce an unreviewed safety question. During the time period this modification was installed the containment isolation valve IAA-UV002 was declared inoperable and the appropriate action statements of the technical specifications complied with.
3-89-IA-102	This temporary modification provided a flow path for testing of the nitrogen backup to the instrument air system. The purpose of the testing was to verify the nitrogen backup to the instrument air system would maintain system pressure during a loss of the normal instrument air supply.	This temporary modification did not introduce an unreviewed safety question. The instrument air system does not perform an important to safety or safety related function. The modification only provides a flow path such that design flow rates can be achieved during testing and does not affect other systems or components. The testing will verify wether the back up nitrogen system will perform its design basis function. This information is needed to assure reliable performance of the system.
3-89-MA-017	This temporary modification installed jumpers across PBA-X contacts to eliminate off/on cycling of cooling fans and	This temporary modification did not introduce an unreviewed safety question. PBA is not addressed in the

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	pumps.	FSAR. This change increases system reliability and does not affect safety-related or important-to-safety components.
3-89-MA-054	This temporary modification installed a digital fault recorder on the main generator subsynchronous resonance protection relay. The purpose of the modification was to provide diagnostic information on the operation of the relay.	This temporary modification did not introduce an unreviewed safety question. The digital fault recorder did not affect operation of installed plant equipment. The subsynchronous protection relay is for equipment protection of the main turbine and generator and does not affect safety related or important to safety systems.
3-89-MA-099	This temporary modification changed the voltage input signal for Torsional Vibration Monitoring System (TVMS) simulation data by substituting Vab generator voltage for Vca for Channel #16 on the Digital Fault Recorder (DFR). The purpose of the 099 modification was to exploit the possibility of eventual TVMS function replacement by DFR-collected data for better TVMS analysis.	This temporary modification did not introduce an unreviewed safety question. Changing the DFR input voltage for Channel #16 did not otherwise alter the DFR configuration as installed in 3-89-MA-054. Neither the DFR nor the SSO are safety-related.
3-89-NA-058	This temporary modification installed pneumatic jumpers around the solenoid valves for dampers 3M-HAA-M01 through M06. The jumper allowed operation of the normal Auxiliary Building Ventilation during "A" train DC bus outages.	This temporary modification did not introduce an unreviewed safety question. This modification was only allowed to be installed when the ESF Pump Room Clean Up System was not required to be operable per the Technical Specifications (i.e. Modes 5 and 6).
3-89-NG-001	This temporary modification provided non class 1E power from 3-E-NGN-L10B3 to 3-E-NGN-W02 during an outage of 3-E-NGN-L03D2.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
3-89-NG-002	This temporary modification provided non class power from NGN-L10D4 to NGN-l17B2 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
		this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
3-89-NG-007	This temporary modification installed conductor from output lugs of NGN-L01E4 to the main load center bus of NGN-L18. The purpose was to provide non-Class 1E 480 VAC power to NGN-L18B4A normal lighting and convenience outlets during the outage of normal supply bus NAN-S02.	This temporary modification did not introduce an unreviewed safety question. The electrical hookup is to non safety-related equipment not regulated by Technical Specifications. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
3-89-NG-019	This temporary modification provided 480v non class 1E power from NGN-L08B3 to NGN-L01C3 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
3-89-NG-025	This temporary modification provided 480v non class 1E power from 3-E-NGN-L09D4 to 3-E-NHN-M0401 during an outage of 3-E-NAN-S02	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
3-89-NG-068	This temporary modification provided 480v non class 1E power from 3-E-NGN-L14C2 to 3-E-NGN-L15D2 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
3-89-NG-069	This temporary modification provided non class 1E power from 3-E-NGN-L08 to 3-E-NGN-L01 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
3-89-NG-079	This temporary modification provided 480v non class 1E power to 3E-NGN-L01E2 and L01E3 from 3E-NGN-L08E3, during an outage of 3E-NAN-S01.	The temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
3-89-NG-082	This temporary modification installed cable from 3ENGNL13C4/convenience source to service/breathing air compressor M-IAN-C02 and to E-NGN-L023B and 3ENHND0214 to provide temporary non-Class 1E 480V/120V power and control functions during the outage of normal supply bus 3ENANS02.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
3-89-NG-091	This temporary modification provided power to the main turbine turning gear oil pump during a maintenance outage of 3E-NAN-S02. The modification was necessary to complete main turbine lube oil flushes during the bus outage.	This temporary modification did not introduce an unreviewed safety question. No safety related or important to safety power systems or components were affected by the modification.
3-89-NH-003	This temporary modification provided temporary power to 3-E-NHN-M1344B from 3-E-NHN-M7115 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker.
3-89-NH-004	This temporary modification provided temporary power to	This temporary modification did not introduce an

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	3-ENHN-1511 from 3-E-NHN-M7115 during an outage of 3-E-NAN-S01.	unreviewed safety question. The equipment affected by this modification in not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
3-89-NH-004	This temporary modification provided temporary power to 3-E-NHN-M1511 from 3-E-NHN-M7115 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker.
3-89-NH-005	This temporary modification provided non class 1E power to non class 1E panel 3-E-NHN-I22A during an electrical bus maintenance outage.	This temporary modification did not introduce an unreviewed safety question. The modification does not affect any equipment important to safety and does not degrade the reliability of the non class 1E electrical system.
3-89-NH-008	This temporary modification provided non class 1E power to non class 1E points 3-ENHN-I09D and 3-E-NHN-I22D during an outage of bus 3-E-NAN-S03.	This temporary modification did not introduce an unreviewed safety question. The temporary power was supplied between two non class 1E power sources and did not affect important to safety equipment or systems.
3-89-NH-014	This temporary modification supplied temporary power to 3-M-FPH-A01, 3-M-FPN-X01, and 3-E-NHN-D27 during the installation of Site Modification 3-SM-ZR-003.	This temporary modification did not introduce an unreviewed safety question. Fire watches are posted during during the TMR installation. The equipment is not operable with respect to the technical specifications while the TMR is installed. The temporary power is supplied for the functionality, not the operability of important to safety equipment.
3-89-NH-020	This temporary modification provided power from bus 3E-NHN-M5001 to bus 3E-NHN-M0301 during a maintenance outage	This temporary modification did not introduce an unreviewed safety question. The power connection was

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	of bus 3E-NAN-S01. The purpose of the modification was to supply power to the emergency diesel air start compressor.	between two non class 1E sources and did not affect any important to safety or safety related systems or components.
3-89-NH-022	This temporary modification provided temporary non class 1E 480v power to E-NHN=M2724 from E-NHN-M1432 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
3-89-NH-023	This temporary modification provided temporary non class 1E 120vac power to loads at D1316, D1103, and D2105 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
3-89-NH-026	This temporary modification installed cable from non-Class 1E 3E-NHN-M0301 to non-Class 1E 3E-NHN-M5001. This change provided 480 VAC power to supply various specified loads during the outage of normal supply bus 3ENANS02.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
3-89-NH-029	This temporary modification installed cable from either local convenience receptacles or the construction power panel to loads at D0201, D1016, and D2819 to support the outage of supply bus 3ENANS02. Power was supplied to instrument air dryer M-IAN-M01B, charging pump #1 packing lube system, and CHN-FISL-203 and 205.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
3-89-NH-030	This temporary modification provided power to 3-J-SSN-A01A, 3-J-RZN-C01, and 3-J-SSN-E022 from 3-ENHN-M1022 during an outage of 3-E-NAN-S03.	This temporary modification did not introduce an unreviewed safety question. The modification did not address any equipment important to safety or safety

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
		related. The temporary power used the safe breaker protection as the original design plus added protection for the temporary cable.
3-89-NH-043	This temporary modification provided non class 1E power to battery chargers 3-E-PKB-H16 and H12 to allow recharging of the class 1E batteries during an outage of the normal power supply.	This temporary modification did not introduce an unreviewed safety question. The class 1E portion of the system affected by this modification was declared inoperable while this modification was installed.
3-89-NH-067	This temporary modification installed in Unit 3 is identical to 1-89-NH-054.	
3-89-NH-070	This temporary modification provided temporary non class 1E 120vac control power for the fire protection system during the outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker.
3-89-NH-071	This temporary modification provided temporary non class 1E 480v power to E-NHN-M1530A from E-NHN-M1919 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker.
3-89-NH-076	This temporary modification provided temporary non class 1E 480vac power to 3-E-NAN-M1314D from 3-E-NHN-M7113 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker.
3-89-NH-078	This temporary modification supplied non class 1E power from	This temporary modification did not introduce an

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	buses 3E-NHN-M1917A and NHN-D1920 to buses 3E-NHN-M1312 and NHN-D1 511, respectively. The purpose of the modification was to support operation of the condensate transfer pump ASN-P01B during a preventive maintenance outage of 3-E-NAN-S01.	unreveiwed safety question. The temporary power connection was between two non class 1E sources and did not affect any important to safety or safety related equipment.
3-89-NH-078	This temporary modification provided temporary non class 1E power to 3-E-NHN-M1312 from 3-E-NHN-M1917 and to 3-E-NHN-D1511 from 3-E-NHN-D1920 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker.
3-89-NH-080	This temporary modification provided temporary non class 1E 480v power to 3-E-NHN-M2502 from 3-E-NHN-M2614 during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker.
3-89-NH-081	This temporary modification provided temporary non class 1E 120vac power to charging pump #3 packing seal lubricaton system from a convenience receptacle during an outage of 3-E-NAN-S01.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this temporary modification is not safety related or important to safety. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination. Additionally, the seal lube pump is not required for charging pump operability.
3-89-NH-083	This temporary modification installed conductors from E-NHN-M2515 to E-NHN-M2626 and from E-NHN-D2507 to E-NHN-D2604. The purpose was to provide temporary non-Class 1E 480 VAC power for auxiliary chiller panel WCN-E07 and 120 VAC power to immersion heater WCN-E02 respectively, during	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	the outage of normal supply bus 3E-NAN-S02.	
3-89-NH-083	This temporary modification provided power from non class 1E sources 3ENHNM2517 and 3ENHND2507 to loads off non class 1E panels 3ENHNM2626 and 3ENHND2604 during an electrical bus maintenance outage.	This temporary modification did not introduce an unreviewed safety question. No safety related equipment per UFSAR Section 3.2.1 or safety related power systems per UFSAR Section 8.3.1.1.1 were affected by this modification. Personnel and equipment safety were considered based upon ground fault protection and downstream breaker corrdination.
3-89-NH-084	This temporary modification provided non-Class 1E 480/120 VAC power from 3E-NHN-M2009 and D2011/13 to specified loads fed from 3ENHNM1028, M1012, and D1005/D1007 during the outage of supply bus 3E-NAN-S02.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
3-89-NH-089	This temporary modification installed cable from panel 3E-NHN-M2515 to ENHN-M2602 to provide temporary 480V non-Class 1E power for containment access area normal AHU fan HAN-A02 during the outage of supply bus 3ENANS02.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
3-89-NH-092	This temporary modification provided temporary power between non class 1E panels NHN-D2508 and NHN-D2617 during an electrical bus maintenance outage.	This temporary modification did not introduce an unreviewed safety question. No safety related power systems per UFSAR Section 8.3.1.1.1 or safety related equipment per UFSAR Section 3.2.1 are affected by this modification. Consideration was given for personnel and equipment safety and downstream breaker coordination.
3-89-NH-093	This temporary modification installed cable from 3ENHNM012 to 3ENHNM0617 and from 3ENHNM0125A to 3ENHNM0608 to provide temporary power to Turbine Building Maintenance Facility Machine Shop AHU fans M-HSN-A03 and M-HSN-A04, respectively.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
3-89-NH-094	This temporary modification provided electrical power between two non class 1E power systems. The purpose of the modification was to provide power to plant equipment during an electrical bus maintenance outage.	This temporary modification did not introduce an unreviewed safety question. The change did not affect any components or systems important to safety. Personnel safety and equipment protection were considered for ground fault protection and down stream breaker protection.
3-89-PK-044	This temporary modification bypassed DC motor control center 3EPKBM42, which was out of service for cleaning, to recharge the class 1E batteries associated with the bus.	This temporary modification did not introduce an unreviewed safety question. The equipment affected by this modification was declared inoperable while the modification was installed.
3-89-PK-045	This temporary modification bypassed a DC motor control center (MCC) that was out of service for cleaning to allow recharging the batteries connected to the MCC.	This temporary modification did not introduce an unreviewed safety question. The modification was installed only while the equipment was inoperable, and was restored prior to the equipment being declared operable.
3-89-PK-107	This temporary modification electrically jumpered out Cell 21 of 125V DC Battery E-PKC-F13 by installation of 2 pairs of 3/0 AWG cable between Cells 20 and 22 and removal of intercell connectors for Cell 21. The purpose of this modification was to correct for a misaligned separator between the last two plates (end plates) of Cell 21, which caused inadequate separation between a positive and a negative plate. This misalignment could have resulted in premature failure of the cell due to internal shorting.	This temporary modification did not introduce an unreviewed safety question. Sufficient voltage still exists to support previously evaluated conditions. Voltage levels required by Calculations 13-EC-PK-161 and 13-EC-PK-202 are not impacted.
3-89-PK-121	This temporary modification jumpered out cell 40 of 3EPKDF14. The cell had a 3/4" crack on top cell cover and jumpering out was recommended by the vendor (Exide).	This temporary modification did not introduce an unreviewed safety question. Engineering evaluated this change and determined that the safety related function of the battery was not affected and the battery would perform in accordance with design calculations 13-EC-PK-161 and 13-EC-PK-202.

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
3-89-PW-085	This temporary modification installed a blind flange on the pressure side of 3NCN-E01A nuclear cooling water heat exchanger return line to permit maintenance on the plant cooling water system. The other nuclear cooling water heat exchanger was still in service to perform its design function.	This temporary modification did not introduce an unreviewed safety question. Neither the plant cooling water or nuclear cooling water systems are safety related, important to safety, or required to support any important to safety or safety related equipment operability.
3-89-QB-012	This temporary modification provided power to essential lighting panel QBN-D91 from NGN-L0383 during an outage of PGA-L3503.	This temporary modification did not introduce an unreviewed safety question. The modification only affected non class 1E power temporarily feeding non safety related equipment. Consideration of personnel and equipment safety was made based upon ground fault protection and downstream breaker coordination.
3-89-QB-013	This temporary modification provided non class 1E power to QBN-D90 from NGN-L05B3 during an outage of PGB-L36D4.	This temporary modification did not introduce an unreviewed safety question. The modification only provided non class 1E power to equipment which was not safety related or important to safety.
3-89-QB-046	This temporary modification provided non class 1E 480v power froma welding receptacle to class 1E equipment off 3-E-PHB-M3217 during an outage of 3-E-PBB-S04.	This temporary modification did not introduce an unreviewed safety question. The class 1E equipment affected by this modification was declared inoperable while this modification was installed and the appropriate action to the Technical Specifications complied with.
3-89-QB-051	This temporary modification provided non class 1E 480v power from a welding receptacle to class 1E equipment off 3EQBAV01 during an outage of 3-E-PBA-S03.	This temporary modification did not introduce an unreviewed safety question. The class 1E equipment normally supplied from 3EQBAV01 was declared inoperable during the time the modification was installed. The temporary power was supplied to provide the control room with supplemental indication during the bus outage.
3-89-SE-114	This modification added a jumper wire across the normally	This temporary modification did not introduce an

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	closed contact of the "A" channel linear calibrate switch. The purpose of the jumper is to ensure the actual excore detector signal is available to the Plant Protection System and Core Protection Calculator during operation and eliminate any contact resistance present in the switch.	unreviewed safety question. The purpose of the jumper was to eliminate the contact resistance present in the switch and ensure that the Plant Protection System and Core Protection Calculators recieve accurate and reliable linear power level indication. This reduces the possibility of spurious plant trips due to contacts in the switch and does not change the function or design basis of the equipment.
3-89-SE-115	This temporary modification added a jumper across the operate contact of the linear calibrate switch of each linear calibrate subchannel.	This temporary modification did not introduce an unreviewed safety question. This temporary modification ensures that an accurate signal is present from the excore detector to the processing electronics. The jumper eliminates the potential of high resistance in the switch contacts providing a false signal of linear power.
3-89-SE-116	This temporary modification added a jumper wire across the normally closed contact of the channel "C" linear calibrate switch. The purpose of the jumper is to ensure that the excore detector signal is available to the Plant Protection System and Core Protection Calculator during operation and eliminate any contact resistance present in the switch.	This temporary modification did not introduce an unreviewed safety question. The purpose of the jumper was to eliminate the contact resistance present in the switch and ensure that the Plant Protection System and Core Protection Calculators receive accurate and reliable linear power level indication. This reduces the possibility of spurious plant trips due to contacts in the switch and does not change the function or design basis of the equipment.
3-89-SE-117	This is the same modification as 3-89-SE-114 except it is performed on the channel "D" linear calibrate switch. See the description and summary of 3-89-SE-114.	
3-89-SG-103	This temporary modification replaced two existing tubing elbows with two tees and two manual shut-off valves on the operator for valve 3JSGBHV0178. The purpose was to add connections to measure differential pressure across the	This temporary modification did not introduce an unreviewed safety question. No changes to process or control functions have been made (UFSAR Sections 7.4.1.1.7 and 10.3.2.2.4). The probability of failure for the tee

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	atmospheric dump valve operator.	and valve is the same as for the existing tubing, fittings, and valves.
3-89-SG-104	This temporary modification replaced two existing tubing elbows with two tees and two manual shut-off valves on the operator for valve 3JSGAHV0179. The purpose was to add connections to measure differential pressure across the atmospheric dump valve operator.	This temporary modification did not introduce an unreviewed safety question. No changes to process or control functions have been made (UFSAR Sections 7.4.1.1.7 and 10.3.2.2.4). The probability of failure for the tee and valve is the same as for the existing tubing, fittings, and valves.
3-89-SG-105	This temporary modification replaced two existing tubing elbows with two tees and two manual shut-off valves on the operator for valve 3JSGAHV0184. The purpose was to add connections to measure differential pressure across the atmospheric dump valve operator.	This temporary modification did not introduce an unreviewed safety question. No changes to process or control functions have been made (UFSAR Sections 7.4.1.1.7 and 10.3.2.2.4). The probability of failure for the tee and valve is the same as for the existing tubing, fittings, and valves.
3-89-SG-106	This temporary modification replaced two existing tubing elbows with two tees and two manual shut-off valves on the operator for valve 3JSGBHV0185. The purpose was to add connections to measure differential pressure across the atmospheric dump valve operator.	This temporary modification did not introduce an unreviewed safety question. No changes to process or control functions have been made (UFSAR Sections 7.4.1.1.7 and 10.3.2.2.4). The probability of failure for the tee and valve is the same as for the existing tubing, fittings, and valves.
3-89-SQ-098	This temporary modification energized heat tracing in RU-142 to keep piping heated while in standby, thus preventing condensation on initial startup.	This temporary modification did not introduce an unreviewed safety question. This modification increases the reliability of RU-142 by eliminating moisture and ensuring a more representative sample for analysis.
3-89-SR-122	This temporary modification removed a 1 inch flanged spool piece containing valve SRNV0975 and installed a 2 inch flanged spool piece with an integral flush connection in its place. The purpose of the modification was to allow the connection of vendor supplied radwaste processing equipment	This temporary modification did not introduce an unreviewed safety question. The modification did not affect any equipment important to safety or safety related. The new spool piece met the same specifications as the original spool piece and did not change the

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
	to the spent resin transfer portion of the solid radwaste system.	probability or consequences of any accident previously evaluated.
3-89-SS-042	This temporary modification cut and capped off the demineralized water system supply line to the nuclear sampling system hot leg sample line. The purpose of the modification was to eliminate any possiblity of back leakage from the reactor coolant system into the demineralized water system.	This temporary modification did not introduce an unreviewed safety question. All modifications were performed on systems listed as having either "No safety function" or "No safety design basis" per UFSAR Section 9.2.3 and 9.3.2.
3-89-WC-056	This temporary modification provided pneumatic jumpers around chilled water control valves WCN-UV-070 and 071 to allow operation of the normal chilled water system during an "A" train DC bus outage.	This temporary modification did not introduce an unreviewed safety question. These valves have no safety function. They are part of the normal chilled water system which is not assumed to be available in the event of an accident. Using tubing and fittings per Specification JM-710 ensures that the modification is equivalent to the existing design in mass, structure and material.
3-89-WC-075	This temporary modification added a cooling tower to operate the normal chiller 3M-WCN-E02. The modification was necessary to provide cooling to the auxiliary building during an outage of the essential cooling water and nuclear cooling water systems.	This temporary modification did not introduce an unreviewed safety question. The cooling tower was only connected to the normal chiller and did not affect the operation of the essential chiller system. The modification did not affect any other systems or components.
3-89-ZC-034	This temporary modification provided 480 VAC, 100 amp continuous power for Sissor Jack, welding, and maintenance support operations in the area surrounding the containment polar crane during outage.	This temporary modification did not introduce an unreviewed safety question. The change affects only non-Class 1E electrical power as referenced in UFSAR Section 8.3.1.1.1. It does not affect safety-related equipment per UFSAR Section 3.2.1.
A-89-NH-001	This temporary modification supplied non class 1E power to the Dry Active Waste Processing building shredder.	This temporary modification did not introduce an unreviewed safety question. Non class 1E power does not

Temporary Modification 50.59 Report

Temporary Modification Number	Description	Safety Evaluation Summary
		have a safety design basis. The change was performed outside the vital areas and does not affect equipment important to safety.
A-89-RR-002	This temporary modification is the same as 2-89-RR-025 except the data is being processed in Trailer 2.	

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
85-RC-214	This EER recommended the use of flexicarb gaskets for the interface between the seal housing and kittybone flanges on the reactor coolant pumps to eliminate leakage at the interface. The EER also recommended changing the surface finish of the flanges from smooth to 125 RMS and increasing the gasket size.	This EER did not introduce an unreviewed safety question. The new gasket material is of a higher quality than that previously installed. The 125 RMS surface and larger gasket size improve sealing capabilities. Small break/large break LOCAs, should the gaskets fail, are bounded by the analysis in the FSAR.
87-AR-004	This EER authorized the installation of threaded pipe plugs, carbon steel compatible with ASTM A-106 pipe and preferably of 1/2 inch size, to plug two holes in line P-ARN-016-HBDB-12" in Units 1 and 2. These holes are used for flow traverse measurements of the air filtration unit and may carry low radiation level gases into the turbine building if not plugged when flow measurements are not being performed.	This EER did not introduce an unreviewed safety question. The Technical Specifications do not cover either the air filtration unit or the installation of pipe plugs. The condenser air filtration unit is not safety-related and is not included in any accident scenarios.
87-FP-020	This EER reviewed the impact of three fire dampers with excessive clearance due to insufficient fiberfax sealant material. Due to area accessibility difficulties, repairs to resolve the excessive clearances were infeasible. Two seals in question are located in the inverter room and one in the communications room.	This EER did not introduce an unreviewed safety question. The seals in question are located in BTP 9.5-1, Appendix A barriers (not 10 CFR 50, Appendix R barriers). The configurations were justified "as-is" on the basis of evaluations performed in accordance with Generic Letter 86-10. These showed that the seals, as found, would perform their intended function of preventing the spread of fire and preserving safe shutdown capability.
87-FP-073	This EER evaluated the performance of a diesel fire pump whose flow versus pressure capability was found to be below the performance required by procedure. Although the pump was deemed operable, in spite of slightly degraded performance, Belzona R&S Metal Coating was employed on various system components for corrosion resistance.	This EER did not introduce an unreviewed safety question. The use of Belzona R&S Metal Coating allows for improved corrosion protection, and thus improves reliability and availability of the fire protection system.
87-FP-083	This EER evaluated the use of unlisted door pins on various	This EER did not introduce an unreviewed safety question.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
	plant rated and unrated, as well as security doors, and directed the replacement of existing pins in security, fire-rated doors with listed (UL/FM) non-removable door pins and listed removable door pins in fire-rated doors. The doors not requiring a fire-rated configuration were justified "as-is."	The modifications made to the rated fire doors ensure that these doors perform their intended function of preventing the spread of fire and preserving safe shutdown capability.
87-HA-034	This EER allowed installation of a 3 inch access port in the auxiliary building normal HVAC duct. The access port is needed to introduce DOP and R-11 into the system for testing.	This EER did not introduce an unreviewed safety question. The access port is installed in non-quality related ductwork which performs no safety function. The access port was analyzed by engineering and found not to degrade the structural integrity of the existing ductwork.
88-AF-062	This EER accepted the as found limit switch settings of the motor operator for valve 1JAFBUV0034 even though they were outside the acceptance criteria of drawing 13-J-ZZI-004 "Controlled Motor Operator Data Base." Engineering evaluated the as found settings and determined the valve will perform its design function. The motor operator is scheduled to be replaced at the next refueling outage.	This EER did not introduce an unreviewed safety question. Engineering evaluated the as found condition of the motor operator limit switches and determined that the valve will perform its design function.
88-CE-011	This EER provided instruction for the repair of a backdraft damper in the Isophase bus cooling system (non-quality related). It also provided instructions for installing an access panel in the Isophase bus duct to inspect the other backdraft damper installed in the system.	This EER did not introduce an unreviewed safety question. The Isophase bus cooling system is not important to safety and does not affect any safety related system. The modification made with this EER did not affect the operational or seismic characteristics of the Isophase bus cooling system.
88-CH-004	This EER allowed the use of EPDM for gasket material in HCCA material class piping in the CVCS system. Engineering evaluated the use of EPDM gasket material in the HCCA portions of the CVCS systems. This material was found to be an acceptable substitute meeting all the design requirements.	This EER did not introduce an unreviewed safety question. The use of EPDM as a gasket material in the HCCA portions of the CVCS system was evaluated by Engineering and found to meet all the design requirements. Thus no safety evaluations are affected.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
88-CH-001	This EER provides for the use of a Teflon gasket material to repair/replace a damaged gasket on the Chemical Waste System acid injection line P-CHN-1134. The Teflon gasket is used in lieu of the white asbestos or monel gasket specified by the piping material classification guide. Due to the carcinogenic nature of asbestos its use is generally discouraged at PVNGS. Monel is not recommended for use with sulfuric acid above a 60% concentration. The acid transfer line has a sulfuric acid concentration of approximately 95%. Thus Teflon is the best choice for this application.	This EER did not introduce an unreviewed safety question. The replacement of the gasket with Teflon material in no way affects the function and or operation of the equipment and floor drainage systems. This action does not affect or involve any quality related structures, components, and or systems.
88-CW-005	This EER repaired stripped bolts in the operators for circulating water valves 2JCWNHV0009 and 2JCWNHV0008 (non-quality components) using helicoils. Engineering evaluated the use of helicoils in this application and found that they would be structurally equivalent to the original bolting.	This EER did not introduce an unreviewed safety question. The use of helicoils to repair stripped bolts is a standard industry practice. Even in the event of failure of the bolts no important to safety or safety related equipment would be affected.
88-CW-020	This EER repaired the cooling tower fan blades by installing leading edge covers. The leading edge covers prevent waterlogging of the blades and arrests leading edge erosion.	This EER did not introduce an unreviewed safety question. The installation of leading edge covers on the cooling tower fan blades does not affect or potentially affect any safety related or important to safety equipment.
88-DG-028	This EER provided for the repair of the diesel fuel oil cooler 2-M-DGA-E03. The fuel oil cooler was found to have experienced some corrosion. The corrosion had occurred in both the upper and lower bonnet ends of the cooler. The diverter plates on the bonnets had deteriorated badly. These plates channel the cooling water flow through the fuel oil cooler. As such the repair or replacement of both bonnet ends was required. No spare bonnet ends were available and Engineering recommended repair of the existing bonnets. The bonnets were repaired using Belzona molecular Ceramic Metal	This repair did not introduce an unreviewed safety question. This change does not affect the function or operation of the fuel oil cooler. The Belzona Ceramic Metal is applied to corroded portions of the fuel oil cooler top an bottom bonnet sections to rebuild these surfaces and protect them from further corrosion.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
	repair materials.	
88-DG-034	This EER performed the same repair as EER 88-DG-028 on the B-train fuel oil cooler. Details of the repair and safety evaluation summary are the same as reported for EER 88-DG-028.	
88-EC-029	This EER evaluated the condition of suspect ASME class material manufactured by West Jersey Manufacturing Company and other vendors identified by IEB 88-05. The vendors were suspected of falsifying Certified Material Test Reports (CMTRs) thus the material supplied by them was of questionable quality. All suspect flanges were hardness tested to verify the acceptability of the material. The results of the testing showed all but flange 1-EC-178-N00C fell within the specified hardness range. Flange 1-EC-178-N00C exceeded the specified hardness range but was evaluated by Engineering as acceptable.	This EER did not introduce an unreviewed safety question. All the flanges identified as having been procured from suspect vendors were tested and found to have acceptable material quality. Thus the ability of the flanges to perform their intended function is unimpaired and does not impact the safety analysis.
88-EW-022	This EER allowed the substitution of a 2" Kerotest manual valve for a 2" Dresser valve in the Essential Cooling Water System. The substitution was necessary because the Dresser valve was no longer manufactured and required replacement.	This EER did not introduce an unreviewed safety question. The substitution was reviewed by Engineering, which determined that installation of the Kerotest valve met all ASME Section III NC-3500, UFSAR Section 3.9, and PVNGS Design Criteria manual requirements. Thus the reliability and operation of the system would be unaffected.
88-FP-001	This EER authorized weld repair of a leak in the piping near Diesel Fire Pump AOM-FPN-P01A. It also authorized recoating the internal wall of the pipe using Belzona molecular ceramic material instead of the original plasite coating.	This EER did not introduce an unreviewed safety question. The pipe repair was performed in accordance with the original piping specification ASME B31.1. The new coating applied is superior to that originally specified. The repair did not affect system operation or performance.
88-FP-018	This EER allowed the continued use of fire door 1-J121 even though it did not meet the door to frame and/or door to	This EER did not introduce an unreviewed safety question. The door was evaluated and the deviation from the

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
	floor gaps. The continued use was based on calculation 13-AC-FP-001 which demonstrated the door would still perform its intended function.	specification did not affect its ability to perform its intended function.
88-FP-034	This EER accepted the condition of fire doors not meeting specification 13-AN-006. Calculation 13-AC-FP-001 was performed by Engineering and demonstrated the as found deviations from the specification did not affect the ability of the doors to perform their intended function.	This EER did not introduce an unreviewed safety question. The subject fire doors were evaluated and determined to be able to perform their intended function. This meets the safety design bases of FSAR 9.5.1.1.1.
88-FP-037	This EER authorized acceptance of fire doors not meeting specification 13-AN-006. Calculation 13-AC-FP-001 demonstrated that the deviation from the specification did not adversely affect the ability of the doors to perform their intended function.	This EER did not introduce an unreviewed safety question. The doors were evaluated and the deviation from the specification was found to not adversely affect the ability of the door to perform its intended function. The safety design bases of FSAR Section 9.5.1.1.1 for Fire Protection is not changed.
88-FP-042	This EER evaluated three fire door assemblies found to have excessive clearances between the doors and frames. As a result of this evaluation, only one door assembly was found to have a clearance which exceeded the previously fire tested configuration. Repairs were initiated to correct the one door not bounded by the tested configuration.	This EER did not introduce an unreviewed safety question. Replacement ensures that the door meets its original design function of preventing the spread of fire.
88-FP-068	This EER evaluated the impact of the "skin separation" of various fire-rated doors on their ability to prevent the spread of fire. With the exception of three doors, all were found to be in a configuration bounded by fire tests previously performed. The remaining three doors were modified to ensure that their function can be adequately performed.	This EER did not introduce an unreviewed safety question. The modifications that arose out of this EER ensure that the fire-rated doors involved perform their intended function of preventing the spread of fire.
88-FP-074	This EER authorized acceptance of a fire door not meeting specification 13-AN-006. Calculation 13-AC-FP-001 justified	This EER did not introduce an unreviewed safety question. The calculation verified the door would still perform its

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
	that the deviation from the specification would not adversely affect the ability of the door to perform its intended function.	intended function. The Safety Design Basis of the Fire Protection System described in FSAR Section 9.5.1.1.1 is not changed.
88-FP-096	This EER authorized acceptance of fire doors not meeting specification 13-AN-006. Calculation 13-AC-FP-001 demonstrated that the deviation from the specification did not adversely affect the ability of the doors to perform their intended function.	This EER did not introduce an unreviewed safety question. The subject doors were evaluated and determined to be able to perform their intended function. The safety design basis of FSAR Section 9.5.1.1.1 for Fire Protection is not changed.
88-FP-177	This EER evaluated the impact of three fire-rated doors that had excessively large gaps as compared to those required by procedure. In the case of two of the doors, new frames were deemed necessary. The remaining door was accepted "as-is" because the observed configuration was bounded by a previously tested configuration.	This EER did not introduce an unreviewed safety question. The modifications that resulted (i.e., installation of new door frames) and the justification of the door "as-found" are based on the need for these components to perform their intended function. That function is to prevent the spread of fire and to preserve safe shutdown capability.
88-FP-211	This EER initiated a review of Temporary Modifications 1-86-RJ-046 and 2-86-RJ-047 from the standpoint of additional combustibles introduced into plant areas associated with installation of Temporary Data Acquisition Systems (TDASs).	This EER did not introduce an unreviewed safety question. The combustibles introduced into the areas associated with the installation of the TDASs are small in comparison to those already existing in the areas. In addition, the existing combustibles were within the capabilities of the detection and suppression systems installed in the areas.
88-FW-004	This EER authorized the temporary repair of a body to bonnet leak on feedwater valve 3PFWNV024 using the Furmanite leak sealing procedure.	This EER did not introduce an unreviewed safety question. The feedwater system is not required for safe shutdown. The repair of the valve does not change system operation or design.
88-FW-009	This EER authorized the temporary repair of leaking feedwater valve 3PFWNV126 using the Furmanite leak seal procedure.	This EER did not introduce an unreviewed safety question. The feedwater system is not required for safe shutdown. The Furmanite leak sealing of this valve does not change system operation or design.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
88-HA-001	This EER replaced an access panel on Air Conditioning Unit (ACU)1MHABZ04 with a sheet metal plate. Engineering performed an evaluation of the access panel requirements and determined a 18 gauge sheet metal cover would be equivalent.	This EER did not introduce an unreviewed safety question. The replacement panel is attached consistent with construction of the ACU. The access panel had no structural requirements and its mass is equivalent to the replacement panel. The ACU will continue to function as described in FSAR 9.4.2.2.
88-HJ-013	This EER provided for the use of Locktite 227 for the bolted connection between the linkage shaft and yoke of dampers XM-HJA-M03 and XM-HJB-M02. This change was necessary to prevent a shift from occuring in the actuator to damper linkage. This shift allowed the actuator to exert excessive closing force on the damper. This excessive closing force was causing failure of the blade to axle bolts.	This EER did not introduce an unreviewed safety question. Engineering performed a study of the root cause of failure of the blade to axle bolts and determined the necessary corrective actions to prevent recurrence. These corrective actions effectively eliminate the identified failure mode. Thus the reliablity of the system is improved. The EER did nothing to affect the system operation or function except to improve its ability to perform its safety function.
88-HP-025	This EER provided instructions on the removal of the space heater from valve operator 2JHPB002. During replacement of the limit switch assembly in the valve operator it was noted that the new limit switch assembly did not have provisions for a space heater. An evaluation by Engineering determined that there was no need for a space heater in the valve operator and that the heater served no function. Consequently Engineering recommended removal of the space heater from the valve operator. The EER provided instructions on removing the space heater from the valve operator.	This EER did not introduce an unreviewed safety question. The space heater originally installed was not electrically connected and did not perform any function. Removal of the space heater did not affect the functioning of the operator or any environmental qualification of the operator and was required for installation of currently manufactured replacement parts.
88-HR-002	This EER provided for the substitution of a 1/4-20 bolts cut to length for installed carbon steel studs in view ports in HRNJ01B (non-quality related). Engineering has evaluated the substitution and determined that the 1/4-20 carbon steel bolts are equivalent to the currently installed studs.	This EER did not introduce an unreviewed safety question. The substitution of component parts which are equivalent does not affect any safety analysis assumptions. The equipment in this case (HRNJ01B) is not important to safety or safety related.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
88-IA-010	This EER allowed the use of 308 or 308L stainless steel wire in lieu of 304 stainless steel wire for safetying the disc on valve 2PIAEV073 (non-quality related). Engineering evaluated the use of 308 or 308L stainless steel in this application and found it to meet all the design requirements.	This EER did not introduce an unreviewed safety question. The Engineering evaluation showed the 304 and 308 stainless steels to have almost identical chemical and physical properties. The application of the 308 wire is in a non important to safety system and its failure would not impact any important to safety or safety related equipment.
88-LR-008	This EER specified the use of garlock gasket material to replace the orignally specified asbestos gasket material for radwaste system strainer 1PLRNF02A. Asbestos containing material is no longer commonly used at PVNGS. Engineering evaluated the material and determined the garlock to be an acceptable substitute.	This EER did not introduce an unreviewed safety question. The use of a material which is equivalent to or better than the original does not affect any safety analysis.
88-LR-041	This EER accepted the installation of a casing drain flange on pump 2NLRNP04A which does not appear on applicable drawings. The flanges were evaluated by Engineering and found to be installed in accordance with original design criteria. The flanges do not affect system performance, maintainability, fit, or safety. A Plant Change Request has been issued to update the drawings.	This EER did not introduce an unreviewed safety question. The flanges were evaluated by Engineering and found to have no impact on the system. The installation conforms to the system design requirements. Any leakage from the flanges will be contained in the Radwaste Building.
88-MA-030	This EER authorized continued use of 2 1/4 inch anchor bolts for the Auxiliary Transformer which were damaged due to arc striking between the transformer lug and anchor bolt. The condition of the bolts was evaluated and the anchorage of the transformer determined to meet all Project Design Criteria.	This EER did not introduce an unreviewed safety question. The anchorage of the transformer was evaluated and found to meet all Project Design Criteria with continued use of the bolts.
88-NA-003	This EER allowed a weld repair to be made to a 13.8Kv Calvert Bus. A damaged portion of the bus was cut out and new material welded in its place.	This EER did not introduce an unreviewed safety question. The weld repaired area is functionally equivalent to the original design. There is no impact on the operation of any system or component.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
88-NC-001	This EER allowed the substitution of stainless steel type 308 wire for stainless steel type 304 wire for locking a check valve disc nut in place.	This EER did not introduce an unreviewed safety question. The 308 and 304 materials are nearly identical chemically and the physical and corrosion resistance properties are identical. Thus the wires are totally interchangable.
88-NC-008	This EER accepted the as found condition (hardness exceeding ASME Sect. II SA-105 range) of flanges which were supplied by vendors identified as falsifying ASME Certified Material Test Reports (CMTR). NRC Bulletin 88-05 identified vendors which had falsified CMTRs. Hardness testing was conducted on the flanges supplied by these vendors. The flanges identified in this EER had hardness values exceeding the range specified in ASME Sect. II.	This EER did not introduce an unreviewed safety question. Engineering evaluated the test results and determined the flanges had suitable mechanical properties for the intended application and would not decrease the Essential Cooling Water Systems ability to function.
88-PC-006	This EER provided instructions for the repair of Fuel Pool/Cask Pit gate seal. The seal had developed a leak at the stem to rubber connection. The repair used a cold vulcanizing process which develops a seal equivalent to the original manufacturing process.	This EER did not introduce an unreviewed safety question. The repair met or exceeded all the original material specifications. This repair did not constitute a change to the facility as described in the FSAR.
88-PC-012	This EER allowed the installation of temporary scaffolding over the Spent Fuel Pool for fuel reconstitution.	This EER did not introduce an unreviewed safety question. The temporary scaffolding was designed by Engineering to meet the same requirement as other structures in the building. The scaffolding does not affect operation of the Spent Fuel Pool.
88-RC-023	This EER changed the castors of the Multiple Stud Tensioner (MST) to a roller bearing type from a ball bearing type. The ball bearings were prone to drop out of the MST castors and into the refueling pool creating a foreign material problem. The roller bearings are better captured and do not come out of the caster thus eliminating the problem.	This EER did not introduce an unreviewed safety question. The new roller bearing castors are equivalent to the original castors and will perform the same function. The new bearings do not loose pieces as the original bearings did and thus will not introduce foreign material into the reactor coolant system (RCS). This is not a change to the facility as described in the FSAR.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
88-RC-030	This EER allowed the use of a different part number conax connector on the cabling to valve 1JRCBHV0102. Engineering evaluated the differences between the connectors and determined them functionally equivalent.	This EER did not introduce an unreviewed safety question. The new connector performs the same function and does not affect system operation. The new connector was evaluated by Engineering and determined to be equivalent to the originally specified part number.
88-RC-066	This EER alllowed the repair of damaged threads in one of nine reactor coolant pump (RCP) Shaft Rigid Coupling cap screw holes by reaming damaged threads and installing a longer bolt to make use of the undamaged threads at the bottom of the hole.	This EER did not introduce an unreviewed safety question. Engineering evaluated the coupling bolt and determined the use of a longer bolt would not affect operation and would perform its intended function in continued use. This is not a change to the facility as described in the FSAR.
88-RC-079	This EER provided instructions to temporarily reweld a pressurizer heater stuck in its installation sleave to allow refueling to continue while a method to remove the heater is developed.	This EER did not introduce an unreviewed safety question. The rewelding of the heater was evaluated by Engineering and determined to provide and adequate RCS boundary for mode 6 operation. The final resolution will be implemented prior to RCS fill and vent.
88-RC-102	This EER eliminated the use of nutlocks on the Pressurizer Manway fasteners. The nutlocks were eliminated to prevent possible under torquing of the nuts when using the Multiple Stud Tensioner (MST). Elimination of these nutlock was recommended by the NSSS vendor Combustion Engineering. A Plant Change Request was submitted to update the Technical Manual and drawings showing the elimination of the nutlocks.	This EER did not introduce an unreviewed safety question. Proper pretensioning of the manway studs will prevent the nuts from loosening. Removal of the nutlock does not compromise the design strength of the nut. The pressurizer manway will continue to perform its intended design function without nutlocks and there is less potential for less than fully tensioned studs.
88-RC-179	This EER installed a permanent flange clamp assembly on the reactor coolant pump seal 3rd stage pressure sensing flange and performed a Furmanite leak seal repair of a cracked weld on the flange.	This EER did not introduce an unreviewed safety question. Engineering evaluated the modification and determined that the modification will eliminate the present leakage from the cracked weld and prevent further crack propagation. The Seal pressure sensing piping includes a 7/32 inch orifice to limit the flow from a line break to the capacity of one charging pump. This capability is not impacted by this

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
		modification.
88-RI-010	This EER provided instruction for repair of galled ICI housing and retainer nut threads.	This EER did not introduce an unreviewed safety question. The repair did not involve any pressure or structual components. The remaining undamaged threads will accomodate all expected loads.
88-RI-010	This EER provided guidance for the repair of an ICI guide housing in which a tap was broken during an attempt to redress the internal threads. The repair involved removing the upper 3/4 inch of the housing to remove the tap and cutting the retainer nut to the same length as the remaining housing threads.	This EER did not introduce an unreviewed safety question. The upper portions of the housing above the O-rings serve no pressure boundary purpose, nor does it serve any role in the function of the ICI instrument. The housing will be replaced during the next refueling outage.
88-RI-012	This EER allowed the beveling of the plate upon which the bottom guide pins of the Incore Instrumentation (ICI) holding frame. The beveling is required to eliminate an interference between the wall mounted plate and the ICI frame block. The guide pins are for alignment only and are not load bearing.	This EER did not introduce an unreviewed safety question. The beveling of the plate was only a cosmetic change and did not affect the function of the guide or the structural integrity of its mounting.
88-RI-014	This EER provided for removal of a damaged fixed incore detector and capping the associated movable incore detector tube at the bottom of the transfer machine on the Incore Instrumentation (ICI) stand. The fixed incore detector will be replaced at the next refueling outage and the movable incore detector guide tube reconnected.	This EER did not introduce an unreviewed safety question. The installation of the cap on the movable incore guide tube ensures RCS integrity. The removal from service of up to 25% of the incore detectors is allowed by Technical Specification 3.3.3.2.
88-SC-012	This EER installed a corrosion resistant coating to the interior surfaces of the blowdown demineralizer high total desolved solids sump. The application of the coating will help prevent corrosion of concrete surfaces in the sump interior.	This EER did not introduce an unreviewed safety question. The application of this coating in no way affects operation of the blowdown demineralizer system. The change does not affect any equipment which is safety related or important to safety.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
88-SC-013	This EERs description and safety evaluation summary is the same as EER 88-SC-017 except the coating is being applied to the Unit 3 High Total Dissolved Solids Sump.	
88-SC-017	This EER provided for the installation of a corrosion resistant coating to the interior surfaces of the blowdown demineralizer high total dissolved solids sump. The application of the coating will help prevent corrosion of the concrete surfaces in the sump interior.	This EER did not introduce an unreviewed safety question. The blowdown demineralizer is part of the Secondary Chemical Control System which is not safety related or important to safety. The application of the coating in no way affects the operation of the Secondary Chemical Control System and is not a change to the facility as described in the FSAR.
88-SG-109	This EER accepted the as found condition of flanges in the Steam Generator System which had questionable material certifications. NRC Bulletin 88-05 identified manufacturers who had falsified ASME Certified Material Test Reports (CMTRs). The flanges supplied by these manufacturers were tested for hardness and the flanges accepted by this EER did not meet the original ASME hardness specification. However, the deviations from the specification were evaluated by Engineering and found to be acceptable for continued use.	This EER did not introduce an unreviewed safety question. Engineering evaluated the flanges as found condition and determined the the deviation from the specification will not affect the flanges ability to perform their intended function.
88-SG-109	This EER accepted the as found condition of flanges in the Steam Generator System which had questionable material certifications. NRC Bulletin 88-05 identified manufacturers who had falsified ASME Certified Material Test Reports (CMTRs). The flanges supplied by these manufacturers were tested for hardness and the flanges accepted by this EER did not meet the original ASME hardness specification. However, the deviations from the specification were evaluated by Engineering and found to be acceptable for continued use.	This EER did not introduce an unreviewed safety question. Engineering evaluated the flanges as found condition and determined the the deviation from the specification will not affect the flanges ability to perform their intended function.
88-SI-086	This EER allowed the use of a quality class Q1C valve bonnet versus the original Q1B valve bonnet on valve 3PSIEV930	This EER did not introduce an unreviewed safety question. The material requirements for the replacement bonnet are the

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
	(Spray Chemical Addition Tank Vent Valve). The original bonnet was an ASME III, Class 2 valve. The replacement bonnet is a ASME III, Class 3. Engineering reviewed the code requirements determined the Class 2 and 3 material requirements to be the same.	same as the original bonnet making this an equivalent substitution.
88-SI-086	This EER allowed the use of a quality class Q1C valve bonnet versus the original Q1B valve bonnet on valve 3PSIEV930 (Spray Chemical Addition Tank Vent Valve). The original bonnet was an ASME III, Class 2 valve. The replacement bonnet is a ASME III, Class 3. Engineering reviewed the code requirements determined the Class 2 and 3 material requirements to be the same.	This EER did not introduce an unreviewed safety question. The material requirements for the replacement bonnet are the same as the original bonnet making this an equivalent substitution.
88-SP-033	This EER describes the same condition and results as EER 88-SP-034 for different flanges in the Essential Spray Pond System. See EER 88-SP-034 for description and safety evaluation summary.	
88-SP-034	This EER accepted flanges in the Essential Spray Pond System which did not meet the hardness specification limits. NRC Bulletin 88-05 identified manufacturers who supplied flanges with ASME Certified Material Test Reports which were falisfied leaving the quality of the flanges indeterminate. Testing was performed on the flanges for hardness using the original hardness specification. The flanges outside that hardness specification were accepted by this EER.	This EER did not introduce an unreviewed safety question. An extensive engineering study was performed which determined there is sufficient conservatism in the design of the flanges that the deviations in hardness noted did not affect the flanges structural integrity. This study also determined that the problem identified by IEB 88-05 was not safety significant.
88-SP-037	This EER accepted the as found condition of flanges with questionable material certifications in the Essential Spray Pond System (ESPS). The flanges were supplied by vendors who had admitted to falsifying ASME Certified Material Test Reports (CMTRs) and were identified in NRC IEB 88-05.	This EER did not introduce an unreviewed safety question. The accessible flanges were tested for hardness and evaluated by Engineering as posessing acceptable material properties. The inaccessible flanges were determined to be acceptable after the results of an extensive engineering study showed the problem described in NRC Bulletin 88-05 was

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
		not safety significant.
88-SQ-080	This EER allowed the slight elongation of the mounting holes for the arc suppressor printed circuit board on the XJSQBRU0146 motor starter. This was necessary to mount the existing motor controller hardware on the new board.	This EER did not introduce an unreviewed safety question. Engineering evaluated the minor deviation in the mounting holes and determined they would have no affect on the operation or siesmic qualification of the equipment.
88-SQ-105	This EER evaluated changing the response time of radiation monitor XJ-SQE-RU-001 from the 1 minute requirement of UFSAR Table 11.5-1 to 15 minutes.	This EER did not introduce an unreviewed safety question. Engineering evaluated the change and determined that the 15 minute response time would satisfy the requirements of Reg. Guide 1.45 "Reactor Coolant Pressure Boundary Leakage Detection Systems."
88-SR-016	This EER installed steel plates (1/4"x4"x4") to the paddle arms of the upper travel limit switch actuation mechanism of the 30-ton bridge crane in the Radwaste building. The purpose of the modification was to ensure positive switch actuation. The limit switch function is as a backup device for stopping crane motion when the crane is at its upper limit.	This EER did not introduce an unreviewed safety question. The modificaton to the crane will ensure the upper travel limit switch will be engaged and function to prevent crane damage.
88-ZJ-056	This EER evaluated the addition of a 10"x10" window to an unrated door for personnel safety reasons. This door (J-324) serves as an airlock door; therefore, wire glass was used to preserve this function. This change was deemed acceptable by the door manufacturer.	This EER did not introduce an unreviewed safety question. This unrated door's function as an airlock is not impacted by the addition of the (wire glass) window for personnel safety concerns.
88-ZY-009	This EER authorized the coating of the Blowdown Demineralizer High Total Dissolved Solids Sump with a corrosion resistant coating. See EER 88-SC-013 for description and summary.	
89-DG-089	This EER accepted "as-is" replacement components for the existing power boost current transformer, paralleling	This EER did not introduce an unreviewed safety question. The new replacements are considered equal to the original

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
	current transformer, and magnetic reactor in the emergency diesel generator system. Identified dimensional variations in the PBCT and the MR were evaluated and determined to have no impact on installation or other safety features in the diesel generator high voltage cubicle. The PCT was found to conform to NEMA ST-20 standards for excitation losses.	components and are qualified for safety-related service. Dimensional and weight deviations do not affect the transformer mounting, cable connection, and other safety features in the cubicle or the seismic integrity of the system.
89-EW-028	This EER pulled 420 stainless steel thrust pins from 24 EW Pratt valves for analysis and replaced the pins with 302 stainless steel pins to preclude future problems. No failures were noted on any of the pins pulled.	This EER did not introduce an unreviewed safety question. The material substitution improves the reliability of valve function and operability and helps to maintain the technical specification margin of safety (ECE-ZZ-163).
89-EW-029	This EER accepted a design equivalent change/material substitution in Henry Pratt valves to preclude hydrogen embrittlement failures. Thrust collar/bearing pins were changed from 420SS to 302SS.	This EER did not introduce an unreviewed safety question. The material substitution helps to maintain valve operability and function, and the technical specification design basis margin of safety.
89-EW-030	This EER directed the use of the seal manufacturer's end play dimension for mechanical seal installation and the addition of this information in step 8.14.8 of maintenance procedure 31MT-9EW01 in addition to the end play dimension based on packing.	This EER did not introduce an unreviewed safety question. This change adds the appropriate end play clearance for Essential Cooling Water Pump mechanical seals.
89-EW-032	This EER allowed the substitution of SA-193 Grade B7 capscrews for SA-193 Grade B7 studs and nuts for use in the essential cooling water pumps packing glands.	This EER did not introduce an unreviewed safety question. The cap screws are of the same material and strength and will perform the same function as the original studs and nuts.
89-EW-033	This EER authorized the machining of the essential cooling water pump seal gland plate to elongate the slotted holes and trim the hub for bolt clearance.	This EER did not introduce an unreviewed safety question. The machining was demonstrated acceptable by a stress analysis performed by Engineering for the reduced section thickness. The change had no affect on pump or seal performance or reliability.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
89-FH-037	This EER analyzed the possible effects on the refueling pool and the reactor vessel of a half link missing from the chain which ensured that the alignment pin located on the S.W. corner of the Fuel Handling Machine was failsafe. The EER recommended a thorough inspection of the refueling pool following draindown.	This EER did not introduce an unreviewed safety question. Previous analysis of a comparably sized piece of metal being ingested into the Shutdown Cooling Pump suction has shown that the effects are not a concern to the impeller or other pump internals (EER 89-FH-033). The impact on fuel channel blockage was analyzed in EER 88-SI-116 for areas greater than that occupied by the missing half link. The impact on the core of the half link is bounded by that analysis.
89-FH-050	This EER analyzed the possible impact of missing 1/4" x 1/2" hydraulic power unit pump/motor coupling roll pin and set screws in the refueling cavity/canal and authorized reworking of the coupling using a safety wired nut and bolt in place of a roll pin.	This EER did not introduce an unreviewed safety question. The roll pin was discovered and retrieved from the floor of the Containment Building below the pump and motor of the containment side hydraulic power unit. The impact of pieces of metal the size of the screws on the shutdown cooling pump suction have been shown to not be a concern to the impeller or other pump internals. (EER-89-FH-033). Impact on the core by the set screws is bounded by the fuel channel blockage analysis in EER-SI-116.
89-FP-113	This EER allowed the use of a latchset versus lockset on door AZANNA347.	This EER did not introduce an unreviewed safety question. There are no fire protection, security, or radiation protection requirements for door A3-47 to be equipped with a lockset.
89-FP-147	This EER provided for a one-time extension of the 18-month administratively controlled interval for performance of "Fire Protection Diesel Pump" maintenance inspection overhaul procedure (31ST-9FP01) to within the 24-month interval recommended by the manufacturer.	This EER did not introduce an unreviewed safety question. There is no adverse effect on the ability of Units 1, 2, or 3 to achieve and maintain safe shutdown in the event of postulated fire.
89-HA-006	This EER accepts the use of 3/32 inch natural rubber gasket ASTM D2000-608/708 material in place of the existing 1/4 inch thick American National Rubber model 4131C as the	This EER did not introduce an unreviewed safety question. An equipment change evaluation (ECE) was performed which demonstrated that the natural rubber gasket material will

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
	gasket material for installation of the VENTLOK test holes in the PVNGS HVAC systems. The EER limits use of the gasket material to all areas except the containment building, volume control tank room, and the purification ion exchanger room.	perform all required functions and will not degrade when installed in the areas specified in the EER.
89-HD-006	This EER allowed up to 3 unused screw holes (1/8" dia.) in the Ventlok test ports of the Unit 2 Diesel Genrator Essential Air Handling Unit ducts.	This EER did not introduce an unreviewed safety question. Engineering evaluated the presence of the unused screw holes and determined that they would not affect the structural integrity or operation of the air handling units and therefore were acceptable.
89-HD-008	This EER allowed the use of existing Varicel Filters for interim operation of the Essential AHU for the Diesel Control Equipment Room. Calculations were performed to show that there is sufficient time for operator action to replace the filters during/following a postulated dust storm and to maintain the DG control room HVAC system within its design basis to limit the temperature in the room to below 122 degrees F.	This EER did not introduce an unreviewed safety question. This change procedurally adds monitoring of the DG control room HVAC filter pressure drop and DG control room temperature to anticipate filter changeout following/during a postulated dust storm. However, the Diesel Generator operating procedure remains in compliance with Reg. Guide 1.33. Operator actions required before the dust loading limit for the filter occurs ensure that the DGCR HVAC system operates within its design limits and therefore, that the DGCR performs its intended safety function.
89-HD-013	This EER allowed the use of a Ventlok test port cover with seven abandoned screw holes in the discharge duct of diesel generator essential exhaust fan.	This EER did not introduce an unreviewed safety question. Engineering evaluated the condition and determined the abandoned screw holes would have an insignificant effect on the structural integrity of the ductwork and no effect on the amount of airflow exhausted from the diesel compartment. Thus ability of the system to perform its function is unimpaired.
89-HJ-031	This EER allowed the use of an alternate method of adding a stiffner to the ductwork of blower 1M-HJA-Z04.	This EER did not introduce an unreviewed safety question. The new stiffner installation was designed by Engineering to meet the original installation specifications. Thus there

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
		was no decrease in the reliability of the system.
89-NC-010	This EER allowed the application of Belzona Ceramic R Metal to the shaft bearing surface of Nuclear Cooling Water Pump "B" until procurement of a new shaft. Dimensions and bearing clearances were maintained per the Pump Technical Manual.	This EER did not introduce an unreviewed safety question. The repair is to one of two non safety-related pumps, each of which has 100% capacity.
89-NC-013	This EER evaluated the use of Belzona R&S Metal Coating on the Nuclear Cooling Water System for improved corrosion protection. This had already been generically approved for use in the fire protection system under EER 88-FP-001.	This EER did not introduce an unreviewed safety question. The use of the Belzona R&S Metal Coating contributes to the improved reliability and availability of the Nuclear Cooling Water System by improving corrosion protection.
89-PK-046	This EER allowed the subtitution of 1/4-20 or 1/4-28 screws for 10-32 screws in the repair of battery charger 3EPKBH16. The larger screws were used to secure the cover to the charger frame. This disposition is generic to all Class 1E battery chargers, PKAH11, 13, 15, PKBH12, 14, 16, in Units 1, 2, and 3.	This EER did not introduce an unreviewed safety question. There is no change to the affected equipment other than the size of the bolts/screws used to secure the panels to the charger frame. This change restores the charger to a conforming condition.
89-PW-012	This EER applied a hard-face to the Plant Cooling Water pump shafts in the area of the shaft packing.	This EER did not introduce an unreviewed safety question. The Plant Cooling Water pumps perform no safety function. The application of the coating will improve the pump reliability without affecting its performance, design, or operation.
89-RX-029	This EER evaluated and accepted the additional extension of fuel/shim pin 015 into the shoulder gap region of assembly P38229. The raised poison rod was not considered a nonconformance.	This EER did not introduce an unreviewed safety question. The lifted poison rod is an anomaly which the fuel assembly is designed to accommodate. Integrity and design of the fuel system are not compromised and the fuel assembly dimensions remain within operation tolerances. The functional capabilities are not reduced below those assumed in the safety analysis.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
89-SB-065	This EER accepted the interim repair of chaffed wires in the lower wire runs for the relay cards in Plant Protection System Channel "B" by insulating with Scotch 33+ electrical tape until rewiring can be completed during refueling outage.	This EER did not introduce an unreviewed safety question. This interim modification does not affect the function of the Plant Protection System.
89-SB-083	This EER authorized replacement of #10-32 metal retaining screws used to secure the DAS module of the channel "A" DNBR/LPD Calculator System in its cabinet with 1/4-20 screws. The DAS module had been inadvertently set up for 1/4-20 screws but secured with the #10-32.	This EER did not introduce an unreviewed safety question. During seismic qualification, the modules were typically held down with either #10-32 screws or 1/4-20 screws (PVNGS Seismic Report, N001-13.03-815-1, DNBR/LPD Calculator System, Rev. 0, 12/18/81 (ICD-E-0022 Rev. 0).
89-SC-038	This EER allowed substitution of Valcor Model #V526-5683-5 valve bonnet for Model #V526-5683-3 valve bonnet for solenoid valve 3JSCNTV0281, SG2 Hot Leg Blowdown sample.	This EER did not introduce an unreviewed safety question. Per EER 89-SC-019, both bonnets are ASME SA-479 Type 316 and the two Valcor valve models are equivalent. The modification is a design equivalent change. The SC system has no safety design basis.
89-SE-017	This EER allowed connection of new cable to the existing non-damaged portion of cable 1ESE01NC1XV at the unscheduled pull box approximately ten feet from panel 1ESQNC02. 1ESE01NC1XV, part of the Facility and Excore Neutron Monitoring System, was caught and damaged when other cables were pulled out of conduit 1EZJ3ANRX20.	This EER did not introduce an unreviewed safety question. The replacement cable ensures proper functioning of the non-safety-related control channels of the system and does not affect functioning of any safety-related system or class 1E component. The repaired cable is part of circuits which provide readout and reactor control and which are completely independent of reactor protection channels.
89-SG-248	This EER changed the allowable Atmospheric Dump Valve seat ring angle to be machined to 45 degrees versus the 48-49 degree seat ring angle specified in EER 89-SG-202.	This EER did not introduce an unreviewed safety question. The new seat ring angle was concurred with by the valve vendor and does not affect the ability of the Atmospheric Dump Valves to perform their intended function.
89-SG-305	This EER allowed the air and hydraulic fittings for MSIVs and FWIVs to be changed from carbon steel to stainless	This EER did not introduce an unreviewed safety question. The stainless steel replacement material is stronger than

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
	steel.	the original carbon steel and therefore the probability of failure of the stainless fittings is less than that of the steel fittings.
89-SG-309	This EER accepted the "as-built" condition of instrument isolation valve support bracket per 13JZZS-185 Detail 1. Mod #1 to Site Modification #3-SM-SG-017 documented the allowable use of 185 Detail 1.	This EER did not introduce an unreviewed safety question. The change is NQR with no impact on the support structural steel or any important-to-safety equipment in the area.
89-SG-313	This EER accepted the as-built condition of Seismic Category I supports for Instrument Sensing Lines. An FCR was initiated against drawing 13-J-ZZS-185 to document the as-built support installations and issued as a modification against S-Mod 3SM-SG-017.	This EER did not introduce an unreviewed safety question. The change is NQR with no impact on the support structural steel or any important-to-safety equipment in the area.
89-SG-317	This EER allowed reassembly of the manual operator for valve 3JSGEUV0169 with a design equivalent change of adding two holes in the upper lock nut mounting surface of the pneumatic cylinder upper piston rod and reworking the set screws. The change was made to ensure that the set screws come into full contact with the piston rod and prevent the lock nut from unthreading from the piston rod and disengaging from the stem extension.	This EER did not introduce an unreviewed safety quesion. The manual operator is not quality-related.
89-SG-328	This EER increased the maximum allowable torque values on Parker flared fittings by 15% over Parker's recommended maximum values for fittings on tubing 3/4" O.D. and larger. This change applies to stopping any leaks in all MSIV/FWIV actuators.	This EER did not introduce an unreviewed safety question. There are no changes to process or control functions and the probability of failure of the tubing fittings remains the same.
89-SG-339	This EER replaces an existing set screw securing the manual handwheel on atmospheric dump valve 3JSGAHV0179 with a 1/4-20 bolt. The purpose of the modification is to securely fasten the handwheel to the operator.	This EER did not introduce an unreviewed safety question. The new attachment for the handwheel provides a more secure attachment and will ensure the valve can be operated manually if required. The change does not affect the

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
		function or qualification of the manual operator.
89-SG-341	This EER allowed the installation of flat washers on the limit switch mounting brackets for valves SGX-UV-170, 180, 171, 181, 174, 177, 132, and 137. The flat washers were added to prevent damage to the existing lock washers.	This EER did not introduce an unreviewed safety question. No change has been made to the process or control functions of the valves.
89-SG-343	This EER allowed use of furmanite sealant compound to stop a body-to-bonnet steam leak in valve 29SGNV095 as a "repair" disposition until the valve was reworked back to its original configuration.	This EER did not introduce an unreviewed safety question. Use of furmanite does not impact the reliability of valve function or impair safety of the valve.
89-SG-374	This EER allowed repair of a steam leak on the hinge pin of check valve 3PSGAV044 using either a thicker gasket or seal welding the hinge pin.	This EER did not introduce an unreviewed safety question. The repair of the hinge pin leak did not affect the function or operation of the check valve.
89-SI-156	This EER provided clarification of code class boundary and acceptability of installed supports for the pipe support clamps called out in 13-PN-204. It was Engineering's position that the listed as-built pipe support installations with additional NDE are acceptable and do not represent a safety hazard.	This EER did not introduce an unreviewed safety question. No Code violation was found. Structural integrity is not a concern since the installation is treated as quality-related for the structural steel parts and re-inspection is to NF criteria.
89-SI-222	This EER authorized the placement of 270 pounds of temporary leadshielding on top of line B-038-GCBC-12" next to valve V442 during modes 5 and 6.	This EER did not introduce an unreviewed safety question. Engineering evaluated the shielding placement and determined that the allowable stress limits for the affected piping and its pipe supports would not be exceeded for the conditions of UFSAR Section 3.9.3. This reanalysis is documented in a Calculation Change Notice against calculation of record 13-MC-SI-502.
89-SP-054	This EER authorized the use of a substitute coating for the essential spray pond filters. The substitute coating had demonstrated excellent corrosion and toughness properties.	This EER did not introduce an unreviewed safety question. The substitute coating was evaluated by Engineering and determined to have superior properties to the originally

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
		specified coating.
89-SQ-145	This EER allowed the use of "in local" and "unreachable" interchangeably in Step 8.1.5, 6, 7 in 36ST-9SQ01 for containment building atmosphere monitor RU01.	This EER did not introduce an unreviewed safety question. Both messages mean that the RMS Mini Computer does not have communications with the monitor and in either case an audible alarm activates at the Control Room and the RP office system consoles. This EER supersedes EER 89-SQ-043.
89-XI-049	This EER authorized changing a 270 ohm 1 watt resistor with a 270 ohm 2 watt resistor in the Beta Products Inverters. The reason for the change was to improve the reliability of the inverters which had experienced several failures of this component.	This EER did not introduce an unreviewed safety question. The change was made in accordance with the manufacturers recommendation. The changeout of the resistor did not affect the performance of the inverter nor its environmental qualification.
89-ZA-028	This EER accepted the as-built condition of the penetration seal support for penetration 436/106. The increased length of the unistrut protruding past the edge of the blockout on top, and the incompletely cut out corrugated metal decking on the bottom of the blockout penetration, do not affect the structural integrity of the seal support, per comparison with the original calculation (13-CC-ZA-140).	This EER did not introduce an unreviewed safety question. The seal support, as detailed, is acceptable and does not affect the operability or function of the penetration seal and its support.
89-ZA-061	This EER allowed the use of Maxi-bolt concrete anchors instead of Hilti-bolt anchors for penetration seal 425/26.	This EER did not introduce an unreviewed safety question. Engineeing evaluated the use of Maxi-bolt concrete anchors in this application. Engineering concluded that the Maxi-bolt anchor would provide support equivalent to the original specification.
89-ZC-103	This EER accepted the erection of tube lock scaffolding to support lead blankets in the REGEN HX for temporary shielding to reduce worker exposure.	This EER did not introduce an unreviewed safety question. The additional loads imposed on the existing platforms and on the scaffolding are well within the original design loads and have no effects on safety related, safe shutdown, or important to safety systems.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
89-ZF-035	This EER accepted the "as is" disposition for the missed QC holdpoint for rigging verification (Step 4.5 of WO 00354057) prior to transportation of test weights for subsequent performance of Refueling Machine Load Test Procedure No. 73ST-9FH01 at Unit 1.	This EER did not introduce an unreviewed safety question. The function, form, and fit characteristics of the Dummy Fuel Assembly, including test weights, was unaffected by this procedural error as shown by the successful completion of additional Refueling Machine load tests.
89-ZF-041	This EER accepted a redesigned swivel lifting eyebolt to replace those supplied by Cimcorp to lift the Overload Test Weights and place them in the Dummy Fuel Assembly for the Refueling Machine load test.	This EER did not introduce an unreviewed safety question. The change does not affect operation of the Refueling Machine, the Spent Fuel Handling Machine, or the Fuel Transfer Machine. There are no Technical Specifications associated with this swivel fixture or the eyebolt.
89-ZJ-010	This EER authorized repair of a hairline crack (max. width 1/64") in the 8"-thick block wall between Remote Shutdown Room "A" and Channel "B" D.C. Equipment Room. Dow Corning 96-081 or approved equal silicone caulk was specified as the repair medium because fire resistive characteristics of DC 96-081 ensure that the integrity of the wall as a 3-HR fire barrier is not compromised.	This EER did not introduce an unreviewed safety question. The hairline crack does not affect the structural integrity of the wall. Its repair ensures that the operability of the wall as a passive fire protection system is not affected.
89-ZJ-016	This EER allowed the use of a latchset rather than a lockset on door AZJNNJ132.	This EER did not introduce an unreviewed safety question. The door is not a security boundary or fire door. It does not provide access to a radiation area. Therefore, a latchset in place of a lockset is acceptable and provides for easier personnel access.
89-ZY-042	This EER accepted the location of a temporary trailer for use as an office and storage area on the south side of the condensate water storage tank during containment tendon testing.	This EER did not introduce an unreviewed safety question. Due to its size and location, the trailer falls within the allowables for tornado-generated missiles. Fire protection is adequately provided by portable extinguisher; no additional radiological protection measures are required. There are no tie-ins to permanent plant systems for power.

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
89-ZY-046	This EER evaluated the relocation and installation of temporary trailer (4-369) and its supply convex box to the Unit 2 North Turbine Yard.	This EER did not introduce an unreviewed safety question. To ensure that the engineering-evaluated tornado-generated missile density of 7 missiles/10,000 SF is adhered to, no other temporary facilities are placed within the established 20,600 SF.
89-ZY-048	This EER allowed moving of trailers 4-98, 4-236, and 4-385 from the protected area to a storage yard northeast of Unit 1.	This EER did not introduce an unreviewed safety question. The new location of the trailers was evaluated against the assumptions of the tornado missile probability study and determined to be acceptable.
89-ZY-051	This EER allowed installation of an 8 wide trailer southwest of the protected area.	This EER did not introduce an unreviewed safety question. The trailer installation was evaluated to be within the tornado missile density analysis and thus did not increase the probability or consequences of an accident previously evaluated.
89-ZY-052	This EER allowed installation of a 6 wide trailer west of the main warehouse (outside the protected area) and removal of trailers 4-317 and 4-264 from the same area.	This EER did not introduce an unreviewed safety question. The installation of the trailers was evaluated against the tornado missile probability study and found to be acceptable. The trailers did not exceed the tornado missile density assumed in the analysis for missiles greater than 800' from the essential spray ponds.
89-ZY-053	This EER removed trailers 35 and 4-363 from the protected area and relocated them to the storage yard south of the Water Reclamation Facility.	This EER did not introduce an unreviewed safety question. The storage of the trailers greater than 1200 feet from the essential spray ponds was evaluated by engineering against the tornado missile probability study. Engineering determined the storage location acceptable provided no other material was stored adjacent to trailers.
89-ZY-064	This EER allowed the movement of trailers within the protected area to provide access to the Unit 3 "A" main	This EER did not introduce an unreviewed safety question. The probability of Tornado generated missiles was evaluated

Engineering Evaluation Request 50.59 Report

EER Number	Description	Safety Evaluation Summary
	transformer.	by engineering for this change and found to be less than the 10E-6 value specified in the Standard Review Plan Section 2.3.3. The EER also required the trailers to be located greater than 50 feet from safety related structures to eliminate potential fire hazards.

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
31MT-9EW01	1	4	This PCN added an end play dimension for the essential cooling water pump mechanical seal.	This PCN did not introduce an unreviewed safety question. The end play dimension specification was required following replacement of pump packing seal with a mechanical seal per Site Modification 1-SM-EW-001. Specification of the end play in the procedure assures that pump assembly is performed correctly.
31MT-9RC27	1		This revision to procedure 31MT-9RC27 "Installation and Removal of Reactor Vessel Temporary Level Indicator RC Loop #1" added quality control holdpoints, added retest requirements, and changed the title to clarify the train.	This procedure revision did not introduce an unreviewed safety question. The procedure installs the temporary refueling water level indicators. The changes to the procedure enhance the safety of the installation of the refueling water level indicator by adding quality control hold points and retest requirements.
36MT-9SB03	2		The change to this procedure "PPS Bistable Input Simulation" added an appendix to enable CPC/CEAC time response testing, correct typographical errors, and various editorial changes.	This procedure revision did not introduce an unreviewed safety question. The changes made did not affect any equipment required to be operable by the Technical Specifications. The procedure complies with UFSAR Section 13.5.2.2C (Instrument Calibration and Test Procedures).
40AC-0ZZ06	8	1	This PCN added the valves installed by temporary modification 3-89-AF-123 to the locked valve program.	This PCN did not introduce an unreviewed safety question. Addition of the valves installed by the temporary modification was necessary to ensure stable auxiliary feedwater pump operation while on minimum recirculation operation. The valves are required to be in the open position for stable operation and this PCN ensured they would be locked open.
40OP-90P20	0		This new procedure 40OP-90P20 "RCS Chemical Cleanup Procedure" uses hydrogen peroxide in the RCS during mode 5 for the purpose of removing activated radionuclide buildup. This is done to reduce radiation levels and personnel exposure during a refueling outage.	This procedure did not introduce an unreviewed safety question. The introduction of hydrogen peroxide is a common practice in US and European plants for removal of activation products. Safety aspects of the introduction were addressed in EPRI NP-692 and NP-3245. These studies documented that no

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
				adverse affects on the RCS were expected or have been observed in previous uses of this procedure.
410P-1FX01	6		This revision to 410P-1FX01 "Refueling Machine Operations" addresses human factors considerations and manual bridge, trolley, and hoist operations.	This procedure revision did not introduce an unreviewed safety question. The procedure meets the requirements of UFSAR 9.1.4.2.3.3 and is consistent with the Technical Specifications and their bases.
410P-1SF06	1		This revision to procedure 410P-1SF06 "CEA Exercising in Modes 3, 4, and 5" allows testing of CEAs in modes 4 and 5 as well as mode 3.	This revision did not introduce an unreveiwed safety question. Movement of CEAs is administratively limited to maintain the shutdown margin required by the Technical Specifications. Maintaining this shutdown margin during CEA movement assures any accident occuring during motion will be covered by the UFSAR analysis.
410P-1SF06	0	0	This was a new procedure to permit moving control element assemblies individually or as a group while the plant is in mode 3. The purpose of the procedure is to allow testing of the control element drive mechanisms.	This procedure did not introduce an unreviewed safety question. The procedure administratively limits CEA movements so that shutdown margin is maintained per Technical Specifications 3.1.1.1 and 3.1.1.2.
410P-2SF06	2		Revision 2 to this procedure "CEA Exercising in Modes 3, 4, and 5" allows CEA testing in Modes 4 and 5 in addition to Mode 3.	This revision did not introduce an unreviewed safety question. The procedure administratively controls boron concentration to maintain the shutdown margin required by Technical Specifications 3.1.1.1 and 3.1.1.2. This assures adherence with the UFSAR requirements.
41TP-1ZZ01	0		This temporary procedure "RCS Control for Unit 1 Tophat Installation" provides the instructions to drain the refueling pool and Reactor Coolant System (RCS), maintain RCS level, and refill the RCS and refueling pool to support installation of the Tophat in Unit 1. This procedure is to be used only when all fuel has been removed from the reactor vessel and from the refueling pool.	This procedure did not introduce an unreviewed safety question. The only time this procedure is allowed to be performed is when fuel has been removed from the reactor vessel and refueling pool. The purpose of the procedure is to limit flow rates when changing level in the refueling pool to prevent damage to unsupported CEA.

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
420P-2SF05	4		This revision to procedure 420P-2SF05 "Operation of the Steam Bypass Control System" added a new section to exercise steam bypass valves with actual steam flow in Mode 1.	This revision did not introduce an unreviewed safety question. The steam bypass valves do not perform a safety function or affect equipment important to safety. This revision allows the valves to be tested at power to verify their operation is within their design basis and provides additional assurance that the valves will perform when required. Proper operation of these valves during a load rejection does not require operation of safety related equipment and thus improves plant reliability and safety.
420P-2ZZ03	5	4	This PCN changed procedure 420P-2ZZ03 "Reactor Startup" to withdraw CEA 41 prior to withdrawal of the other CEAs during a reactor startup. This was due to a known ground fault on CEA 41 which could potentially interfere with other CEAs while it is being moved. By withdrawing it first it can not affect the operation of other CEAs. .	This PCN did not introduce an unreviewed safety question. The ground on CEA 41 does not affect its ability to maintain position or fall free into the core upon a reactor trip. Withdrawing it first during a reactor startup does not affect any accident analysis and prevents it from interfering with the operation of other CEAs.
420P-2ZZ08	1	7	This PCN to procedure "Reactor Shutdown" allowed a reactor shutdown to be performed by tripping the shutdown groups after the regulating groups have been inserted. This change was necessary to minimize motion of CEA #41 which has a known ground fault and could cause a multiple CEA slip/drop event when energized for movement. Tripping the shutdown groups eliminates the need to move CEA #41 and thus eliminates the possiblity of a multiple CEA slip/drop event.	This PCN did not introduce an unreviewed safety question. Tripping the shutdown groups, rather than inserting them using the control element drive motor, during a reactor shutdown after the regulating groups have been inserted does not affect any accident analysis in Chapter 15 of the UFSAR. The method of insertion is not a critical function, only the fact that all CEAs are inserted following a reactor shutdown.
42ST-2SG05	0		This procedure "ADV N2 Accumulator Pressure Drop Test" perform a leak test of the ADV accumulators by isolating instrument air to the ADV and observing accumulator pressure drop. The purpose of the test is to verify there is sufficient accumulator volume to maintain the ADV operable for 10.5 hours as assumed in the UFSAR.	This procedure did not introduce an unreviewed safety question. The ADV is still operable during the pressure drop test and would perform its safety related function if demanded. The test verifies operability of the ADV by ensuring the actuator system leakage is low enough to accomodate 10.5 hours of operation with the accumulator at minimum allowable pressure.

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
430P-3SF06	1		This procedure is the same as 420P-2SF06, Revision 2, except it is applicable to Unit 3.	See 420P-2SF06, Revision 2, summary.
430P-3ZZ12	2	4	This PCN to procedure 430P-3ZZ12 "Mode 6 Operations" provides guidance for defeating the auto-closure interlocks of the shutdown cooling suction valves.	This PCN did not introduce an unreviewed safety question. Removal of the shutdown cooling suction valve interlocks was recommended in NRC Generic Letter 88-17 to reduce the probability of a loss of shutdown cooling. The shutdown cooling interlocks are not required to be operable in mode 6, when this procedure allows them to be disabled. No safety analysis relies on their operation during mode 6 and defeating the interlock reduces the probability of a loss of shutdown cooling due to inadvertant actuation or equipment failure.
43ST-3AF02	1	8	This PCN added valves to the verification alignment of the procedure to accomodate the installation of temporary modification 3-89-AF-123.	This PCN did not introduce an unreviewed safety question. The installation of the temporary modification was reviewed in accordance with 50.59 prior to installation. This procedure change maintains the testing basis following installation of the temporary modification.
43ST-3AF03	2	7	This change added Procedure Change Notice (PCN) 7 to Auxiliary Feedwater Pump (AFW) "B" surveillance procedure. The PCN was necessary to allow for the additional recirculation flow from the installation of temporary modification 3-89-AF-123 an additional miniflow line in the minimum recirculation line of AFW "B."	This PCN did not introduce an unreviewed safety question. The temporary modification was approved by the 50.59 process and this procedure change updated the surveillance procedure to account for the temporary modification.
44TP-XLR04	0		This procedure "Temporary Level Indication for LRS Concentrate Monitor Tanks LRN-T03A & LRN-T03B" provides instructions for the installation, operation, and removal of temporary level indication for LRS concentrate monitor tanks LRN-T03A and LRN-T03B until reliable permanent level indication has been installed.	This temporary procedure did not introduce an unreviewed safety question. The procedure establishes a method of monitoring level in the concentrate monitor tanks in the liquid radioactive waste system. No safety related or important to safety equipment is affected by this procedure. Leakage from the temporary level indicator was analyzed and

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
				determined to be contained by the threshold of the concentrate tank room and collected by the radioactive floor drain system. The procedure will only be utilized until installation of Site Modification SM-LR-018 which will install pemanent level indication.
4XOP-XHP02			This PCN (Unit 1, Rev. 4, PCN 2; Unit 2, Rev. 5, PCN 3; and Unit 3, Rev. 3, PCN 3) to all three units procedure "Containment Hydrogen Control and Hydrogen Purge Exhaust System (HP)" required closing of the cooling air isolation dampers of the Recombiner which was not operating to prevent recirculation of the cooling air. The change was necessary since the dampers had been changed from normally closed to normally open.	This PCN did not introduce an unreviewed safety question. Changing the operating procedure to require closing of the cooling air dampers does not affect operation of the recombiners. This change is necessary to maintain recombiner operation given the change in operating mode of dampers from normally closed to open. Maintaining the dampers in the open condition will not affect any normal operating or post accident release from the dampers. The safety design basis of the recombiners is maintained with this change.
4XOP-XSF05	3		This procedure revision of "Operation of the Steam Bypass Control System" incorporates instructions for various modes of controller/valve operation (incorporates CE Info Bulletin 88-07, Potential for Spurious Opening of Turbine Bypass Valves), and "Exercising Steam Bypass Valves with Full Steam Flow."	This procedure revision did not introduce an unreviewed safety question. The revision operates the Steam Bypass Control System (SBCS) in a manner consistent with the design as described in UFSAR Sections 7.7.1 and 10.4.4. Thereby maintaining the validity of the accident analysis conducted on the SBCS (CESSAR Sections 15.1.3, 15.1.4, 15.2.4, and questions 440.64, and 440.7; UFSAR Sections 15.2.1, 15.2.2, 15.2.4, 15.2.5, and question 15A.26; SER 7.7, 10.3.2, and 10.4.4). The SBCS is a control grade system and is not required to mitigate the consequences of an accident or for safe shutdown.
4XOP-XZZ16	0		This new procedure for all three units "RCS Drain Operations" provides specific guidance for reduced inventory and mid-loop operation.	This procedure did not introduce an unreviewed safety question. The procedure incorporates the guidance of Generic Letters 87-12 and 88-17. The procedure is consistent with the normal equipment limitations and is in accordance with the Units Technical Specifications.

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
4XST-XSG05	1		This revision to all three units procedures "ADV Nitrogen Accumulator Drop Test" requires that the high pressure nitrogen header be depressurized prior to performance of the ADV nitrogen accumulator leak test.	This revision did not introduce an unreviewed safety question. The additional requirement to vent the high pressure nitrogen header prevents in leakage from this system into the ADV accumulator. In leakage during the performance of this test would mask accumulator leakage and not give an accurate indication of the ability of the ADV to perform its safety related function of 10.5 hours of operation. The high pressure nitrogen system is not safety related or important to safety and venting it does not render any safety related equipment inoperable.
72CP-9RX06	0		This is a new procedure "Removal and Installation of Fuel Assembly Upper End Fitting" which provides guidance for removal and installation of the fuel assembly upper end fitting during fuel reconstitution.	This procedure did not introduce an unreviewed safety question. The procedure was reviewed by Reactor Engineering and it was concluded that the fuel reconstitution could pose no accidents or consequences greater than those previously analyzed.
72CP-9RX07	0		This new procedure "Fuel Assembly Rod Removal Transfer and Insertion" provides for the removal and insertion of fuel rods during reconstitution.	This new procedure did not introduce an unreviewed safety question. Reconstitution of the fuel was evaluated by Reactor Engineering and found to not involve any activity which could lead to an accident in the fuel building which is not bounded by the UFSAR analysis of a single dropped fuel assembly.
72CP-9RX08	0		This new procedure "Fuel Rod Eddy Current Defect Examinations" provides guidance for non destructive examination of fuel pins.	This procedure did not introduce an unreviewed safety question. The Reactor Engineering group evaluated this activity and determined the all potential accidents were bounded by the current analysis of a dropped single fuel assembly described in UFSAR Section 15.7.4. Further the probability of an accident was not increased by this activity.
72CP-9RX10	0		This new procedure "Fuel Assembly Reconstitution" provides	This procedure did not introduce an unreviewed safety

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
			guidance for replacing fuel rods in an assembly and/or replacing the cage for a fuel assembly.	question. The Reactor Engineering group evaluated this activity and determined it did not involve any potential accidents or increased consequents of accidents not previously described in the UFSAR. Reconstitution of a fuel assembly is limited to one fuel assembly at a time and is performed in an isolated portion of the spent fuel pool.
721C-1RX03	0		This revision to procedure 721C-1RX03 "Core Reloading" incorporates the total off loading and reloading of the core and provides for cycle specific loading patterns for refueling operations.	This revision did not introduce an unreviewed safety question. Complete off loading of the core does not affect any accident analysis. Reloading is consistent with Technical Specification 6.2.2.1.d and the CESSAR description of initial fuel load. An inventory of the spent fuel pool is performed prior to the start of the reloading, and the fuel inventory tag board is checked against the inventory. Special Nuclear Material transfer sets are located in the Control Room, Fuel Building, and Containment during reload to aid operators in verifying proper locations for picking up or setting down fuel assemblies. A core verification is performed after the reloading to verify that all assemblies are correctly located in the reactor vessel. All the fuel handling equipment is operated in accordance with approved procedures such that no increased probability or consequences of an accident exist during off load or reload.
721C-3RX03	0		This new procedure is identical to 721C-2RX03, Revision 1. See that description contained in the report.	
720P-RX07	0		This new procedure 720P-9RX07 "Fuel Assembly Recovery" provides controls needed to recover mispositioned fuel assemblies.	This procedure did not introduce an unreviewed safety question. The procedure allows manual operation of the refueling machine to free stuck fuel assemblies. Additional adminstrative controls are required by the procedure when hoisting above the overload cutoff of the Technical Specifications. The load is limited to that allowed by the fuel vendor such that damage to the assembly would be

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
				minimized.
72TI-9RC01	0		This procedure "Reactor Coolant System Ultrasonic Flow Measurement" measures Reactor Coolant System flow rate and flow coastdown characteristics.	This procedure did not introduce an unreviewed safety question. The procedure is performed in Mode 3 following a refueling outage to minimize decay heat present. In this condition only approximately .01% of the decay heat assumed in the safety analysis evaluation of a loss of flow event is present. The reactor coolant pump coastdowns performed by this procedure are used to validate the assumptions of the safety analysis and during these coastdowns plant pressure and temperature are maintained in the normal operating ranges. Following the coastdown forced circulation can be immediately restored using the Reactor Coolant Pumps or natural circulation can be established to remove decay heat. No part of the procedure places the plant in a condition not previously analyzed in the UFSAR.
72TP-1RX01	0		This procedure "U1C2 CEA #56/Fuel Assembly Inspection/Rework" provided guidance for the inspection and rework of CEAs and fuel assemblies as a result of stuck CEA #56.	This procedure did not introduce an unreviewed safety question. The procedure utilized normal fuel handling equipment (refueling machine, cameras, etc) to perform inspections of CEA #56 and associated fuel assemblies. Any rework directed by the procedure would be consistent with the design basis and descriptions contained in CESSAR 4.2.1.1, 4.2.1.4, 4.2.2.1, and 4.2.2.4. The procedure contains the same precautions and limitations as the fuel reloading procedure to prevent misplacing of fuel assemblies. Possible occurances as a result of this procedure are bounded by CESSAR analysis 15.7.4 and UFSAR 15.7.4.1 and 15.7.4.2.
73MT-9IA01	0		This procedure "Instrument Air System Quality Testing" installed test equipment and sampled the instrument air system quality to verify it met the ANSI/ISA Standard S7.3-1975, "Quality Standard for Instrument Air."	This procedure did not introduce an unreviewed safety question. This test only obtained samples of instrument air at various locations and did not affect the performance of the instrument air system. The instrument air system is not

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
				important to safety or safety related and not required for safe shutdown.
73ST-1CL02	0		This new Unit 1 specific "Integrated Leak Rate Test" procedure revised the sensor arrangement and made editorial changes to the original procedure.	This new procedure did not introduce an unreviewed safety question. The procedure is only performed in mode 5 when containment integrity is not required. The equipment installed for the performance of the test has been evaluated and found not to impact any equipment important to safety or safety related equipment.
73ST-9CL02	3		See description and summary of 73ST-1CL02, Revision 0, except that this procedure is not Unit 1 specific.	
73TI-9IA02	0		This test instruction "Low Pressure Nitrogen (GA) Backup Supply to Instrument Air (IA) Header" simulated a loss of the non class instrument air system and determined the ability of the non class nitrogen backup system to supply the IA header during normal and transient IA demand conditions.	This test instruction did not introduce an unreviewed safety question. Neither of the systems being tested are important to safety or safety related. The IA system is not relied upon for safe shutdown and all safe shutdown equipment supplied by the header has either a separate class nitrogen backup system or fails in the position required for safe shutdown.
73TI-9IA02	1		This revision to 73TI-9IA02 changed the procedure such that the low pressure regulators in the system could be adjusted prior to the test.	See 73TI-IA02, Revision 0, summary.
73TI-9IA02	2		This procedure tested the nitrogen backup to the instrument air system to ensure it would perform in accordance with its design basis following a loss of the instrument air system.	This procedure did not introduce an unreviewed safety question. The systems being tested are not safety related or important to safety. The testing was necessary to ensure the backup system performed as designed when the instrument air system was not available.
73TI-9RC03	0		This new procedure installed instrumentation to monitor for thermal stratification in the pressurizer surge and auxiliary spray lines.	This procedure did not introduce an unreviewed safety question. The monitoring methods were nonintrusive and did not affect the seismic or environmental qualification of any

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
				equipment. The monitoring equipment was installed and cables routed such that there would be no affect on safety related or important to safety equipment.
73TI-9SG06	0		This new procedure performed testing of the atmospheric dump valves to ensure they would perform in accordance with their design basis.	This procedure did not introduce an unreviewed safety question. The procedure ensured the atmospheric dump valves would perform in accordance with their design basis and did not place the plant in any unanalyzed conditions.
73TP-2SG01	0		This temporary procedure "ADV Nitrogen Pressure Drop Test" takes data to determine the effect of having the high pressure nitrogen system depressurized during the performance of 42ST-2SG02 "ADV Nitrogen Accumulator Pressure Drop Test." The purpose of the test is to verify the validity of performing 42ST-2SG02 with the high pressure nitrogen header pressurized and the potential for leakage from this system to mask ADV accumulator leakage.	This temporary procedure did not introduce an unreveiwed safety question. The venting of the high pressure nitrogen header during performance of the ADV Nitrogen Accumulator Pressure Drop Test does not affect the operability of any important to safety or safety related components. The test potentially identifies a deficiency which could give a false indication of ADV operability if excessive inleakage from the high pressure nitrogen system is occuring.
73TP-9CH02	0		This temporary procedure "Pressure Test for Leakage on Valve CHA-HV-0507" was for a leak test of valve CHA-HV-0507.	This temporary procedure did not introduce an unreviewed safety question. The equipment the test was performed on was removed from service prior to the test and thus the test affected no equipment important to safety or safety related. The pressure the test was performed at did not exceed normally operating pressure.
73TP-9HP01	0		This procedure "Post LOCA Hydrogen Analyzer Special Range Demonstration" was a temporary test procedure to verify the hydrogen analyzer would correctly respond to a 10% hydrogen gas concentration in nitrogen.	This temporary procedure did not introduce an unreviewed safety question. This was a one time test to verify the response of the containment hydrogen analyzer to a 10% hydrogen sample. The test was evaluated from a hydrogen analyzer operability basis and found not to be detrimental to the function of the analyzer. The test was also evaluated to ensure an explosive gas concentration would not be created.

1989 PVNGS Procedure 50.59 Report

Procedure Number	Rev	PCN	Description	Safety Evaluation Summary
73WP-0ZZ18	0		This was a new procedure to weld carbon alloy steels and copper alloys.	This procedure did not introduce an unreviewed safety question. The welding procedure was in accordance with applicable industry standards adn met the requirements of UFSAR 17.2.
76CP-9NP17	0		This new procedure, 76CP-9NP17, Rev. 0, "Palo Verde RCP Impeller Decon Installation and Checkout Procedure," describes the procedural controls placed on the equipment and activities associated with decontamination of the PVNGS Reactor Coolant Pump impellers.	This new procedure did not introduce an unreviewed safety question. The new procedure describes the equipment and chemicals temporarily installed and used in the fuel building to effect decontamination of the PVNGS Reactor Coolant Pump impellers. The temporarily installed equipment and chemicals were evaluated to neither interact with nor interface with any equipment important to safety and hence will not result in operation of the affected unit in a manner inconsistent with the safety evaluation or the Technical Specifications.
82CP-1RC01	0		This new procedure was for the installation of the guide support structure system (GSSS). The GSSS was installed as a result of DCP 1,2FM-RC-154.	This procedure did not introduce an unreviewed safety question. The task in question requires procedural guidance and this procedure provides that guidance.

SAFETY ANALYSIS REPORT CHANGE NOTICE 50.59 REPORT FOR 1989

SAR CHANGE NO.	DESCRIPTION	SAFETY EVALUATION SUMMARY
2119	This change to sections 3.6,3A.20 and Table 3E-1 of the UFSAR assumes a one square foot break of a main steam line (instead of a double-area break) for the purpose of calculating the pressure-temperature response of the main steam support structure (MSSS).	This change did not introduce an unreviewed safety question. The assumption of a one square foot break size is consistent with Branch Technical Position ASB3-1. The design basis of the main steam and main feedwater piping in the MSSS is not being changed.
2123	This change to section 9.4 and Table 9.4-2 of the UFSAR removes the commitment to use the atomizing water spray system of the diesel generator (DG) building HVAC system during testing of the diesel generators.	This change did not introduce an unreviewed safety question. The atomizing water spray system was designed to maintain room temperature below 120 F during DG testing for personnel occupancy purposes only, but startup testing revealed problems caused by the added moisture in the air. The operability of the DG's is not affected by not using the atomizing water spray system, since the DG's are designed to function in a room temperature of 140 F, and the HVAC is designed to maintain room temperature below 140 F without using the water spray system.
3051R1	This change to section 1.8 of the UFSAR deletes the reference to a specific revision of Regulatory Guide 1.147.	This change did not introduce an unreviewed safety question. Regulatory Guide 1.147 is a list of approved code cases and is periodically updated by the NRC. This change will allow the latest version of this Regulatory Guide to be utilized when doing new design work, and therefore currently approved code cases can be utilized.
3054	This change to section 9.2 of the UFSAR removes references to the caustic day tank and pump in the regeneration subsystem of the demineralized water (DW) system.	This change did not introduce an unreviewed safety question. The DW system serves no safety function and has no safety design bases. The functions of the caustic day tank and pump are satisfied as follows: caustic for the makeup demineralizer regenerators is pumped directly to the mixing tee from the dilute caustic pumps in the chemical production building, and flow is regulated by a control valve based on conductivity.

SAFETY ANALYSIS REPORT CHANGE NOTICE 50.59 REPORT FOR 1989

SAR CHANGE NO.	DESCRIPTION	SAFETY EVALUATION SUMMARY
3057	This change to section 1.8 of the UFSAR takes exception to Regulatory Guide 1.137, Fuel Oil Systems for Standby Diesel Generators, replacing the testing requirements of ASTM D2274-70 and ASTM D270-1975 with those of ASTM D2276 and ASTM D4057-81, respectively.	This change did not introduce an unreviewed safety question. ASTM D2276 is replacing ASTM D2274-70 because it is a better measure of particulate contamination, and has been accepted by the NRC as an acceptable substitute in San Onofre Nuclear Generating Station Operating License amendments. Astm D4057-81 is replacing ASTM D270-1975 because the D270-1975 has been deleted as an ASTM Standard.
3070R1	This change to Table 3.2-1 of the UFSAR allows material procurement and corrective maintenance of the meteorological system to be accomplished non-quality related. Meteorological system calibration continues to be subject to the operational qaulity assurance program. This change received approval from NRC under 10CFR50.54(a)(3) submittal.	This change did not introduce an unreviewed safety question. The meteorological system is used for monitoring purposes only and does not affect the operation of any structures, systems or components which are safety related or important to safety. The meteorological instrumentation continues to meet relevant regulatory requirements.
3100	This change to section 9.5 of the UFSAR revises the criteria used for control room carpet flamability from ASTM E84 test method to NFPA 253 test method.	This change did not introduce an unreviewed safety question. The carpeting industry no longer recognizes the ASTM E84 test for carpeting. The NFPA 253 test method is used throughout the industry and is an actual measure of the heat flux required to ignite the carpeting.
3103	This change to section 9.3 of the UFSAR revises the normal operating pressure of the reactor drain tank (RDT) from 0.5 psig to 0.8 psig, which will allow for better control by the pressure control valve.	This change did not introduce an unreviewed safety question. The revised normal operating pressure of the reactor drain tank (RDT) is within the original design criteria.
3104R1	This change to section 18.II of the UFSAR revises the description of the reactor coolant gas vent system to state that their are seven solenoid-operated vent valves in the system, instead of six, and that the two pressurizer vent paths consist of one with two solenoid isolation valves and one with one solenoid isolation valve and an orifice, instead of one solenoid isolation valve in each path.	This change did not introduce an unreviewed safety question. The RCS gas vent system meets the NUREG-0737 requirements and the requirements for RCS pressure boundary components. The additional valve in one of the pressurizer vent paths reduces the probability of a LOCA through the vent system.

SAFETY ANALYSIS REPORT CHANGE NOTICE 50.59 REPORT FOR 1989

SAR CHANGE NO.	DESCRIPTION	SAFETY EVALUATION SUMMARY
	Figure 18.II.B-1 is also revised to reflect these changes.	
3105	This change to section 11.5 of the UFSAR revises the commitment of radiation monitoring system (RMS) calibration periodicity from each refueling to at least every 18 months.	This change did not introduce an unreviewed safety question. The PVNGS Technical Specifications require surveillance testing of RMS channels to be performed at least once per 18 months. This change will make the UFSAR consistent with the Tech Specs.
3106	This change to section 9.2 of the UFSAR changes the statement that hypochlorite solution is normally injected into the essential spray pond (ESP) filtration system, to state that hypochlorate solution is normally injected into the ESP system.	This change did not introduce an unreviewed safety question. Hypochlorite is added to the essential spray pond (ESP) for chemistry control. This change allows hypochlorite to be added to the ESP via a designed-in flow path that is not a part of the filter system. This change reduces the corrosion in the filtration system piping due to the concentrated hypochlorite injection, and continues to allow for proper ESP chemistry control.
3107	This change to section 9.1 of the UFSAR allows the spent fuel pool cooling system to be operated with a single train, instead of both trains; as long as fuel pool temperature is maintained below the 125 F limit which is unchanged.	This change did not introduce an unreviewed safety question. The temperature limit of 125 degree F for the spent fuel pool is not being changed. This change to allow the use of a single train to maintain this limit will reduce the probabilty of malfunctions because there will be less wear and tear on equipment.
3110	This change to Table 7.2-1 of the UFSAR corrects footnotes pertaining to low pressurizer pressure and low steam generator pressure trip setpoints. The statement that the setpoints can be manually decreased to a fixed increment of 200 psia below existing pressure as pressure is reduced is changed to state that the increment is no greater than 200 psia for low steam generator pressure and no greater that 400 psia for low pressurizer pressure. Additionally, the minimum trip set point is changed to read 100 psia instead of 300 psia.	This change did not introduce an unreviewed safety question. These corrections make the UFSAR consistent with Technical Specifications which received review and approval.

SAFETY ANALYSIS REPORT CHANGE NOTICE 50.59 REPORT FOR 1989

SAR CHANGE NO.	DESCRIPTION	SAFETY EVALUATION SUMMARY
3111	This change to Table 7.2-4 of the UFSAR corrects the stated ranges of monitoring steam generator pressure from 0 - 1400 psia to 0 - 1523 psia, and steam generator primary pressure differential from 0 - 47 psia to 0 - 70 psia.	This change did not introduce an unreviewed safety question. The accident analysis of chapter 15 uses the setpoints as reflected in Technical Specifications for bases. Changes in the ranges which can be monitored will not affect this analysis. The changes to these monitored ranges will not affect any trip set points.
3113	This change was reported under Site Mod 3-SM-SS-006	
3114	These changes to section 9.5 and Table 9.B.3-1 of the UFSAR delete the descriptions of, references to and requirements for hose houses.	This change did not introduce an unreviewed safety question. The protection previously provided by hose houses is now provided by a class A fire truck which is used to respond to all fires by the full-time fire team. This truck is backed up by an attack vehicle which carries necessary fire fighting equipment.
3115	This change to section 5.4 of the UFSAR allows a shutdown cooling system train to be operated with one injection nozzle isolated when in modes 5 or 6, with a flow limit of 6000 gpm through the operating nozzle.	This change did not introduce an unreviewed safety question. The minimum Technical Specification requirement of 4000 gpm shutdown cooling flow through the core will continue to be met. A flow baffle plate distributes the discharge from each injection nozzle, therefore injection from a single nozzle will continue to be distributed as it enters the core area.
3116	These changes to sections 1.2,2.4 and 3.8 of the UFSAR correct errors by identifing the correct dimensions and height of the DG building and the size of the space between the DG building and the Control Building.	These changes did not introduce an unreviewed safety question. The original dimensions stated in the FSAR were close estimates which are being updated by this change.
3117	This change to Figure 9B-9 of the UFSAR deletes unnecessary information shown for the corridor building, which does not contain any safety related equipment.	This change did not introduce an unreviewed safety question. The corridor building is not assigned any fire area number nor is it fire analysed for UFSAR Appendix 9B purposes. The corridor building is shown on Figure 9B-9 for reference only

SAFETY ANALYSIS REPORT CHANGE NOTICE 50.59 REPORT FOR 1989

SAR CHANGE NO.	DESCRIPTION	SAFETY EVALUATION SUMMARY
		as it adjoins the control building.
3118	This change to section 7.2 of the UFSAR incorporates CESSAR Table 7.2-5, listing plant protection system-failure modes and analysis. The NSSS ESFAS power supply symptoms to PPS failure modes are revised to reflect characteristics of power supplies replaced by DCP 13 FJ-SA-020, and the voltages of these power supplies is revised.	This change did not introduce an unreviewed safety question. Any failure of an auxiliary power supply will not cause an accident or degrade the protection provided by these cabinents. The failure modes have not been altered by this change. Engineering Evaluation has determined that the replacement power supply is an acceptable substitute for the original power supply.
3119	Editorial change	
3120	These changes to sections 12.3 and 12.5 revise descriptions of the radiation protection equipment to improve clarity, and to ensure consistency with Technical Specifications and other UFSAR sections.	These changes did not introduce an unreviewed safety question. The radiation protection program and equipment continues to comply with requirements of Technical Specifications and 10CFR20.
3121	This change to section 1.8 of the UFSAR revises the response to Regulatory Guides 1.70 and 1.101 to identify that NUREG 0654 supercedes Regulatory Guide 1.101 (which is referenced in R.G. 1.70) and that we acept the position of NUREG 0654.	This change did not introduce an unreviewed safety question. This change commits PVNGS to updated guidance from the NRC concerning emergency response plans.
3122	This change to Table 5.2-4 updates ASME Code Case N-249-1 to N-249-2.	This change did not introduce an unreviewed safety question. Code Case N-249-2 has been approved by the NRC for safety related use in nuclear power plants.
3123	These changes to sections 13.1 and 18.I.B of the UFSAR update the PVNGS organization descriptions.	These changes did not introduce an unreviewed safety question. No responsibilities which were previously committed to were eliminated. The organization changes were made to improve the performance and safety of PVNGS.
3124	These changes to section 17.2 of the UFSAR update position titles, organization titles and distribution of	Thess changes did not introduce an unreviewed safety question. No responsibilities which were previously

SAFETY ANALYSIS REPORT CHANGE NOTICE 50.59 REPORT FOR 1989

SAR CHANGE NO.	DESCRIPTION	SAFETY EVALUATION SUMMARY
	responsibilities with regard to quality assurance.	committed to were reduced. The organization changes were made to improve the performance and safety of PVNGS.
3125	This change to section 3.8 ot the UFSAR will allow structural steel welding to be performed by welders or welding operators qualified to either AWS D1.1 or ASME section IX.	This change did not introduce an unreviewed safety question. The weld procedures are not being changed nor are visual acceptance criteria. Welder qualifications are not being reduced by this change since ASME section IX criteria is equal to or better than AWS D1.1.
3127	This change to section 8.3 of the UFSAR clarifies that the load imbalance trip and alarm for the diesel generator is also known as the negative sequence trip and alarm.	This change did not introduce an unreviewed safety question. Only the nomenclature is being added to the UFSAR description to remove any confusion regarding the DG load imbalance trip.
3128	These changes to sections 9.5,9A,9B and 13A of the UFSAR replace "fire brigade" with "fire team".	These changes did not introduce an unreviewed safety question. The original fire brigade, made up of designated personnel from various departments on shift, has been replaced by a full time, dedicated fire team. This fire team receives training in accordance with existing commitments, and the minimum team size is in accordance with existing commitments. Fire fighting capability is enhanced using professional fire fighters instead of a fire brigade.
3129	These changes to sections 11.2,11.4,12.5,12.A and Table 11.2-8 remove references to a radioactive laundry facility on site.	These changes did not introduce an unreviewed safety question. The removal of the radioactive laundry facility has no affect on any structure, system or component that is safety related or important to safety.
3130	This change to section 17.2 of the UFSAR designates Nuclear Engineering as the PVNGS design authority, with responsibility for ensuring high quality designs.	This change did not introduce an unreviewed safety question. These changes conform to INPO Guidelines 88-016, "Guidelines for the Conduct of Design Engineering", and focus the responsibility for design on the Nuclear Engineering group.

SAFETY ANALYSIS REPORT CHANGE NOTICE 50.59 REPORT FOR 1989

SAR CHANGE NO.	DESCRIPTION	SAFETY EVALUATION SUMMARY
3131	Editorial change.	
3132	These changes to section 9B of the UFSAR provides information regarding specific fire dampers in Unit 1 that are not installed in accordance with the fire tested configuration.	These changes did not introduce an unreviewed safety question. The barriers containing these dampers are not required to achieve seperation in accordance with 10CFR50 Appendix R, section III.G.2. Engineering Evaluation determined that the barrier will still be able to perform its intended design function.
3134	This change was reported as PCP 87-13-HJ-005.	
3135	These changes to sections 4.2,4.3 and 4.4 of the UFSAR incorporate core reload information for Unit 1, Cycle 3 and Unit 3, Cycle 2 and information from CESSAR, as well as editorial corrections.	These changes did not introduce an unreviewed safety question. Information regarding core reload was reviewed and approved by the NRC in the Reload Analysis Reports (RAR's), and information from CESSAR was previously reviewed and approved by NRC in the plant licensing precess.
3136	These changes to chapter 15 of the UFSAR incorporate core reload information for Unit 1, Cycle 3, and Unit 3, Cycle 2, and information from CESSAR, as well as editorial corrections. Response to Regulatory Guide 1.70 in section 1.8 of the UFSAR was updated to allow UFSAR consistency with CESSAR.	These changes did not introduce an unreviewed safety question. Information regarding core reload was reviewed and approved by the NRC in the Reload Analysis Reports (RAR's), and information from CESSAR was previously reviewed and approved by NRC in the plant licensing process.
3137	These changes to sections 6.3,7.2 and 7.7 of the UFSAR incorporate core reload information for Unit 1, Cycle 3 and Unit 3, Cycle 2, and information form CESSAR, as well as editorial corrections.	These changes did not introduce an unreviewed safety question. Information regarding core reload was reviewed and approved by the NRC in the Reload Analysis Reports (RAR's), and information from CESSAR was previously reviewed and approved by NRC in the plant licensing process.
3138	This change to section 9.2 of the UFSAR deletes reference to a flow control valve that limits flow of the demineralized water system from the reverse osmosis units in the Water	This change did not introduce an unreviewed safety question. This valve was installed under a previous change, and process testing showed that it did not function as desired.

SAFETY ANALYSIS REPORT CHANGE NOTICE 50.59 REPORT FOR 1989

SAR CHANGE NO.	DESCRIPTION	SAFETY EVALUATION SUMMARY
	Reclamation Facility.	The demin water system provides no safety function, and removal of this valve has no impact on safety related or important to safety structures, systems or components.
3139	Editorial change.	
3140	Editorial change	
3153	This change to section 18.I.C.5 shifts the responsibility for implementing the operating experience review (OER) program from ISEG to the Technical Data Department.	This change did not introduce an unreviewed safety question. The responsibilities assigned to ISEG in Technical Specifications are not being reduced or transfered. This change allows ISEG to assign greater resources to those Tech Spec assigned responsibilities, while the OER program will continue to be properly administered by the Technical Data Department.

Miscellaneous 50.59 Report for 1989

Item	Description	Safety Evaluation Summary
NCR 0-063-86	This NCR accepted "as is" use of zinc-coated washers in dry air environments for electrical and I & C applications. The washers originally specified were stainless steel.	This NCR did not introduce an unreviewed safety question. The zinc coated washers are equivalent to teh originally specified stainless steel. The electrical properties are essentially equivalent. The potential for galvanic corrosion is small because of the dry air environment. The conduct of maintenance procedure has been amended to ensure personnel are aware of the possibility of corrosion and the need to notify engineering if any electrical connections exhibity corrosion.