Harris Nuclear Plant
Fire Probabilistic Risk Assessment
Pre-Submittal Audit

to ASME Standard for Level 1/Large Early Release Frequency
Probabilistic Risk Assessment for
Nuclear Power Plant Applications

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Acronyms

Acronym	Definition
AFW	Auxiliary Feedwater
ANS	American Nuclear Society
ANSI	American National Standards Institute
AOT	Allowed Outage Time
ASME	American Society Of Mechanical Engineers
CC	Capability Category
CCF	Common Cause Failure
CCW	Component Cooling Water
CDF	Core Damage Frequency
CF	Circuit Failures (ASME Fire PRA Standard Element)
CS	Cable Selection and Location (ASME Fire PRA Standard Element)
CST	Condensate Storage Tank
DA	Data Analysis (ASME PRA Standard Element)
DC	Direct Current
EOOS	Equipment Out Of Service
EPRI	Electric Power Research Institute
EQ	Equipment Qualification
ES	Equipment Selection (ASME Fire PRA Standard Element)
F&O	Facts and Observations
FPRA	Fire PRA
FQ	Fire Risk Quantification (ASME Fire PRA Standard Element)
FRANC	R&R Workstation Fire Module
FSS	Fire Scenario Selection and Analysis (ASME Fire PRA Standard Element)
GL	Generic Letter
HEP	Human Error Probability
HFE	Human Failure Event
HLR	High Level Requirement
HNP	Harris Nuclear Plant
HRA	Human Reliability Analysis
HRA	Human Reliability Analysis (ASME Fire PRA Standard Element)
IE	Initiating Event (ASME PRA Standard Element)
iePRA	Internal Events PRA
IF	Internal Flood (ASME PRA Standard Element)
IGN	Ignition Frequency (ASME Fire PRA Standard Element)
LE	Large Early Release Frequency (ASME PRA Standard Element)
LERF	Large Early Release Frequency
LOCA	Loss of Coolant Accident
MSPI	Mitigating Systems Performance Indicators

Acronym	**Definition**
MUD	PRA Configuration Control (ASME FPRA Standard Element)
Mwt	Megawatts Thermal
N/A	Not Applicable
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam supply System
PE	Progress Energy
PORV	Power Operated Relief Valve
PP	Plant Partitioning (ASME FPRA Standard Element)
PRA	Probabilistic Risk Assessment
PRM	FPRA Plant Response Model (ASME FPRA Standard Element)
PWR	Pressurized Water Reactor
QLS	Qualitative Screening (ASME Fire PRA Standard Element)
QNS	Quantitative Screening (ASME Fire PRA Standard Element)
QU	Quantification (ASME PRA Standard Element)
R&D	Research and Development
RCS	Reactor Coolant System
RG	Regulatory Guide
RHR	Residual Heat Removal
RIS	Regulatory Information Summary
RWST	Refueling Water Storage Tank
SC	Success Criteria Analysis (ASME PRA Standard Element)
SF	Seismic Fire (ASME Fire PRA Standard Element)
SGTR	Steam Generator Tube Rupture
SI	Safety Injection
SR	Supporting Requirement
SSEL	Safe Shutdown Equipment List
SY	Systems Analysis (ASME PRA Standard Element)
UNC	Uncertainty and Sensitivity Analysis (ASME FPRA Standard Element)
WOG	Westinghouse Owners Group

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1.0 Introduction

The purpose of this report is to document the final results of the U.S. Nuclear Regulatory Commission (NRC) staff review of the Shearon Harris Nuclear Power Plant (HNP) Unit 1 fire probabilistic risk assessment (fire PRA) against the requirements of Part 3 "Internal Fires at Power Probabilistic Risk Assessment Requirements," of draft ASME/ANS RA-S 2007, "American Society of Mechanical Engineers/American Nuclear Society, Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications" (Reference 1). The review is intended to determine whether the base fire PRA model is of sufficient technical adequacy and appropriate scope to support implementation of NFPA standard NFPA 805, "Performance Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," (Reference 7) as allowed under Title 10 of the *Code of Federal Regulations*, Part 50, Section 48(c). This Staff review used the guidance set forth in the Nuclear Energy Institute's (NEI) draft document on conducting fire PRA peer reviews, NEI 07-12, "Fire Probabilistic Risk Assessment Peer Review Process Guidance" (Reference 3). This report supersedes the preliminary report in its entirety (Agency wide Documents Access and Management System (ADAMS) Accession No. ML080650403). The technical results documented in this report are essentially unchanged from the preliminary report, although users should verify this when addressing specific technical facts and observations.

1.1 Background

NRC Staff and contractors conducted a review of the HNP fire PRA model in the first quarter of calendar year 2008. The onsite portion of the review took place the week of February 4, 2008, at the Progress Energy (PE) corporate offices in Raleigh, North Carolina. The purpose, methodology, and other aspects of the review may be found in the NRC letter to PE dated January 9, 2008 (Reference 6).

The purpose of the review was to allow the NRC staff to assess the technical adequacy of the base HNP fire PRA model. The results of this review are expected to support the staff's review of HNPs license amendment request to transition the HNP fire protection program to one based on NFPA 805, as allowed under 10 CFR 50.48(c). The NRC conducted this review because HNP is a NFPA 805 pilot application.

ASME/ANS RA-S-2007 includes a number of technical requirements for assessing the technical adequacy of a fire PRA. There are thirteen technical elements, each addressing an area or task involved in constructing and using a fire PRA. The technical elements are composed of one or more high level requirements (HLRs). The HLRs are further broken down into one or more supporting requirements (SRs). A peer review of a fire PRA model, as defined in the PRA Standard, evaluates that model against the applicable SRs and the HLRs. In addition to the thirteen elements, the peer review process requires the team to review the results of the peer review of the internal events PRA that formed the basis for building the fire PRA. Finally, the PRA Standard includes requirements for configuration control and updates to the fire PRA model, and a peer review includes an assessment of those requirements.

The NRC staff review of the Harris Fire PRA model was a pre-application audit of the technical adequacy of the base fire PRA that will be used to support a license amendment request to transition the plant's fire protection program to one based on NFPA 805, as stated above. Although not a peer review, the NRC staff review was conducted in accordance with the peer review guidelines in the PRA Standard to the extent practicable.

This report documents the staff's review of the HNP fire PRA in a manner consistent with the requirements in the PRA Standard. The report includes not only the findings resulting from the NRC staff review of the fire PRA, but also information regarding review team members and qualifications.

1.2 Scope

There are 187 SRs in the fire portion of the PRA Standard if the model configuration control and update requirements are included. The NRC staff reviewed 139 SRs applicable to the Harris Fire PRA model. An additional 18 SRs could not be reviewed because PE had not yet completed those tasks. These include the elements seismic fire and uncertainty and sensitivity analysis, as well as two HLRs in the fire scenario selection and analysis element. 30 SRs were not applicable for the Harris Fire PRA model; for example, PE did not use qualitative or quantitative screening in developing the model, so the associated SRs do not apply.

The scope of this review included both estimation of core damage frequency (CDF) and large early release frequency (LERF) resulting from internal fire events. However, PE had not yet completed a LERF analysis, which accounts for some of the NRC review team findings.

2.0 Peer Review Process

The purpose of the PRA peer review process is to provide a method for establishing the technical capability and adequacy of a PRA relative to expectations of knowledgeable practitioners, using a set of guidance that establishes a set of minimum requirements.

2.1 Overview of Review Process

The review consisted of the following phases:

- Team member selection and training (see Section 3.0, below),
- Up-front review (offsite) of selected fire PRA documentation,
- On-site review of fire PRA, and
- Development of review results and completion of review report (this report).

The review of the licensee's fire PRA model assessed the elements contained in Section 3-1 of ASME/ANS RA-S-2007 to the extent necessary to determine if the methodology and its implementation meet the requirements of that Standard. It also assessed the licensee's process for maintaining configuration control of the fire PRA model in accordance with Section 1-5 of ASME/ANS RA-S-2007.

The review did not assess all aspects of the fire PRA; however, enough aspects of the fire PRA were reviewed for the reviewers to achieve consensus on the adequacy of methodologies and their implementation for each fire PRA element. The judgment of the assigned reviewers was used to determine the specific depth of the review in each fire PRA element.

For each fire PRA element assessed by the review team, all high-level requirements and supporting requirements were attempted to be assessed. Note that assessment is not necessary for an element determined to be "not applicable" by the review team (e.g., if no qualitative screening were performed, element "QLS" would not be applicable).

The review team reviewed the results of the overall fire PRA and the results of each applicable fire PRA element to determine their reasonableness given the design and operation of the plant (e.g., investigation of cutset or sequence combinations for reasonableness). Section 3.2 of ASME/ANS RA-S-2007 requires that a peer review be performed using a written methodology that assesses and addresses the requirements of Section 3-1 of ASME/ANS RAS-2007. A review plan fulfilling this requirement for a written methodology was provided in the January 9, 2008, letter to PE (Reference 6).

2.2 Assignment of Capability Categories

Section 3 of ASME/ANS RA-S-2007 presents the fire PRA assessment technical SRs. These requirements are specified in terms of Capability Category requirements with, in many cases, increasing scope and level of detail, increasing plant-specificity, and increasing realism as SRs satisfy Capability Category I through Capability Category III. See Table 1.3-1 of the ASME PRA Standard (Reference 2).

For a peer review against ASME/ANS RA-S-2007, the applicable portions of a host utility's fire PRA will be reviewed against the applicable ASME Fire PRA Standard SRs in Section 3 (per review plan [reference 6] Section II)

Table 2-1. Interpretation of Supporting Requirements[1]

Action Statement Spans	Peer Review Finding	Interpretation of the Supporting Requirement
All Three Capability Categories (I/II/III)	Meets SR	Capable of supporting applications in all Capability Categories
	Does not meet SR	Does not meet minimum standard
Single Capability Category (I or II or III)	Meets Individual SR	Capable of supporting applications requiring that Capability Category or lower
	Does not meet any SR	Does not meet minimum standard
Lower Two Capability Categories (I/II)	Meets SR for CC I/II	Capable of supporting applications requiring Capability Category I or II
	Meets SR for CC III	Capable of supporting applications in all Capability Categories
	Does not meet SR	Does not meet minimum standard
Upper Two Capability Categories (II/III)	Meets SR for CC II/III	Capable of supporting applications in all Capability Categories
	Meets SR for CC I	Capable of supporting applications requiring Capability Category I
	Does not meet SR	Does not meet minimum standard

[1] This is a reproduction of Table 1 from NEI 05-04 (Reference 8).

3.0 Staff Review Team Member Selection and Training

The review was conducted by a team of NRC staff and contractors who individually and collectively meet the experience requirements in ASME/ANS RA-S-2007 (reference 1). The team was assigned review areas within their expertise and reviewed documentation, discussed questions with the licensee fire PRA practitioners, reviewed fire PRA model elements (e.g., event trees, fault trees) and reviewed risk assessment results.

ASME/ANS RA-S-2007 requires that peer review team members' collective qualifications include:

- The ability to assess all the PRA Elements of Part 3 of ASME/ANS RA-S-2007 and the interfaces between those elements
- Knowledge of the plant NSSS design, containment design, and plant operation
- Knowledge of: systems engineering; fire PRA; Appendix R or equivalent fire safe shutdown analysis; circuit failure analyses; fire modeling; and fire protection programs and their elements.

Part 3 of ASME/ANS RA-S-2007 requires individual peer reviewers to:

- Be knowledgeable of the requirements in this Standard for their area of review
- Be experienced in performing the activities related to the fire PRA Elements for which the reviewer is assigned
- Not be allowed to review their own work or work for which they have contributed
- Not be allowed to review a fire PRA for which they have a conflict of interest, such as a financial or career path incentive or disincentive that may influence the outcome of the peer review

The NRC Review team member are knowledgeable (by direct experience) of the specific methodology, code, tool, or approach that was used in the fire PRA element assigned for their review. The team members assigned to review each element have experience specific to the area and are capable of recognizing the impact of plant specific features on the analysis.

A training session on ASME/ANS RA-S-2007 was developed by Dr. G. Parry and presented to team members on January 9, 2008. All members who participated in the staff review of the HNP fire PRA model attended that training or self-studied the presentation materials.

3.1 Peer Review Schedule and Reviewer Assignment

The NRC Review team for the Harris PRA consisted of ten members. Nine of the members were NRC personnel, including the team leader/facilitator and the remaining member was a Fire Risk

Assessment consultant. Three of the reviewers had previously participated as reviewers in WOG or other owners group PRA Peer Reviews and/or program pilot reviews.

Table 3-1 summarizes the qualifications of the individual team members. Appendix C contains the resumes of the peer review team members.

3.2 Statement of Independence

The resumes in Appendix C document that each reviewer:

1) is NOT assigned to review his/her work, and
2) DOES NOT have a conflict of interest in performing this fire PRA review

This satisfies the independence requirements of ASME/ANS RA-S-2007.

Table 3-1. Summary of Shearon Harris Fire PRA Reviewer Qualifications by Review Element

Area \ Individual		Barrett	Circle	Gallucci	Howe	Hyslop	Lain	Laur	Mitchell	Parry	Vettori
PP	Plant Partitioning	X	X				X		X		X
ES	Equipment Selection	X	X	X					X		
CS	Cable Selection and Location	X	X		X				X		
QLS	Qualitative Screening		X				X				
PRM	FPRA Plant Response Model		X	X	X			X		X	
FSS	Fire Scenario Selection and Analysis		X			X	X				X
IGN	Ignition Frequency		X	X	X		X				
QNS	Quantitative Screening		X	X							
CF	Circuit Failures	X	X		X						
HRA	Human Reliability Analysis		X							X	
SF	Seismic Fire						X				
FQ	Fire Risk Quantification		X	X	X			X		X	
UNC	Uncertainty and Sensitivity Analysis		X	X						X	
MUD	PRA Configuration Control		X		X	X	X	X		X	

(shaded) indicates assigned review area (at least 1 reviewer must be qualified in each area)

X indicates qualified per resume

Table 3-2. Collective Team Qualifications for Shearon Harris Fire PRA Review

Area \ Individual	Barrett	Circle	Gallucci	Howe	Hyslop	Lain	Laur	Mitchell	Parry	Vettori
Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007		X	X		X				X	
Knowledge of FPRA, NUREG/CR-6850		X	X		X			X	X	
Appendix R/Safe Shutdown Analysis	X	X		X				X		
Nuclear Steam System Supplier Design		X	X	X				X		
Circuit Failure Analysis	X	X		X				X		
Containment Design								X		
Plant Operations	X			X			X	X		
Fire Modeling		X								X
Systems Engineering	X	X	X	X				X		
Fire Protection Programs/Elements	X	X				X				
Industry or Similar PRA Peer Review Experience		X	X	X			X		X	

X indicates qualified per resume

4.0 Summary of Review Results

The NRC review team noted that the Harris Fire PRA is not yet complete – some tasks have yet to be started, and many areas are still in draft form. At the time of the onsite portion of the review, the Harris Fire PRA represented a scoping analysis, rather than a completed fire PRA. Very little detailed fire modeling has been done, the screening approach to identification of which areas could generate a hot gas layer appears extremely conservative, and the probability of spurious actuation in the model reviewed was assumed to be 1.0. This is significant since there were a large number of spurious actuations included in the model. The results of the PRA reviewed by the NRC staff were based upon a number of conservatisms.

Further work is being done by the licensee to finalize the fire PRA and to reduce the excess conservatisms. For example, detailed circuit analyses are being done so that more realistic probabilities of spurious actuation can be assigned. However, it appeared to the NRC review team that a great deal of work will be required in order to achieve a usable fire PRA model.

For these reasons, the NRC staff review of the Harris baseline fire PRA cannot be regarded as sufficient for determination of technical adequacy to support risk-informed applications. Additional review of the completed fire PRA will be necessary. One approach would be a full-scope industry peer review of the completed fire PRA model.

4.1 General Findings and Results

There were a number of findings and suggestions[2] as the result of the NRC staff review of the Harris Fire PRA model. The detailed facts and observations (F&Os) are in the next section. The findings included the following:

- Use of non-rated barriers for fire compartments
- Containment bypass not considered in selection of equipment
- Incorrect instruments identified in some cases
- Power supply cables not cascaded into PRA model
- Coordination studies not tied well to configuration management
- Excessive modeling conservatisms leading to unrealistic results

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[2] Findings and Suggestions are discussed in NEI-07-12, "Fire Probabilistic Risk Assessment (FPRA) Peer Review Process Guidelines Draft Version F" (Reference 3). A *finding* is an issue or discrepancy that is necessary to address to ensure the technical adequacy of the PRA, the capability/robustness of the PRA update process, or the process for evaluating the necessary capability of the PRA technical elements to support applications. A *suggestion* is an observation considered desirable to maintain maximum flexibility for PRA applications and consistency with industry practices. Failing to resolve a suggestion should have no significant impact on the PRA results or the integrity of the PRA.

- Zone of Influence not applied for wall and corner transient fire sources
- Only target considered was cables
- Fire response operator actions not modeled (neither beneficial nor adverse effects)
- Errors of commission based on instrument availability not modeled
- quantification method does not identify individual sequences to support identification of significant accident sequences
- Inability to determine significant components
- Guidance for configuration control references out-of-date material
- Documentation not complete in a number of areas
- Several areas not performed; e.g., LERF analysis, uncertainty analysis, seismic-fire interaction, assessment of potential fire effect on exposed structural steel

Almost two-thirds of the HLRs had one or more SR that was not met. While HLRs are not assigned capability categories as are the SRs, all applicable SRs must be met at some level in order to conclude that the HLR has been satisfied. As summarized Table 4-1 below, over ten percent of the applicable HLRs were in areas that could not be reviewed because the Harris Fire PRA model was not complete at the time of the NRC staff review. Table 4-6 provides a detailed summary of each HLR.

Table 4-1. High Level Requirements Overview

High Level Requirements Status:	#	%
HLRs with "Not Met" SRs	24	55%
HLRs not Ready for Review	5	11%
HLRs with all SRs "Met"	15	34%
Total Applicable HLRs:	44	100%

Table 4-2 shows that almost two-thirds of the applicable SRs were met. About thirteen percent of the SRs that were not met were in areas of the model that were mostly complete; the remaining twenty-one percent were in areas that were in-progress or not done. There are a couple of caveats associated with the SRs that are shown as “met,” however. First, because the Harris Fire PRA is still a work in progress, major changes to the modeling and the resulting risk estimates are to be expected. Some of the changes to the model may be significant, resulting in the need for additional or follow-on review for technical adequacy. The second caveat is that the assigned capability category, even if the model had been complete at the time of the NRC staff review, applies to the base Harris Fire PRA model. PE will need to determine what capability category for each SR is necessary to support a given risk-informed application, such as transition to NFPA 805.

Table 4-7 provides a summary of all the findings and observations (F&O), detailed F&O sheets from the review are included as Appendix B. A summary of the review of all SRs is included as Appendix A.

Table 4-2. Supporting Requirements Overview

Supporting Requirements Status	#	%
SRs Not Met - Model in Development	15	10%
SRs Not Met - Model Appears Ready	21	13%
SRs Not Reviewed - Task not Performed	18	11%
SRs Appeared to be Met	103	66%
Total:	157	100%

4.2 Detailed Findings of the NRC Staff Review

The individual assessment of each SR that supports the HLRs, organized by PRA Standard technical element is included in Appendix A. Detailed findings, in the form of F&O review sheets, organized by PRA Standard technical element are included in Appendix B.

As shown in Table 4-3, the NRC review team identified 43 findings and 22 suggestions, for a total of 65 F&Os.

Table 4-3. Shearon Harris Fire PRA - Number of F&Os by Element

	Element	F&O Type	
		Finding	Suggestion
-	Internal Events Peer Review	0	2
PP	Plant Partitioning	3	0
ES	Equipment Selection	4	1
CS	Cable Selection and Location	5	0
QLS	Qualitative Screening	N/A	
PRM	FPRA Plant Response Model	3	2
FSS	Fire Scenario Selection and Analysis	9	4
IGN	Ignition Frequency	1	3
QNS	Quantitative Screening	N/A	
CF	Circuit Failures	1	2
HRA	Human Reliability Analysis	6	6
SF	Seismic Fire	1	0
FQ	Fire Risk Quantification	8	0
UNC	Uncertainty and Sensitivity Analysis	1	0
MUD	PRA Configuration Control	1	2
	Total:	43	22

Table 4-4 shows the number of supporting requirements that were “not met” in each HLR. An HLR is designated by the element abbreviation followed by a letter; for example, PP-A.

Table 4-5 shows the number of SRs in each element that met a given capability category. It includes the number of SRs that did not meet any capability category, and includes columns for “not reviewed” and “not applicable.” The “not reviewed” designation is applied to SRs that should have been met but, owing to the fire PRA model not being completed, could not be evaluated by the NRC review team.

Table 4-4. Results Summary: Shearon Harris Fire PRA High Level Requirements

	Element	Number of Supporting Requirements "Not Met"							
		A	B	C	D	E	F	G	H
-	Internal Events Peer Review	-							
PP	Plant Partitioning	0	2	1					
ES	Equipment Selection	1	1	1	1				
CS	Cable Selection and Location	4	0	1					
QLS	Qualitative Screening	N/A							
PRM	FPRA Plant Response Model	2	3	N/A	0				
FSS	Fire Scenario Selection and Analysis	1	1	1	1	1	Not Rev.	Not Rev.	2
IGN	Ignition Frequency	0	0						
QNS	Quantitative Screening	N/A							
CF	Circuit Failures	0	1						
HRA	Human Reliability Analysis	0	2	1	N/A	0			
SF	Seismic Fire	Not Rev.	Not Rev.						
FQ	Fire Risk Quantification	1	0	0	1	1	2		
UNC	Uncertainty and Sensitivity Analysis	Not Rev.							
MUD	PRA Configuration Control	0	3	0	0	0	0		
	Sum:	9	13	5	3	2	2	0	2

Table 4-5. Results Summary: Shearon Harris Fire PRA Supporting Requirements

	Element	Not Met	Met	1	1&2	2	2&3	3	Not Rev	N/A
-	Internal Events Peer Review									
PP	Plant Partitioning	3	7							2
ES	Equipment Selection	4	6			3		2		
CS	Cable Selection and Location	5	7				1	1		2
QLS	Qualitative Screening									7
PRM	FPRA Plant Response Model	5	10							7
FSS	Fire Scenario Selection and Analysis	7	18	6	1	1	3	4	9	1
IGN	Ignition Frequency		8	1		1		1		4
QNS	Quantitative Screening									6
CF	Circuit Failures	1	2							
HRA	Human Reliability Analysis	3	4							1
SF	Seismic Fire								6	
FQ	Fire Risk Quantification	5	5							
UNC	Uncertainty and Sensitivity Analysis								3	
MUD	PRA Configuration Control	3	11							
	Totals:	36	78	7	1	5	4	8	18	30

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HIGH LEVEL REQUIREMENTS FOR PLANT PARTITIONING (PP)		
HLR-PP-A	The FPRA shall define the global boundaries of the analysis so as to include all plant locations relevant to the plant-wide FPRA.	The Global Analysis Boundary requirements were met based on the inclusion of all buildings and equipment within the protected area as outlying areas (Cooling Tower Structure, Emergency Service Water Intake Structure, etc.) and justification of the excluded buildings/areas. There were no F&Os associated with this HLR.
HLR-PP-B	The FPRA shall perform a Plant Partitioning analysis to identify and define the physical analysis units to be considered in the FPRA.	Use of the predefined fire areas as the basic Fire PRA physical analysis units is considered acceptable practice for all capability categories. However, the licensee has chosen to define smaller physical analysis units consistent with capability category 2&3 of supporting requirement PP-B1. Supporting requirement PP-B1 is not met because the licensee has not justified the use of non-rated barriers for these smaller physical analysis units. Supporting requirements PP-B2 through PP-B5, which would not be applicable had the licensee used the predefined fire areas, are considered applicable for the Harris plant. Refer to F&O findings PP-B2-1, PP-B2-2, and PP-C3-1.
HLR-PP-C	The FPRA shall document the results of the Plant Partitioning analysis in a manner that facilitates FPRA applications, upgrades, and peer review.	The documentation for this element appeared adequate except in one case; refer to F&O finding PP-C3-1 involving justification for using non-rated barriers.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HIGH LEVEL REQUIREMENTS FOR EQUIPMENT SELECTION (ES)		
HLR-ES-A	The FPRA shall identify equipment whose failure caused by an initiating fire including spurious operation will contribute to or otherwise cause an initiating event.	All supporting requirements for this HLR appeared to be met except ES-A6, which was not met because the licensee has not included LERF in the fire PRA scope. The licensee procedure contains guidance on selection of equipment failures for initiating events provided that they are in the safe shutdown equipment list (SSEL) and the internal events PRA. An additional list of initiating events provided by the Westinghouse Owners' Group is being reviewed to ensure all applicable initiating events have been considered. Interlocks and two spurious actuations were considered in the consideration of fire initiating events. Refer to F&O finding ES-A6-1 regarding lack of a LERF analysis.
HLR-ES-B	The FPRA shall identify equipment whose failure including spurious operation would adversely affect the operability/functionality of that portion of the plant design to be credited in the FPRA.	All supporting requirements for this HLR appeared to be met except ES-B4, which was not met because the licensee has not addressed containment bypass other than ISLOCA. The licensee considered all internal events PRA and SSEL items, and considered the potential for two spurious operations. The licensee should finish the in-process assessment of potential additional initiating events (list derived from Westinghouse Owners' Group) and provide guidance to the expert panel on how to consider these initiating events. The licensee is currently assessing an additional list derived from the WOG. Refer to F&O finding ES-B4-1 and suggestion ES-B3-1.
HLR-ES-C	The FPRA shall identify instrumentation whose failure including spurious operation would impact the reliability of operator actions associated with that portion of the plant design to be credited in the FPRA.	Supporting requirement ES-C1 was not met. In several cases, the reviewer noted that the incorrect instrument was identified. The licensee did identify instrumentation that could cause operators to take an incorrect action and identified instruments that operators would use to provide confirmation of an action (ES-C2). Supporting requirement ES-C2 appears to imply, in part, that errors of commission need to be considered; this aspect was not reviewed. Refer to F&O finding ES-C1-1 regarding incorrect instruments identified.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HLR-ES-D	The FPRA shall document the FPRA equipment selection, including that information about the equipment necessary to support the other FPRA tasks (e.g., equipment identification; equipment type; normal, desired, failed states of equipment; etc.) in a manner that facilitates FPRA applications, upgrades, and peer review.	The documentation of the ES element is not sufficient to support peer review. Better traceability is needed, especially related compartments and scenarios. The standard requires that the cables need to be identified with the component (relative to its failure mode). There are no links to this information which makes tracing components difficult for future updates. Suggest creating a database with fields of components, cables which cause the failure state, mode of failure (spurious, short to ground, etc.), compartment location with FRANC scenario for all routings per cable, and basic event mapping. Documents reviewed included FPIP-202 Rev. 0, HNP-F/PSA-0076 Rev. 0, and HNP-FPSA-0077 Rev. 0. Refer to F&O finding ES-D1-1.
HIGH LEVEL REQUIREMENTS FOR CABLE SELECTION AND LOCATION (CS)		
HLR-CS-A	The FPRA shall identify and locate the plant cables whose failure could adversely affect credited equipment or functions included in the FPRA plant response model, as determined by the Equipment Selection process (HLR-ES-A, HLR-ES-B, and HLR-ES-C).	Four supporting requirements for this HLR were not met. At least one instance was identified where postulated fire damage to a power supply cable was not reflected in the Fire PRA model. Inter-cable and three-phase hot shorts were considered for ISLOCA scenarios, but not for containment bypass. Refer to F&O findings F&O CS-A3-1, CS-A4-1, CS-A7-1, and CS-A8-1.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HLR-CS-B	The FPRA shall (a) perform a review for additional circuits that are either required to support a credited circuit (i.e., per HLR-CS-A) or whose failure could adversely affect a credited circuit, and (b) identify any additional equipment and cables related to these additional circuits consistent with the other equipment and cable selection requirements of this Standard.	The sole supporting requirement for this HLR was met. The licensee procedure includes verification of proper electrical coordination with appropriate actions for any circuits not properly coordinated.
HLR-CS-C	The FPRA shall document the cable selection and location process and results in a manner that facilitates FPRA applications, upgrades, and peer review.	The documentation requirements for the Cable Selection element were generally met, with the exception of one finding related to configuration management of electrical coordination calculations; refer to F&O finding CS-C4-1. (Supporting requirement CS-C3 was not applicable, because assumed cable routing was not used.)
HIGH LEVEL REQUIREMENT FOR QUALITATIVE SCREENING (QLS)		
HLR-QLS-A	The FPRA shall identify those physical analysis units that screen out as individual risk contributors without quantitative analysis.	The licensee did not perform a qualitative screening. This element is not applicable.
HLR-QLS-B	The FPRA shall document the results of the qualitative screening analysis in a manner that facilitates FPRA applications, upgrades, and peer review.	The licensee did not perform a qualitative screening. This element is not applicable.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HIGH LEVEL REQUIREMENTS FOR FIRE PRA PLANT RESPONSE MODEL (PRM)		
HLR-PRM-A	The FPRA shall include the FPRA plant response model capable of supporting the HLR requirements of FQ.	Two supporting requirements were not met because the licensee has not developed a LERF model at this time. This HLR appeared to be met with respect to core damage frequency and conditional core damage probability. Modifications to the internal events PRA fault tree model appear to be developed to a level of detail and conventions consistent with those used in the internal event logic. Therefore, solutions of the model will allow determination of the relative contribution and effects of uncertainty of the new component failure modes. The development of the new logic for the fire PRA plant response model assessed equipment in the safe shutdown equipment list and in the PRA model. The scope of components appears to be complete. Refer to F&O findings PRM-A1-1 and PRM-A2-1.
HLR-PRM-B	The FPRA plant response model shall include fire-induced initiating events, both fire-induced and random failures of equipment, fire-specific as well as non-fire related human failures associated with safe shutdown, accident progression events (e.g., containment failure modes), and the supporting probability data (including uncertainty) based on the SRs provided under this HLR that parallel, as appropriate, the ASME PRA Standard for Internal Events PRA.	Three supporting requirements are not met for this HLR. All three involve the need to investigate the possibility of typically minor LERF contributors for internal events PRA becoming more important for fire. It appeared that the licensee did review new components and failure modes identified in the Component Selection task and ensured that the model captures those impacts. The focus of the internal events PRA model, as enhanced for fire, was on quantification of fire-induced CCDP, not CLERP. Two suggestions were made by the review team, involving overly conservative modeling and data-related F&O's from the focused scope peer review conducted in 2007. Refer to F&O finding PRM-B1-01 and F&O suggestions PRM-B8-1 and PRM-B12-1.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HLR-PRM-C	The FPRA plant response model shall be expanded to include new contributors because of additional spurious operation considerations following a review of the results produced in meeting Section 4.16 of this Standard.	This HLR was not reviewed because it is not clear what is expected in order to comply with the fire PRA standard or how one might accomplish the inferred goal. The purpose is stated as "…to provide greater assurance than that obtained by meeting the ES and PRM-A and PRM-B SRs that the Fire PRA results capture the most risk-significant contributors including spurious operation type failures that may have been limited in number in the model …" The fire PRA standard then acknowledges that "… this is an evolving technical area." The NRC review team decided to not review this requirement.
HLR-PRM-D	The FPRA shall document the FPRA plant response model in a manner that facilitates FPRA applications, upgrades, and peer review.	This HLR was met. The model revisions made to account for new fire-induced failure impacts are adequately documented to comply with the internal events standard for documentation of system models. Initiating events, accident sequence, success criteria and data elements do not apply to the scope of new modeling developed.
HIGH LEVEL REQUIREMENTS FOR FIRE SCENARIO SELECTION AND ANALYSIS (FSS)		
HLR-FSS-A	The FPRA shall select one or more combinations of an ignition source and damage target sets to represent the fire scenarios for each unscreened physical analysis unit upon which estimation of the risk contribution (CDF and LERF) of the physical analysis unit will be based.	All supporting requirements were met except FSS-A2, which involves specifying the equipment and cable failures for each target set. The licensee assumed that cables were the only important targets; the lower damage threshold for critical equipment targets was not considered. Also, the zone of influence for transient fires did not account for wall and corner effects. Refer to F&O finding FSS-A2-1 and suggestions FSS-A1-1 and FSS-A2-2.
HLR-FSS-B	The FPRA shall include an analysis of potential fire scenarios leading to the MCR abandonment.	All supporting requirements for this HLR were met except FSS-B1, involving lost/degraded functions leading to control room abandonment. Refer to F&O finding FSS-B1-1.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HLR-FSS-C	The FPRA shall characterize the factors that will influence the timing and extent of fire damage for each combination of an ignition source and damage target sets selected per HLR-FSS-A.	All supporting requirements for this HLR were met except FSS-C5, because the only target item considered was cable. Other targets, such as solid-state control components, have a much lower damage threshold. Refer to F&O finding FSS-C5-1.
HLR-FSS-D	The FPRA shall quantify the likelihood of risk-relevant consequences for each combination of an ignition source and damage target sets selected per HLR-FSS-A.	All supporting requirements for this HLR were met except FSS-D1, because of excessive conservatism in the fire modeling. Detailed fire modeling or other, more realistic approaches may be required for high risk areas. Refer to F&O finding FSS-D1-1 and suggestion FSS-D1-2.
HLR-FSS-E	The parameter estimates used in fire modeling shall be based on relevant generic industry and plant-specific information. Where feasible, generic and plant-specific evidence shall be integrated using acceptable methods to obtain plant-specific parameter estimates. Each parameter estimate shall be accompanied by a characterization of the uncertainty.	All supporting requirements for this HLR were met except FSS-E3, which involves uncertainty analysis. Uncertainty had not been addressed by the licensee as of the time of the staff review. Refer to F&O finding FSS-E3-1.
HLR-FSS-F	The FPRA shall search for and analyze risk-relevant scenarios with the potential for causing fire-induced failure of exposed structural steel.	This HLR was not reviewed because the fire PRA model was not complete: The licensee had not analyzed risk-relevant scenarios with the potential for causing fire-induced failure of exposed structural steel. Refer to F&O finding FSS-F-1.
HLR-FSS-G	The FPRA shall evaluate the risk contribution of multi-compartment fire scenarios.	This HLR was not reviewed because the fire PRA model was not complete: The licensee had not evaluated the risk contribution of multi-compartment fire scenarios. Refer to F&O finding FSS-G-1.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HLR-FSS-H	The FPRA shall document the results of the fire scenario and fire modeling analyses including supporting information for scenario selection, underlying assumptions, scenario descriptions, and the conclusions of the quantitative analysis, in a manner that facilitates FPRA applications, upgrades, and peer review.	The documentation supporting requirements for this HLR were met with the exception of two areas that have not been performed by the licensee: fire-induced failure of exposed structural steel and uncertainty analysis. It was noted that the documentation could be improved by adding a cross-reference or list showing where all the related information is found ("road map"). See F&O findings FSS-H8-1 and FSS-H9-1, and suggestion FSS-H1-1.
HIGH LEVEL REQUIREMENTS FOR IGNITION FREQUENCY (IGN)		
HLR-IGN-A	The FPRA shall develop fire ignition frequencies for every physical analysis unit that has not been qualitatively screened.	All applicable supporting requirements for this HLR were met. However, the ignition frequency data from NUREG/CR-6850 are in error because they are based on nuclear power history years rather than reactor year. This discrepancy is judged to be small in magnitude and result in slightly conservative frequencies. One finding was written to update the ignition frequencies when the NUREG/CR-6850 data are revised. Two suggestions were made: Perform the review of plant-specific fire data and justify using (or not using) Bayesian updating of the generic fire frequencies; clarify documentation regarding whether locked high radiation areas were exempted from consideration of transient combustibles. Refer to F&O finding IGN-A5-1, and suggestions IGN-A4-1 and IGN-A9-1.
HLR-IGN-B	The FPRA shall document the fire frequency estimation in a manner that facilitates FPRA applications, upgrades, and peer review.	All applicable supporting requirements for this HLR were met. One suggestion was made regarding improving the documentation to include a discussion of ignition frequency uncertainty. Refer to F&O suggestion IGN-B5-1.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HIGH LEVEL REQUIREMENTS FOR QUANTITATIVE SCREENING (QNS)		
HLR-QNS-A	If quantitative screening is performed, the FPRA shall establish quantitative screening criteria to ensure the estimated cumulative impact of screened physical analysis units on CDF and LERF is small.	The licensee did not perform quantitative screening. This element is not applicable.
HLR-QNS-B	If quantitative screening is performed, the FPRA shall identify those physical analysis units that screen out as individual risk contributors.	The licensee did not perform quantitative screening. This element is not applicable.
HLR-QNS-C	VERIFY the cumulative impact of screened physical analysis units on CDF and LERF is small.	The licensee did not perform quantitative screening. This element is not applicable.
HLR-QNS-D	The FPRA shall document the results of quantitative screening in a manner that facilitates FPRA applications, upgrades, and peer review	The licensee did not perform quantitative screening. This element is not applicable.
HIGH LEVEL REQUIREMENTS FOR CIRCUIT FAILURES (CF)		
HLR-CF-A	The FPRA shall determine the applicable conditional probability of the cable and circuit failure mode(s) that would cause equipment functional failure and/or undesired spurious operation based on the credited function of the equipment in the FPRA.	Based upon conversations with licensee staff, both supporting requirements for this HLR were met. However, the performance of these tasks was not documented. Two suggestions were made regarding documentation. Refer to F&O suggestions CF-A1-1 and CF-A2-1.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HLR-CF-B	The FPRA shall document the development of the elements above in a manner that facilitates FPRA applications, upgrades, and peer review.	The supporting requirement for this HLR was not met due to lack of documentation of the tasks performed. Refer to F&O finding CF-B1-1.
HIGH LEVEL REQUIREMENTS FOR HUMAN RELIABILITY ANALYSIS (HRA)		
HLR-HRA-A	The FPRA shall identify human actions relevant to the sequences in the FPRA plant response model.	Both supporting requirements for this HLR were met. One suggestion was made to ensure that HLR-E3 and HLR-E4 are met if shutdown actions are added to the model in the future. Refer to F&O suggestion HRA-A2-1.
HLR-HRA-B	The FPRA shall include events where appropriate in the FPRA that represent the impacts of incorrect human responses associated with the identified human actions.	Two supporting requirements were not met for this HLR. The first involves not modeling any fire response operator actions, neither the beneficial nor adverse effects. The second involves failure to model operator errors based on instrument unavailability due to fire. A suggestion was made to confirm the time available for key human actions that would not be affected by the fire. Refer to F&O findings HRA-B2-1 and HRA-B3-1, and suggestion HRA-B1-1.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HLR-HRA-C	The FPRA shall quantify HEPs associated with the incorrect responses accounting for the plant-specific and scenario-specific influences on human performance, particularly including the effects of fires.	The nine supporting requirements for this HLR are from the internal events portion of the standard and are incorporated by reference. All supporting requirements were met except for supporting requirement HR-G6, which involves checking post-initiating event human error probabilities for reasonableness relative to each other in the context of the various scenarios. This could not be assessed because the Harris Fire PRA has not been completed. There were four findings associated with this HLR. One is that the detailed analysis approach does not conform to the standard definition of "significant" for capability category II. Another involves availability of instrumentation. The third has to do with whether event timing is influenced by the fire. The final finding is associated with HR-G6, discussed above. Refer to F&O findings HRA-C1-3, HRA-C1-4, HRA-C1-5, and HRA-C1-6. There were three suggestions associated with this HLR. One involves use of the simplified screening method for modifying internal events human error probabilities. A second suggests basing the changed HEP on the time when the cues needed to make the decision would occur, rather than the time window. The final suggestion relates to assigning a lower bound for combinations of three or more HFEs in combination. Refer to F&O suggestions HRA-C1-1, HRA-C1-2, and HRA-C1-7.
HLR-HRA-D	The FPRA shall include recovery actions only if it has been demonstrated that the action is plausible and feasible for those scenarios to which it applies, particularly accounting for the effects of fires.	This HLR was not applicable; fire recovery actions were not included in the Harris Fire PRA model. However, if such actions are incorporated at a later date, the licensee should ensure that supporting requirement HRA-D1, and the supporting requirements associated with internal events PRA standard HLR-HR-H are met. Refer to F&O suggestion HRA-D1-1.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HLR-HRA-E	The FPRA shall document the HRA, including the unique fire-related influences of the analysis, in a manner that facilitates FPRA applications, upgrades, and peer review.	The supporting requirements for this HLR were met.
HIGH LEVEL REQUIREMENTS FOR SEISMIC FIRE (SF)		
HLR-SF-A	The FPRA shall include a qualitative assessment of potential seismic-fire interaction issues in the FPRA.	The licensee provided a sparse and incomplete write-up on seismic-fire interactions. This area was not reviewed because it has not been performed by the licensee. Refer to F&O finding SF-A1-1.
HLR-SF-B	The FPRA shall document the results of the seismic-fire interaction assessment in a manner that facilitates FPRA applications, upgrades, and peer review.	See HLR-SF-A
HIGH LEVEL REQUIREMENTS FOR FIRE RISK QUANTIFICATION (FQ)		
HLR-FQ-A	Quantification of the FPRA shall quantify the fire-induced CDF.	All supporting requirements for this HLR were met except for FQ-A4, which incorporates the QU-A supporting requirements from the internal events portion of the standard. Specifically, QU-A2a was not met, because the fire quantification method used at Harris does not identify individual sequences to support identification of significant accident sequences. Refer to F&O finding FQ-A4-1.
HLR-FQ-B	The fire-induced CDF quantification shall use appropriate models and codes, and shall account for method specific limitations and features.	This HLR incorporates the QU-B supporting requirements from the internal events portion of the standard. All supporting requirements for this HLR were met.
HLR-FQ-C	Model quantification shall determine that all identified dependencies are addressed appropriately.	This HLR incorporates the QU-C supporting requirements from the internal events portion of the standard. All supporting requirements for this HLR were met.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HLR-FQ-D	The frequency of different containment failure modes leading to a fire-induced large early release shall be quantified and aggregated thus determining the fire-induced LERF.	This HLR, which incorporates the LE-E supporting requirements from the internal events portion of the standard, was not met because the licensee has not performed a LERF assessment. Refer to F&O finding FQ-D1-1.
HLR-FQ-E	The fire-induced CDF and LERF quantification results shall be reviewed and significant contributors to CDF and LERF, such as fires and their corresponding plant initiating events, fire locations, accident sequences, basic events (equipment unavailability's and human failure events), plant damage states, containment challenges and failure modes, shall be identified. The results shall be traceable to the inputs and assumptions made in the FPRA.	This HLR, which incorporates the QU-D and LE-F supporting requirements from the internal events portion of the standard, was not met. There were two findings. The first finding involves the inability to determine significant basic events and sequences. The second finding relates to the definition of significant contributor. Refer to F&O findings FQ-E1-1 and FQ-E1-2.
HLR-FQ-F	The CDF and LERF analyses shall be documented consistent with the applicable SRs.	This HLR, which incorporates the QU-F and LE-G supporting requirements from the internal events portion of the standard, was not met. There were four findings. The first finding is that several of the documentation requirements in QU-F2 are not in place. The second finding is that there is no documentation of the significant contributors to fire CDF. The third is that the assumptions and sources of uncertainty are not documented. The final finding is that no basis was provided to support any claim of non-applicability of any of the requirements incorporated by reference. Refer to F&O findings FQ-F1-1, FQ-F1-2, FQ-F1-3 and FQ-F2-1.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HIGH LEVEL REQUIREMENT FOR UNCERTAINTY AND SENSITIVITY ANALYSIS (UNC)		
HLR-UNC-A	The FPRA shall identify key sources of CDF and LERF uncertainties, including key assumptions and modeling approximations. These uncertainties shall be characterized such that their impacts on the results are understood.	The licensee has not addressed uncertainty. The applicable document has a list of twenty items, which includes some items not addressed completely, some items that are in the nature of identifications of conservatisms, and some things not addressed in the model. However, there is no treatment of uncertainty. This area was not reviewed because it has not been performed by the licensee. Refer to F&O finding UNC-1.
HIGH LEVEL REQUIREMENTS FOR PRA CONFIGURATION CONTROL/MODEL UPDATE (MUD)		
HLR-MUD-A	A process for monitoring FPRA inputs and collecting new information.	This requirement was met. Two suggestions were made. The first is to provide direction for monitoring industry-wide operational history. The second is to add the requirement to monitor updated or new methods. Refer to F&O suggestions MUD-A1-1 and MUD-A3-1.
HLR-MUD-B	A process that maintains and upgrades the FPRA to be consistent with the as-built, as operated plant.	This requirement was not met in several respects. The Harris configuration control procedures do not reference the fire PRA standard or the supporting requirements therein. Also, the version of Regulatory Guide 1.200 which is expected to endorse, potentially with exceptions, the Standard for PRA for Nuclear Power Plant Applications, i.e., the combined standard which includes the fire PRA part, should be referenced once it is completed and is issued. Refer to F&O finding MUD-B4-1.
HLR-MUD-C	A process that ensures that the cumulative impact of pending changes is considered when applying the FPRA.	This requirement was met.

Table 4-6. High Level Requirements

HLR	HLR Description	HLR Summary (From Review)
HLR-MUD-D	A process that evaluates the impact of changes on previously implemented risk-informed decisions that have used the FPRA.	This requirement was met. One requirement that is currently in the standard, to assess past risk-informed applications when the PRA model is updated or upgraded, is slated for removal from the PRA standard in a future revision. The Harris configuration control procedure does not include such a requirement, but this was not considered a finding due to the anticipated standard revision.
HLR-MUD-E	A process that maintains configuration control of computer codes used to support FPRA quantification.	This requirement was met.
HLR-MUD-F	Documentation of the Program.	This requirement was met.

Table 4-7. Supporting Requirement F&Os

Basis	Level	Observation
IEPRA-1	Suggestion	AS-06: confirm that the assumption of no RHR pump damage for non-fire-induced SI events remains valid when fire is considered.
IEPRA-2	Suggestion	TH-01: confirm that the dismissal of SWGR room heatup as a concern remains valid when fire-induced failures of cooling equipment are considered.
See PP-B2	Summary	Although they have created fire compartments smaller than the fire areas in the current fire protection plan, they do not meet Capability Category 2&3 because PP-B2 has not been met. (B2 not met for justification for use of non-rated barriers).
PP-B2-1 PP-B2-2	Finding	Justification for non-rated partition boundaries insufficient. Insufficient justification/ documentation for "rooms" within Fire Compartments.
PP-C3-1; Refer to PP-B2	Finding	Inadequate justification for non-rated barriers and the use of rooms to partition physical analysis units.
ES-A6-1	Finding	Harris has not considered LERF at this point.
ES-B3-1	Suggestion	HNP-FPSA-0077, attachment 6 has a list of additional equipment which has to be added, it is derived from the existing FSSEL. The expert panel had considered initiating events outside the scope of the original SSEL and internal events PRA. The licensee is currently assessing an additional list derived from the WOG . However, there is no guidance for the expert panel on how to include these initiators for consideration.
ES-B4-1	Finding	Not met because containment bypass other than ISLOCA has not been addressed.
ES-C1-1	Finding	Incorrect instrumentation was identified in several cases reviewed.
ES-D1-1	Finding	The documentation of the ES element is not sufficient to support peer review. Better traceability is needed, especially related compartments and scenarios.
CS-A3-1	Finding	One instance was identified where postulated fire damage to a power supply cable was not reflected in the Fire PRA model.
CS-A4-1	Finding	One instance was identified where postulated fire damage to a power supply cable was not reflected in the Fire PRA model.

Table 4-7. Supporting Requirement F&Os

Basis	Level	Observation
CS-A7-1	Finding	Inter-cable hot shorts not considered for containment bypass that could result in large early release.
CS-A8-1	Finding	Three-phase hot shorts not considered for containment bypass that could result in large early release.
CS-C4-1	Finding	No configuration management tie to the electrical coordination calculations performed.
PRM-A1-1	Finding	Section 5.3.2 specifically states that no specific Conditional Large Early Release Probability (CLERP) model was developed.
PRM-A2-1	Finding	No LERF model developed; see related finding on PRM-A1 for CLERP.
PRM-B1-1	Finding	Need to investigate the possibility of typically minor LERF contributors for internal events PRA becoming more important for fire.
PRM-B8-1	Suggestion	SY-A20 - Model should be revised to realistically reflect the system impacts and credit potential recovery actions.
PRM-B12-1	Suggestion	Review the DA-related F&O's from the 12/2007 Focused Scope Peer Review to ensure no effect on the Fire PRA.
PRM-B1-1	Finding	Need to investigate the possibility of typically minor LERF contributors for internal events PRA becoming more important for fire.
FSS-A1-1	Suggestion	The walkdown database needs to reflect the final transient ignition source mapping.
FSS-A2-1	Finding	Need to consider non-cable targets with lower damage threshold (e.g., sensitive electronic equipment). Need to account for wall and corner effects for transient combustible fires.
FSS-A2-2	Suggestion	The screening approach used to determining the time to generate a hot gas layer is considered to be potentially very conservative.
FSS-B1-1	Finding	Lost/degraded functions should be clarified/discussed in the documentation of the control room abandonment analysis.
FSS-C5-1	Finding	Only target item considered was cable. No other targets such as solid state control components were considered. See NUREG/CR 6850 Appendix H Section H.2. Solid State failure criteria is 3kW/m^2 and 65 °C.

Table 4-7. Supporting Requirement F&Os

Basis	Level	Observation
FSS-D1-1	Finding	Used HNP-M/MECH-1128 Hot Gas Layer Calculations and HNP-M/MECH-1129 Fire Zone of Influence Calculations in walk downs. Also used spreadsheet calculations that they developed. These spreadsheets appear to give very conservative results and can be located in C:\PRA\HNP\FPRA_FRANC Did not use detailed fire modeling such as CFAST or FDS
FSS-D1-2	Suggestion	Current calculation method for determining time to HGL formation is overly conservative. More detailed fire modeling may be required for high risk areas. Conservative fire modeling is not appropriate for high risk areas. Need to use other computer fire models, i.e., CFAST, FDS to further analyze rooms of interest.
FSS-E3-1	Finding	No uncertainty analysis was performed.
FSS-F-1	Finding	Did not perform this task
FSS-G-1	Finding	Did not perform this task
FSS-H1-1	Suggestion	Need to list where documents are located.
FSS-H8-1	Finding	No multi compartment fire scenarios were considered.
FSS-H9-1	Finding	No work on uncertainties was done
IGN-A4-1	Suggestion	Perform the review of plant-specific fire data (or cite this if it has been performed) and justify why (and how) or why not Bayesian updating of the generic fire frequencies was performed.
IGN-A5-1	Finding	Need to update ignition frequency data once NUREG/CR-6850 is updated with the correct numbers based on reactor-year basis.
IGN-A9-1	Suggestion	Revise the misleading text so that it is clear that every compartment was assigned a transient fire frequency, with explanation of how administratively-controlled entities within such compartments were treated for the purpose of assigning transient.
IGN-B5-1	Suggestion	Include reference in HNP-F/PSA-0076 to the discussion of ignition frequency uncertainties in NUREG/CR-6850.
CF-A1-1	Suggestion	Need to complete the analysis and incorporate the results into the appropriate document.
CF-A2-1	Suggestion	Directly include uncertainty values into the documentation.
CF-B1-1	Finding	Incorporate the material discussed in SRs CF-A1 and A2 into the documentation.
HRA-A2-1	Suggestion	Ensure that HLR-E3 and HLR-E4 are met if shutdown actions are added to the model in the future.

Table 4-7. Supporting Requirement F&Os

Basis	Level	Observation
HRA-B1-1 HRA-C1-5	Suggestion	Confirm that the time available for key human actions would not be affected by any fire effects, including spurious actions.
HRA-B2-1	Finding	PRA needs to reflect potential adverse consequences of operator actions taken per the fire response procedures.
HRA-B3-1	Finding	Need to model operator errors based on instrument unavailability due to fire.
HRA-C1-1	Suggestion	(HR-G1) Review use of the simplified screening method for modifying the internal events HEPs for local actions and for control room actions.
HRA-C1-2	Suggestion	(HR-G3) Consider basing the timing on the time when the cues needed to make the decision would occur, rather than the time window.
HRA-C1-3	Finding	(HR-G1) The approach to determining which HEPs are developed using a detailed analysis does not conform to the standard definition of significant for capability category II.
HRA-C1-4	Finding	(HR-G3) Need to address the availability of instrumentation as one of the factors considered in determining the HEPs, both in the simplified screening method and the detailed method.
HRA-C1-5	Finding	(HR-B4) Need to determine whether event timing is influenced by the fire, rather than assuming that T-H analysis based on the accident sequence is unaffected by the initiator being a fire.
HRA-C1-6	Finding	(HR-G6) Check post-initiating event human error probabilities for reasonableness relative to each other in the context of the various scenarios.
HRA-C1-7	Suggestion	(HR-G7) Need to apply the recommended lower bound (1E-05) to combinations of three or more HFEs in combination, or justify the use of a lower bound (1E-06 was used).
HRA-D1-1	Suggestion	This HLR was not applicable; fire recovery actions were not included in the Harris Fire PRA model. However, if such actions are incorporated at a later date, this would become applicable.
SF-A1-1	Finding	Perform the tasks associated with fire PRA standard element SF and document. Self-assess to HLRs SS-A and SS-B and the associated supporting requirements. Have the completed work peer reviewed per the fire PRA standard requirements.
FQ-A4-1	Finding	QU-A2a was not met; therefore this SR is also not met. Need to identify individual sequences to support identification of significant accident sequences

Table 4-7. Supporting Requirement F&Os

Basis	Level	Observation
FQ-D1-1	Finding	LERF is not mentioned in the quantification calculation HNP-F/PSA-0079 Rev. 0. The fire PRA summary specifically excludes calculation of LERF from the scope of the fire PRA model.
FQ-E1-1 FQ-E1-2	Finding	Significant contributors and significant basic events to fire LERF have not been determined. Also, Harris does not appear to use the definition as provided in the PRA standard.
FQ-F1-1	Finding	QU-F2 - Several of the recommended documentation requirements are not in place, specifically items b, e, f, g, i, j, m.
FQ-F1-2	Finding	QU-F3 - There is currently no record of significant contributors to fire CDF.
FQ-F1-3	Finding	QU-F4 - Assumptions and sources of uncertainty are not documented.
FQ-F2-1	Finding	Harris has not assessed the fire PRA to the standard, and has therefore not determined whether any of the referenced internal events requirements are not applicable or provided bases if appropriate.
UNC-1	Finding	Perform the tasks associated with fire PRA standard element UNC and document. Self-assess to HLRs UNC-A and the associated supporting requirements. Have the completed work peer reviewed per the fire PRA standard requirements.
MUD-A1-1[3]	Suggestion	Provide direction in process to monitor industry wide operational history. Ensure that component data (generic and plant-specific) includes active fire protection systems, e.g. fixed suppression, dampers.
MUD-A3-1	Suggestion	Add language to monitor updated or new methodologies as appropriate.
MUD-B4-1	Finding	Since fire standard not referenced, those SRs are not evaluated. Fire standard needs to be referenced in 9.2.5; currently only ASME Internal Events. Add latest reference to R.G. 1.200, which is expected to endorse the fire standard.

[3] Definitions of the configuration control/model update (MUD) supporting requirements can be found in Appendix A.

5.0 Conclusions

The NRC review team noted that the Harris Fire PRA is not yet complete, some tasks have yet to be started, and many areas are still in draft form. At the time of the onsite portion of the review, the Harris Fire PRA was more similar to a scoping analysis, rather than a completed fire PRA. The results produced by the fire PRA reviewed by the NRC staff were based upon a number of modeling conservatisms. The staff understands that further work is being done by PE to finalize the fire PRA and to reduce the excess conservatisms.

Because the fire PRA model available was a work in-progress, the NRC staff review of the Harris baseline fire PRA cannot be regarded as sufficient for determination of technical adequacy to support risk-informed applications. Additional review of the completed fire PRA will be necessary in the future. One approach would be a full scope industry peer review of the completed HNP fire PRA model.

6.0 References

1. ASME/ANS RA-S 2007, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications", American Society of Mechanical Engineers/American Nuclear Society, New York, NY, December 2007, Draft

2. RA-Sb-2005, "Addenda to ASME RA-S-2002 Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," American Society of Mechanical Engineers, New York, NY, December 2005.

3. NEI 07-12: "Fire Probabilistic Risk Assessment (FPRA) Peer Review Process Guidelines," Draft Version F, Rev. 0, December 2007 (ADAMS Accession No. ML073551166).

4. Regulatory Guide 1.200, Revision 1, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities" USNRC, January 2007.

5. NRC Memorandum, Michael D. Tschiltz to David C. Lew, "Results of the Regulatory Guide (RG) 1.200 Implementation Pilot Program," June 8, 2005 (ADAMS Accession No. ML051590519).

6. NRC Letter, M. Vaaler to J. Donahue, "Shearon Harris Nuclear Power Plant, Unit 1 – Review of the Fire Probabilistic Risk Assessment Model to Support Implementation of the National Fire Protection Association Standard 805 "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plant," As Endorsed under Title 10 of the Code of Federal Regulations, Paragraph 50.48(c) (TAC No. MC5630)", January 9, 2008 (ADAMS Accession No ML ML080070531)

7. NFPA 805, 2001 Edition, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," National Fire Protection Association, February, 9 2001

8. NEI 05-04, Revision 1 (Draft), "Process for Performing Follow-On PRA Peer Reviews Using the ASME PRA Standard (Internal Events)", Nuclear Energy Institute, November 2007.

9. GL 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities – 10 CFR 50.54(f)", USNRC, November 1988.

10. NEI 00-02, Revision 3A, "Probabilistic Risk Assessment (PRA) Peer Review Process Guidance", March 2000.

11. RA-S-2002," Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications", American Society of Mechanical Engineers, New York, NY, April 2002.

12. RIS 2007-06, "Regulatory Guide 1.200 Implementation", March 2007.

Appendix A. Supporting Requirements Review Summary

SR	Level	Observation	Basis	Cap Cat
INTERNAL EVENTS PRA QUALITY				
IEPRA	Suggestion	AS-06: confirm that the assumption of no RHR pump damage for non-fire-induced SI events remains valid when fire is considered.	F&O IEPRA-1	N/A
IEPRA	Suggestion	TH-01: confirm that the dismissal of SWGR room heatup as a concern remains valid when fire-induced failures of cooling equipment are considered.	F&O IEPRA-2	N/A
SUPPORTING REQUIREMENTS FOR PLANT PARTIONING				
PP-A1	Summary	Global Analysis Boundary requirements are met based on the inclusion of all buildings and equipment within the protected area as outlying areas (Cooling Tower Structure, Emergency Service Water Intake Structure, etc.) and justification of the excluded buildings/areas.		Met
PP-B1	Summary	Although they have created fire compartments smaller than the fire areas in the current fire protection plan, they do not meet Capability Category 2&3 because PP-B2 has not been met. (B2 not met for justification for use of non-rated barriers).	See PP-B2	Not Met
PP-B2	Finding	Justification for non-rated partition boundaries insufficient. Insufficient justification/ documentation for "rooms" within Fire Compartments.	F&O PP-B2-1 F&O PP-B2-2	Not Met
PP-B3	Summary	Spatial separation has only been used for exterior features/fire compartments.		N/A
PP-B4	Summary	Met. Fire Physical Analysis Units have not utilized Electrical Raceway Fire Barrier Systems as a defining barrier.		Met

SR	Level	Observation	Basis	Cap Cat
PP-B5	Summary	Active fire protection features (that have not been considered as part of a qualified fire barrier) have not been used.		N/A
PP-B6	Summary	Met. The defined physical analysis units encompass all locations within the global analysis boundary and no two physical analysis units overlap.		Met
PP-B7	Summary	Met. There is ample evidence that confirmatory walkdowns were performed to verify conditions and characteristics of credited partitioning elements.		Met
PP-C1	Summary	Met.		Met
PP-C2	Summary	Met. Buildings excluded from global analysis boundary have adequate justification.		Met
PP-C3	Finding	Inadequate justification for non-rated barriers and the use of rooms to partition physical analysis units.	F&O PP-C3-1; Refer to PP-B2	Not Met
PP-C4	Summary	Although several different numbering/naming conventions are in use, there are adequate mapping tables provided to guide the appropriate use within the PRA.		Met
SUPPORTING REQUIREMENTS FOR EQUIPMENT SELECTION (ES)				
ES-A1	Summary	FPIP-202 does contain guidance on selection of equipment failures for initiating events provided that they are in the safe shutdown equipment list (SSEL) and the internal events PRA. In general, Harris handled initiating events by using a generic event of %FIRE with a frequency of 1.0 along with individual compartment events inside the internal events fault tree.		Met

SR	Level	Observation	Basis	Cap Cat
ES-A2	Summary	Interlocks were considered when separate cases were investigated through the fire PRA database, control wiring diagrams and FRANC mapping. Suggest linked roadmap to facilitate easier validation.		Met
ES-A3	Summary	FPIP-202 does contain guidance on selection of equipment failures for initiating events provided that they are in the safe shutdown equipment list (SSEL) and the internal events PRA. Evidence is seen in Attachment 1 of HNP-FPSA-0077 for previously screened potential initiators.		Met
ES-A4	Summary	Step 4 of HNP-FPSA-0077 provides guidance for two spurious actuations. The expert panel Engineering Change document EC54965, Rev. 0 provides two spurious actuation guidance in Attachment P.		3
ES-A5	Summary	Initiating events are not treated separately from internal fire events in this model. The licensee mapped failures to the mitigating portion of the fault tree.		2
ES-A6	Finding	Harris has not considered LERF at this point.	F&O ES-A6-1	Not Met
ES-B1	Summary	All internal events and FSSPMD are used as a starting point in HNP-FPSA-0077.		3
ES-B2	Summary	HNP-FPSA-0077, step 7 specifies two spurious actuations.		2

SR	Level	Observation	Basis	Cap Cat
ES-B3	Suggestion	HNP-FPSA-0077, attachment 6 has a list of additional equipment which has to be added, it is derived from the existing FSSEL. The expert panel had considered initiating events outside the scope of the original SSEL and internal events PRA. The licensee is currently assessing an additional list derived from the WOG . However, there is no guidance for the expert panel on how to include these initiators for consideration.	F&O ES-B3-1	Met
ES-B4	Finding	Not met because containment bypass other than ISLOCA has not been addressed.	F&O ES-B4-1	Not Met
ES-B5	Summary	Tested cases of flow diversion from RWST and charging pump minimum flow valves misposition due to interlock failure. Found that mappings were present in the FRANC input.		Met
ES-B6	Summary	Licensee apparently included combinations which might be screened out on probability.		Met
ES-C1	Finding	Incorrect instrumentation was identified in several cases reviewed.	F&O ES-C1-1	Not Met
ES-C2	Summary	Attachment 7 does identify instrumentation that could cause the operators to take an incorrect action, and also identifies the instrumentation that could be used as confirmation of the action. This is not restricted to consequences that are not already included and therefore is closer to a Capability Category II.		2
ES-C2	Other	It is difficult to determine what is intended by this supporting requirement. It appears to be related to errors of commission.		

SR	Level	Observation	Basis	Cap Cat
ES-D1	Finding	The documentation of the ES element is not sufficient to support peer review. Better traceability is needed, especially related compartments and scenarios.	F&O ES-D1-1	Not Met
SUPPORTING REQUIREMENTS FOR CABLE SELECTION				
CS-A1	Summary	Calculation HNP-F/PSA-0077, Rev. 0 documents the components included in the scope of the Fire PRA. The Fire PRA documentation demonstrates that the cables associated with Fire PRA components have been identified in the Fire PRA. 12 different Fire PRA components were reviewed for failure modes, cable inclusion and model inclusion. All were acceptable.		Met
CS-A2	Summary	Calculation HNP-F/PSA-0077, Rev. 0 provides documentation that up to two components and/or cables have been identified and considered within the scope of the Fire PRA.		Met
CS-A3	Finding	One instance was identified where postulated fire damage to a power supply cable was not reflected in the Fire PRA model.	F&O CS-A3-1	Not Met
CS-A4	Finding	One instance was identified where postulated fire damage to a power supply cable was not reflected in the Fire PRA model.	F&O CS-A4-1	Not Met
CS-A5	Summary	Calculation HNP-F/PSA-0077, Rev. 0 references the Post-Fire Safe Shutdown Analysis for the methodology to be used for circuit analysis, which specifically requires consideration of hot shorts, shorts to ground and open circuits as fire-induced damage states.		Met

SR	Level	Observation	Basis	Cap Cat
CS-A6	Summary	Calculation HNP-F/PSA-0077, Rev. 0 references the Post-Fire Safe Shutdown Analysis for the methodology to be used for circuit analysis, which specifically requires consideration of hot shorts, shorts to ground and open circuits as fire-induced damage states. Calculation HNP-E-ELEC-0001, Rev. 1 specifically addresses Multiple High Impedance Faults as well as verification of proper over-current protection coordination.		Met
CS-A7	Finding	Inter-cable hot shorts not considered for containment bypass that could result in large early release.	F&O CS-A7-1	Not Met
CS-A8	Finding	Three-phase hot shorts not considered for containment bypass that could result in large early release.	F&O CS-A8-1	Not Met
CS-A9	Summary	Fire PRA and Safe Shutdown methodology both assume hot shorts of up to two cables and/or components.		Met
CS-A10	Summary	Cable routing methodology documented in HNP-E-ELEC-0001, Rev. 1 includes cross referencing cable routing to the Fire PRA physical analysis units, down to the cable raceway/conduit level for use in fire scenario development. The information includes treatment of termination end locations. The Fire PRA addressed the fire impact on end point locations through the implementation of "Self" fire scenario variations.		3
CS-A11	Other	Assumed cable routing was not used at Harris.		N/A
CS-B1	Summary	Calculation HNP-E-ELEC-0001, Rev. 1 includes verification of proper electrical coordination with appropriate actions for any circuits that are not properly coordinated.		2&3

SR	Level	Observation	Basis	Cap Cat
CS-C1	Summary	Documentation of cable selection and location methodology is contained within the Post-Fire Safe Shutdown calculation and associated FSSPMD database.		Met
CS-C2	Summary	Documentation of cable selection and location methodology is contained within the Post-Fire Safe Shutdown calculation and associated FSSPMD database.		Met
CS-C3	Other	Assumed cable routing was not used at Harris.		N/A
CS-C4	Finding	No configuration management tie to the electrical coordination calculations performed.	F&O CS-C4-1	Not Met
SUPPORTING REQUIREMENTS FOR PLANT RESPONSE MODEL				
PRM-A1	Finding	Section 5.3.2 specifically states that no specific Conditional Large Early Release Probability (CLERP) model was developed.	F&O PRM-A1-1	Not Met
PRM-A2	Finding	No LERF model developed; see related finding on PRM-A1 for CLERP.	F&O PRM-A2-1	Not Met
PRM-A3	Summary	Modifications to the internal events PRA fault tree model appear to be developed consistent with the level of detail and conventions used in the internal event logic. Therefore, solutions of the model will allow determination of the relative contribution of the new component failure modes.		Met
PRM-A4	Summary	Modifications to the internal events PRA fault tree model appear to be developed consistent with the level of detail and conventions used in the internal event logic. Therefore, solutions of the model will allow determination of the effects of uncertainty of the new component failure modes.		Met

SR	Level	Observation	Basis	Cap Cat
PRM-A5	Summary	The development of the new logic for the fire PRA plant response model assessed both equipment in the safe shutdown equipment list for addition to the PRA model, and equipment in the PRA model for addition to the safe shutdown equipment list. Therefore, the scope of components appears to be complete. The review did not attempt to validate the locations of cables for the new equipment.		Met
PRM-A6	Summary	Modifications to the internal events PRA fault tree model appear to be developed consistent with the level of detail and conventions used in the internal event logic. Therefore, the new logic is consistent with the relevant HLRs referenced.		Met
PRM-B1	Finding	Need to investigate the possibility of typically minor LERF contributors for internal events PRA becoming more important for fire.	F&O PRM-B1-1	Not Met
PRM-B2	Summary	As stated in HNP-F/PSA-0077, "Review of the Initiating Events PRA Event Tree and Accident Sequence documentation revealed no changes to the current accident progression sequences. However, there will be new fault tree logic to account for some events that were previously screened for internal events (see Table 6-2 [which indicates no new initiating events, but the reintroduction of some that were previously screened {typically due to low frequency}])."		Met
PRM-B3	Summary	This element is not applicable because new initiating events were not identified.		N/A

SR	Level	Observation	Basis	Cap Cat
PRM-B4	Summary	This element is not applicable because new initiating events were not identified.		N/A
PRM-B5	Summary	This element is not applicable because new initiating events were not identified.		N/A
PRM-B6	Summary	This element is not applicable because new or modified success criteria is not identified.		N/A
PRM-B7	Summary	This element is not applicable because new or modified success criteria were not identified.		N/A
PRM-B8	Summary	See additional entries made for internal events SRs referenced by the fire standard.		Met
PRM-B8	Summary	SY-A4 - a multi-disciplined group including Engineering and Operations staff was used to identify the new failure modes required for fire-induced failures including spurious operations. This approach clearly satisfies capability category I. Capability category II specifically requires walkdowns and interviews. Walkdowns are judged to not directly apply to the system modeling aspects of these new failure modes (which are essentially new components and/or failure methods of existing components). The multi-disciplined team approach is considered superior to interview techniques required by the standard at capability category II. Therefore, it is concluded that SY-A4 is met at capability category II for the modifications made to the internal events model for fire-induced failures.		2
PRM-B8	Summary	SY-A7 - A detailed system model is provided for each new fire-induced failure mode, which satisfies Capability Category III for this SR.		3

SR	Level	Observation	Basis	Cap Cat
PRM-B8	Summary	SY-A - All other SRs from the internal events standards, not specifically discussed in other Summary observations, are either met or not directly applicable to the new fire system modeling. SY-B - For the new modeling, CCF is not directly included as appropriate; single fire scenarios which can cause the failure of redundant components will occur based on proper identification of the cable locations relative to each particular fire scenario. Therefore, for system modeling, SRs in SY-B are not applicable.		
PRM-B8	Suggestion	SY-A20 - Model should be revised to realistically reflect the system impacts and credit potential recovery actions.	F&O PRM-B8-1	
PRM-B9	Summary	The documentation does not identify any PRA components not selected for detailed cable routing, and therefore this element is not directly applicable.		N/A
PRM-B10	Summary	Existing HFEs from the internal events model were re-evaluated for fire effects. However, the new modeling for fire-induced failures do not include any new operator actions.		Met

SR	Level	Observation	Basis	Cap Cat
PRM-B11	Summary	New failure modes used existing internal events failure modes. For fire scenarios, the fire-induced failure mode of cable faults is addressed during the quantification process, not directly in the fault tree model. HNP-F/PSA-0001, Rev. 8, Attachment 1, documents changes to the internal events PRA model necessitated by the update to the integrated model including the Fire PRA. Included are new basic events and existing basic events requiring assignment of new or modified probabilities.		Met
PRM-B12	Suggestion	Review the DA-related F&O's from the 12/2007 Focused Scope Peer Review to ensure no effect on the Fire PRA.	F&O PRM-B12-1	Met
PRM-B13	Finding	Need to investigate the possibility of typically minor LERF contributors for internal events PRA becoming more important for fire.	F&O PRM-B1-1	Not Met
PRM-B14	Finding	Need to investigate the possibility of typically minor LERF contributors for internal events PRA becoming more important for fire.	F&O PRM-B1-1.	Not Met
PRM-C1	Comment on Standard	Problem with Fire PRA Standard		Not Rev
PRM-D1	Summary	The model revisions made to account for new fire-induced failure impacts are adequately documented to comply with the internal events standard for documentation of system models. Initiating events, accident sequence, success criteria and data elements do not apply to the scope of new modeling developed.		Met
SUPPORTING REQUIREMENTS FOR FIRE SCENARIO SELECTION AND ANALYSIS				
FSS-A1	Suggestion	The walkdown database needs to reflect the final transient ignition source mapping.	F&O FSS-A1-1	Met

SR	Level	Observation	Basis	Cap Cat
FSS-A2	Finding	Need to consider non-cable targets with lower damage threshold (e.g., sensitive electronic equipment). Need to account for wall and corner effects for transient combustible fires.	F&O FSS-A2-1	Not Met
FSS-A2	Suggestion	The screening approach used to determining the time to generate a hot gas layer is considered to be potentially very conservative.	F&O FSS-A2-2	
FSS-A3	Summary	Progress decided that initially, no primary systems would be summarily counted as failed in a fire scenario. Therefore, no PRA components were excluded from comparison against the Safe Shutdown components based on these system and functional differences. A phased process is expected where initial quantification will assume that certain systems (non-App-R credited secondary plant systems such as de-mineralized water, condensate, and main feedwater) are failed. Based on importance, specific equipment/circuits will be credited, subject to determination of cable routing data. After initial quantification: de-mineralized water, instrument air, condensate, and main feed water system cables routed and those cables routing data is now in the FSSPMD. Progress does not use assumed cable routing.		Met

SR	Level	Observation	Basis	Cap Cat
FSS-A4	Summary	The scoping walkdown calculation (HNP-F/PSA-0078), results in a Source-Target Relationship Table (Attachment 2), which represents the fire sources and related target sets in each fire compartment. This table is a subset of the HNP-FPRA database which groups the scenario specific target sets so the fire compartment impacts can be analyzed. In addition, HGL is calculated for each fire compartment and associated cable failures are tabulated in another database. Multiple databases are used for FRANC runs which characterize the credible range of impacts to systems and SSA functions.		Met
FSS-A5	Summary	Progress has developed sufficient variety of data (HNP_FPSA Database) to quantify the risk from multiple ignition sources and associated targets with in each fire compartment. Their database is extensive enough to correlate the risk contribution from specific ignition sources and/or fire scenarios with in each fire compartment. Their quantification process calculation (HNP-F/PSA-0079) documents their process and attachment 2 provides the risk for each fire compartment from the top 5 ignition sources, including the ZOI CDF, HGL CDF, and total CDF.		3
FSS-A6	Summary	Based on review of Main Control Room Analysis Rev D Draft.pdf .		Met
FSS-B1	Finding	Lost/degraded functions should be clarified/discussed in the documentation of the control room abandonment analysis.	F&O FSS-B1-1	Not Met

SR	Level	Observation	Basis	Cap Cat
FSS-B2	Summary	Each panel in the MCR was sub-divided and fires postulated in each sub-division. Scenarios for fire suppress and non-suppressed were evaluated.		3
FSS-C1	Summary	Assumptions From Page 35 of 200 of HNP-F/PSA-0079		2
FSS-C2	Summary	Each Fire Area has been analyzed. The time-dependent fire growth profile that was used can be found in the spreadsheets located in C:\PRA\HNP\FPRA_FRANC.		2&3
FSS-C3	Summary	Data on fire heat release rate decay profile was obtained from NUREG/CR 6850 Appendix G. Reason for Category 2&3 is that the licensee attempted to use a more realistic fire growth rate which included consideration of possible fire spread. Each Fire Area has been analyzed.		2&3
FSS-C4	Summary	Each Fire Area has been analyzed. Section 5.5.2 of HNP-F/PSA-0079 references how severity factor is calculated and used.		3
FSS-C5	Finding	Only target item considered was cable. No other targets such as solid state control components were considered. See NUREG/CR 6850 Appendix H Section H.2. Solid State failure criteria is $3kW/m^2$ and 65 °C.	F&O FSS-C5-1	Not met
FSS-C6	Summary	Assumption is made that as soon as target is in HGL, damage occurs. The nearest target is always located in the plume and not in the flame, ceiling jet, or radiation regions. Page 35 of HNP-F/PSA-0079. Note: only item considered as a target was cable.		1&2

SR	Level	Observation	Basis	Cap Cat
FSS-C7	Summary	Following are assumptions that were made and are located in HPN-F/PSA-0079 page 9: 1. If no detection system is installed manual detection will occur in 15 minutes. 2. Fires initiated in the presence of a fire watch will not propagate to a HGL due to early manual suppression actions. 3. Continuous fire watch personnel are brigade qualified and will take first action to suppress an observed fire within 2 minutes. 4. Fire brigade response times applied are 50% of the drill times based on feedback from HNP fire protection. 5. Incipient detection of low voltage cabinets provides additional 60 minutes for manual suppression Recovery of a failed suppression system was not considered.		Met
FSS-C8	Summary	The licensee did take credit for fire wrap. Documented technical basis. Confirmed the mechanical damage criteria, and direct flame impingement criteria. Page 12 of HNP-M/MECH-1103		Met

SR	Level	Observation	Basis	Cap Cat
FSS-D1	Finding	Used HNP-M/MECH-1128 Hot Gas Layer Calculations and HNP-M/MECH-1129 Fire Zone of Influence Calculations in walk downs. Also used spreadsheet calculations that they developed. These spreadsheets appear to give very conservative results and can be located in C:\PRA\HNP\FPRA_FRANC Did not use detailed fire modeling such as CFAST or FDS	F&O FSS-D1-1	Not Met
FSS-D1	Suggestion	Current calculation method for determining time to HGL formation is overly conservative. More detailed fire modeling may be required for high risk areas. Conservative fire modeling is not appropriate for high risk areas. Need to use other computer fire models, i.e., CFAST, FDS to further analyze rooms of interest.	F&O FSS-D1-2	
FSS-D2	Summary	Used HNP-M/MECH-1128 Hot Gas Layer Calculations and HNP-M/MECH-1129 Fire Zone of Influence Calculations in walk downs. Also used spreadsheet calculations that they developed. These spreadsheets appear to give very conservative results and can be located in C:\PRA\HNP\FPRA_FRANC. Did not use detailed fire modeling such as CFAST or FDS.		Met

SR	Level	Observation	Basis	Cap Cat
FSS-D3	Summary	Used HNP-M/MECH-1128 Hot Gas Layer Calculations and HNP-M/MECH-1129 Fire Zone of Influence Calculations in walk downs. Also used spreadsheet calculations that they developed. These spreadsheets appear to give very conservative results and can be located in C:\PRA\HNP\FPRA_FRANC. Did not use detailed fire modeling such as CFAST or FDS.		1
FSS-D4	Summary	Based on review of - FPIP-0208 Scoping Fire Modeling Revision 2 - Associated Spreadsheets located in C:\PRA\HNP\FPRA_FRANC. - HNP-M/MECH-1128 Hot Gas Layer Calculations - HNP-M/MECH-1129 Fire Zone of Influence Calculations		Met
FSS-D5	Summary	Used 75th and 98th percentile. HRR HNP-M/MECH-1128 Hot Gas Layer Calculations references a simple statistical dimensionless correlation for evaluating fire growth in a compartment (hot gas layer temperature) with natural ventilation. FPIP 0206 references using Plant Specific Bayesian Updates		3
FSS-D6	Summary	Based on review of: - HNP-M/MECH-1128 Hot Gas Layer Calculations - HNP-M/MECH-1129 Zone Of Influence Calculations - NUREG/CR-6850 - FPIP-0208 Scoping Fire Modeling Revision 2		Met
FSS-D7	Summary	Based on review of: - Spreadsheets provided by licensee - NUREG/CR-6850		1

SR	Level	Observation	Basis	Cap Cat
FSS-D8	Summary	Based on review of: - Spreadsheets provided by licensee - NUREG/CR-6850		Met
FSS-D9	Summary	Smoke damage to FPRA equipment was not considered. There is "No Requirement" under Capability Category 1 for this SR. They automatically meet Capability Category 1.		1
FSS-D10	Summary	Based on review of: - Att2(Source-Target).pdf - Att3(Fixed Walkdown).pdf - Att4(Transient Walkdown).pdf		2&3
FSS-D11	Summary	Based on review of: - Att2(Source-Target).pdf - Att3(Fixed Walkdown).pdf - Att4(Transient Walkdown).pdf		Met
FSS-E1	Summary	Based on review of: - HNP-M/MECH-1128 Hot Gas Layer Calculations - HNP-M/MECH-1129 Zone Of Influence Calculations - NUREG/CR-6850 - FPIP-0208 Scoping Fire Modeling Revision 2 - FPIP-0206 FIRE PRA Fire Ignition Frequency		Met
FSS-E2	Summary	For fire modeling parameters, generic estimations were used from the referenced documents. For the spreadsheets developed by the licensee, expert judgment was used in developing the fire growth rates.		Met
FSS-E3	Finding	No uncertainty analysis was performed.	F&O FSS-E3-1	Not met
FSS-E4	Other	No assumptions were made on cable routing		N/A
FSS-F	Finding	Did not perform this task	F&O FSS-F-1	Not Rev
FSS-G	Finding	Did not perform this task	F&O FSS-G-1	Not Rev

SR	Level	Observation	Basis	Cap Cat
FSS-H1	Summary	Much of the documentation done by both the licensee and/or contractors was extensive and in some cases very detailed. However, the information was difficult to find. It would be very helpful, if for a particular SR, the associated document and section within the document be listed.		Met
FSS-H1	Suggestion	Need to list where documents are located.	F&O FSS-H1-1	
FSS-H2	Summary	Same comment as FSS-H1 Documents for where this information can be found are listed in the referenced documents.		1
FSS-H3	Summary	Same comment as FSS-H1 Documents for where this information can be found are listed in the referenced documents.		Met
FSS-H4	Summary	Same comment as FSS-H1 Documents for where this information can be found are listed in the referenced documents.		Met
FSS-H5	Summary	Same comment as FSS-H1 Documents for where this information can be found are listed in the referenced documents. Justification for Capability Category 1 is that the licensee did not include any uncertainty evaluations.		1
FSS-H6	Summary	Same comment as FSS-H1 Documents for where this information can be found are listed in the referenced documents. Justification for Capability Category 1 is that the licensee provided a method for applying statistical models for plant specific updates, see SR FSS-D-5, however there was no updates made,		1
FSS-H7	Summary	FPIP-0150 Ignition Source Characterization Section 9.6 documents assumptions made.		Met

SR	Level	Observation	Basis	Cap Cat
FSS-H8	Finding	No multi compartment fire scenarios were considered.	F&O FSS-H8-1	Not Met
FSS-H9	Finding	No work on uncertainties was done	F&O FSS-H9-1	Not Met
FSS-H10	Summary	Same comment as FSS-H1 Documents for where this information can be found are listed in the referenced documents.		Met
SUPPORTING REQUIREMENTS FOR IGNITION FREQUENCY				
IGN-A1	Summary	This SR is Met because the NUREG/CR-6850 ignition frequency data are used and these are based on nuclear power history for plants of similar type, characteristics, etc., as Harris. No datum was excluded. (Reference = HNP-F/PSA-0071)		Met
IGN-A2	Other	This SR is N/A because no datum outside the nuclear power industry was included.		N/A
IGN-A3	Other	This SR is N/A because no engineering judgment was required or employed.		N/A
IGN-A4	Summary	This SR is CC-I (No Requirement).		1
IGN-A4	Suggestion	Perform the review of plant-specific fire data (or cite this if it has been performed) and justify why (and how) or why not Bayesian updating of the generic fire frequencies was performed.	F&O IGN-A4-1	
IGN-A5	Summary	This SR is Met because the NUREG/CR-6850 ignition frequency data are used and these are calculated on a reactor-year basis which includes weighting by the plant availabilities in the database. (Reference = HNP-F/PSA-0071) But: refer to F&O IGN-A5-1		Met
IGN-A5	Finding	Need to update ignition frequency data once NUREG/CR-6850 is updated with the correct numbers based on reactor-year basis.	F&O IGN-A5-1	

SR	Level	Observation	Basis	Cap Cat
IGN-A6	Other	This SR is N/A because no Bayesian updating for plant-specific fire history has been performed.		N/A
IGN-A7	Summary	This SR is Met because the NUREG/CR-6850 ignition source counting and frequency apportioning methods are used, as supplemented by NFPA 805 FAQs. (Reference = HNP-F/PSA-0071, with Attachments) In addition, as per the Discussion, a calculation was performed (Ricky Davis) at the reviewer's request on whether the sum of ignition bin frequencies and physical analysis unit frequencies matched (i.e., "plant-wide fire frequency must be conserved," and this was confirmed).		Met
IGN-A8	Summary	This SR is CC-III because not only are greater-than-zero ignition frequencies assigned to every plant physical analysis unit, but also each potentially fire-risk-relevant ignition source has an assigned frequency. (Reference = HNP-F/PSA-0071, with Attachment 8)		3
IGN-A9	Summary	This SR is Met, although there is a misleading statement in the documentation regarding postulation of transient combustibles in locked high radiation areas or very small rooms; see F&O IGN-A9-1.		Met
IGN-A9	Suggestion	Revise the misleading text so that it is clear that every compartment was assigned a transient fire frequency, with explanation of how administratively-controlled entities within such compartments were treated for the purpose of assigning transient.	F&O IGN-A9-1	

SR	Level	Observation	Basis	Cap Cat
IGN-A10	Summary	This SR is CC-II because use of the NUREG/CR-6850 fire ignition frequencies carries with it fully characterized uncertainty distributions. (Reference = HNP-F/PSA-0071)		2
IGN-B1	Summary	This SR is Met per the documentation in HNP-F/PSA-0071.		Met
IGN-B2	Summary	This SR is Met per the documentation in HNP-F/PSA-0071.		Met
IGN-B3	Summary	This SR is Met per the documentation in HNP-F/PSA-0071.		Met
IGN-B4	Other	This SR is N/A because plant-specific frequency updating was not performed.		N/A
IGN-B5	Summary	This SR is Met because the uncertainties associated with the NUREG/CR-6850 ignition frequency data automatically apply.		Met
IGN-B5	Suggestion	Include reference in HNP-F/PSA-0076 to the discussion of ignition frequency uncertainties in NUREG/CR-6850.	F&O IGN-B5-1	
SUPPORTING REQUIREMENTS FOR CIRCUIT FAILURES				
CF-A1	Summary	Based on discussions with licensee staff, Harris has identified cable failures and whether or not the mode is intra-cable or inter-cable. See F&O CF-A1-1		Met
CF-A1	Suggestion	Need to complete the analysis and incorporate the results into the appropriate document.	F&O CF-A1-1	
CF-A2	Summary	This SR is Met. By using the values from NUREG/CR-6850, the associated uncertainties are assumed to apply. See F&O CF-A2-1		Met
CF-A2	Suggestion	Directly include uncertainty values into the documentation.	F&O CF-A2-1	
CF-B1	Summary	This SR is Not Met because the material discussed in SRs CF-A1 and A2 has not yet been incorporated into the documentation.		Not Met

SR	Level	Observation	Basis	Cap Cat
CF-B1	Finding	Incorporate the material discussed in SRs CF-A1 and A2 into the documentation.	F&O CF-B1-1	
SUPPORTING REQUIREMENTS FOR HUMAN RELIABILITY ANALYSIS				
HRA-A1	Summary	Section 6 of Harris calculation HNP-F/PSA-0075 states that all HFEs from the internal event model are included in the fire PRA.		Met
HRA-A2	Summary	The safe shutdown actions have been identified, and HLR-E 1 and E2 are met - see Attachment 6 to HNP-F/PSA-0075 for the list of actions.		Met
HRA-A2	Suggestion	Ensure that HLR-E3 and HLR-E4 are met if shutdown actions are added to the model in the future.	F&O HRA-A2-1	
HRA-B1	Summary	None of this definition is changed from the internal events PRA		Met
HRA-B1	Suggestion	Confirm that the time available for key human actions would not be affected by any fire effects, including spurious actions.	F&O HRA-B1-1 F&O HRA-C1-5	
HRA-B2	Summary	No new fire-related safe shutdown HFEs were included in the fire PRA, even though some were determined to have negative consequences.		Not Met
HRA-B2	Finding	PRA needs to reflect potential adverse consequences of operator actions taken per the fire response procedures.	F&O HRA-B2-1	
HRA-B3	Finding	Need to model operator errors based on instrument unavailability due to fire.	F&O HRA-B3-1	Not Met
HRA-C1	Summary	Part 2 HLR-HR-G is incorporated by reference. All supporting requirements were addressed, and one (HR-G6) was not met.		Not Met
HRA-C1	Suggestion	(HR-G1) Review use of the simplified screening method for modifying the internal events HEPs for local actions and for control room actions.	F&O HRA-C1-1	

SR	Level	Observation	Basis	Cap Cat
HRA-C1	Suggestion	(HR-G3) Consider basing the timing on the time when the cues needed to make the decision would occur, rather than the time window.	F&O HRA-C1-2	
HRA-C1	Finding	(HR-G1) The approach to determining which HEPs are developed using a detailed analysis does not conform to the standard definition of significant for capability category II.	F&O HRA-C1-3	1
HRA-C1	Finding	(HR-G3) Need to address the availability of instrumentation as one of the factors considered in determining the HEPs, both in the simplified screening method and the detailed method.	F&O HRA-C1-4	1
HRA-C1	Finding	(HR-B4) Need to determine whether event timing is influenced by the fire, rather than assuming that T-H analysis based on the accident sequence is unaffected by the initiator being a fire.	F&O HRA-C1-5	Met
HRA-C1	Finding	(HR-G6) Check post-initiating event human error probabilities for reasonableness relative to each other in the context of the various scenarios.	F&O HRA-C1-6	Not Met
HRA-C1	Suggestion	(HR-G7) Need to apply the recommended lower bound (1E-05) to combinations of three or more HFEs in combination, or justify the use of a lower bound (1E-06 was used).	F&O HRA-C1-7	
HRA-D1	Suggestion	This HLR was not applicable; fire recovery actions were not included in the Harris Fire PRA model. However, if such actions are incorporated at a later date, this would become applicable.	F&O HRA-D1-1	N/A
HRA-E1	Summary	The documentation is consistent with the level of detail of the analysis; the detailed analyses are consistent with those of the internal events analysis.		Met

SR	Level	Observation	Basis	Cap Cat
SUPPORTING REQUIREMENTS FOR FIRE RISK QUANTIFICAITON				
FQ-A1	Summary	There is a clear link between components and required cables and the PRA basic events, and the association of applicable fire sources and targets in the plant. The quantification is complete in that each source is addressed, and the database queries which generate the quantification files (i.e., the PRA basic events assumed failed) appear to be correct.		Met
FQ-A2	Summary	Each fire scenario is quantified using a fire initiating event, which is evaluated using the transient - loss of decay heat removal and the transient-induced LOCA event tree logic. Fires which could cause another initiator (such as loss of feedwater or loss of offsite power for example) are effectively addressed by the target cables in the mitigating systems fault tree logic. The fire event also addresses interfacing-systems LOCA logic, including fire-induced ISLOCAs.		Met
FQ-A3	Summary	The quantification included the specific elements identified.		Met
FQ-A4	Finding	QU-A2a was not met; therefore this SR is also not met. Need to identify individual sequences to support identification of significant accident sequences	F&O FQ-A4-1	Not Met
FQ-A4	Summary	QU-A2b - Only point estimates are calculated from the CAFTA model quantification of the CCDP, and from the Excel calculation of CDF.		1
FQ-A4	Summary	Other QU-A SRs are either met or do not apply to the fire PRA.		
FQ-B1	Summary	All SRs from QU-B are met or not applicable; none of the SRs differentiate capability category.		Met

SR	Level	Observation	Basis	Cap Cat
FQ-C1	Summary	All SRs from QU-C are met or not applicable; none of the SRs differentiate capability category.		Met
FQ-D1	Finding	LERF is not mentioned in the quantification calculation HNP-F/PSA-0079 Rev. 0. The fire PRA summary specifically excludes calculation of LERF from the scope of the fire PRA model.	FQ-D1-1	Not Met
FQ-E1	Finding	Significant contributors and significant basic events to fire LERF have not been determined. Also, Harris does not appear to use the definition as provided in the PRA standard.	FQ-E1-1 FQ-E1-2	Not Met
FQ-F1	Summary	Many SRs from QU-F are not met; none of the SRs for LE-G can be met since LERF is not addressed.		Not Met
FQ-F1	Finding	QU-F2 - Several of the recommended documentation requirements are not in place, specifically items b, e, f, g, i, j, m.	FQ-F1-1	
FQ-F1	Finding	QU-F3 - There is currently no record of significant contributors to fire CDF.	FQ-F1-2	
FQ-F1	Finding	QU-F4 - Assumptions and sources of uncertainty are not documented.	FQ-F1-3	
FQ-F2	Finding	Harris has not assessed the fire PRA to the standard, and has therefore not determined whether any of the referenced internal events requirements are not applicable or provided bases if appropriate.	FQ-F2-1	Not Met
SUPPORTING REQUIREMENTS FOR CONFIGURATION CONTROL/MODEL UPDATE				
MUD-A1	Monitor changes in the design, operation, maintenance, and industry-wide operational history that could affect the FPRA.			
	Suggestion	Provide direction in process to monitor industry wide operational history. Ensure that component data (generic and plant-specific) includes active fire protection systems, e.g. fixed suppression, dampers.	MUD-A1-1	Met

SR	Level	Observation	Basis	Cap Cat
MUD-A2	Include inputs that impact operating procedures, design configuration, initiating event frequencies, system or sub-system unavailability, and component failure rates.			
	Summary	Based on review of licensee procedure ADM-NGGC-0004		Met
MUD-A3	Monitoring of changes to the FPRA technology and industry experience that could change the results of the FPRA model.			
	Suggestion	Add language to monitor updated or new methodologies as appropriate.	MUD-A3-1	Met
MUD-B1	FPRA's representation of the as-built, as-operated plant is sufficient to support the applications for which it is being used.			
	Summary	Based on review of licensee procedure ADM-NGGC-0004		Met
MUD-B2	Changes in FPRA inputs or discovery of new information identified pursuant to paragraph 1-5.3 shall be evaluated to determine whether such information warrants FPRA maintenance or FPRA upgrade.			
	Summary	Based on review of licensee procedure ADM-NGGC-0004		Met
MUD-B3	Changes that would impact risk-informed decisions should be prioritized to ensure that the most significant changes are incorporated as soon as practical.			
	Summary	Based on review of licensee procedure ADM-NGGC-0004		Met
MUD-B4	Changes that are relevant to a specific application shall meet the SRs pertinent to that application as determined through the process described in paragraph 1-3.5			
	Finding	Since fire standard not referenced, those SRs are not evaluated. Fire standard needs to be referenced in 9.2.5; currently only ASME Internal Events. Add latest reference to R.G. 1.200, which is expected to endorse the fire standard.	F&O MUD-B4-1	Not Met
MUD-B5	Changes to a FPRA due to FPRA maintenance and FPRA upgrade shall meet the requirements of the Technical Requirements Section of each respective Part of this Standard.			
	Finding	See above finding regarding lack of reference of fire standard.	F&O MUD-B4-1	Not Met
MUD-B6	Upgrades of a FPRA shall receive peer review in accordance with the requirements specified in Section 1-6, but limited to aspects of the FPRA that have been upgraded.			

SR	Level	Observation	Basis	Cap Cat
	Finding	See above finding on lack of reference of fire standard Note that peer reviews of the revised PSA model as determined by the PSA supervisor are prescribed	F&O MUD-B4-1	Not Met
MUD-C1	Consider the cumulative impact of pending changes on the application being performed			
	Summary	Based on review of licensee procedure ADM-NGGC-0004		Met
MUD-D1	Evaluate the impact of a FPRA change on previously implemented risk-informed decisions that relied upon FPRA information and that affect the safe operation of the plant			
	Summary	Impact on previously implemented decisions not performed except for required programs such as A-4, ISI, MSPI, TS 4B etc. `Not performed on past decisions such as one time AOT or other license amendment. It should be noted that the impact on other ongoing analyses and applications is assessed. This is not a “finding” because this portion of the requirement is slated for removal from the PRA standard in a future revision.		Met
MUD-E1	The computer codes used to support and to perform FPRA analyses shall be controlled to ensure consistent, reproducible results			
	Summary	Based on review of: - EGR-NGGC-0003 (9.7) - CSP-NGGC-2505 - EGR-NGGC-0016 - ADM-NGGC-0004		Met
MUD-F1	Documentation of the Configuration Control Program and of the performance of the above elements shall be adequate to demonstrate that the FPRA is being maintained consistently with the as-built, as-operated plant.			
	Summary	Based on review of electronic database for a plant change. See MUD-F2		Met

SR	Level	Observation	Basis	Cap Cat
MUD-F2	The documentation typically includes (a) a description of the process used to monitor FPRA inputs and collect new information (b) evidence that the aforementioned process is active (c) descriptions of proposed changes (d) description of changes in a FPRA due to each FPRA upgrade or FPRA maintenance (e) record of the performance and results of the appropriate FPRA reviews (f) record of the process and results used to address the cumulative impact of pending changes (g) record of the process and results used to evaluate changes on previously implemented risk-informed decisions pursuant to paragraph 1-5.6 (h) a description of the process used to maintain software configuration control			
	Summary	Note: Documentation program is electronic.		Met

Appendix B. Fact/Observation Regarding FPRA Technical Elements

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: IEPRA-1	**Level of Significance:** Suggestion
Reviewer: RHG	**Capability Category:**

OBSERVATION:

AS-06: HFE for operators to secure RHR pumps following SI events with RCS at high pressure (protect pumps when running on minimum flow) was not modeled; Harris provided the basis for excluding this HFE, namely that pumps will successfully operate at minimum flow (does this assumption hold true for spurious SI events that would start the RHR pumps?) Suggestion F&O AS-01 is to confirm that the assumption of no RHR pump damage for non-fire-induced SI events remains valid when fire is considered.

BASIS FOR LEVEL OF SIGNIFICANCE:

Suggestion F&O IEPRA-AS-01 is to confirm that the assumption of no RHR pump damage for non-fire-induced SI events remains valid when fire is considered.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
HNP-F/PSA-0069 (HNP - PSA WOG F&O Resolutions)	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: IEPRA-2	**Level of Significance:** Suggestion
Reviewer: RHG	**Capability Category:**

OBSERVATION:

TH-01: Room heatup for the SWGR rooms was dismissed based on the slow heatup rate and "the low probability of the sequence of events necessary to lose SWGR room cooling;" the latter justification (low probability) may not apply when fire-induced probabilities are considered; Suggestion F&O IEPRA-TH-01 is to confirm that the dismissal of SWGR room heatup as a concern remains valid when fire-induced failures of cooling equipment are considered.

BASIS FOR LEVEL OF SIGNIFICANCE:

Suggestion F&O IEPRA-TH-01 is to confirm that the dismissal of SWGR room heatup as a concern remains valid when fire-induced failures of cooling equipment are considered.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	**Personnel Contacted:**
HNP-F/PSA-0069 (HNP - PSA WOG F&O Resolutions)	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: PP-B2-1	**Level of Significance:** Finding
Reviewer: HXB	**Capability Category:** Not Met

OBSERVATION:

Not Met - Justification for non-rated partition boundaries insufficient; standard and 6850 requires a technical discussion regarding fire spread, subtstantially containing the affects of fire, etc.

BASIS FOR LEVEL OF SIGNIFICANCE:

Standard requires justification for the use of non-rated barriers. There were numerous instances of summary statements such as "Non-rated walls fully enclose the compartment and are adequate for defining compartment boundaries." Discussion 2 references NUREG-6850 for guidance on justifications. The NUREG provides guidance for addressing such items as Open Doorways, Unsealed Cable Penetrations, Gratings, Open Stairwells, etc. The NUREG also discussed using a 1-hour equivalent fire rating as acceptable to be "substantial enough to meet conditions defining a 1-hour rating can be credited in partitioning."

POSSIBLE RESOLUTION (REVIEWER):

Provide a technical justification for non-rated barrier acceptability. Include in the discussion the presence or absence of penetrations through the barrier, openings, and other features that would otherwise disqualify the barrier as a rated barrier.

Reference(s):	Personnel Contacted:
PI-FPIP-NGG-0201, Rev. 0 HNP-F/PSA-0071, Rev. 1	Dave Miskiewicz

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: PP-B2-2	**Level of Significance:** Finding
Reviewer: HXB	**Capability Category:** Not Met

OBSERVATION:

Not Met - Insufficient justification/documentation for "rooms" within Fire Compartments. Drawings provided in calculation do not provide sufficient information to indicate why hot gas layer could be formed in smaller areas than fire compartment.

BASIS FOR LEVEL OF SIGNIFICANCE:

Standard requires justification for the use of smaller physical analysis units. The fact that a section of a room may allow a hot gas layer to form does not necessarily meet the intent of "spacial separation" as treated in the standard.

POSSIBLE RESOLUTION (REVIEWER):

Remove the treatment of rooms from the plant partitioning section of the PRA and handle it within the scenario development in either Scoping or Detailed Fire Modeling tasks.

Reference(s):	Personnel Contacted:
PI-FPIP-NGG-0201, Rev. 0 HNP-F/PSA-0071, Rev. 1	Dave Miskiewicz

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: PP-C3-1	**Level of Significance:** Finding
Reviewer: HXB	**Capability Category:** Not Met

OBSERVATION:

Not met. Addequate justification required for non-rated barriers and the use of rooms as partitioning physcial anlaysis units.

BASIS FOR LEVEL OF SIGNIFICANCE:

Refer to PP-B2

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
PI-FPIP-NGG-0201, Rev. 0 HNP-F/PSA-0071, Rev. 1	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: ES-A6-1	**Level of Significance:** Finding
Reviewer: JAC	**Capability Category:** Not Met
OBSERVATION:	
Harris has not considered LERF at this point.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**
FPIP-202 Rev. 0 HNP-F/PSA-0076 Rev. 0 HNP-FPSA-0077 Rev. 0	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: ES-B3-1	**Level of Significance:** Suggestion
Reviewer: JAC	**Capability Category:** Met
OBSERVATION:	
HNP-FPSA-0077, attachment 6 has a list of additional equipment which has to be added, it is derived from the existing FSSEL. The expert panel had considered initiating events outside the scope of the original SSEL and internal events PRA. The licensee is currently assessing an additional list derived from the WOG . However, there is no guidance for the expert panel on how to include these initiators for consideration. The licensee should finish the in-process assessment of potential additional initiating events (list derived from Westinghouse Owners' Group) and provide guidance to the expert panel on how to consider these initiating events.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**
HNP-FPSA-0077 Rev. 0, Attachment 6	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: ES-B4-1	**Level of Significance:** Finding
Reviewer: JAC	**Capability Category:** Not Met

OBSERVATION:

Not met because containment bypass other than ISLOCA has not been addressed.

HNP-FPSA-0077 considers two spurious actuations for ISLOCA. After discussion with licensee, expert panel might have considered more than two spurious actuations however, there is no documentation guidance on considering beyond two actuations.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
FPIP-202 Rev. 0 HNP-F/PSA-0076 Rev. 0 HNP-FPSA-0077 Rev. 0	Dave Miskiewicz

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: ES-C1-1	**Level of Significance:** Finding
Reviewer: GWP	**Capability Category:** Not Met

OBSERVATION:

The table includes an identification of an indication that is used to provide information to the operators in their performance of a required action.

While the general assumption is that there is redundant or diverse indication to support actions, in some cases, only one instrument is identified. An example is OPER-1, where the indication seems to relate more to confirmation that an action has been performed (and therefore affects the recovery of a failed first attempt (i.e. internal to the calculation of the HEP)), rather than an indication that would initiate the action. Even if this were the appropriate instrument it would not answer the question of whether there is redundant and diverse instrumentation.

In the case of OPER-3, the instrument/equipment is Accumulator and Pressurizer PORV n2 supply manual valve. It would be expected that the instrumention would be low steam generator level.

Therefore, while some identification has been made, it would not appear to be complete.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
Attachment 4 of HNP-F-PSA-0077	Ricardo Davis-Zapata

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: ES-D1-1	**Level of Significance:** Finding
Reviewer: JAC	**Capability Category:** Not Met

OBSERVATION:

The documentation of the ES element is not sufficient to support peer review. Better traceability is needed, especially related compartments and scenarios. The standard requires that the cables need to be identified with the component (relative to its failure mode). There are no links to this information which makes tracing components difficult for future updates. Suggest creating a database with fields of components, cables which cause the failure state, mode of failure (spurious, short to ground, etc.), compartment location with FRANC scenario for all routings per cable, and basic event mapping. Documents reviewed included FPIP-202 Rev. 0, HNP-F/PSA-0076 Rev. 0, and HNP-FPSA-0077 Rev. 0.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: CS-A3-1	**Level of Significance:** Finding
Reviewer: HXB	**Capability Category:** Not Met

OBSERVATION:

Upon detailed investigation, at least one instance was identified where postulated fire damage to a power supply cable was not reflected in the Fire PRA model.

Specifically, the cable that provides power to MCC 1A24 from the 480V load center was not modeled such that fire damage to cable 1767B would not result in the failure of valve 1RC-113A (PORV Block Valve) due to loss of power.

BASIS FOR LEVEL OF SIGNIFICANCE:

Fire PRA Plant Response Model will not accurately reflect the loss of a power supply to an active component that has a requirement to actively close, which requires power (valve is a motor operated valve that requires power to change position to the required safe shutdown position).

POSSIBLE RESOLUTION (REVIEWER):

Revise Plant Response Model to include 480V load center, MCC and associated cables.

Reference(s):	Personnel Contacted:
FSSPMD FRANC model CAFTA model Fire PRA Database	Dave Miskiewicz

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: CS-A4-1	**Level of Significance:** Finding
Reviewer: HXB	**Capability Category:** Not Met

OBSERVATION:

Upon detailed investigation, at least one instance was identified where postulated fire damage to a power supply cable was not reflected in the Fire PRA model.

Specifically, the cable that provides power to MCC 1A24 from the 480V load center was not modeled such that fire damage to cable 1767B would not result in the failure of valve 1RC-113A (PORV Block Valve) due to loss of power.

BASIS FOR LEVEL OF SIGNIFICANCE:

Fire PRA Plant Response Model will not accurately reflect the loss of a power supply to an active component that has a requirement to actively close, which requires power (valve is a motor operated valve that requires power to change position to the required safe shutdown position).

POSSIBLE RESOLUTION (REVIEWER):

Revise Plant Response Model to include 480V load center, MCC and associated cables.

Reference(s):	Personnel Contacted:
FSSPMD FRANC model CAFTA model Fire PRA Database	Dave Miskiewicz

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: CS-A7-1	**Level of Significance:** Finding
Reviewer: HXB	**Capability Category:** Not Met

OBSERVATION:

Although inter-cable hot shorts have been considered for interfacing system LOCAs, the same can not be said for containment bypass that results in core damage and large early release.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
HNP-F/PSA-0077, Rev. 0 HNP-E-ELEC-0001, Rev. 1	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: CS-A8-1	**Level of Significance:** Finding
Reviewer: HXB	**Capability Category:** Not Met

OBSERVATION:

Although three-phase hot shorts were postulated as part of the safe shutdown analysis for interfacing system LOCAs, I found no evidence of a review of three-phase hot shorts that could result in containment bypass.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
HNP-F/PSA-0077, Rev. 0 HNP-E-ELEC-0001, Rev. 1	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: CS-C4-1	**Level of Significance:** Finding
Reviewer: HXB	**Capability Category:** Not Met

OBSERVATION:

Although Calculation HNP-E-ELEC-0001, Rev. 1 includes verification of proper electrical coordination with appropriate actions for any circuits that are not properly coordinated, there is no configuration management tie to the electrical coordination calculations performed.

BASIS FOR LEVEL OF SIGNIFICANCE:

Any future changes to the electrical coordination calculations must be reviewed for possible impact to the safe shutdown analysis and the resulting impact on the Fire PRA model.

POSSIBLE RESOLUTION (REVIEWER):

Include by reference any and all electrical coordination calculations reviewed as part of the Post-Fire Safe Shutdown Analysis.

Reference(s):	Personnel Contacted:
HNP-F/PSA-0077, Rev. 0 HNP-E-ELEC-0001, Rev. 1	Robert Rhodes

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: PRM-A1-1	**Level of Significance:** Finding
Reviewer: AJH	**Capability Category:** Not Met

OBSERVATION:

Section 5.3.2 specifically states that no specific conditional LERF model was developed.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

If required for an application, the LERF model must be developed and peer reviewed.

Reference(s):	Personnel Contacted:
HNP-F/PSA-0076 R0	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: PRM-A2-1	**Level of Significance:** Finding
Reviewer: AJH	**Capability Category:** Not Met
OBSERVATION:	
See related finding on PRM-A1 for CLERP.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
Refer to PRM-A1	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**
HNP-F/PSA-0076 R0	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: PRM-B1-1	**Level of Significance:** Finding
Reviewer: RHG	**Capability Category:** Not Met

OBSERVATION:

This SR is Not Met. As stated in HNP-F/PSA-0077, "In Task 5, new components and failure modes identified in the Component Selection task (Task 2) were reviewed for possible inclusion into the Internal Events PRA model. The Internal Events PRA model was then modified to capture the impact of new components or failure modes identified in Task 2. Task 5 was focused on the enhancement of the Internal Events PRA model to allow quantification of fire-induced CCDP. A LERF top event for Conditional Large Early Release Probability (CLERP) was not developed [for several reasons {as listed}] ..." Also, to satisfy the Discussion, the internal events PRA has been reviewed against ASME-RA-2002/RA-Sb-2005 as documented by the 2006 "Gap Analysis" against RG-1.200. Despite the preceding, this assumed subsumation of LERF within CDF based on assuming that the internal events PRA major LERF contributors (SGTR and ISLOCA) constitute the only major LERF contributors for the Fire PRA, may not cover the possibility of a typically minor LERF contributor to the internal events PRA becoming a more important LERF contributor for fire (e.g., spurious opening of non-ISLOCA-related CNMT penetrations). Finding F&O PRM-B1-01 cites the need to investigate the possibility of typically minor LERF contributors for internal events PRA becoming more important for fire, at least before concluding that only the major internal events LERF contributors could be the only major ones for fire.

BASIS FOR LEVEL OF SIGNIFICANCE:

Finding F&O PRM-B1-01 cites the need to investigate the possibility of typically minor LERF contributors for internal events PRA becoming more important for fire, at least before concluding that only the major internal events LERF contributors could be the only major ones for fire.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
P-F/PSA-0077	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: PRM-B8-1	**Level of Significance:** Suggestion
Reviewer: AJH	**Capability Category:**

OBSERVATION

SY-A20 - The model for some spurious failures is conservative, in that actual system capability may still allow the system function to be achieved. For example:

1. The fire-induced opening of a SG PORV or steam dump valve is assumed to cause the affected SG to be faulted and unavailable for decay heat removal. In reality, the plant may only be cooling down at a nominal rate consistent with TS and procedures (albeit in an uncontrollable condition). Failing secondary heat removal (event B in the transient event tree logic) for this condition is conservative.

2. The failure of control and isolation valves for a steam generator AFW supply from the motor-driven pump header is assumed to cause SG overfill and subsequent unavailability of that steam generator to supply steam to the turbine-driven AFW pump. However, at least one MDAFW pump must be operating, and therefore the unavailability of the turbine-driven AFW pump would not be a concern. For fire scenarios, it is therefore implicitly assumed that the MDAFW pump does not fail until after the control and isolation valves fail and the SG is lost, which may be overly conservative for some specific fire scenarios, depending upon the physical location of the cables.

3. Failure to isolate the non-essential chilled water components is identified as a chilled water system failure. This is overly conservative since these non-essential components are normally supplied by the system. In fact, the internal events model was subsequently revised to add a required piping failure. Currently, the licensee staff is considering a new failure mode related to this failure to isolate the non-essential components due to cross-train water inventory issues. A more careful review of the actual failure effects of not isolating the non-essential header would seem to be warranted.

4. It does not appear that the failure mode of draining the RWST to the containment sumps vial the RHR and containment spray pump suctions is crediting potential operator action to isolate the flowpath,

Since there are examples of conservative modeling of the system impacts, this SR is only met at capability category I.

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: PRM-B8-1	**Level of Significance:** Suggestion
Reviewer: AJH	**Capability Category:**

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Model should be revised to realistically reflect the system impacts and credit potential recovery actions. If these failure modes are not important to the overall fire PRA results, then no changes would be necessary, and the remaining modeling would satisfy capability category II.

Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: PRM-B12-1	**Level of Significance:** Suggestion
Reviewer: RHG	**Capability Category:** Met

OBSERVATION:

This SR is Met, based on the related SRs from DA in ASME RA-Sb-2005, to which this SR (PRM-B12) refers. All FPRA PRM probability input values from PRM-B11 underwent data analysis in the same way as performed in the original internal events PRA and its subsequent updates. Therefore, it was judged that the evaluations of the previous internal events SRs applied here. All relevant SRs under HLR-DA from the 2006 "Gap Analysis" were graded as Met or at least CC-II (or CC-I/II, i.e., none were Not Met or solely CC-I). The recent (12/2007) "Focused Scope" Peer Review of HLR-DA identified three SRs that did not meet CC-II (two were Not Met and one was CC-I). The associated F&O's were mainly associated with (1) failure to estimate the time for which MOVs are configured in standby (DA-C8-01); (2) component boundaries and selection of CCF parameter values (DA-D6-01 thru 03); and (3) screening out failure events when followed by successful operation shortly afterward, when it would be better if these were treated as failure followed by success to account for possibility of < 1 hr being available during emergency (chiller trip, followed by restart; DA-C4-01). It is unlikely any of these would significantly affect the results of the Fire PRA if not resolved, but this should be examined and, if necessary, the F&O's should be resolved quickly. Attachment 1 to HNP-F/PSA-0001, Rev. 8, lists all basic events for which probability values were updated (or added for the first time, if the basic event was new) as per the changes/additions discussed in SR PRM-B11. Updates/additions were made for plant-specific unavailabilities due to scheduled and unscheduled maintenance, initiating events, MOVs and CCFs. Included among these were updates/additions for fire-related basic events and initiators. Suggestion F&O PRM-B12-01 is to (1) review the DA-related F&O's from the 12/2007 Focused Scope Peer Review to ensure no effect on the Fire PRA (and resolve quickly if there is an effect) and (2) add discussion and references to HNP-F/PSA-0001, Rev. 8, Att. 1, to the Fire PRA summary documents regarding these data uupdates/additions for fire-related events.

BASIS FOR LEVEL OF SIGNIFICANCE:

Suggestion F&O PRM-B12-01 is to (1) review the DA-related F&O's from the 12/2007 Focused Scope Peer Review to ensure no effect on the Fire PRA (and resolve quickly if there is an effect) and (2) add discussion and references to HNP-F/PSA-0001, Rev. 8, Att. 1, to the Fire PRA summary documents regarding these data uupdates/additions for fire-related events.

POSSIBLE RESOLUTION (REVIEWER):

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: PRM-B12-1	**Level of Significance:** Suggestion
Reviewer: RHG	**Capability Category:** Met
Reference(s):	**Personnel Contacted:**
HNP-F/PSA-0001, Rev. 8, Att. 1; 12/2007 "Focused Scope" Peer Review	Dave Miskiewicz; Steve Mabe

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: FSS-A1-1	**Level of Significance:** Suggestion
Reviewer: PWL	**Capability Category:** Met

OBSERVATION:

Scoping fire modeling instructions (FPIP-0208) provide instructions to identifiy fixed and transient fire scenarios. The instruction screens out sources that won't cause target damage, however, fire PRA component sources would not be screened. For transient sources, there positioning will effect at least one target, could reasonably assumed to be in that location, placed roughly every 1000 square feet, and located on the floor near cable tray risers, low-lying cable trays, areas without train separation, or groups of conduits. A 3' by 3' (trash bag) size transient source was used with a 143 kW and 317 kW ZOI. Transients were not postulated in locked high radiation areas, small rooms, or rooms that fixed sources hit all targets.

FPRA walkdown instruction (FPIP-0200) included mapping out fixed ignition sources and identifying existing transient combustible sources, but not locating postulated transient sources.

The fire ignition frequency calculation (HNP-F/PSA-0071) assumes all fixed ignition sources were identified during the walkdowns. Attachment 8 contains a list identifying over 2900 fixed ignition sources. Attachment 10 maps the fixed ignition sources of plant plan views. It was noted that diesel fuel oil storage fire areas were not walked downed, since the fire compartments are basically the storage tank. The calc noted placement of transient sources was chosen for locations where a transient fire would reasonably assume to be placed during routine work.

Progress Energy conducted a transient fire ignition source frequency evaluation to identify risk relevant transient source location. They considered the following; given the nature of transients it is possible to have multiple plausible locations within a compartment. General transient locations are postulated in every room except those that are locked high radiation areas or small rooms where a transient fire is assumed to damage all targets.

Additional plant walkdowns were done to identify targets from transients sources (HNP-F/PSA-0078). Attachment 4 mapped the locations of the transients and the HNP_FPRA_Database indicated about 250 transient sources were considered, with about 90 of these sources were credited for failing all targets in their associated fire compartment. Comparison of the mapped transient locations, walkdown sheets, walkdown validation sheet, and the source target relationship targets for fire area 12-A-BAL, fire zone 12-A-5-DIH (FC01) showed some inconsistencies between mapped transient numbers did not have a walkdown sheets and one walkdown sheet (T-9) showed a target (C1223) as a tray, when the source-target database showed it was a riser. Progress researched this inconsistencies and noted that those walkdown sheets were preliminary and transient locations were consolidated if two sources hit the same targets and are redundant.

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: FSS-A1-1	**Level of Significance:** Suggestion
Reviewer: PWL	**Capability Category:** Met
BASIS FOR LEVEL OF SIGNIFICANCE:	
Licensee should take into consideration the vertical height of transient ignition sources. The walkdown database needs to reflect the final transient ignition source mapping.	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**
PI-FPIP-NGG-0200, Rev 3 Draft FPIP-0208, Rev 2 Draft HNP-F/PSA-0071, Rev 1 Draft HNP-F/PSA-0078, Rev 0 HNP_FPRA_database	Dave Miskiewicz Ricky Davis-Zapata

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: FSS-A2-1	**Level of Significance:** Finding
Reviewer: PWL	**Capability Category:** Not Met

OBSERVATION:

Progress Energy developed Zones of Influence (ZOI) for the 98 and 75 percentile fires for different fire sources (MM/MECH-1128) and calculated vertical and horizontal distances from a source fire that would damage cable (i.e., target). Progress also developed a Hot Gas Layer (HGL) methodology (MM/MECH-1129) which correlates Heat Release Rate (HRR) needed in a room to cause a HGL to a certain length of cable tray needed to obtain that HRR. If a fire compartment develops a HGL, Progress assumes all targets will be damaged. Progress utilized the damage of the Kerite cable temperature (400 F) as the damage threshold. These Calcs are reviewed in later SRs.

Progress Energy utilized their ZOI distances and the postulated cable tray length needed to generate a HGL to conduct walkdowns to identfy target sets. Progress sketched and photographed each source for there database. Project instruction FPIP-0200, provides the walkdown instruction and F/PSA-0078 provides the scoping walkdown calculation. In the calc, attachment 3 provides the fixed source walkdowns data sheets. These sheets did not consider damage to critical equipment, which has a lower threshold temperature and a larger ZOI, so some targets may have been missed. Attachment 4 provides the transient walkdown data sheets and these sheets did not consider wall and corner fire ZOIs. These fires create larger ZOIs so the walkdowns may have miss some potential targets. Attachment 2 provides a source to target database, with over 21,000 target sets.

BASIS FOR LEVEL OF SIGNIFICANCE:

The lower damage threshold for critical equipment targets were not considered. ZOI for transient wall and corner fire sources were not used and some targets may have been missed.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
Draft HNP-NN/MECH-1128 Draft HNP-NN/MECH-1129 PI-FPIP-NGG-0200, Rev 3 Draft HNP-F/PSA-0078, Rev 0	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-08
ID Number: FSS-A2-2	**Level of Significance:** Suggestion
Reviewer: GWP	**Capability Category:**

OBSERVATION:

The screening approach to determining the time to generate a hot gas layer is considered to be potentially very conservative. The approach compares two curves. The first is a measure of the time at which the total heat deposited at a given heat release rate is sufficient to generate a hot gas layer. The assumption underlying this curve is that the fire grows instantaneously to its maximum heat release rate. The second curve expresses the growth of heat release rate as a function of time. The time to development of a hot gas layer is the time given by the intersection of these two curves. This is incorrect since the first curve is based on the total heat deposited in the fire area, while second curve is a plot of the instantaneous heat release rate as a function of time. It is the area under this curve that provides the total heat deposited as a function of time. The approach to determining the time to hot gas layer is conservative on two counts: firstly, because of the assumption of an instantaneous fire to generate the first curve, and secondly, because the comparison is made using the instantaneous heat release rate rather than the integral.

The use of the screening approach, while technically incorrect, is adequate for demonstrating that a fire scenario is an insignificant contributor to risk. However, any scenarios that contribute to fire risk for which the assessment is based on the timing developed using this method, should be characterized as very conservative

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: FSS-B1-1	**Level of Significance:** Finding
Reviewer: RHG	**Capability Category:** Not Met

OBSERVATION:

Main Control Room Analysis Rev D Draft.pdf page A-28 discusses control room abandonment.

Finding: Loss/degraded functions are not clearly included in the control room abandoment analysis. This should be clarified/discussed in the documentation.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
Main Control Room Analysis Rev D Draft.pdf SHNPP_Ctrl Room Report DRAFT_12-31-2007_B.pdf	Dave Miskiewicz

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: FSS-C5-1	**Level of Significance:** Finding
Reviewer: RXV	**Capability Category:** Not met

OBSERVATION:

Only target item considered was cable. The damage criteria used for cables is 205 °C (Page 35 of HNP-F/PSA-0079). No other damage criteria used. NUREG/CR-6850 Appendix H page H10 indicates that if a scenario should arise involving solid state control components as a thermal damge target, the failure criteria to be applied is screening are 3kW/m2 and 65 °C.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
HNP-F/PSA-0079 Appendix H of NUREG/CR-6850	Ricardo Davis David Miskiewicz

<table>
<tr><th colspan="2">FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS</th></tr>
<tr><td>Plant Name: Harris 1</td><td>Date: 2008-02-06</td></tr>
<tr><td>ID Number: FSS-D1-1</td><td>Level of Significance: Finding</td></tr>
<tr><td>Reviewer: RXV</td><td>Capability Category: Not Met</td></tr>
<tr><td colspan="2">OBSERVATION:</td></tr>
<tr><td colspan="2">Used HGL and ZOI in walk downs.

Also used spreadsheet calculations that they developed. Appears to give very conservative results.

Did not use detailed fire modeling such as CFAST or FDS</td></tr>
<tr><td colspan="2">BASIS FOR LEVEL OF SIGNIFICANCE:</td></tr>
<tr><td colspan="2">More detailed fire modeling may be required for high risk areas. Conservative fire modeling is not appropriate for high risk areas. Need to use other computer fire models, i.e., CFAST, FDS to further analyze rooms of interest.</td></tr>
<tr><td colspan="2">POSSIBLE RESOLUTION (REVIEWER):</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Reference(s):</td><td>Personnel Contacted:</td></tr>
<tr><td>FPIP-0208 Scoping Fire Modeling Revision 2
Spreadsheets located in C:\PRA\HNP\FPRA_FRANC
HNP-M/MECH-1128 Hot Gas Layer Calculaitons
HNP-M/MECH-1129 Fire Zone of Influence Calculation</td><td></td></tr>
</table>

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: FSS-D1-2	**Level of Significance:** Suggestion
Reviewer: GWP	**Capability Category:**

OBSERVATION:

The screening approach to determining the time to generate a hot gas layer is considered to be potentially very conservative. The approach compares two curves. The first is a measure of the time at which the total heat deposited at a given heat release rate is sufficient to generate a hot gas layer. The assumption underlying this curve is that the fire grows instantaneously to its maximum heat release rate. The second curve expresses the growth of heat release rate as a function of time. The time to development of a hot gas layer is the time given by the intersection of these two curves. This is incorrect since the first curve is based on the total heat deposited in the fire area, while second curve is a plot of the instantaneous heat release rate as a function of time. It is the area under this curve that provides the total heat deposited as a function of time. The approach to determining the time to hot gas layer is conservative on two counts: firstly, because of the assumption of an instantaneous fire to generate the first curve, and secondly, because the comparison is made using the instantaneous heat release rate rather than the integral.

The use of the screening approach, while technically incorrect, is adequate for demonstrating that a fire scenario is an insignificant contributor to risk. However, any scenarios that contribute to fire risk for which the assessment is based on the timing developed using this method, should be characterized as very conservative, and considered for more detailed fire analysis

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: FSS-E3-1	**Level of Significance:** Finding
Reviewer: RXV	**Capability Category:** Not met
OBSERVATION:	
No uncertainity analysis was performed.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: FSS-F-1	**Level of Significance:** Finding
Reviewer: PWL	**Capability Category:** Not Met
OBSERVATION:	
Perform the tasks associated with fire PRA standard high level requirement FSS-F and document. Self-assess to the supporting requirements of HLR FSS-F. Have the completed work peer reviewed per the fire PRA standard requirements.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
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POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: FSS-G-1	**Level of Significance:** Finding
Reviewer: PWL	**Capability Category:** Not Met
OBSERVATION:	
Perform the tasks associated with fire PRA standard high level requirement FSS-G and document. Self-assess to the supporting requirements of HLR FSS-G. Have the completed work peer reviewed per the fire PRA standard requirements.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: FSS-H1-1	**Level of Significance:** Suggestion
Reviewer: RXV	**Capability Category:** Met

OBSERVATION:

Need to list where documents are located.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
FPIP-0208 Scoping Fire Modeling Revision 2 Spreadsheets located in C:\PRA\HNP\FPRA_FRANC HNP-M/MECH-1128 Hot Gas Layer Calculaitons HNP-M/MECH-1129 Fire Zone of Influence Calculation Att2(Source-Target).pdf Att3(FixedWalkdown).pdf Att4(TransientWalkdown).pdf	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: FSS-H8-1	**Level of Significance:** Finding
Reviewer: RXV	**Capability Category:** Not Met
OBSERVATION:	
No multi compartment fire scenarios were considered.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: FSS-H9-1	**Level of Significance:** Summary
Reviewer: RXV	**Capability Category:** Not Met
OBSERVATION:	
No work on uncertainities was done	
BASIS FOR LEVEL OF SIGNIFICANCE:	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: IGN-A4-1	**Level of Significance:** Suggestion
Reviewer: RHG	**Capability Category:** 1

OBSERVATION:

This SR is CC-I (No Requirement). The following discussion addresses the assumed intention to achieve CC-II or III. As stated in FPIP-0206, "plant specific fire events need to be collected so that it can be determined if the generic frequencies need to be specialized, i.e. Bayesian updated, to take into account plant experience. Two questions need to be answered: (1) Are there any unusual fire occurrence patterns at the plant? (2) Is the development of plant specific fire frequencies warranted given the answer to question (1). Plant fire events need to be collected … If the answer to question (1) is that the plant has not experienced any fire patterns, then a Bayesian update of the generic frequencies is not necessary … On the other hand, if the plant has experienced patterns of fire that stem from a common cause, these fires need to be investigated. If that common cause has been addressed and plant changes have taken place to address them, then generic frequencies are warranted … If the plant's events are already in the Fire Events DataBase, then, due to the nature of Bayesian statistics, the events for the plant that are already in the database can be ignored except for one case. If that fire or set of fires represent a pattern of fires due to a common or recurring cause, then the generic frequency for the applicable location(s) needs to be updated with the events not already in the Fire Events DataBase." There is no discussion whether a review of plant-specific fires was performed, although it has been confirmed by Harris PRA staff (Dave Miskiewicz) that no Bayesian updating of generic fire frequencies has been performed for plant-specific history. This implies that both of the questions above were answered NO. This confirmation, along with a listing of the plant-specific fire history (which was provided by Dave Miskiewicz to the reviewer) needs to be included in the appropriate documentation (presumably HNP-F/PSA-0071). It appears that the listing of plant-specific fire history (1988-present) appropriately captures potential candidate fires for Bayesian updating, if deemed necessary, to ensure a thorough review can be performed. Suggestion F&O IGN-A4-01 is to perform the review of plant-specific fire data (or cite this if it has been performed) and justify why (and how) or why not Bayesian updating of the generic fire frequencies was performed.

BASIS FOR LEVEL OF SIGNIFICANCE:

Suggestion F&O IGN-A4-01 is to perform the review of plant-specific fire data (or cite this if it has been performed) and justify why (and how) or why not Bayesian updating of the generic fire frequencies was performed.

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: IGN-A4-1	**Level of Significance:** Suggestion
Reviewer: RHG	**Capability Category:** 1
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**
FPIP-0206	Dave Miskiewicz

<table>
<tr><td colspan="2">FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS</td></tr>
<tr><td>Plant Name: Harris 1</td><td>Date: 2008-02-05</td></tr>
<tr><td>ID Number: IGN-A5-1</td><td>Level of Significance: Finding</td></tr>
<tr><td>Reviewer: RHG</td><td>Capability Category: Met</td></tr>
<tr><td colspan="2">OBSERVATION:</td></tr>
<tr><td colspan="2">This SR is Met because the NUREG/CR-6850 ignition frequency data are used and these are calculated on a reactor-year basis which includes weighting by the plant availabilities in the database. (Reference = HNP-F/PSA-0071)</td></tr>
<tr><td colspan="2">BASIS FOR LEVEL OF SIGNIFICANCE:</td></tr>
<tr><td colspan="2">The following Note (3) from Table 4.5.1-2(c) of ASME RA-Sb-2005 under HLR-IE-C applies throughout HLR-IGN. Note that the IGN SRs for the Harris FPRA were not evaluated against this Note because this Note was not followed in developing the generic ignition frequencies in NUREG/CR-6850, the curently acceptable source for generic ignition frequencies. It is anticipated that NUREG/CR-6850 will correct their frequencies (either through the NFPA 805 FAQ process or another revision) to align with the Note. Nonetheless, Finding F&O HLR-IGN-01 (applicable to all related SRs under HLR-IGN) is to ensure compatibility with the requirement of Note (3) to Table 4.5.1.2© of ASME RA-Sb-2005 (HLR-IE-C) throughout HLR-IGN for the Harris FPRA. Here is the Note. "For the computation of average annual CDF/LERF … the appropriate units for initiating event frequency are events per calendar year, commonly expressed as events per reactor-year, where a reactor-year is one full calendar of experience for one reactor." Additional detail as to how to perform the appropriate calculation can be found in the Note and should be considered part of Finding HLR-IGN-01.</td></tr>
<tr><td colspan="2">POSSIBLE RESOLUTION (REVIEWER):</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Reference(s):</td><td>Personnel Contacted:</td></tr>
<tr><td>HNP-F/PSA-0071</td><td></td></tr>
</table>

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: IGN-A9-1	**Level of Significance:** Suggestion
Reviewer: RHG	**Capability Category:** Met

OBSERVATION:

This SR is Met, although there is a statement that "Transients were postulated in each compartment with the exception of those that were either locked high radiation areas or very small rooms where a transient fire is assumed to impact all targets" in the Fire PRA Notebook. While the latter exclusion (small rooms where all targets were assumed to be impacted) may be acceptable (provided a non-zero fire ignition frequency was assigned to this area), the former exclusion for "locked high radiation areas" is not because the Standard requires that the possibility of transient combustible fires be postulated "regardless of administrative restrictions." Based on subsequent discussion with Harris PRA staff (Beth Baucom and Mike Fletcher), the reviewers discovered that the statement regarding failure to postulate transients in "compartments ... that were locked high radiation areas" was misleading. No high radiation area comprised an entire compartment - any such entity was always only part of a larger compartment (in effect a sub-compartment) such that there was always a transient postulated in each compartment. In fact, the floor area of the high radiation area was included with that of its enclosing compartment, such that it was implicitly assigned the same transient weighting factors as the rest of the compartment. Suggestion F&O IGN-A9-01 is to revise the misleading text so that it is clear that every compartment was assigned a transient fire frequency, with explanation of how administratively-controlled entities within such compartments were treated for the purpose of assigning transient weighting factors.

BASIS FOR LEVEL OF SIGNIFICANCE:

Suggestion F&O IGN-A9-01 is to revise the misleading text so that it is clear that every compartment was assigned a transient fire frequency, with explanation of how administratively-controlled entities within such compartments were treated for the purpose of assigning transient weighting factors.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	**Personnel Contacted:**
HNP-F/PSA-0076 (FPRA Notebook)	Beth Baucom Mike Fletcher

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: IGN-B5-1	**Level of Significance:** Suggestion
Reviewer: RHG	**Capability Category:** Met

OBSERVATION:

This SR is Met because the uncertainties associated with the NUREG/CR-6850 ignition frequency data automatically apply (although this should be mentioned in HNP-F/PSA-0071) and the following assumptions related to and sources of uncertainty in ignition frequencies are stated in HNP-F/PSA-0076 (FPRA Notebook): "Fire ignition frequencies remain constant over time; The likelihood of fire ignition is the same across an equipment type, regardless of size, usage level, working environment, etc." Suggestion F&O IGN-B5-01 is to include reference in HNP-F/PSA-0076 to the discussion of ignition frequency uncertainties in NUREG/CR-6850, including parametric values for the generic frequencies, that is found in FPIP-0206.

BASIS FOR LEVEL OF SIGNIFICANCE:

Suggestion F&O IGN-B5-01 is to include reference in HNP-F/PSA-0076 to the discussion of ignition frequency uncertainties in NUREG/CR-6850, including parametric values for the generic frequencies, that is found in FPIP-0206.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	**Personnel Contacted:**
HNP-F/PSA-0076 (FPRA Notebook)	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-04
ID Number: CF-A1-1	**Level of Significance:** Suggestion
Reviewer: RHG	**Capability Category:** Met

OBSERVATION:

This SR is Met. Per discussion with Harris PRA staff (Beth Baucom and Dave Miskiewicz), as a supplement to the draft material in Table 10-1 of HNP-F/PSA-0076 (FPRA Notebook), Harris has identified cable failures and whether or not the mode is intracable or intercable. Furthermore, the maximum best estimate probabilities from NUREG/CR-6850 Table 10-1 through 10-4 (0.6 for intracable without CPT, 0.3 for intracable or intercable with CPT) have been assumed). What remains is to complete this analysis and incorporate into the appropriate document (likely HNP-F/PSA-0079). Suggestion F&O CF-A1-01 cites the need to complete the analysis and incorporate the results into the appropriate document.

BASIS FOR LEVEL OF SIGNIFICANCE:

Suggestion F&O CF-A1-01 cites the need to complete the analysis and incorporate the results into the appropriate document.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
HNP-F/PSA-0076, Table 10-1 independent calculation (as per Harris staff) NUREG/CR-6850	Beth Baucom Dave Miskiewicz

<table>
<tr><td colspan="2">FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS</td></tr>
<tr><td>Plant Name: Harris 1</td><td>Date: 2008-02-04</td></tr>
<tr><td>ID Number: CF-A2-1</td><td>Level of Significance: Suggestion</td></tr>
<tr><td>Reviewer: RHG</td><td>Capability Category: Met</td></tr>
<tr><td colspan="2">OBSERVATION:</td></tr>
<tr><td colspan="2">This SR is Met. By using the values from NUREG/CR-6850, the associated uncertainties are assumed to apply (see Tables 10-1 through 10-4). Suggestion F&O CF-A2-01 is to directly include these uncertainty values into the documentation.</td></tr>
<tr><td colspan="2">BASIS FOR LEVEL OF SIGNIFICANCE:</td></tr>
<tr><td colspan="2">Suggestion F&O CF-A2-01 is to directly include these uncertainty values into the documentation.</td></tr>
<tr><td colspan="2">POSSIBLE RESOLUTION (REVIEWER):</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Reference(s):</td><td>Personnel Contacted:</td></tr>
<tr><td>NUREG/CR-6850</td><td>Beth Baucom
Dave Miskiewicz</td></tr>
</table>

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-04
ID Number: CF-B1-1	**Level of Significance:** Finding
Reviewer: RHG	**Capability Category:** Not Met

OBSERVATION:

This SR is Not Met because the material discussed in SRs CF-A1 and A2 has not yet been incorporated into the documentation. Finding F&O CF-B1-01 is to incorporate this material.

BASIS FOR LEVEL OF SIGNIFICANCE:

Finding F&O CF-B1-01 is to incorporate this material.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-04
ID Number: HRA-A2-1	**Level of Significance:** Suggestion
Reviewer: GWP	**Capability Category:** Met

OBSERVATION:

The safe shutdown actions have been identified, and HLR-E 1 and E2 are met - see Attachment 6 to HNP-F/PSA-0075 for the list of actions. There is no evidence that HLR-E3 and E4 have been met. However, since none of these actions was included in the Fire PRA, it is somewhat moot.

BASIS FOR LEVEL OF SIGNIFICANCE:

Low significance since no actions are accounted for. If shutdown actions are included in the model in future HLR-E3 and 4 should be addressed.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
Calc file HNP-F/PSA-0075	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-04
ID Number: HRA-B1-1	**Level of Significance:** Suggestion
Reviewer: GWP	**Capability Category:** Met

OBSERVATION:

None of this definition is changed from the internal events PRA

BASIS FOR LEVEL OF SIGNIFICANCE:

Confirm that the time available for key human actions would not be affected by any fire effects, including spurious actions. See comment under HRA-C1, HR-G4.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	**Personnel Contacted:**
Calc file HNP-F/PSA-0075	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-04
ID Number: HRA-B2-1	**Level of Significance:** Finding
Reviewer: GWP	**Capability Category:** Not Met

OBSERVATION:

No new fire-related safe shutdown HFEs were included in the fire PRA, even though some were determined to have negative consequences. This is acceptable if the corresponding actions are removed from the fire response procedures, and the PRA is intended to model the plant using these modified procedures. However, it is not clear at this time what is ultimately intended. If the actions which would disable plant equipment are retained, then the PRA needs to reflect the negative consequences, even if the positive aspects of the actions are not credited.

BASIS FOR LEVEL OF SIGNIFICANCE:

Finding since the inclusion of negative effects could negatively impact risk.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
Calc file HNP-F/PSA-0075	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-04
ID Number: HRA-B3-1	**Level of Significance:** Finding
Reviewer: GWP	**Capability Category:** Not Met

OBSERVATION:

Section 7.3 states that no additions were made to the fire PRA model to model equipment failure due directly to operator response from a faulty indications, due to redundant indication being always available, and opertator training reinforces checking redundant and diverse indications prior to initiating a response.

Attachment 7 to PSA-0077 lists the annunciators associated with shutting down equipment. However, there is no discussion of the routing of the cables, so there is no validation that at least one of the identified instruments is available for a given fire. Further, there is no discussion as to how the operator would deal with conflicting indications, which is identified as the specific concern for this element of the standard.

Furthermore, this scope may not be sufficient to address HR-B3, since this should include cases where, for example, spurious indications of valve closure could lead to shutting pumps off, without necessarily causing a specific alarm evaluated in Attachment 7.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Provide a demonstration that the instruments are routed and protected, and/or the protocol for dealing with conflicting annunciators and instrumentation. Also identify those other indications that could lead the operator to secure a system or train which may not cause the specific alarms evaluated on Attachment 7.

Reference(s):	Personnel Contacted:
Calc file HNP-F/PSA-0075 Calc file HNP-F/PSA -0077, attachment 7	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: HRA-C1-1	**Level of Significance:** Suggestion
Reviewer: AJH	**Capability Category:**

OBSERVATION:

The simplified screening method identifies how the internal events HEPs are modified for local actions and for control room actions. Some anomalies were noted in the application of this method:

OPER-20 is set to 1.0 as a local action. The HEP assumes that seal injection is unavailable, and evaluates local action to slowly restore CCW to the RCP thermal barrier cooler. This action would not be consistent with Westinghouse recommendations for loss of RCP seal cooling, which would require a plant cooldown without restoration of cooling flow. If seal injection is available at the time OPER-20 applies, then it would not be a local action.

OPER-3 is doubled rather than multiplied by a factor of 10, indicating that feed and bleed is always initiated after the fire is out. No basis for this assumption is provided.

OPER-32 is an ATWS dependency of 0.5, but it is doubled to 1.0 which is unnecessary.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: HRA-C1-2	**Level of Significance:** Suggestion
Reviewer: GWP	**Capability Category:**

OBSERVATION:

The HRA screening approach is based on three factors: whether the action is ex-control room or not, whether the instrumentation is available, and on the timing of the action. The timing is based on the total time for completion of the action. Basing the change in HEP on timing is presumably a surrogate for the additional stress resulting from the fire effects. Since the increased stress will certainly be a factor during the cognitive phase, it would perhaps be better to base the timing on the time when the cues needed to make the decision would occur, rather than the time window. For example, this would change the screening value for OPER-3 by a factor of 10 rather than 2.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-04
ID Number: HRA-C1-3	**Level of Significance:** Finding
Reviewer: GWP	**Capability Category:** 1

OBSERVATION:

HR-G1 as incorporated by reference: The approach to determining which HEPs are developed using a detailed analysis does not conform to the standard definition of significant for capability category II. Given the fact that the model is still in development, this is understandable.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

When the model is more stable, if a Capability Category II is required, the significant HEPs as defined in the standard will need to be analyzed in detail.

Reference(s):	Personnel Contacted:
Calc file HNP-F/PSA-0075 Spreadsheet file hfe_cp.xls	Ricardo Davis-Zapata

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-04
ID Number: HRA-C1-4	**Level of Significance:** Finding
Reviewer: GWP	**Capability Category:** 1

OBSERVATION:

HR-G3 incorporated by reference: The majority of the HEPs are evaluated by the simplified screening method, and six are analyzed using by modifying the internal events HEP evaluations. While the instruments required have been identified, to date no cable tracing has been documented as being performed. Availability of insrumentation is one of the factors considered in determining the HEPs, both in the simplified screening method and the detailed method. However in both cases it is simply assumed to be available. In fact in Section 4.3, it is stated that the instrumentation is assumed to be available. To achieve Capability Category II, this would have to be verified, and where there is a possibility of conflicting indication, how this affects the HEPs needs to be documented and incorporated into the HEP calculations. While this verification is identified as currently in progress, the documentation does not describe how conflicting indications will be dispositioned in the HEP calculations.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Document the method and basis for accounting of conflicting indications in the calculation of HEPs, and complete cable route verifications.

Reference(s):	**Personnel Contacted:**
Calc file HNP-F/PSA-0075	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-04
ID Number: HRA-C1-5	**Level of Significance:** Finding
Reviewer: GWP	**Capability Category:** Met

OBSERVATION:

HR-G4 is incorporated by reference: Section 7.1.3, detailed HRA analysis, states that the event timing was generally driven by T-H analysis based on the accident sequence and was unaffected by the initiator being a fire. While this may be generally true, it is possible that a fire caused problem, e.g., spurious iclosure of a valve used in the suction path of many injection paths may need quick detection and response by the crew (example from NUREG/CR-6850, page 12-15). It is not clear if this is an important issue.

BASIS FOR LEVEL OF SIGNIFICANCE:

This is probably not a significant issue, but could have an impact on some sequences.

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
Calc file HNP-F/PSA-0075	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-04
ID Number: HRA-C1-6	**Level of Significance:** Finding
Reviewer: GWP	**Capability Category:** Not Met

OBSERVATION:

HR-G6 as incorporated by reference: It is too early in the process for this supporting requirement to have been achieved satisfactorily, since only a few HFEs have been developed in detail.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

When a more complete set of detailed HEP evaluations are available, check for consistency of the HEP quantification per this SR.

Reference(s):	Personnel Contacted:
Calc file HNP-F/PSA-0075	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: HRA-C1-7	**Level of Significance:** Suggestion
Reviewer: GWP	**Capability Category:**

OBSERVATION:

The documentation states that "for combinations of three or more HFEs, a lower bound of 1E-06 was used. This lower bound was decreased to account for the fact that many of the third and fourth HFEs are actions that occur many hours after the initiating event and ... " While this may be true for the majority of cases, those cases for which this is not true should use the 1E-05 limit.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
HNP-F/PSA-0075	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: HRA-D1-1	**Level of Significance:** Suggestion
Reviewer: GWP	**Capability Category:** N/A

OBSERVATION:

This HLR was not applicable; fire recovery actions were not included in the Harris Fire PRA model. However, if such actions are incorporated at a later date, the licensee should ensure that supporting requirement HRA-D1, and the supporting requirements associated with internal events PRA standard HLR-HR-H are met.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:

<table>
<tr><td colspan="2">FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS</td></tr>
<tr><td>Plant Name: Harris 1</td><td>Date: 2008-02-07</td></tr>
<tr><td>ID Number: SF-1</td><td>Level of Significance: Finding</td></tr>
<tr><td>Reviewer: PWL</td><td>Capability Category: Not Met</td></tr>
<tr><td colspan="2">OBSERVATION:</td></tr>
<tr><td colspan="2">Perform the tasks associated with fire PRA standard element SF and document. Self-assess to HLRs SS-A and SS-B and the associated supporting requirements. Have the completed work peer reviewed per the fire PRA standard requirements.</td></tr>
<tr><td colspan="2">BASIS FOR LEVEL OF SIGNIFICANCE:</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2">POSSIBLE RESOLUTION (REVIEWER):</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Reference(s):</td><td>Personnel Contacted:</td></tr>
<tr><td></td><td></td></tr>
</table>

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: FQ-A4-1	**Level of Significance:** Finding
Reviewer: AJH	**Capability Category:** Not Met
OBSERVATION:	
QU-A2a - the fire quantification method does not identify individual sequences to support identification of significant accident sequences. Each fire initiator (source) is a separate number, with a supporting cutset file for the conditional CDP. The specific sequence is not identified in the cutset file for each cutset. Since the initiating event frequency, suppression credit, and details of the fire two-point modeling is addressed in each individual sheet, aggregation of the plant fire PRA results to evaluate significant sequences would be cumbersome, and has not been done.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-05
ID Number: FQ-D1-1	**Level of Significance:** Finding
Reviewer: SAL	**Capability Category:** Not Met

OBSERVATION:

LERF is not mentioned in the quantification calculation HNP-F/PSA-0079 Rev. 0. The fire PRA summary specifically excludes calculation of LERF from the scope of the fire PRA model.

BASIS FOR LEVEL OF SIGNIFICANCE:

ASME standard includes LERF. NFPA 805 requires estimate of both CDF and LERF (paragraph 2.4.3.1).

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
HNP-F/PSA-0079 Rev. 0 (unapproved) HNP-F/PSA-0076 R0	

<table>
<tr><td colspan="2">FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS</td></tr>
<tr><td>Plant Name: Harris 1</td><td>Date: 2008-02-06</td></tr>
<tr><td>ID Number: FQ-E1-1</td><td>Level of Significance: Finding</td></tr>
<tr><td>Reviewer: SAL</td><td>Capability Category: Not Met</td></tr>
<tr><td colspan="2">OBSERVATION:</td></tr>
<tr><td colspan="2">LERF not calculated, so significant contributors and significant basic events to fire LERF have not been determined. Component and equipment importances cannot be determined effectively at this stage in the FPRA model development. A number of fire scenarios have CCDP = 1.0. Cutset files are "subsumed" to remove non-minimal events, leaving behind a representative cutset file that may not include all equipment actually failed by the fire.</td></tr>
<tr><td colspan="2">BASIS FOR LEVEL OF SIGNIFICANCE:</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2">POSSIBLE RESOLUTION (REVIEWER):</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Reference(s):</td><td>Personnel Contacted:</td></tr>
<tr><td>HNP-F/PSA-0079 Rev. 0 (unapproved)</td><td></td></tr>
</table>

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: FQ-E1-2	**Level of Significance:** Finding
Reviewer: SAL	**Capability Category:** Not Met

OBSERVATION:

The definition of significant contributor in the PRA standard includes the idea of summing, in rank order, the fire sequences and considering any in the top 95%, or any that individually contribute 1% or more, as significant. This determination has not been made for fire CDF or LERF. Harris does not appear to use the definition as provided in the PRA standard.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	**Personnel Contacted:**
HNP-F/PSA-0079 Rev. 0 (unapproved)	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: FQ-F1-1	**Level of Significance:** Finding
Reviewer: AJH	**Capability Category:** Not Met

OBSERVATION:

QU-F2 - Several of the recommended documentation requirements are not in place, specifically items b, e, f, g, i, j, m.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS

Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: FQ-F1-2	**Level of Significance:** Finding
Reviewer: AJH	**Capability Category:** Not Met

OBSERVATION:

QU-F3 - There is currenty no record of significant contributors to fire CDF.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: FQ-F1-3	**Level of Significance:** Finding
Reviewer: SAL	**Capability Category:**

OBSERVATION:
QU-F4 - Assumptions and sources of uncertainty are not documented.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-06
ID Number: FQ-F2-1	**Level of Significance:** Finding
Reviewer: SAL	**Capability Category:** Not Met
OBSERVATION:	
Harris has not assessed the fire PRA to the standard, and has therefore not determined whether any of the referenced internal events requirements are not applicable or provided bases if appropriate.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: UNC-1	**Level of Significance:** Finding
Reviewer: PWL	**Capability Category:** Not Met
OBSERVATION:	
Perform the tasks associated with fire PRA standard element UNC and document. Self-assess to HLRs UNC-A and the associated supporting requirements. Have the completed work peer reviewed per the fire PRA standard requirements.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: MUD-A1-1	**Level of Significance:** Suggestion
Reviewer: JSH	**Capability Category:** Met
OBSERVATION:	
Suggestion: Provide direction in process to monitor industry wide operational history. Ensure that component data (generic and plant-specific) includes active fire protection systems, e.g. fixed suppression, dampers.	
BASIS FOR LEVEL OF SIGNIFICANCE:	
POSSIBLE RESOLUTION (REVIEWER):	
Reference(s):	**Personnel Contacted:**
ADM-NGGC-004	

FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS	
Plant Name: Harris 1	**Date:** 2008-02-07
ID Number: MUD-A3-1	**Level of Significance:** Suggestion
Reviewer: JSH	**Capability Category:** Met

OBSERVATION:

Suggestion: Add language to monitor updated or new methodologies as appropriate

Currently, have language to use updated or new methodologies which reflect current industry and requirements as appropriate.

BASIS FOR LEVEL OF SIGNIFICANCE:

POSSIBLE RESOLUTION (REVIEWER):

Reference(s):	Personnel Contacted:
ADM-NGGC-004	

<table>
<tr><td colspan="2">FACT/OBSERVATION REGARDING FIRE PRA (FPRA) TECHNICAL ELEMENTS</td></tr>
<tr><td>Plant Name: Harris 1</td><td>Date: 2008-02-07</td></tr>
<tr><td>ID Number: MUD-B4-1</td><td>Level of Significance: Finding</td></tr>
<tr><td>Reviewer: JSH</td><td>Capability Category: Not Met</td></tr>
<tr><td colspan="2">OBSERVATION:</td></tr>
<tr><td colspan="2">Finding: Since fire standard not referenced, those SRs are not evaluated. Fire standard needs to be referenced in 9.2.5; currently only ASME Internal Events. Add latest reference to R.G. 1.200 once fire standard is endorsed</td></tr>
<tr><td colspan="2">BASIS FOR LEVEL OF SIGNIFICANCE:</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2">POSSIBLE RESOLUTION (REVIEWER):</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Reference(s):</td><td>Personnel Contacted:</td></tr>
<tr><td>ADM-NGGC-0004</td><td></td></tr>
</table>

Appendix C. Reviewer Resumes

<table>
<tr><th colspan="2">Record of Staff Reviewer Experience and Qualification for FPRA Review</th></tr>
<tr><td>Name: Harold T. Barrett (Harry)</td><td>Tel. No.: (301) 415-1402</td></tr>
<tr><td>Employer: US NRC</td><td>e-mail: hxb3@nrc.gov</td></tr>
<tr><td>Address: Mail Stop OWFN 11H18
Washington, DC 20555-0001</td><td>FPRA for Nuclear Plant: Shearon Harris Unit 1</td></tr>
<tr><td colspan="2">Resume Cameo:
Mr. Barrett has over 32 years of experience in the nuclear power field. He has detailed knowledge of structures, systems and components and general operating characteristics of nuclear reactors. He held a Senior Reactor Operators license at Nine Mile Point Unit 1 and served as General Supervisor Operations. He is a registered professional engineer in North Carolina and South Carolina in Fire Protection Engineering. He has been performing Post-Fire Safe Shutdown analysis for over 20 years.</td></tr>
<tr><td colspan="2">Contribution to Team Collective Qualifications</td></tr>
<tr><td colspan="2">[ ] Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007
[ ] Knowledge of FPRA, NUREG/CR-6850 [□] Appendix R/Safe Shutdown Analysis
[ ] Nuclear Steam System Supplier Design [□] Circuit Failure Analysis
[ ] Containment Design [□] Plant Operations [ ] Fire Modeling
[□] Systems Engineering [□] Fire Protection Programs/Elements
[ ] Industry or Similar PRA Peer Review Experience</td></tr>
<tr><td colspan="2">Supporting Details for areas checked above:
Mr. Barrett held an SRO license at Nine Mile Point and held a position in Operations Management at that facility. He was a key member of the original Appendix R Safe Shutdown Analysis team at Nine Mile Point. In this capacity, he performed circuit analysis, system design calculations, revised operating procedures, designed and installed plant modifications and performed significant pre-operational testing of Appendix R modifications. As a consultant, he was the lead system engineer for an Appendix R reanalysis project at Salem. While employed at Duke Power, he was responsible for a complete reanalysis of the Post-Fire Safe Shutdown design basis at all three Oconee units. Mr. Barrett was the Project Manager and Corporate Technical Lead for the NFPA 805 Transition at Oconee. Participated in a self assessment (NEI 04-06) at North Anna Nuclear Station to investigate Multiple Spurious Operation (MSO). Participated as a peer in the Arkansas Nuclear One Unit 1 & 2 MSO expert panels. Directly supervised armored cable fire testing and analysis in support of the Oconee NFPA 805 Transition.</td></tr>
<tr><td colspan="2">Specific Expertise (Check areas assigned for FPRA review)</td></tr>
<tr><td colspan="2">[□] Plant Partitioning [□] Equipment Selection [□] Cable Selection [ ] Qualitative Screen
[ ] Plant Resp. Model [ ] Fire Scenario Select. [ ] Ignition Frequency [ ] Quantitative Screen
[□] Circuit Failure [ ] Post-Fire HRA [ ] Seismic/Fire Interact. [ ] Quantification
[ ] Uncertainty/Sens. [ ] Configuration Control</td></tr>
<tr><td colspan="2">Supporting Details for areas checked above (i.e., summary of relevant direct experience):
Performed technical activities similar in scope and knowledge to Plant Partitioning at Nine Mile, Salem and Oconee as part of Appendix R Safe Shutdown Analysis (definition of fire areas/zones, defined fire barriers, etc.). Performed Equipment Selection, Cable Selection and Circuit Failure analysis as part of Appendix R Safe Shutdown Analysis at Nine Mile Point, Salem and Oconee. At Oconee, personally ran the MSO expert panel. Participated as an industry peer in a MSO self assessment at North Anna as well as participated in the expert panel held as part of the NFPA 805 Transition at Arkansas Nuclear One. Developed test plan and supervised fire testing of armored cable to support Duke's Oconee NFPA 805 Transition.</td></tr>
<tr><td>[□] Individual is NOT assigned to review his/her work</td><td>[□] Individual DOES NOT have a conflict of interest in performing this FPRA review</td></tr>
</table>

Record of Staff Reviewer Experience and Qualification for FPRA Review	
Name: Jeff A. Circle	Tel. No.: (301) 415-1152
Employer: USNRC	e-mail: jac12@nrc.gov
Address: Mail Stop OWFN 10-H4 Washington, DC 20555-0001	FPRA for Nuclear Plant: Shearon Harris Unit 1
Resume Cameo: Mr. Circle has over 27 years of experience in the nuclear power field. He has a detailed knowledge of structures, systems, components, and general operating characteristics of commercial nuclear reactors. Mr. Circle started his career as an instrumentation and control engineer at an architectural/engineering firm engaged in design and consulting to utilities on nuclear power projects. He went on to a technical and administrative supervisory capacity at a major public power utility managing numerous PRA projects including two fire PRAs. After the sale of generating assets, Mr. Circle continued with expanded responsibility for all PRA analysis activities in support of five nuclear plants in the northeast US. He began working in the PRA arena in 1982.	
Contribution to Team Collective Qualifications	
[□] Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007 [□] Knowledge of FPRA, NUREG/CR-6850 [□] Appendix R/Safe Shutdown Analysis [□] Nuclear Steam System Supplier Design [□] Circuit Failure Analysis [ ] Containment Design [ ] Plant Operations [□] Fire Modeling [□] Systems Engineering [□] Fire Protection Programs/Elements [□] Industry or Similar PRA Peer Review Experience	
Supporting Details for areas checked above: Mr. Circle performed various fire safe shutdown consequence and combustible loading calculations for Sandia National Laboratories in support of research projects. In 1984, Mr. Circle lead the Appendix R associated circuits analysis for Waterford-3. He managed two fire PRAs using the EPRI Fire PRA Methodology which was a precursor to NUREG/CR-6850. He developed extensive cable databases (mapped to risk-relevant components) and a circuit failure analysis technique which ultimately became the Sandia hot probe method. In 2001, he participated as part of an expert panel on hot short circuits for NEI. He performed SDP evaluations for potential fire-related findings at James A. FitzPatrick, Indian Point Unit 2, Pilgrim, and Vermont Yankee plants. Mr. Circle has developed detailed PRA models for internal events and fire for BWRs (Mark I containment) and PWR (Westinghouse and Combustion Engineering) NSSS plants. Working for a utility, he has intimate knowledge of the day-to-day operations at these plants and has provided support to plant engineering, licensing and management on all matters involving PRA such as SDP, TSTF, LER safety significance, inspection support, incident response, etc.	
Specific Expertise (Check areas assigned for FPRA review)	
[□] Plant Partitioning [□] Equipment Selection [□] Cable Selection [□] Qualitative Screen [□] Plant Resp. Model [□] Fire Scenario Select. [□] Ignition Frequency [□] Quantitative Screen [□] Circuit Failure [□] Post-Fire HRA [ ] Seismic/Fire Interact. [□] Quantification [□] Uncertainty/Sens. [□] Configuration Control	
Supporting Details for areas checked above (i.e., summary of relevant direct experience): In addition to the above industry experience, Mr. Circle has worked at the Nuclear Regulatory Commission with primary responsibility in areas of the SDP including fire PRA and quantification. He has provided training on circuit analysis to members of the Fire Protection Branch in NRR (AFPB). Mr. Circle has extensive experience in modeling and quantification using a variety of codes such as CAFTA, SAPHIRE, NURELMCS, FRANC, EOOS, FORTE, NUPRA, and SETS. He developed single top gate models for workweek 10CFR50.65 (a)(4) activities at several plants and is currently involved with issuing industry guidance on handling such models.	
[□] Individual is NOT assigned to review his/her work	[□] Individual DOES NOT have a conflict of interest in performing this FPRA review

Record of Staff Reviewer Experience and Qualification for FPRA Review	
Name: Raymond HV Gallucci, Ph.D., P.E.	Tel. No.: 301-415-1255
Employer: USNRC	e-mail: rhg@nrc.gov
Address: MS O-11A11 Rockville, MD 20852	FPRA for Nuclear Plant: Shearon Harris Unit 1
Resume Cameo: USNRC/NRR/DRA/AFPB – Senior Fire PSA Engineer: 2003-present Ginna Nuclear Plant, Senior PSA Engineer: 1997-2003 Battelle Pacific NW Labs, Senior Research Engineer: 1991-1997 Combustion Engineering, Principal Statistical Scientist/Engineer: 1984-1991 Battelle Pacific NW Labs, Research Engineer: 1980-1984 Rensselaer Polytechnic Institute, B.S., M.E., Ph.D., Nuclear Engineering & Science: 1971-1980	
Contribution to Team Collective Qualifications	
[□] Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007 [□] Knowledge of FPRA, NUREG/CR-6850 [□] Nuclear Steam System Supplier Design [ ] Containment Design [ ] Plant Operations [□] Systems Engineering [□] Industry or Similar PRA Peer Review Experience	[ ] Appendix R/Safe Shutdown Analysis [ ] Circuit Failure Analysis [ ] Fire Modeling [ ] Fire Protection Programs/Elements
Supporting Details for areas checked above: ANSI/ANS-58.23-2007 Review Committee Ph.D., Nuclear Engineering Senior PSA Engineer, Ginna Nuclear Plant Industry PRA Peer Reviewer for WOG: Byron, Indian Point, Point Beach; hosted industry PRA Peer Review for Ginna	
Specific Expertise (Check areas assigned for FPRA review)	
[ ] Plant Partitioning [□] Equipment Selection [ ] Cable Selection [ ] Qualitative Screen [□] Plant Resp. Model [ ] Fire Scenario Select. [□] Ignition Frequency [□] Quantitative Screen [ ] Circuit Failure [ ] Post-Fire HRA [ ] Seismic/Fire Interact. [□] Quantification [□] Uncertainty/Sens. [ ] Configuration Control	
Supporting Details for areas checked above (i.e., summary of relevant direct experience): NUREG/CR-6850, Fire Protection SDP, ANSI/ANS-58.23-2007 Review Committee, Ginna Senior PSA Engineer (including Fire IPEEE/PRA) – I am the Fire Protection Branch staff expert on Fire PRA, including NUREG/CR-6850, the Fire Protection SDP and ANS & ASME/ANS Fire PRA Standards. I updated the Ginna PSA to include fire events and failures. My Ph.D. thesis addressed probabilistic methods for fire-induced loss of nuclear power plant safety functions, a pioneering work in the field of fire PRA (1980). I have worked in the area of risk and reliability analysis/probabilistic and statistical modeling for over 25 years at the employers listed above. I have published numerous papers in these areas.	
[□] Individual is NOT assigned to review his/her work	[□] Individual DOES NOT have a conflict of interest in performing this FPRA review

<table>
<tr><th colspan="2">Record of Staff Reviewer Experience and Qualification for FPRA Review</th></tr>
<tr><td>Name: Andrew J Howe</td><td>Tel. No.: (301) 415-3078</td></tr>
<tr><td>Employer: USNRC</td><td>e-mail: ajh1@nrc.gov</td></tr>
<tr><td>Address: Mail Stop OWFN 10-H4
Washington, DC 20555-0001</td><td>FPRA for Nuclear Plant: Shearon Harris Unit 1</td></tr>
<tr><td colspan="2">Resume Cameo:
Mr. Howe has over 25 years of experience in the nuclear power field. He has a detailed knowledge of structures, systems, components, and general operating characteristics of nuclear reactors. He held a Senior Reactor Operator (SRO) license on the Shearon Harris plant and has worked in Operations, Licensing, Systems and Reactor Engineering. He began working in the PRA field in 1992.</td></tr>
<tr><td colspan="2">Contribution to Team Collective Qualifications</td></tr>
<tr><td colspan="2">[ ] Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007
[ ] Knowledge of FPRA, NUREG/CR-6850 [☐] Appendix R/Safe Shutdown Analysis
[☐] Nuclear Steam System Supplier Design [☐] Circuit Failure Analysis
[ ] Containment Design [☐] Plant Operations [ ] Fire Modeling
[☐] Systems Engineering [ ] Fire Protection Programs/Elements
[☐] Industry or Similar PRA Peer Review Experience</td></tr>
<tr><td colspan="2">Supporting Details for areas checked above:
Mr. Howe held an SRO license at Shearon Harris. He was the Operations representative for the original safe shutdown design at Harris reviewing circuit analyses, and developed the original operating and test procedures for safe shutdown. He was a reactor systems engineer and also served as a reactor engineer. Mr. Howe was involved in industry PRA audits and comment resolutions, and has participated in RG 1.200 audits as well as two PRA audits with the NRC.</td></tr>
<tr><td colspan="2">Specific Expertise (Check areas assigned for FPRA review)</td></tr>
<tr><td colspan="2">[ ] Plant Partitioning [ ] Equipment Selection [☐] Cable Selection [ ] Qualitative Screen
[☐] Plant Resp. Model [ ] Fire Scenario Select. [☐] Ignition Frequency [ ] Quantitative Screen
[☐] Circuit Failure [ ] Post-Fire HRA [ ] Seismic/Fire Interact. [☐] Quantification
[] Uncertainty/Sens. [☐] Configuration Control</td></tr>
<tr><td colspan="2">Supporting Details for areas checked above (i.e., summary of relevant direct experience):
Mr. Howe has worked in the PRA field since 1992. He was the lead engineer for the IPE at Shearon Harris, and performed technical oversight of the IPEEE development by a contractor staff. He has performed a significant number of PRA applications to support risk-informed license amendment requests, to determine the risk of an event or non-conforming condition, or to provide risk insights and ranking information for a risk-informed program. Many of these applications involved assessment of specific fire scenarios. He is experienced at PRA model quantification and results interpretation and is proficient at using the CAFTA suite of risk programs. He was involved in original design work for safe shutdown analyses of the Harris plant, including circuit failure analyses and cable selection and routing.</td></tr>
<tr><td>[☐] Individual is NOT assigned to review his/her work</td><td>[☐] Individual DOES NOT have a conflict of interest in performing this FPRA review</td></tr>
</table>

Record of Staff Reviewer Experience and Qualification for FPRA Review	
Name: J.S. Hyslop	Tel. No.: 301-415-6354
Employer: NRC	e-mail: jsh2@nrc.gov
Address: Mail Stop T-9F39 Washington, DC 20555	FPRA for Nuclear Plant: Harris Unit 1 Oconee Unit 3
Resume Cameo: Dr. Hyslop has approximately eighteen years in the nuclear power field at the Nuclear Regulatory Commission. He has worked exclusively in the fire PRA area for over ten years. In NRR, he performed assessments of the significance of fire protection inspection findings, and assessments of the importance of more generic fire protection issues (e.g. Kaowool). In RES, he has overseen and participated in the development of comprehensive detailed fire PRA methods being used extensively in fire PRAs being developed by industry for their NFPA 805 transition. He also led a technical group associated with the revision of the fire protection SDP. He has a Ph.D. in physics.	
Contribution to Team Collective Qualifications	
[□] Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007 [□] Knowledge of FPRA, NUREG/CR-6850 [ ] Nuclear Steam System Supplier Design [ ] Containment Design [ ] Plant Operations [ ] Systems Engineering [ ] Industry or Similar PRA Peer Review Experience	 [ ] Appendix R/Safe Shutdown Analysis [ ] Circuit Failure Analysis [ ] Fire Modeling [ ] Fire Protection Programs/Elements
Supporting Details for areas checked above: Dr. Hyslop has performed reviews of the fire PRA standard as an ANS reviewer, and has participated in and coordinated the review for NRC. He has participated in technical meetings with the ANS working group responsible for writing the standard. He also is the NRC Project Manager for NUREG/CR-6850, the joint fire PRA methodology report being used extensively by licensees in performing their NFPA 805 transition. In that vein, he oversaw and participated in the development of fire PRA methods.	
Specific Expertise (Check areas assigned for FPRA review)	
[ ] Plant Partitioning [ ] Equipment Selection [ ] Plant Resp. Model [□] Fire Scenario Select. [ ] Circuit Failure [ ] Post-Fire HRA [ ] Uncertainty/Sens. [□] Configuration Control	[ ] Cable Selection [ ] Qualitative Screen [ ] Ignition Frequency [ ] Quantitative Screen [ ] Seismic/Fire Interact. [ ] Quantification
Supporting Details for areas checked above (i.e., summary of relevant direct experience): Through his work in assessing fire protection inspection findings, as well participation in development of NUREG/CR-6850 and the fire protection SDP revision, Dr. Hyslop has performed analyses and participated in development of methods related to implementation of criteria in FSS. Regarding the Configuration Control area, he performed the assessment at Harris.	
[□] Individual is NOT assigned to review his/her work	[□] Individual DOES NOT have a conflict of interest in performing this FPRA review

Record of Staff Reviewer Experience and Qualification for FPRA Review	
Name: Paul William Lain, P.E.	Tel. No.: 301.415.2346
Employer: US NRC	e-mail: pwl@nrc.gov
Address: MS: O-11A11 Washington DC, 20555	FPRA for Nuclear Plant: Shearon Harris Unit 1
Resume Cameo: BS & MS in Fire Protection Engineering (MD Professional Engineering License) 24 years of Fire Protection Engineering Experience (8 yr Navy, 6 yr DOE, 10 yr NRC)	
Contribution to Team Collective Qualifications	
[ ] Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007 [ ] Knowledge of FPRA, NUREG/CR-6850 [ ] Appendix R/Safe Shutdown Analysis [ ] Nuclear Steam System Supplier Design [ ] Circuit Failure Analysis [ ] Containment Design [ ] Plant Operations [ ] Fire Modeling [ ] Systems Engineering [☐] Fire Protection Programs/Elements [ ] Industry or Similar PRA Peer Review Experience	
Supporting Details for areas checked above: NRC Representative on NFPA Technical Committee for Nuclear Facilities 6 yr NFPA 805 Program Manager 3 yr NFPA 805 Pilot Project Manager	
Specific Expertise (Check areas assigned for FPRA review)	
[☐] Plant Partitioning [ ] Equipment Selection [ ] Cable Selection [☐] Qualitative Screen [ ] Plant Resp. Model [☐] Fire Scenario Select. [☐] Ignition Frequency [ ] Quantitative Screen [ ] Circuit Failure [ ] Post-Fire HRA [☐] Seismic/Fire Interact. [ ] Quantification [ ] Uncertainty/Sens. [☐] Configuration Control	
Supporting Details for areas checked above (i.e., summary of relevant direct experience): Review of NUREG/CR-6850, ASME Combined Standard 2 yrs of NFPA 805-Pilot Plant Reviews	
[☐] Individual is NOT assigned to review his/her work	[☐] Individual DOES NOT have a conflict of interest in performing this FPRA review

<table>
<tr><th colspan="2">Record of Staff Reviewer Experience and Qualification for FPRA Review</th></tr>
<tr><td>Name: Steven A. Laur</td><td>Tel. No.: (301) 415-2889</td></tr>
<tr><td>Employer: USNRC</td><td>e-mail: sal@nrc.gov</td></tr>
<tr><td>Address: Mail Stop OWFN 10-H4
Washington, DC 20555-0001</td><td>FPRA for Nuclear Plant: Shearon Harris Unit 1</td></tr>
<tr><td colspan="2">Resume Cameo:
Mr. Laur has over 27 years of experience in the nuclear power field. He has a detailed knowledge of structures, systems, components, and general operating characteristics of nuclear reactors. He held a Senior Reactor Operator (SRO) license on the St. Lucie plant and served as a Shift Technical Advisor. He is a Registered Professional Engineer in the State of Florida in both the nuclear and electrical disciplines. He began working in the PRA arena in 1991.</td></tr>
<tr><td colspan="2">Contribution to Team Collective Qualifications</td></tr>
<tr><td colspan="2">[ ] Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007
[ ] Knowledge of FPRA, NUREG/CR-6850 [ ] Appendix R/Safe Shutdown Analysis
[ ] Nuclear Steam System Supplier Design [ ] Circuit Failure Analysis
[ ] Containment Design [□] Plant Operations [ ] Fire Modeling
[ ] Systems Engineering [ ] Fire Protection Programs/Elements
[□] Industry or Similar PRA Peer Review Experience</td></tr>
<tr><td colspan="2">Supporting Details for areas checked above:
Mr. Laur held an SRO license at St. Lucie and reviewed procedures and conducted simulator observations at several plants while performing the human reliability analysis for their IPE PRA models (Robinson, Dresden and Quad Cities). He led teams that performed audits of the Beaver Valley and Browns Ferry PRA models to support license amendment requests. He developed the audit plans, selected team members, organized team planning sessions, coordinated the conduct of the audit on site and led preparation of the audit report. He also participated in PRA quality reviews of three of the five Regulatory Guide 1.200 pilot plants.</td></tr>
<tr><td colspan="2">Specific Expertise (Check areas assigned for FPRA review)</td></tr>
<tr><td colspan="2">[ ] Plant Partitioning [ ] Equipment Selection [ ] Cable Selection [ ] Qualitative Screen
[□] Plant Resp. Model [ ] Fire Scenario Select. [ ] Ignition Frequency [ ] Quantitative Screen
[ ] Circuit Failure [ ] Post-Fire HRA [ ] Seismic/Fire Interact. [□] Quantification
[ ] Uncertainty/Sens. [□] Configuration Control</td></tr>
<tr><td colspan="2">Supporting Details for areas checked above (i.e., summary of relevant direct experience):
Mr. Laur has worked in the PRA arena since 1991. He helped to develop the Individual Plant Examination PRA models for the Harris, Robinson, Dresden and Quad Cities nuclear plants. He performed a large number of PRA applications to support risk-informed license amendment requests, to determine the risk of an event or non-conforming condition, or to provide risk insights and ranking information for a risk-informed program. Many of these applications involved changing the PRA model event trees and/or fault trees. He is experienced at PRA model quantification and results interpretation and is proficient at using the CAFTA suite of risk programs. He developed the initial Progress Energy program and procedures for PRA quality control, update, software QA, personnel training and qualification, and applications.</td></tr>
<tr><td>[□] Individual is NOT assigned to review his/her work</td><td>[□] Individual DOES NOT have a conflict of interest in performing this FPRA review</td></tr>
</table>

Record of Staff Reviewer Experience and Qualification for FPRA Review	
Name: Mark R. Mitchell	Tel. No.:509-372-4069
Employer: Battelle	e-mail: m.r.mitchell@pnl.gov
Address: PO Box 999 Richland, WA 99352	FPRA for Nuclear Plant: Shearon Harris Unit 1
Resume Cameo: Mr. Mitchell has over 25 years of experience in the nuclear power field. He has a detailed knowledge of structures, systems, components, and general operating characteristics of nuclear reactors. He held a Reactor Operator (RO) license on the Fort St. Vrain plant and Senior Reactor Operator (SRO) certification at Duane Arnold plant. He has worked as a system engineer, operations trainer, and licensed operator examiner.	
Contribution to Team Collective Qualifications	
[ ] Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007 [☐] Knowledge of FPRA, NUREG/CR-6850 [☐] Nuclear Steam System Supplier Design [☐] Containment Design [☐] Plant Operations [☐] Systems Engineering [ ] Industry or Similar PRA Peer Review Experience	[☐] Appendix R/Safe Shutdown Analysis [☐] Circuit Failure Analysis [ ] Fire Modeling [ ] Fire Protection Programs/Elements
Supporting Details for areas checked above: Mr. Mitchell held a Reactor Operator (RO) license on the Fort St. Vrain plant and reviewed procedures and conducted simulator observations at many US BWR plants while conducting licensed operator examinations for NRC. He worked as a systems engineer at the Fort St. Vrain plant, did hands-on and analytical work for maintenance/calibration of instrumentation, coordinated shutdown work, and worked with the reactor vendor to resolve plant operating problems relating to single loop operations. He successfully completed EPRI/NRC training on Fire PRA and on Circuit Analysis in 2007.	
Specific Expertise (Check areas assigned for FPRA review)	
[☐] Plant Partitioning [☐] Equipment Selection [ ] Plant Resp. Model [ ] Fire Scenario Select. [ ] Circuit Failure [ ] Post-Fire HRA [ ] Uncertainty/Sens. [ ] Configuration Control	[☐] Cable Selection [ ] Qualitative Screen [ ] Ignition Frequency [ ] Quantitative Screen [ ] Seismic/Fire Interact. [ ] Quantification
Supporting Details for areas checked above (i.e., summary of relevant direct experience): Mr. Mitchell gained experience in Plant Partitioning, Equipment Selection, and Cable Selection during his work as an RO, licensed operator trainer, and licensed operator examiner. In addition to overall familiarity with plant safety-related equipment and its power supplies, how to read Piping and Instrumentation Drawings, etc. he studied these topics and their relation to Fire PRA in the EPRI/NRC training courses held in 2007.	
[☐] Individual is NOT assigned to review his/her work	[☐] Individual DOES NOT have a conflict of interest in performing this FPRA review

<table>
<tr><th colspan="2">Record of Staff Reviewer Experience and Qualification for FPRA Review</th></tr>
<tr><td>Name: Gareth W Parry</td><td>Tel. No.: 301-415-1464</td></tr>
<tr><td>Employer: U.S. Nuclear Regulatory Commission</td><td>e-mail: gwp2@ncr.gov</td></tr>
<tr><td>Address: Mail Stop OWFN 10-H4
Washington, DC 20555-0001</td><td>FPRA for Nuclear Plant: Shearon Harris Unit 1</td></tr>
<tr><td colspan="2">Resume Cameo: Over 30 years experience in the nuclear safety field. He worked at the UKAEA Safety and Reliability Directorate for five years performing research into methodology for safety and reliability assessment. He worked for NUS Corporation, a U.S. consulting company, for more than fifteen years, contributing to a large number of PRA studies, both as an analyst and as project manager. In the latter role he managed a number of fire PRA projects. He also worked on methods development for human reliability analysis, common cause failure analysis, and uncertainty analysis. At NRC he is a senior advisor on PRA in the Office of Nuclear Reactor Regulation, where his main focus has been the development of the infrastructure for risk-informed regulation, including the development and use of consensus PRA standards.</td></tr>
<tr><td colspan="2">Contribution to Team Collective Qualifications</td></tr>
<tr><td colspan="2">[□] Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007
[□] Knowledge of FPRA, NUREG/CR-6850 [ ] Appendix R/Safe Shutdown Analysis
[ ] Nuclear Steam System Supplier Design [ ] Circuit Failure Analysis
[ ] Containment Design [ ] Plant Operations [ ] Fire Modeling
[ ] Systems Engineering [ ] Fire Protection Programs/Elements
[□] Industry or Similar PRA Peer Review Experience</td></tr>
<tr><td colspan="2">Supporting Details for areas checked above: He is a member of the ASME Committee for Nuclear Risk Management subcommittee on PRA applications, and an NRC alternate member of the ANS RISC. In that role he has participated significantly to the development of the PRA standards, either as a contributor or as a reviewer. He is NRR's primary contributor to the development of RG 1.200. He has participated in more than ten PRA studies both domestically and overseas. He was project manager for five of these studies. Several of these studies included a fire PRA within the scope. He participated in a number of PRA reviews both for US utility companies, for the NRC (NUREG 1150) and for the IAEA.</td></tr>
<tr><td colspan="2">Specific Expertise (Check areas assigned for FPRA review)</td></tr>
<tr><td colspan="2">[ ] Plant Partitioning [ ] Equipment Selection [ ] Cable Selection [ ] Qualitative Screen
[□] Plant Resp. Model [ ] Fire Scenario Select. [ ] Ignition Frequency [ ] Quantitative Screen
[ ] Circuit Failure [□] Post-Fire HRA [ ] Seismic/Fire Interact. [□] Quantification
[□] Uncertainty/Sens. [□] Configuration Control</td></tr>
<tr><td colspan="2">Supporting Details for areas checked above (i.e., summary of relevant direct experience): As project manager for several fire PRAs he had the responsibility for ensuring that the various elements of the model were combined appropriately to estimate the fire risk. He was the analyst responsible for uncertainty analyses for almost all of the NUS performed PRAs, and has written several journal articles on the treatment of uncertainty in PRA, and has recently contributed to the development of the draft NUREG 1855 – Guidance on the treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making. He has contributed to the development of HRA methods, including the CBDT method developed by EPRI, and ATHEANA, developed by NRC.</td></tr>
<tr><td>[□] Individual is NOT assigned to review his/her work</td><td>[□] Individual DOES NOT have a conflict of interest in performing this FPRA review</td></tr>
</table>

Record of Staff Reviewer Experience and Qualification for FPRA Review	
Name: Robert Vettori	Tel. No.: 301-415-3666
Employer: Nuclear Regulatory Commission	e-mail: rxv1@nrc.gov
Address: 11555 Rockville Pike Rockville, MD 20852	FPRA for Nuclear Plant: Shearon Harris Unit 1

Resume Cameo: BS University of Maryland Fire Protection Engineering 1986
MS University of Maryland Fire Protection Engineering 1999
Employment 11/07 Present: NRC NRR/DRA/AFPB
9/04 – 11/07 Full time at National Institute of Standards and Technology
12/85 – 9/04 Part time at national Institute of Standards and Technology
1/74 – 8-04 Full time Montgomery County Maryland Dept of Fire and Rescue

Contribution to Team Collective Qualifications

[ ] Knowledge of Parts 1 and 3 of ASME/ANS RA-S-2007
[ ] Knowledge of FPRA, NUREG/CR-6850 [ ] Appendix R/Safe Shutdown Analysis
[ ] Nuclear Steam System Supplier Design [ ] Circuit Failure Analysis
[ ] Containment Design [ ] Plant Operations [□] Fire Modeling
[ ] Systems Engineering [ ] Fire Protection Programs/Elements
[ ] Industry or Similar PRA Peer Review Experience

Supporting Details for areas checked above:
While at NIST worked with computer models CFAST, FPETOOL, and FDS modeling sprinkler experiments, and in reconstruction of line of duty death of fire fighters.
Masters thesis at the University of Maryland was on the computer model FDS. At the time it was called Industrial Fire Simulator

Specific Expertise (Check areas assigned for FPRA review)

[□] Plant Partitioning	[ ] Equipment Selection	[ ] Cable Selection	[ ] Qualitative Screen
[ ] Plant Resp. Model	[□] Fire Scenario Select.	[ ] Ignition Frequency	[ ] Quantitative Screen
[ ] Circuit Failure	[ ] Post-Fire HRA	[ ] Seismic/Fire Interact.	[ ] Quantification
[ ] Uncertainty/Sens.	[ ] Configuration Control		

Supporting Details for areas checked above (i.e., summary of relevant direct experience):
Past work at NIST and relevant school work.

[□] Individual is NOT assigned to review his/her work	[□] Individual DOES NOT have a conflict of interest in performing this FPRA review

Appendix D. Entrance/Exit Meeting Attendance Sheets

Attendance Sheet: February 4, 2008 Entrance Meeting		
Name	Organization	Phone
Allen, Shirelle	PGN/Fire Protection	919-546-5232
Barrett, Harold T.	NRC/NRR/DRA	301-415-1402
Baucom, Beth	PGN/PRA	919-546-2453
Blackburn, Tyrone R.	PNNL	509-372-4092
Brinkman, Scott	PGN/PRA	919-546-6243
Circle, Jeff	NRC/NRR/DRA	301-415-1152
Davis-Zapata, Ricardo	PGN/PRA	919-546-7711
Dukes, Bob	NISYS/HNP SSD	770-497-8818
Fletcher, Mike	PGNHNP	919-362-2803
Gallucci, Ray	NRC/NRR/DRA/AFPB	301-415-1255
Heffner, Kenneth W.	PGN/Crop Reg Affairs	919-546-5688
Holder, Alan	PGN/Fire Protection	919-546-3372
Howe, Andrew	NRC/NRR/DRA	301-415-3078
Johnson, Neil	PGN/PRA Contractor	919-546-2706
Lain, Paul	NRC/NRR/DRA	301-415-2346
Laur, Steven	NRC/NRR/DRA	301-415-2889
Mabe, Steve	PGN/PRA	919-546-7559
Miskiewicz, David	PGN	919-546-7588
Mitchell, Mark R.	PNNL	509-372-4069
Parry, Gareth	NRC/NRR/DRA	301-415-1464
Rhodes, Bob	PGN/HNP SSA	919-362-2603
Rishel, Robert	PGN	919-546-2662
Rogers, Walt	NRC/RII	404-562-4819
Smith, Robert	PGN	919-546-4553
Vettori, Robert	NRC/NRR/DRA	301-415-3666
Zentner, Mike	PNNL	509-372-4988

Attendance Sheet: February 8, 2008 Exit Meeting		
Name	Organization	Phone
Anoba, Richard	PGN/PRA	650-678-6784
Attarian, George	PGN/Chief Engineer CES	919-546-4573
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Began, Keith	PGN	919-546-5026
Blackburn, Tyrone R.	PNNL	509-372-4092
Davis, Maury	PGN	919-546-6600
Davis-Zapata, Ricardo	PGN/PRA	919-546-7711
Ertman, Jeff	PGN/CES	919-546-3681
Heffner, Kenneth M.	PGN/PE&RAS	919-546-5688
Holder,Alan	PGN	919-546-3372
Howe, Andrew	NRC/NRR/DRA	301-415-3078
Johnson, Neil	PGN/PRA	919-546-2706
Klein, Alex	NRC/NRR/DRA	301-415-2822
Lain, Paul	NRC/NRR/DRA	301-415-2346
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Mabe, Steve	PGN	919-546-7559
Miskiewicz, David	PGN	919-546-7588
Parry, Gareth W.	NRC/NRR/DRA	301-415-1464
Paul Gaffney	PGN/CES	919-546-2926
Rhodes, Bob	PGN	919-362-2603
Rishel, Robert	PGN	919-546-2662
Rogers, Walt	NRC/RII	404-562-4819
Stiles, Harold	NGG/PRA	919-546-4570