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December 7, 2006

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Subject: Oconee Nuclear Station  
Docket Nos. 50-269, -270, -287  
Licensee Event Report 269/2006-004, Revision 0  
Problem Investigation Process No.: O-05-3849,  
O-05-4578, O-06-1638, O-06-8064

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 269/2006-004, Revision 0, regarding deficiencies identified as part of the Appendix R Reconstitution Program and NFPA 805 Pilot Program.

This report is being submitted in accordance with 10 CFR 50.73 (a)(3)(ii)(B) as unanalyzed conditions.

This event is expected to have no significance with respect to the health and safety of the public.

Very truly yours,

Bruce H. Hamilton, Vice President  
Oconee Nuclear Site

Attachment

Document Control Desk  
Date: December 7, 2006  
Page 2

cc: Mr. William D. Travers  
Administrator, Region II  
U.S. Nuclear Regulatory Commission  
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Mr. D. W. Rich  
NRC Senior Resident Inspector  
Oconee Nuclear Station

INPO (via E-mail)

Date: December 7, 2006

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bxc:

ONS Site:

bxc: ONS Site:

Document Control (Master File)*	PIP FILE*
Site PORC Members	
RGC MGR/B.G. Davenport	
RGC: Commitment Index/J.E. Smith#	LER Book*#
WOE Mgr/S.J. Magee	
OPS-Procedures/D.B. Coyle#	
Work Control:D.V. Deatherage#	
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Non-routine Recipients:

None

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(Revised 8-1-2006)

**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME Oconee Nuclear Station, Unit	2. DOCKET NUMBER 050- 0269	3. PAGE 1 OF 8
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4. TITLE  
Design Oversight Results in Appendix R Deficiencies

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
06	03	2005	06	- 004	0	12	07	2006	Unit 2	050-0270
									Unit 3	050- 0287

9. OPERATING MODE NA	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)										
	<input type="checkbox"/> 20.2201(b)			<input type="checkbox"/> 20.2203(a)(3)(i)			<input type="checkbox"/> 50.73(a)(2)(i)(C)			<input type="checkbox"/> 50.73(a)(2)(vii)	
	<input type="checkbox"/> 20.2201(d)			<input type="checkbox"/> 20.2203(a)(3)(ii)			<input type="checkbox"/> 50.73(a)(2)(ii)(A)			<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
	<input type="checkbox"/> 20.2203(a)(1)			<input type="checkbox"/> 20.2203(a)(4)			<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B)			<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
	<input type="checkbox"/> 20.2203(a)(2)(i)			<input type="checkbox"/> 50.36(c)(1)(i)(A)			<input type="checkbox"/> 50.73(a)(2)(iii)			<input type="checkbox"/> 50.73(a)(2)(ix)(A)	
	<input type="checkbox"/> 20.2203(a)(2)(ii)			<input type="checkbox"/> 50.36(c)(1)(ii)(A)			<input type="checkbox"/> 50.73(a)(2)(iv)(A)			<input type="checkbox"/> 50.73(a)(2)(x)	
	<input type="checkbox"/> 20.2203(a)(2)(iii)			<input type="checkbox"/> 50.36(c)(2)			<input type="checkbox"/> 50.73(a)(2)(v)(A)			<input type="checkbox"/> 73.71(a)(4)	
	<input type="checkbox"/> 20.2203(a)(2)(iv)			<input type="checkbox"/> 50.46(a)(3)(ii)			<input type="checkbox"/> 50.73(a)(2)(v)(B)			<input type="checkbox"/> 73.71(a)(5)	
	<input type="checkbox"/> 20.2203(a)(2)(v)			<input type="checkbox"/> 50.73(a)(2)(i)(A)			<input type="checkbox"/> 50.73(a)(2)(v)(C)			<input type="checkbox"/> OTHER	
	<input type="checkbox"/> 20.2203(a)(2)(vi)			<input type="checkbox"/> 50.73(a)(2)(i)(B)			<input type="checkbox"/> 50.73(a)(2)(v)(D)			Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME B.G. Davenport, Regulatory Compliance Manager	TELEPHONE NUMBER (Include Area Code) (864) 885-3044
--	--

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED				15. EXPECTED SUBMISSION DATE		
<input checked="" type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input type="checkbox"/> NO	MONTH	DAY	YEAR		
		12	31	2007		

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

Licensee Event Reports 269/2002-02 (5-28-2002) and 269/2003-01 (8-4-2003) reported vulnerabilities to hot shorts and other Appendix R design deficiencies. As a result of the corrective actions from the first event, Oconee Nuclear Station initiated an Appendix R reconstitution program and subsequently elected to participate in the pilot NPPA 805 transition program. The original Appendix R evaluations considered spurious operation of many analyzed components to not be credible and assumed components would lose power, thus precluding spurious operation. However, the Current Licensing Basis requires that plant transients caused by one worst case hot short must be addressed. Between 6-3-2005 and 11-21-2006, the reconstitution program identified and documented in the Oconee corrective action program vulnerabilities to hot shorts which had not previously been considered. These issues involve potential spurious pump starts and spurious valve operations with associated procedure changes needed to address the possible hot shorts. The continuation of the Appendix R reconstitution program and the pilot NPPA 805 transition program will continue to identify and correct these items.

This event is expected to have no significance with respect to the health and safety of the public.

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EVALUATION:

BACKGROUND

This event is reportable per 10CFR 50.73(a)(2)(B)

The issues identified below do not meet the Current Licensing Basis with respect to spurious actuations for Oconee Nuclear Station (ONS) in that plant transients caused by one worst case hot short are not addressed.

Historically, the issue of hot shorts and multiple hot shorts requirements has received extensive attention by the NRC and industry without resolution. For many years ONS considered that hot shorts were not credible and were therefore not addressed. In late 2002, ONS initiated an Appendix R Reconstitution Program in response to deficiencies that were identified as an acknowledgment that the ONS current licensing basis required a single case worst hot short with respect to Appendix R requirements. The purpose of the Reconstitution Program is to perform a thorough Safe Shutdown Analysis to identify potential fire damage and related impacts on the plant. Duke met with the NRC on December 6, 2004 to discuss the Appendix R Reconstitution Project and to also discuss transition to NFPA 805. Transitioning to NFPA 805 will address multiple hot shorts in addition to single case worst hot shorts and will provide resolution to a long standing industry/NRC issue. On February 28, 2005 Duke submitted a letter formally committing to NFPA 805 and volunteering Oconee to serve as a pilot plant for the proposed transition to NFPA 805. The NRC letter dated June 8, 2005 accepted Oconee as an NFPA 805 pilot plant and interpreted that Oconee would initiate transition June 1, 2005 and complete by May 31, 2007. As a pilot plant for a Fire Protection Program under 10CFR50.48(c) and NFPA-805, we are developing with industry experts, NRC NRR staff and NRC inspectors the tools and methodology needed to implement a risk-informed approach to post-fire safe shutdown and the means to effectively address multiple spurious actuations.

The Current Licensing Basis with respect to spurious actuations for ONS is now interpreted that plant transients caused by one worst case hot short must be addressed as part of the licensing basis. Spurious operation of many analyzed components was considered to

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not be credible in the original Appendix R evaluations and components were assumed to fail as a result of loss of power precluding spurious operation.

As recommended in the NRC Inspection Manual, ONS enters identified conditions into the corrective action program via the Problem Investigation Process (PIP). PIP O-02-1357 and LER 269/2002-02 identified possible failure of the Reactor Coolant Makeup (RCMU) pump as the result of spurious operation of two motor operated valves. PIP O-02-5549 documented Appendix R deficiencies identified during an Appendix R compliance self assessment in October 2002. PIP O-03-3708 and LER 269/2003-01 identified cable routing in areas not protected by fire suppression or detection systems which could potentially lead Reactor Coolant System (RCS) (EIIS:AB) leakage to exceed the capability of the RCMU pump during an event requiring Standby Shutdown Facility (SSF) (EIIS:NB) activation.

Prior to this event Units 1, 2, and 3 were operating at ~100% power with no safety systems or components out of service that would have contributed to this event.

EVENT DESCRIPTION

As a result of the ongoing Appendix R reconstitution program and the pilot NFPA 805 transition program, additional items have been identified which are vulnerable to hot shorts which had not previously been considered. The items identified as vulnerable to hot shorts needing to be addressed are; (1) spurious pump starts and (2) spurious valve operations. We have also identified needed procedure revisions to assure appropriate manual operator actions and cold shutdown repairs are implemented if a hot short occurs. These items were not evaluated as part of the original Appendix R analysis. These items are considered reportable per 10CFR50.73 (a)(2)(B) as unanalyzed conditions.

These items are identified and tracked in four PIPS (O-05-3849, O-05-4578, O-06-1638 and O-06-8064) dated June 3, 2005, July 13, 2005, March 22, 2006, and November 21, 2006. At the time of the first PIP all three plants were operating at 100% power. LER 269/2002-02 had identified vulnerability to hot shorts previously and these items were considered to be additional examples of the extent of condition of the same issue (vulnerability to hot shorts)

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and an LER supplement was considered appropriate when the identification of items was complete and the risk evaluation completed. As the program has extended for a longer period than originally anticipated, it is appropriate to issue an LER at this time prior to completion of the risk evaluation.

Compensatory measures are in place in accordance with Nuclear System Directive 316 Fire Protection Impairment and Surveillance and Site Directive 3.2.14 Fire Protection Program Compensatory Measure Process. Fire prevention surveillances are presently in place for Appendix R deficiencies as follows:

1. 1, 2, 3 Cable Rooms,
2. 1, 2, 3 Turbine Building 3rd floor Various Areas
3. 1, 2, 3 Auxiliary Shutdown Panels
4. 1, 2, 3 Equipment Rooms
5. 1, 2, 3 East Penetration Rooms
6. 1, 2, 3 West Penetration Rooms
7. 1, 2, 3 Cask Decon rooms
8. 1, 2, 3 Spent Fuel Cooler Rooms
9. Standby Shutdown Facility

Further discussion of the identified Appendix R deficiencies are provided in the Safety Analysis section of this report.

CAUSAL FACTORS

LER 269/2002-02 previously addressed vulnerability to hot shorts and identified the cause as a historic design deficiency existing since the Standby Shutdown Facility was declared operational in 1986. It had been assumed that these components would fail as a result of loss of power thereby precluding spurious operation. The items identified in this LER are the results of the same historic Appendix R design deficiency.

The original ONS Appendix R Safe Shutdown Analysis considered the consequences of a spurious HPI pump start to be a low risk problem. The following statement was made in an internal correspondence from Safety Analysis to Design Engineering dated 10/10/85: "Spurious operation of HPI would increase RCS inventory and cause RCS pressure and pressurizer level to rise. The maximum fill rate from the worst case would be approximately 26 inches per minute in the pressurizer. Subcooled natural circulation would maintain core

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cooling, and the pressurizer safety relief valves would prevent overpressurization of the primary system. Therefore, no mandatory action is required to mitigate the spurious actuation of HPI. However, it is recommended that the following caution be included in the SSF procedure: 'if increasing pressurizer level and RCS pressure are observed along with stable or decreasing RCS temperatures, and the RCS is adequately subcooled, then spurious high pressure injection is occurring and action should be taken to control it when possible.'

CORRECTIVE ACTIONS

Immediate:

Fire prevention surveillances have been set per NSD 316 and SD 3.2.14. These procedures have been developed using industry best practices. Valves 1MS-33, 2MS-24, and 3MS-33 were verified closed and associated breakers White Tagged Open.

Subsequent and Planned:

The Appendix R Reconstitution and NFPA 805 Transition Program is continuing. The following tasks remain to be completed:

1. Identification of actions necessary to mitigate spurious pump starts and valve operation,
2. Feasibility evaluation of manual operator actions to mitigate spurious pump starts and valve operation,
3. Development/identification of procedural guidance necessary to mitigate spurious pump starts, valve operation and cold shutdown repairs,
4. Identification and implementation of appropriate modifications,
5. Evaluate the identified issues with respect to risk in order to compare them to NFPA-805 Enforcement Discretion requirements.
6. Conduct risk analysis of multiple spurious operations and compare them to NFPA-805 Enforcement Discretion requirements



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7. Update this LER. (expected ~ December 31, 2007)

Corrective action 7 is considered an NRC Commitment item. There are no other NRC Commitment items contained in this LER.

SAFETY ANALYSIS

To date approximately 30 spurious HPI Pump Starts and approximately 90 spurious valve operations have been identified as hot short vulnerabilities. Evaluations have also identified 21 procedure enhancements. All deficiencies are captured and tracked within the corrective action program.

SPURIOUS HPI PUMP STARTS

Post Fire Safe Shutdown procedural guidance does not adequately address potential spurious operation of the High Pressure Injection (HPI) (EIIS:BG) Pumps. Based upon a review of the pump circuits, the HPI pumps could be affected by fires in numerous fire areas/zones as documented in the referenced PIPs.

Since a spurious start of an HPI Pump could result in plant conditions that could defeat safe shutdown, the plant design does not meet the requirements of the current licensing basis. This situation was not addressed in the original plant design which assumed that HPI would fail as a result of loss of power, precluding spurious HPI operation.

OTHER SPURIOUS INITIATIONS

In addition to spurious HPI pump starts, other issues not evaluated as part of the original Appendix R analysis also have the potential to affect post-fire safe shutdown. The identified issues are not typically with the "required" or "credited" component or systems to achieve and maintain safe shutdown but with "associated" components whose mal-operation could adversely affect safe shutdown and which were not addressed in the supporting analyses.

The areas identified were: Spurious Pump Starts, Spurious Engineered Safeguards (ES) (EIIS:JE) Actuations, Spurious Pressurizer (EIIS:PZR) Heater Operation, Spurious Valve (EIIS:20) Operations, and procedure enhancement for required manual actions

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and implementation of cold shutdown repairs. The other spurious starts identified are: Low Pressure Injection (LPI) (EIIS:BP) pump, Condensate Booster (EIIS:SD) pump, Main Feedwater (MFW) (EIIS:SJ) pump, Emergency Feedwater (EFW) (EIIS:BA) pump, Building Spray (BS) (EIIS:BE) pump, and Reactor Coolant pump. These situations were not addressed in the original plant design which assumed that these components would fail as a result of loss of power, precluding spurious operation.

The Reconstitution Project performed a unit similarity comparison with Unit 2 as the base which found a 2% deviation for Unit 1 and 11% deviation for Unit 3. Circuit and cabling analysis were completed for Unit 2 and Unit 3. Although the re-analysis performed to date has not included Unit 1, the results are considered representative of all three units and compensatory measures were enacted for the affected fire areas in all three units. Circuit and cabling analysis for Unit 1 will be conducted for all risk significant scenarios identified for Units 2 and 3. Procedure Enhancements for required manual operator actions and implementation of cold shutdown repairs are taken from the Unit 2 review and are tracked in the corrective action program and are representative of Units 1, 2, and 3. Typically steps have been identified to guide the operator through appropriate actions.

These items are not expected to significantly degrade plant safety; however the risk analysis evaluation portion of the program has not been completed.

This event did not include a Safety System Functional Failure.

Therefore, this event is not expected to have any impact on the health and safety of the public.

**ADDITIONAL INFORMATION**

The Appendix R Reconstitution and NFPA 805 Transition Project is divided into three phases as described in the December 14, 2004 meeting. Phase I, which developed the Safe Shutdown Equipment List and logic diagrams, was completed prior to the December 2004 Meeting. The issues described in this LER were identified during the ongoing Phase II Cable and Fire Area Analysis phase. Phase III, Performance Based/Risk Informed analysis of multiple spurious actuations, is expected to complete on a schedule to be determined

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with NRC Region II. This LER will then be updated with the Phase III results.

The status of the NFPA 805 Transition Project was discussed with the NRC during the October 2006 NFPA 805 Pilot Plant Transition Observation Visit at the Oconee site. Additional status meetings are expected to be conducted monthly.

The items identified in this LER occurred at the same time as the Appendix R deficiencies identified in LER 269/2002-02 and LER 269/2003-01 as a result of design oversights. The corrective actions identified in those LERs could not prevent the occurrence of these items. The corrective actions from those LERs have led to the identification of the items reported in this LER. Therefore, this event is not considered recurring.

There were no releases of radioactive materials, radiation exposures or personnel injuries associated with this event.

This event is not considered reportable under the Equipment Performance and Information Exchange (EPIX) program.

**ENCLOSURE 1**

**SIGNATURE SHEET**

**PIP O-05-3849**

Prepared By: \_\_\_\_\_ Date: \_\_\_\_\_

Revised By: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewed By: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_ Date: \_\_\_\_\_

Approved By: \_\_\_\_\_ Date: \_\_\_\_\_

Manager, RGC

Reviewed By: \_\_\_\_\_ Date: \_\_\_\_\_

Station Manager

**ENCLOSURES:**

1. Regulatory Compliance Signature Sheet
2. References
3. Corrective Action Schedule
4. Personnel Contacted
5. Cause Code Summary

## ENCLOSURE 2

### REFERENCES

- PIP O-01-1325 SSF Cables do not meet 10CFR50, Appendix R, Section III.G separation requirements.
- PIP O-02-1357 An issue has been raised to a potential Appendix R fire that may cause a failure of LP-19 or LP-20 (LPI Emergency Sump Suction) on any Oconee unit.
- PIP O-02-5549 Assessment of Oconee Fire Protection/Safe Shutdown Program (10CFR50 Appendix R)
- PIP O-03-3708 Review of Procedure and Cable routing for Appendix R Project
- PIP O-4-3779 Control Circuit for Circuit Breaker OTS-1 does not meet Appendix R Section III.L.7 separation requirements
- PIP O-04-6342 white finding for the Appendix R procedure response time.
- PIP O-05-3849 Current Post-Fire Safe Shutdown procedural guidance does not adequately address spurious operation of HPI pumps.
- PIP O-05 4578 a number of identified Appendix R issues
- PIP O-06-1638 Valves \*CC-3, 4, 5, 6 are susceptible to closure due to fire induced hot short with no annunciator to alert the operator.
- PIP O-06-8064 During analysis being performed for PIP 06-7655, a condition equivalent to a failed or missing fire barrier was identified in regards to MS-24/ 33 and MS-126/ 129.
- LER 269 2002-02 Rev. 1 Potential for Fire to Indirectly Damage Mitigation component
- LER 269 2003-01 Rev 0 Design Oversight Results in Appendix R Control Cable Separation Issue
- Compliance Manual Sect 3.7 dated 1/19/01 Licensee Event Reports NUREG 1022, Rev. 2 Event Reporting Guidelines
- NUREG CR-6850 "Fire PRA Methodology for Nuclear Power Facilities"
- NSD 202, Rev. 20 dated 11/30/05 Reportability
- NSD 316, Rev. 6 dated 4/26/05 Fire Protection Impairment and Surveillance
- NSD 320, Rev. 0 dated 6/8/05 Guidance for Performing Licensing Review of Proposed Changes to Fire Protection Program
- SD 3.2.4, Rev. 0 Fire Protection Program Compensatory Measure Process Calculation OSC-6832 Rev. 1 dated 3/9/99
- NRC Letter dated 12/14/04 "Summary of December 6, 2004 Meeting to Discuss Appendix R Reconstitution and Transition to NFPA 805"
- Duke Letter dated 2/28/05 "Letter of Intent to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants, 2001 Edition"
- NRC Letter dated 6/8/05 "NRC Response to Duke's Letter of Intent to Adopt 10CFR50.48(c) (NFPA 805 Rule)
- 10CFR48 Fire Protection

ENCLOSURE 3

CORRECTIVE ACTION SCHEDULE

PIP O-05-3849

CORRECTIVE  
ACTION

PERSON(S)  
CONTACTED

PERSON(S)  
ASSIGNED TO

DUE DATE

**ENCLOSURE 4**

**PERSONNEL CONTACTED**

**PIP O-05-3849**

Harold Barrett/ONS  
Steve Nader/GO  
Randy Todd/ONS/RGC

ENCLOSURE 5

CAUSE CODE ASSIGNMENT SHEET

PIP 0-05-3849

CAUSE CODES:



## Enclosure 6 Detailed Listing of Deficiencies

Post Fire Safe Shutdown procedural guidance does not adequately address potential spurious operation of the HPI Pumps. Based upon a review of the pump circuits, the HPI pumps could be affected for fires in the following areas/zones (30 items):

Pump	Fire Area	Fire Zone	Fire Zone Description
1A HPI Pump	BOP	34	Unit 1 6900/4160 Volt Switchgear
		106	Unit 1 Cable Room
		110	Unit 1 & 2 Control Room
1B HPI Pump	BOP	34	Unit 1 6900/4160 Volt Switchgear
		41	Unit 2 Heater Bay, Upper Surge Tanks and Offices
		106	Unit 1 Cable Room
		110	Unit 1 & 2 Control Room
1C HPI Pump	BOP	34	Unit 1 6900/4160 Volt Switchgear
		106	Unit 1 Cable Room
		110	Unit 1 & 2 Control Room
2A HPI Pump	BOP	33	Unit 2 6900/4160 Volt Switchgear
		105	Unit 2 Cable Room
		110	Unit 1 & 2 Control Room
2B HPI Pump	BOP	33	Unit 2 6900/4160 Volt Switchgear
		41	Unit 2 Heater Bay, Upper Surge Tanks & Offices
		105	Unit 2 Cable Room
		110	Unit 1 & 2 Control Room
2C HPI Pump	BOP	33	Unit 2 6900/4160 Volt Switchgear
		105	Unit 2 Cable Room
		110	Unit 1 & 2 Control Room
3A HPI Pump	BOP	29	Unit 3 6900/4160 Volt Switchgear
		101	Unit 3 Cable Room
		112	Unit 3 Control Room
3B HPI Pump	BOP	29	Unit 3 6900/4160 Volt Switchgear
		39	Unit 3 Heater Bay, Upper Surge Tanks & Offices
		101	Unit 3 Cable Room
		112	Unit 3 Control Room
3C HPI Pump	BOP	29	Unit 3 6900/4160 Volt Switchgear
		101	Unit 3 Cable Room
		112	Unit 3 Control Room

## Enclosure 6 Detailed Listing of Deficiencies

The following is a summary of potential spurious valve operations identified that could adversely affect safe shutdown, which are not addressed by the existing analyses (90 items):

Eq. Tag	Equipment Description	Eq. Tag	Equipment Description
1CCW-269	A S/G FDW CONTROL	1FDW-347	1B S/G INLET BLOCK ON EMERG HDR
1LP-21	1B RX BLDG SUCT (PENE #37)	1LP-22	1A LPI BWST SUCTION
1HP-3	1A L/D COOLER OUTLET (PENE #6)	1HP-4	1B L/D COOLER OUTLET (PENE #6)
1HP-20	RCP SEAL RETURN (PENE #7)	1HP-21	U-1 RCP SEAL RETURN PENE (#7)
1HP-0426	RC LETDOWN TO SPENT FUEL POOL	1HP-0428	RC LETDOWN RETURN ISO VLV
1RC-4	PZR POWER RELIEF BLOCK	1RC-5	PZR STEAM SAMPLE ISOL (PENE #1)
1RC-6	PZR WATER SAMPLE ISOL (PENE #1)	1RC-7	U-1 PZR SAMPLE ISOL PENE (#1)
1RC-155	1A OTSG HOT LEG VENT VALVE	1RC-156	1A OTSG HOT LEG VENT BLOCK VALVE
1RC-157	1B HOT LEG VENT	1RC-158	1B HOT LEG VENT BLOCK
1RC-159	RX VESSEL HEAD VENT VLV 1RC-159	1RC-160	RX VESSEL HEAD VENT VLV 1RC-160
1RC-162	RC SAMPLE VLV (1RC-162)	1RC-163	PALS (PENE #5B) SAMPLE LINE BLK
2CCW-269	A S/G FDW CONTROL	2FDW-347	TD EFDWP DISCH TO 2B SG VENT (NOR-EMERG HDR)
2LP-21	2A LPI BWST SUCTION	2LP-22	2B LPI BWST SUCTION
2HP-3	2A L/D COOLER OUTLET (PENE #6)	2HP-4	2B L/D COOLER OUTLET (PENE #6)
2HP-20	RCP SEAL RETURN (PENE #7)	2HP-21	RCP SEAL RETURN PENE (#7)
2HP-0426	RC LETDOWN TO SPENT FUEL POOL	2HP-0428	RC LETDOWN RETURN ISOLATION
2RC-4	PZR RELIEF BLOCK	2RC-5	PZR STEAM SAMPLE (PENE #58A) CONT ISOL
2RC-6	PZR WATER SAMPLE PENE(#58)	2RC-7	U2 PZR SAMPLE ISOL PENE (#1)
2RC-155	2A HOT LEG VENT	2RC-156	2A HOT LEG VENT BLOCK
2RC-157	2B HOTLEG VENT	2RC-158	2B HOTLEG VENT BLOCK
2RC-159	RX VESSEL HEAD VENT VLV 2RC-159	2RC-160	RX VESSEL HEAD VENT VLV 2RC-160
2RC-162	RC SAMPLE ISOL VLV (2RC-162)	2RC-163	PALS (PENE #5B) SAMPLE LINE BLK
3CCW-269	3A S/G FDW CONTROL	3FDW-347	3B S/G EMERG HDR PENE (#17) INLET BLOCK
3LP-21	3B RX BLDG SUCT (PENE #37)	3LP-22	3A LPI BWST SUCTION
3HP-3	3A L/D COOLER OUTLET (PENE #6)	3HP-4	3B L/D COOLER OUTLET (PENE #6)
3HP-20	RCP SEAL RETURN (PENE #7)	3HP-21	U-3 RCP SEAL RETURN PENE (#7)
3HP-0426	RC LETDOWN TO SPENT FUEL POOL	3HP-0428	RC LETDOWN RETURN ISOLATION
3RC-4	PZR RELIEF BLOCK	3RC-5	PZR STEAM SAMPLE (PENE #58A)
3RC-6	PZR WATER SAMPLE (PENE	3RC-7	U-3 PZR SAMPLE ISOL PENE

**Enclosure 6 Detailed Listing of Deficiencies**

	#58A)		(#1)
3RC-155	3A HOT LEG VENT	3RC-156	3A HOT LEG VENT BLOCK
3RC-157	3B HOT LEG VENT	3RC-158	3B HOT LEG VENT BLOCK
3RC-159	RX VESSEL HEAD VENT	3RC-160	RX VESSEL HEAD VENT
3RC-162	RC SAMPLE VALVE 3RC-162 (SOLENOID VLV)	3RC-163	PALS (PENE #5B) SAMPLE LINE BLK
1CC-3	RCP B1 COOLER OUTLET VLV	1CC-4	RCP B2 COOLER OUTLET VLV
1CC-5	RCP A1 COOLER OUTLET VLV	1CC-6	RCP A2 COOLER OUTLET VLV
2CC-3	RCP B1 COOLER OUTLET VLV	2CC-4	RCP B2 COOLER OUTLET VLV
2CC-5	RCP A1 COOLER OUTLET VLV	2CC-6	RCP A2 COOLER OUTLET VLV
3CC-3	RCP B1 COOLER OUTLET VLV	3CC-4	RCP B2 COOLER OUTLET VLV
3CC-5	RCP A1 COOLER OUTLET VLV	3CC-6	RCP A2 COOLER OUTLET VLV
1MS-24	MS LINE "A" SUPPLY TO STARTUP HDR	1MS-33	MS LINE "B" SUPPLY TO STARTUP HDR
1MS-126	AUX STEAM SUPPLY CONTROL VLV	1MS-129	AUX STEAM SUPPLY CONTROL VLV
2MS-24	MS LINE "A" SUPPLY TO STARTUP HDR	2MS-33	MS LINE "B" SUPPLY TO STARTUP HDR
2MS-126	AUX STEAM SUPPLY CONTROL VLV	2MS-129	AUX STEAM SUPPLY CONTROL VLV
3MS-24	MS LINE "A" SUPPLY TO STARTUP HDR	3MS-33	MS LINE "B" SUPPLY TO STARTUP HDR
3MS-126	AUX STEAM SUPPLY CONTROL VLV	3MS-129	AUX STEAM SUPPLY CONTROL VLV

## Enclosure 6 Detailed Listing of Deficiencies

Procedure Enhancements for required manual operator actions and cold shutdown repairs are taken from the Unit 2 review and are representative of Units 1, 2, and 3 (21 items):

Operator actions required to ensure a turbine trip are not included in post-fire safe shutdown procedures.
A BH12 fire may result in a CT4 lockout signal due to faults in cables 4CT1, 1B2T910 or 1EB2T908 (see OEE-78 & KEE-17-1). These faults could activate the CT4 lockout relay (86CT4) or short the conductors connected the lockout relay contacts (simulating a lockout condition). (CSD)
Loss of 4KV switchgear 1TC and the underground feed to Keowee Auxiliary power transformer CX (cables 1ETC4X, 1ETC4Y and 1ETC4Z) would result in the loss of Keowee auxiliary power. Actions required to restore power are not addressed by the safe shutdown procedures. (CSD)
2CC PU0002, 2CC PU0003 - For Cold Shutdown, Operator Repair is required to start one of two CC pumps which have not been incorporated in safe shutdown procedures (eg: Assure that 2CC VA0007 is open, pull control fuse for pump controls and repair by installing jumper around 2CC VA0007 limit switch contact at MCC 2XN (pts. H17, H17a) or MCC 2XL (pts. H36, H36a).
2CC VA0001 - For Cold Shutdown, Operator Action is required to open / close valve 2CC VA0001 to align component cooling to Letdown Cooler used which have not been incorporated in safe shutdown procedures.
2CC VA0002 - For Cold Shutdown, Operator Action is required to open / close valve 2CC VA0002 to align component cooling to Letdown Cooler used which have not been incorporated in safe shutdown procedures.
2CF VA0001 - Reactor building entry is necessary for manual operation of 2CF-1 if its power cable burns. 2CF-1, 2 are discussed in the Reactor Building Fire Scenario Descriptions in IP/0/A/0050/002 & RP/0/B/1000/022, but clear procedural guidance is not provided on mechanically closing this valve for a reactor building fire. Valve must be closed for cold shutdown before RCS pressure is decreased below CFT pressure (600 psig).
2CF VA0002 - Reactor building entry is necessary for manual operation of 2CF-2 if its power cable burns. 2CF-1, 2 are discussed in the Reactor Building Fire Scenario Descriptions in IP/0/A/0050/002 & RP/0/B/1000/022, but clear procedural guidance is not provided on mechanically closing this valve for a reactor building fire. Valve must be closed for cold shutdown before RCS pressure is decreased below CFT pressure (600 psig).
2HP VA0003 - A valid ES signal could close valve 2HP VA0003. A failure of cable 2EXSF2203 (control) or cable 2EXS22A (power) prevents repositioning this valve. For Cold Shutdown, Operator Action would be required to open 2HP VA0003 or 2HP VA0004 to establish Normal Letdown Path which has not been incorporated in safe shutdown procedures.
2HP VA0004 - A valid ES signal could close valve 2HP VA0004. A failure of cable 2EXSF2303 (control) or cable 2EXS23A (power) prevents repositioning this valve. For Cold Shutdown, Operator Action would be required to open 2HP VA0003 or 2HP VA0004 to establish Normal Letdown Path which have not been incorporated in safe shutdown procedures.

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<p>2HP VA0005 - Failure (short to ground) of cables 2XR3701A, 2XR3701B, 2XR3901A or 2XR3901B could cause loss of power to 2HP VA0005. For Cold Shutdown, Operator Action is required to open valve 2HP VA0005 to establish Normal Letdown Path which have not been incorporated in safe shutdown procedures.</p>
<p>2HP VA0021 - Failure (short to ground) of cables 2XR3701A, 2XR3701B, 2XR3901A or 2XR3901B could cause loss of power to 2HP VA0021. This valve is energize-to-close and SSD position is closed. Valve will fail open. For hot shutdown, Operator Action is required to close valve 2HP VA0021 or an analysis is required to justify this loss through the seal leak-off return path.</p>
<p>2LP VA0001 - Reactor building entry is necessary for manual operation of 2LP-1 if its power cable burns. Valve must be opened for cold shutdown. 2LP-1, 2 are discussed in the Reactor Building Fire Scenario Descriptions in IP/0/A/0050/002 &amp; RP/0/B/1000/022, but clear procedural guidance is not provided on mechanically opening this valve for a reactor building fire. Also, refer to OP/0/A/1102/024, OP/0/A/1102/025 and OP/2/A/1104/004. OP/2/A/1104/004 states that special tooling is required to mechanically open this valve.</p>
<p>2LP VA0002 - Reactor building entry is necessary for manual operation of 2LP-2 if its power cable burns. Valve must be opened for cold shutdown. 2LP-1, 2 are discussed in the Reactor Building Fire Scenario Descriptions in IP/0/A/0050/002 &amp; RP/0/B/1000/022, but clear procedural guidance is not provided on mechanically opening this valve for a reactor building fire. Also, refer to OP/0/A/1102/024, OP/0/A/1102/025 and OP/2/A/1104/004. OP/2/A/1104/004 states that special tooling is required to mechanically open this valve.</p>
<p>2RC VA0066 - For hot shutdown RC Pressure and Inventory Control, Operator Action is required to open breaker #24 at PNLBD 2DIB to preclude possible spurious operation concern for cable 2DIB24A. This action will de-energize PORV control circuitry and fail it closed. A conductor-to-conductor hot short (internal to cable 2DIB24A) to solenoid actuator for this valve can occur. Completion of this shorting path would require a negative ground fault in the reactor building on circuits fed from either PNLBD 2DIB or 2DIA. No such circuits were found in an initial search. A more exhaustive search would be required to ensure that this does not occur.</p>
<p>2RC VA0162 - This RC Sample Isolation Valve is closed and its associated breaker (2KVIB-9) is opened per procedure CP/2/A/2002/004E. Armored-sheath cable inside containment precludes a spurious actuation of the valve from an external hot short. Procedural action is required to open this valve for cold shutdown RC Sampling flow path. A review of CP/2/A/2002/004E, OP/0/A/1102/024, and RP/0/B/1000/022 provided no guidance for opening this valve after a reactor building fire.</p>
<p>2RC VA0163 - This RC Sample Isolation Valve is normally closed and fails closed. Procedural action is required to open this valve for cold shutdown RC Sampling flow path. A review of CP/2/A/2002/004E, OP/0/A/1102/024, and RP/0/B/1000/022 provided no guidance for opening this valve after a reactor building fire.</p>
<p>2RC VA0164 - This RC Sample Isolation Valve is normally closed and fails closed. Procedural action is required to open this valve for</p>

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cold shutdown RC Sampling flow path. A review of CP/2/A/2002/004E, OP/0/A/1102/024, and RP/0/B/1000/022 provided no guidance for opening this valve after a reactor building fire.

Procedure OP/O/A/1102/025 uses 2HP-140 and 2HP-120 instead of 2HP-31 and 2HP-122 respectively. Neither 2HP-140 nor 2HP-120 is in the SSEL or shown on the logic diagrams.

Procedure OP/O/A/1102/025 directs the operators to throttle 2LP-17 vs. 2LP-12 as specified on Logic Diagram U2-LPI-004.