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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTENTION: Document Control Desk

SUBJECT: Duke Energy Corporation
Oconee Nuclear Station Units 1, 2 and 3
Docket Nos: 50-269, 270 and 287
Integrated Inspection Report 05000269/2005004,
05000270/2005004, 05000287/2005004,
Unresolved Items 2005004-10 and 2005004-08

The subject Inspection Report issued on October 28, 2005, identified a number of Non-Cited Violations (NCVs) and opened six new Unresolved Items (URIs). Duke is not contesting any of the NCVs, but does wish to present additional information for the NRC staff's consideration prior to final disposition of URI 2005004-10 and 2005004-08. Both of these URIs are directly related to the Oconee High Energy Line Break (HELB) mitigation strategy. URI 2005004-10 relates to the maintenance of containment electrical penetration enclosures. URI 2005004-08 relates to compliance with the reportability requirements of 10 CFR 50.73 for the east penetration room blow out panel deficiency.

The information contained in Attachment 1 supports the following conclusions for URI 2005004-10:

- There are no environmental qualification (EQ) requirements that the electrical penetration enclosures in the penetration room be designed, installed or maintained to meet a NEMA 4 classification.
- The parameters for the EQ of the penetration enclosures in the penetration rooms following a pipe rupture outside containment are pressure, temperature and 100% relative humidity.

IE01

- The effects of missing enclosure covers has resulted in contamination of terminal boards. Assuming that this contamination could have an adverse affect on plant operation during a HELB, evaluation of various failures at the component level has concluded that this condition would not prevent safe shutdown from a HELB event.
- The lack of maintenance on these penetration enclosures had no impact on safety.

The information contained in Attachment 2 supports the following conclusions for URI 2005004-08:

- Intermediate break sizes are not required to be postulated as part of the Oconee Nuclear Station (ONS) licensing basis for analyzing the effects from postulated piping breaks outside containment.
- No operator actions are required to mitigate flooding consequences for the licensing basis feedwater line break in the east penetration room. The Reactor Protection System trips the reactor on high reactor coolant pressure. The Automatic Feedwater Isolation System isolates main feedwater to the affected main feedwater line. These systems will perform their associated actions regardless of the Integrated Control System.
- There is at least 10 minutes available for operator action to terminate flooding from "critical cracks" in the main feedwater piping.
- Electrical penetrations in the east penetration room will not be subjected to submergence following the postulated main feedwater line break or a "critical crack" in the main feedwater piping. Therefore, instrumentation inside the reactor building will remain available to the operators.
- This issue does not meet the reportabilty requirements set forth in 10 CFR 50.73.

Additionally, in a letter from Duke to the NRC, dated January 31, 2006, Duke provided the NRC staff with the proposed scope and schedule for actions necessary to address licensing basis issues associated with HELB events outside of containment. The actions described in the January 31, 2006 letter will address concerns associated with the blow out panel deficiency and jet impingement resulting from line breaks and critical cracks in the east penetration room.

If you have any questions or comments regarding these issues, please contact Noel Clarkson of the Oconee Nuclear Site Regulatory Compliance Group at 864-885-3077.

Very truly yours,

Bruce Hamilton

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Enclosure

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Attachment 1

Duke Energy Response to Unresolved Item 2005004-10 (Failure to Maintain Containment Electrical Penetration Enclosures)

Background:

As identified in the NRC Inspection Report, dated October 26, 2005, Unresolved Item (URI) 05000269, 270, 287/2005004-10 exists due to failure of ONS to identify a condition adverse to quality by not maintaining the electrical penetration enclosures in the east and west penetration rooms as "spray-proof"/NEMA 4 enclosures. The NRC stated (per discussion with NRR) that the Oconee Nuclear Site (ONS) High Energy Line Break (HELB) licensing basis for electrical penetration should consider both spray and direct jet impingement.

The Inspection Report, dated October 25, 2005, states that inspectors identified that covers for a significant number of electrical penetrations were missing or improperly attached. Due to missing enclosure hardware and resulting potential terminal block contamination, it was postulated that safety-related electrical systems would be significantly affected due to grounds and shorts following a HELB and mitigation equipment would thus be unavailable.

Discussion:

The electrical penetrations originally installed at Oconee were manufactured by Viking Industries Inc and Westinghouse (used only for 6900V reactor coolant pump (RCP) motor power). Subsequently, additional penetrations manufactured by D. G. O'Brien and Conax were installed.

Calculation OSC-8505 (Oconee HELB EQ Analysis for Penetration Rooms) has been revised to qualify the various manufactured penetration assemblies for the new main steam (MS) and main feedwater (MFDW) temperature and pressure profiles. The qualification for the MS temperature profile is based on the short duration of the temperature spike and the inability to transfer heat to the terminal blocks in that short time frame. The new MS and MFDW profiles have been documented in revisions to the Environmental Qualification Criteria Manual (EQCM).

These revisions to the EQCM for the new MS and MFDW profiles maintained the environment as a 100% relative humidity environment. Chemical spray and submergence elevation are considered not applicable and direct steam impingement is not included. Regarding the qualification of the assemblies for moisture intrusion, the qualification conclusions are manufacturer dependent and are summarized as follows:

- Per the Conax qualification test report (OM 363-023), both the inside and outside containment portions of the electrical penetration have the same design materials and potential paths for moisture intrusion. Additionally, a design basis test was performed on the Kulka series terminal blocks used within Conax electrical penetrations which included a chemical spray simulation.
- Per the D.G. O'Brien qualification test report (OM 337-0089), the outside containment portion of the electrical penetration has been tested under a series of HELB-event conditions which included 100% relative humidity at elevated temperature, and this testing included evaluations on the Weidmueller and Allen Bradley terminal block connections. Most of the D.G. O'Brien assemblies are installed in the west penetration room, and thus would not need to be qualified for moisture intrusion resulting from a HELB occurring in the East Penetration Room. The only D.G. O'Brien assemblies installed in the East Penetration Room are 2EA09 and 3EA12. Neither of these is credited for a HELB.
- Per the Viking qualification test report (OM 337-0080), the LOCA qualification for the electrical penetrations was performed without the installation of the junction box covers and also included 100% relative humidity at elevated temperature. Tab 6 of the Viking qualification test report references the Duke Power Test Report TR-028 (MCM-1393.02-0004) for evaluating the applications of Buchanan terminal blocks within a condensing steam environment. This test included 100% relative humidity due to a water spray being applied to the steam entrance of the test chamber at elevated temperature and pressure conditions.

Based on these test results, there is no concern with potential moisture intrusion for these electrical penetrations used within applications located inside the electrical penetration room areas. This qualification does not depend on the penetration enclosure boxes being sealed. In fact, the applicable EQMM sections state "The cables entering electrical penetration assemble junction boxes do not require environmental sealing. The junction boxes are vented."

The original Viking enclosures were modified by NSM-970 (Replace Grating with Solid Cover Plate on Types B thru K Electrical Penetrations) in the 1977-1982 timeframe. The modification replaced the original metal grating that served as the front covers for both the inside and outside containment enclosures. As stated in the Safety Evaluation, the modification "...replaces existing grate covers on the penetration room and reactor building ends of electrical penetrations type B thru J. This revision will increase equipment reliability and personnel safety by eliminating paths through which foreign debris can enter through the electrical connection areas."

For the penetration room side, the modification installed a large solid sheet metal cover and two smaller covers; one on the enclosure front to provide visual access to the pressure gauge and test fittings and another on the enclosure top to cover a pressure test valve knob. The reactor building side has one solid sheet metal cover.

No documents associated with the modification mention these enclosures as now meeting NEMA 4 requirements. The National Electrical Manufacturers Association defines a NEMA 4 enclosure as:

> *"Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and will be undamaged by the external formation of ice on the enclosure."*

While this modification provided an additional measure of protection from potential wetting, no testing was done to determine if the enclosures did indeed qualify as NEMA 4 enclosures. The NSM revised two vendor drawings to indicate the new cover design; no changes were made to EQ-related documents to take credit for the replacement of the original metal grating covers.

The misconception that NEMA 4 applies to terminal blocks used in containment penetrations may have been taken from CGD-3007.02-04-0001 (Commercial Grade Item Evaluation for States Terminal Blocks, Test Switches and Accessories). Section 2.2.3 of the CDG states: "These terminal blocks and test switches must be installed inside an enclosure (NEMA 4 or equivalent in areas where direct steam or spray impingement is postulated during accident scenarios)." None of the penetrations use States terminal blocks, therefore this CGD is not applicable.

An engineering walkdown was performed on all penetrations in the east penetration rooms. The purpose of the inspection was to ascertain the extent of penetration terminal boards with observed contamination. An initial conservative assumption was that if any indication of terminal board contamination was found, all circuits in that penetration were assumed to be affected. If required, an additional evaluation of the individual terminal boards was performed. The following eighteen penetrations were found that had evidence of terminal board contamination:

Unit Number	Penetration Number	Penetration Manufacturer	Potentially Affected Components
1	1 EA 09	Viking	R. C. Pump 1A2 Seal Leakage Flow 1RC MI000 R. C. Pump 1A1 Seal Leakage Flow 1RC MI0001 R. C. Pump 1A1 Seal Lower Cavity Transmitter 1RC PT0219 Pressurizer Temperature 1RC RD0043C Quench Tank Pressure Transmitter 1CS PT0042 1WD3-PT Quench Tank Level Transmitter 1CS LT0045P 1WD1-LT HPI Nozzle Warming Line A1 Flow 1HPIFT0185 HPI Nozzle Warming Line A2 Flow 1HPIFT0186 C/D Waste Disposal System Quench Tank Temp. 1CS RD0048 Reactor Vessel Level Loop A 1RC LT0005A
1	1 EB 09	Viking	CCTV Camera 4 Signal Process Amp. CCTV Camera 2 Signal Process Amp.
1	1 EC 08	Viking	R. C. Pump 1A1 Term Box R. C. Pump 1A1 Oil Lift Pump Motor (AC) R. C. Pump 1A1 Oil Lift Pump Motor (DC) R. C. Pump 1A1 Motor Heater
1	1 EC 12	Viking	R. C. Pump Mtr. 1A1 Inlet Valve 1LPSW7 (Power & Control) R. C. Pump Mtr. 1A1 Outlet Valve 1LPSW8 (Power & Control) R. B. Cooling Unit Fan 1A Damper Position Indication R. C. Pump Mtr. 1A2 Inlet Valve 1LPSW13 Computer Points R. C. Pump Mtr. 1A1 Inlet Valve 1LPSW7 Computer Points R. B. Pen Room Vent Sample Valve 1PR59 (Control) R. C. Pump Mtr. 1A1 Inlet Valve 1LPSW7 Computer Points R. B. Pen Room Vent Sample Valve 1PR59 (Control) R. C. Pump Mtr. 1A1 Outlet Valve 1LPSW8 Computer Points R. B. Pen Room Vent Sample Valve 1PR59 (Control) R. C. Pump Mtr. 1A1 Outlet Valve 1LPSW8 Computer Points R. B. Pen Room Vent Sample Valve 1PR59 (Control) R. C. Pump Mtr. 1A2 Outlet Valve 1LPSW14 Computer Points

Unit Number	Penetration Number	Penetration Manufacturer	Potentially Affected Components
			R. B. Pen Room Vent Sample Valve 1PR60 (Control) R. C. Pump Mtr. 1A2 Outlet Valve 1LPSW14 Computer Points R. B. Pen Room Vent Sample Valve 1PR60 (Control) R. B. Cooling Unit Fan 1A Damper Position Indication Computer Points R. B. Pen Room Vent Sample Valve 1PR60 (Control) R. B. Cooling Unit Fan 1A Damper Position Indication Computer Points R. B. Pen Room Vent Sample Valve 1PR60 (Control) R. C. Pump Mtr. 1A2 Outlet Valve 1LPSW14 (Power & Control) R. C. Pump Mtr. 1A2 Inlet Valve 1LPSW13 (Power & Control) R. C. Pump Mtr. 1A1 Inlet Valve 1LPSW7 Heater R. C. Pump Mtr. 1A2 Inlet Valve 1LPSW13 Heater R. B. Pen Room Vent Sample Valve 1PR60 (Power) R. B. Pen Room Vent Sample Valve 1PR59 (Power)
1	1 ED 13	Viking	R. C. Pump 1A1 Oil Tank Level Alarm R. C. Pump 1A2 Oil Tank Level Alarm Fuel Handling System Loose Parts Monitor Channels 1, 2, 3, and 4 Loose Parts Monitor Channel 21 Loose Parts Monitor Channel 7 Loose Parts Monitor Channel 21 Loose Parts Monitor Channel 7 Loose Parts Monitor Channel 8 Loose Parts Monitor Channel 22 Loose Parts Monitor Channel 18 Loose Parts Monitor Channel 12 Loose Parts Monitor Channel 8 Loose Parts Monitor Channel 22 Loose Parts Monitor Channel 18 Loose Parts Monitor Channel 12

Unit Number	Penetration Number	Penetration Manufacturer	Potentially Affected Components
			Loose Parts Monitor Channel 11 Loose Parts Monitor Channel 9 Loose Parts Monitor Channel 17 Loose Parts Monitor Channel 10 Loose Parts Monitor Channel 11 Loose Parts Monitor Channel 9 Loose Parts Monitor Channel 17 Loose Parts Monitor Channel 10 Fuel Handling System Main Fuel Handling Bridge Console Light/Recept. Receptacle for TCA-1000 Position Instrument Fuel Handling System P A System CRD Service Structure Fan Monitor Panel 1
1	1 EE 04	Viking	Incore Detector Assy 48 Loc. O-12 Incore Detector Assy 49 Loc. M-14 Incore Detector Assy 48 Loc. O-12 Incore Detector Assy 49 Loc. M-14 Incore Detector Assy 18 Loc. L-11 Incore Detector Assy 21 Loc. H-13 Incore Detector Assy 20 Loc. K-12 Incore Detector Assy 18 Loc. L-11 Incore Detector Assy 21 Loc. H-13 Incore Detector Assy 20 Loc. K-12 Incore Detector Assy 18 Loc. L-11 Incore Detector Assy 20 Loc. K-12 Incore Detector Assy 18 Loc. L-11 Incore Detector Assy 18 Loc. L-11

Unit Number	Penetration Number	Penetration Manufacturer	Potentially Affected Components
			Incore Detector Assy 21 Loc. H-13 Incore Detector Assy 18 Loc. L-11 Incore Detector Assy 48 Loc. O-12 Incore Detector Assy 49 Loc. M-14 Incore Detector Assy 50 Loc. L-13 Incore Detector Assy 20 Loc. K-12 Incore Detector Assy 21 Loc. H-13 Incore Detector Assy 48 Loc. O-12 Incore Detector Assy 50 Loc. L-13 Incore Detector Assy 49 Loc. M-14
1	1 EF 11	Viking	Pressurizer Heater Group G (Power) Pressurizer Heater Group J (Power)
2	2 EB 09	Viking	TV CAMERA # 7 TV CAMERA # 5 TV CAMERA # 7 TV CAMERA # 5 TV CAMERA # 5
2	2 ED 10	Viking	2FDW-105 STM. GEN. '2A' ISOLATION VLV. 2HP-228 2A1 RCP SEAL RETURN STOP VLV. 2HP-226 2A2 RCP SEAL RETURN STOP VLV. RB AUX. VENT FAN '2A' VIBRATION SW. RB AUX. VENT FAN '2B' VIBRATION SW. RB AUX. VENT FAN '2A' VIBRATION SW. RB AUX. VENT FAN '2B' VIBRATION SW. 2HP-228 2A1 RCP SEAL RETURN STOP VLV. (OAC) 2HP-226 2A2 RCP SEAL RETURN STOP VLV. (OAC) H2 SAMPLE VLV. 2SV211 H2 SAMPLE VLV. 2SV212

Unit Number	Penetration Number	Penetration Manufacturer	Potentially Affected Components
			RBCU '2A' VIBRATION SW. RBCU '2B' VIBRATION SW. RBCU '2A' VIBRATION SW. RBCU '2B' VIBRATION SW. 2CC-5 RCP '2A1' COOLER OULTET VLV. (OAC) H2 SAMPLE VLV. 2SV213 H2 SAMPLE VLV. 2SV214 2CC-5 RCP '2A1' COOLER OULTET VLV. H2 SAMPLE VLV. 2SV-210 2GWD-12 WASTE DISPOSAL SYS. QUENCH TANK VENT VLV. 2HP-228 '2A1' RCP SEAL RETURN STOP VLV. (MOTOR PWR.) 2HP-226 '2A2' RCP SEAL RETURN STOP VLV. (MOTROR PWR.) RBCU '2B' MOTOR HEATER 2GWD-12 (SEE TERM. BLK. 10 ABOVE) RBCU '2A' MOTOR HEATER
2	2 EF 06	Viking	RCP '2A1' TACHOMETER RCP '2A1' ZERO SPEED SWITCH NO. 1 RCP '2A1' STATOR TEMP. RTD RCP '2A1' MANIFOLD OIL PRESS. SW. 2PS103 RCP '2A1' MANIFOLD OIL PRESS. SW. 2PS109 RCP '2A1' MANIFOLD OIL PRESS. SW. 2PS110 RCP '2A1' WATER LEAKAGE PROBE (L2A1) RCP '2A1' DC OIL PUMP PRESS. SW. 2SP107 RCP '2A1' UPPER OIL POT LEVEL SENSOR 2RCLT0135 RCP '2A1' UPPER OIL POT LEVEL SENSOR 2RCLT0135 RCP '2A1' LOWER OIL POT LEVEL SENSOR 2RCLT0136 RCP '2A1' VIBRATION DETECTOR RCP '2A1' ZERO SPEED SWITCH NO. 2 RCP '2A1' STATOR TEMP. RTD

Unit Number	Penetration Number	Penetration Manufacturer	Potentially Affected Components
			RCP '2A1' AC OIL PUMP PRESS. SWITCH RCP '2A1' ZERO SPEED SWITCH NO. 3 RCP '2A1' LOWER OIL POT LEVEL SENSOR 2RCLT0136
2	2 EF 09	Viking	PZR. HEATER GROUP 2E PZR. HEATER GROUP 2H
3	3 EB 08	Viking	RB TELEPHONE SYS TERMINAL CAB MAIN FUEL HANDLING BRIDGE TB 2234 RC PUMP DRAIN OIL STAND PIPE PS424 RB PA SYSTEM SPEAKER RC PUMP DRAIN OIL STAND PIPE 3SV233 RC PUMP DRAIN OIL STAND PIPE PS425 RC PUMP DRAIN OIL STAND PIPE 3SV234 MAIN FUEL HANDLING BRIDGE TB 2234 SOUND POWERED TELEPHONE MAIN FUEL HANDLING BRIDGE TB 2234
3	3 EC 04	Viking	POWER RANGE NUCLEAR CHANNEL NI-5 RC WIDE RANGE PRESSURE (3PT21P) RC NARROW RANGE PRESSURE (3PT17P) RC OUTLET TEMP (3RD1A) RC FLOW LOOP A (3FT14B) RC FLOW LOOP B (3FT15B) Note: Subsequent walkdown has determined that terminal block area where 3PT21P is landed is not contaminated.
3	3 ED 08	Viking	RB AUX VENT FAN 3B (PWR) RB AUX VENT FAN 3A (PWR)

Unit Number	Penetration Number	Penetration Manufacturer	Potentially Affected Components
			RB ELEVATOR (PWR) EMERGENCY LIGHTING RC PUMP 3A1 CT
3	3 ED 10	Viking	STM GEN 3A SAMPLE ISOL VALVE 3FDWVA0105 HYDROGEN SAMPLE SV214 (OEE-331-23) RC PUMP 3A1 SEAL RETURN HPI VALVE 3HP-V43B RC PUMP 3A2 SEAL RETURN HPI VALVE 3HP-V43D RB AUX VENT FAN 3A VIB SW COMPUTER & RESET RB AUX VENT FAN 3A VIB SW COMPUTER & RESET SHIELD FOR RB AUX VENT FAN 3A VIB SW RB AUX VENT FAN 3B VIB SW COMPUTER & RESET RB AUX VENT FAN 3B VIB SW COMPUTER & RESET SHIELD FOR RB AUX VENT FAN 3B VIB SW RC PUMP 3A1 SEAL RETURN HPI VALVE 3HP-V43B COMPUTER RC PUMP 3A2 SEAL RETURN HPI VALVE 3HP-V43D COMPUTER STM GEN 3A VENT VALVE 3RCVA0156 AND LS0156 STM GEN 3A VENT VALVE 3RCVA0155 AND LS0155 RB COOLING UNIT FANS 3A & 3B VIB SWS HYDROGEN SAMPLE SV210 HYDROGEN SAMPLE SV211 HYDROGEN SAMPLE SV212 HYDROGEN SAMPLE SV213 RC PUMP 3A1 COOLER OUTLET VALVE 3CCVA2 STM GEN 3A VENT VALVE 3RCVA0156 AND LS0156 QUENCH TANK VENT VALVE 3WDV1 HYDROGEN SAMPLE SV214 RC PUMP 3A1 SEAL RETURN HPI VALVE 3HP-V43B (PWR) RC PUMP 3A2 SEAL RETURN HPI VALVE 3HP-V43D (PWR) RB COOLING UNIT FAN 3B MOTOR HEATER

Unit Number	Penetration Number	Penetration Manufacturer	Potentially Affected Components
			STM GEN 3A SAMPLE ISOL VALVE 3FDWVA0105 HEATER QUENCH TANK VENT VALVE 3WDV1 HEATER RB COOLING UNIT FAN 3A MOTOR HEATER Note: Subsequent walkdown has determined that terminal block area where 3RC-155 and 3RC-156 are landed is not contaminated.
3	3 ED 11	Viking	HPI & PURIFICATION LETDOWN COOLER 3A OUTLET VALVE 3HP4 RC PUMP 3A2 COOLER OUTLET VALVE 3CC-6 RB PURGE OUTLET VALVE 3PR-1 RC PUMP 3A2 COOLER OUTLET VALVE 3CC-6 COMPUTER RB COOLING UNIT FAN 3C VIB SW RB SAMPLING LINE OUTLET VALVE 3PR-9 RB SAMPLING LINE INLET VALVE 3PR-7 RB PURGE OUTLET VALVE 3PR-1 (PWR) RB COOLING UNIT FAN 3C MOTOR HEATER (PWR)
3	3 ED 13	Viking	RC PUMP 3A1 OIL TANK LEVEL ALARM RC PUMP 3A2 OIL TANK LEVEL ALARM FUEL HANDLING TRANSFER SYS 3B INCORE TANK LIGHT RELAY LOOSE PARTS MONITOR CHAN 1 (INCORE TUBE 1) LOOSE PARTS MONITOR CHAN 3 (INCORE TUBE 41) LOOSE PARTS MONITOR CHAN 2 (INCORE TUBE 34) LOOSE PARTS MONITOR CHAN 4 (INCORE TUBE 52) LOOSE PARTS MONITOR CHAN 21 (MAIN FDW LINE A) FLOW SENSOR HEAD 3B VALVE 3LP104 LOOSE PARTS MONITOR CHAN 7 (CF LINE A) LOOSE PARTS MONITOR CHAN 8 (CF LINE B) LOOSE PARTS MONITOR CHAN 22 (MAIN FDW LINE B)

Unit Number	Penetration Number	Penetration Manufacturer	Potentially Affected Components
			LOOSE PARTS MONITOR CHAN 18 (SG A VENT LINE) LOOSE PARTS MONITOR CHAN 12 (RC PUMP A2 DISCHARGE) LOOSE PARTS MONITOR CHAN 11 (RC PUMP A2 SUCTION) LOOSE PARTS MONITOR CHAN 9 (RC PUMP A1 SUCTION) LOOSE PARTS MONITOR CHAN 17 (SG A HANDHOLE) LOOSE PARTS MONITOR CHAN 10 (RC PUMP A1 DISCHARGE) PA SYSTEM TB PAJ18 (PWR) FLOW SENSOR HEAD 3B VALVE 3LP104 FUEL HANDLING TRANSFER SYS 3A HEATER MAIN FUEL HANDLING BRIDGE CONSOLE LIGHT/RECPT TB2234 RECPT FOR TCA-1000 POSITION INSTRUMENT TB2235 FUEL HANDLING TRANSFER SYS 3B HEATER FUEL HANDLING TRANSFER SYS 3A FUEL HANDLING TRANSFER SYS 3A (PWR) FUEL HANDLING TRANSFER SYS 3B (PWR) ANN FOR CRD SERVICE STRUCTURE FAN MONITOR PNL #1
3	3 EF 10	Viking	PRESS HEATER GROUP D (PWR) PRESS HEATER GROUP A (PWR) PRESS HEATER GROUP 3K (PWR)

The electrical penetrations with evidence of terminal board contamination have been evaluated as follows:

I. Unit 1

A. Affected Penetrations

Oconee Nuclear Station (ONS) Reactor and Engineering Systems (RES) engineering has identified a number of electrical penetrations inside the east penetration room with contamination on the terminal strips. The affected electrical penetrations include:

- Electrical Penetration 1EA9
- Electrical Penetration 1EB9
- Electrical Penetration 1EC8
- Electrical Penetration 1EC12
- Electrical Penetration 1ED13
- Electrical Penetration 1EF11
- Electrical Penetration 1EE4

The following equipment is served by the above electrical penetrations and would therefore be vulnerable to failure following a main steam line break (MSLB) or feedwater line break(FWLB) inside the East Penetration Rooms:

Component	Penetration	Drawing
1A1 & 1A2 RCP Seal Leakage	1EA9	O-767-A42
1A1 RCP Lower Seal Cavity Pressure	1EA9	O-767-A42
Quench Tank Level, Pressure and Temperature	1EA9	O-767-A42
1A1 & 1A2 HPI Nozzle Warming Flow	1EA9	O-767-A42
Pressurizer Temperature (1RC RD0043C)	1EA9	O-767-A42
RV Level LT-5A	1EA9	O-767-A42
Cameras inside the RB	1EB9	O-767-A35
1A1 RCP Term Box, AC & DC Oil Lift Pumps, Mtr Htr	1EC8	O-767-A6
1A1 RCP Motor LPSW Inlet & Outlet Valves	1EC12	O-767-A8
1A2 RCP Motor LPSW Inlet & Outlet Valves	1EC12	O-767-A8
1PR-59 and 1PR-60	1EC12	O-767-A8
1A RBCU Damper Position Indication	1EC12	O-767-A8
1A1 & 1A2 RCP Oil Tank Alarms	1ED13	O-767-A13
Loose Parts Monitoring System	1ED13	O-767-A13
Fuel Handling Systems	1ED13	O-767-A13
CRD Service Structure Monitoring Panel 1	1ED13	O-767-A13
Pressurizer Heater Groups G & J	1EF11	O-767-A1
Incore Detector Assemblies	1EE4	O-767-A58

B. Effects on Environmentally Qualified Components

A review of the ONS Equipment Database (EDB) was performed to identify which equipment was required to be environmentally qualified. Only the pressurizer temperature instrument (1RC RD0043C) was listed as EQ. However, this instrument does not perform any safety function. Failure of this instrument does not affect the RG 1.97 pressurizer level indication in that density compensation is provided by 1RC RD0043A and 1RC RD0043B.

C. Effects on Non-EQ Components

All of the remaining components that could be affected by the contaminated penetrations are not environmentally qualified and are therefore not expected to function following MSLBs or FWLBs inside the East Penetration Room. With that being said, the effects of possible alarming conditions that may affect the operators, were evaluated as follows:

Various alarms related to the operation of the 1A1 and 1A2 reactor coolant pump (RCP) may be received in the control room. Computer alarms may be generated for high RCP seal leakage. Statalarm 1SA-6, A-5 (RC Pump A1 Seal Cavity Pressure Hi/Low) may actuate. Statalarms 1SA-16, A-6 (RC Pump Motor1A1 Oil Pot Low Level) and D-2 (RC Pump Motor 1A2 Oil Pot Low Level) may actuate. These statalarm response guides direct the operators to monitor the affected RCP parameters and to refer to AP/1/A/1700/16, Abnormal Reactor Coolant Pump Operation. Operators may elect to secure the 1A1 and 1A2 RCPs based on these failed instruments. Continued operation of these reactor coolant pumps is not required for accident mitigation or bringing the unit to a safe shutdown condition.

The 1A1 and 1A2 RCP Motor low pressure service water (LPSW) inlet & outlet valves are normally open. Contamination of the terminals may prevent closure of the affected valves. These valves are closed by the operator to isolate the applicable RCP motor and bearing coolers for maintenance. These valves may also be closed to isolate possible leaks in the applicable RCP motor stator or bearing coolers (ref. OSS-0254.00-00-1039). However, cooler leakage is not postulated to occur during a MSLB or FWLB inside the east penetration room. Therefore, loss of function for these valves does not adversely affect the operator's ability to mitigate the consequences of a MSLB or FWLB.

Loss of the quench tank level, pressure and temperature instruments do not affect the operator's ability to place the unit in a safe shutdown condition. Although these instruments are listed as Reg Guide (RG) 1.97 instruments, they have been classified as Category 3. Category 3 instruments are not required to be environmentally qualified in that they do not play a key role in the management of an accident (ref. Updated Final Safety Analysis Report (UFSAR) 7.5.2.35 - 7.5.2.37). Statalarms 1SA-6 A-7 (CS Quench Tank Level High/Low), 1SA-6 B-7 (CS Quench Tank Pressure High), and 1SA-6 C-7 (CS Quench Tank Temperature High) may actuate. Operators are directed to determine the cause of the alarm. A low level alarm would cause the quench tank pump and the component drain pump to trip. These pumps are not required to mitigate the consequences of an accident.

Failure of the 1A1 & 1A2 high pressure injection (HPI) nozzle warming flow transmitters may generate computer alarms. There is no computer alarm response information available. However, these instruments are not required for any safe shutdown function. These instruments do not play any role in the control of HPI flow following an accident. No actions are expected to be taken by the operator during emergency operations, should these instruments fail.

Several components are not normally in service, with their power removed. These include the reactor building (RB) cameras, RV Level LT-5A, RB Fuel Handling Systems, PR-59 and PR-60. Therefore, no alarms are expected for these components.

The 1A Reactor Building Cooling Unit (RBCU) damper position indication may fail. However, this indication is not required to verify proper operation of the RBCU. The damper is part of the non-QA ductwork and is not safety related (ref. OSS-0254.00-00-1026). No operator action is expected from a failure of the position indication.

Numerous channels in the Loose Parts Monitoring System may be affected. The only operator action would be to determine if the alarms generated were valid. Operator response to the failed channels would be to notify maintenance for repairs (ref. OP/1/A/1105/011).

The control rod drive (CRD) service structure monitoring panel may be affected. Statalarms 1SA-2 D-6 (CRD Even Cooling Fan Fail) or 1SA-2 E-6 (CRD Odd Cooling Fan Fail) may actuate. Operators would be directed to monitor the area temperatures. The CRD Service Structure Cooling Fans do not provide any accident mitigation function. Failure of any or all of the fans following a MSLB or FWLB inside the east penetration room will not result in any additional actions by the operator.

Numerous incore detector assemblies may be affected. The incore detectors are not required post accident. With the reactor tripped, the neutron flux is monitored using NI-1 through NI-4, which are the RG 1.97 instruments (ref. UFSAR 7.5.2.12).

Effects on Pressurizer Heater Groups G and J do not add any additional consequences to the MSLB and FWLB inside the East Penetration Room. Statalarm 1SA-6 E-8 (Pressurizer Heaters Ground Fault) would be actuated due to failures of motor control centers (MCCs) 1XH, 1XI, 1XJ, and 1XK. These MCCs are located inside the east penetration room and are expected to be lost due to environmental conditions resulting from a MSLB or FWLB inside the east penetration room. Pressurizer heaters with power routed through the SSF would remain available.

II. Unit 2

A. Affected Penetrations

RES has identified a number of electrical penetrations inside the east penetration room with contamination on the terminal strips. The affected electrical penetrations include:

- Electrical Penetration 2EB9
- Electrical Penetration 2ED10
- Electrical Penetration 2EF6
- Electrical Penetration 2EF9

The following equipment is served by the above electrical penetrations and would therefore be vulnerable to failure following MSLB and FWLB inside the East Penetration Rooms:

Component	Penetration	Drawing
Reactor Building Cameras	2EB9	O-1767-A35
2A SG Sample Isolation (2FDW-105)	2ED10	O-1767-A10
2A1 RCP Seal Return Valve (2HP-228)	2ED10	O-1767-A10
2A1 RCP Cooler Outlet Valve (2CC-5)	2ED10	O-1767-A10
2A2 RCP Seal Return Valve (2HP-226)	2ED10	O-1767-A10
Quench Tank Vent Valve (2GWD-12)	2ED10	O-1767-A10
RB Hydrogen Sample Valves (SV210 – SV214)	2ED10	O-1767-A10
2A & 2B RB Aux Fan Vibration Switches	2ED10	O-1767-A10
2A & 2B RBCU Fan Vibration Switches	2ED10	O-1767-A10
2A & 2B RBCU Motor Heaters	2ED10	O-1767-A10
2A1 RCP Instrumentation	2EF6	O-1767-A39
Pressurizer Heater Groups 2E and 2H	2EF9	O-1767-A1

B. Effects on Environmentally Qualified Components

A review of the EDB was performed to identify which equipment was required to be environmentally qualified. The 2A steam generator (SG) sample isolation valve (2FDW-105), the Quench Tank Vent Valve (2GWD-12), and the RB Hydrogen Sample Valves (SV210 - SV214) are the only components listed as environmentally qualified.

2FDW-105 is normally closed. The valve is opened periodically to sample the 2A SG. The valve receives an automatic closure signal from engineered safeguards (ES) Channel 1, but it does not perform any event mitigation function. The valve is not required to close for containment isolation (ref. OSS-0254.00-00-1036). Therefore, failure of the valve to operate following a MSLB or FWLB inside the east penetration room has no adverse consequence.

The Quench Tank Vent Valve (2GWD-12) is normally closed. The valve may be opened periodically to vent the quench tank to the gaseous waste disposal system. If opened, the valve automatically closes following an engineering safeguards signal to isolate containment. This automatic closure function is credited for large break loss of coolant accident (LOCA), rod ejection accident, and small break LOCA (ref. OSS-0254.00-00-1032). The automatic closure function is not required for MSLB or FWLB inside the east penetration room.

The RB Hydrogen Sample Valves are normally closed with the power removed. The loss of the hydrogen sample valves (SV210 through SV214) would result in the loss of one hydrogen analyzer channel. The hydrogen analyzers are no longer required to mitigate design basis accidents. The hydrogen analyzers have been reclassified as RG 1.97 Category 3 instruments (ref. Selected Licensee Commitment 16.7.4 Bases). As such the analyzers are no longer required to be environmentally qualified.

C. Effects on Non-EQ Components

All of the remaining components that could be affected by the contaminated penetrations are not environmentally qualified and are therefore not expected to function following MSLBs or FWLBs inside the East Penetration Room. With that being said, the effects of possible alarming conditions that may affect the operators, were evaluated as follows:

The RB cameras are not normally in service with the power removed. Therefore, no alarms are expected for these components.

The 2A1 RCP Seal Return Valve (2HP-228) and 2A2 RCP Seal Return Valve (2HP-226) are normally open. The valves are not required to operate to mitigate any design basis accidents. However, the valves are designed to automatically close when the seal inlet flow to the applicable RC Pump is low coupled with low component cooling flow. In addition, these valves provide input to another interlock to automatically close 2HP-21 when all four RCP seal return valves are closed. Neither of these non-safety automatic closure circuits are required to function for accident mitigation. It should be noted that should an ES Channel 2 signal actuate due to the accident, 2HP-21 will automatically close to isolate all RCP seal return (ref. OSS-0254.00-00-1001).

The 2A1 RCP Cooler Outlet Valve (2CC-5) is normally open. The valve is not required to close to mitigate any design basis accidents. However, operators may close the valve following a defective cooling coil on the 2A1 RCP to isolate reactor coolant system (RCS) leakage into the CC system (ref. OSS-0254.00-1022). This is not required to be postulated with a MSLB or FWLB inside the east penetration room.

Failure of the 2A & 2B RB Aux Fan Vibration Switches may cause computer alarms for high vibration on the affected fans (ref. OSS-0254.00-00-1030). No operator action is expected to occur other than notifying Engineering to evaluate the alarms.

Failure of the 2A & 2B RBCU Fan Vibration Switches may cause computer alarms for high vibration on the affected fans. The RBCUs are actuated by an engineering safeguards signal on high reactor building pressure. Should these alarms occur during normal operation, the operators may secure both the 2A and 2B RBCUs, if running. MSLB and FWLB outside containment will not actuate engineering safeguards on high reactor building pressure. Therefore, the RBCUs should not be operating in the emergency cooling mode of operation. The operator may secure the affected RBCUs, if it is concluded that they are not needed to mitigate the event. Regardless if the RBCUs are left operating or tripped by the operator, the RBCUs are not required to mitigate a MSLB or FWLB inside the east penetration room (ref. OSS-0254.00-00-1026).

Failure of the 2A & 2B RBCU Motor Heaters are not expected to result in any additional alarms in the control room.

The affected 2A1 RCP instrumentation includes the following:

- Tachometer
- Zero Speed Switches No. 1, 2, and 3
- Stator Temperature RTD
- Oil Pressure Switches 2PS103, 2PS109, 2PS110
- Water Leakage Probe
- DC Oil Pump Pressure Switch 2PS107
- AC Oil Pump Pressure Switch
- Upper Oil Pot Sensor LT135
- Lower Oil Pot Sensor LT136
- Vibration Detector

Failure of the 2A1 RCP instrumentation may result in various alarms related to the operation of the pump. Statalarms 2SA-1 E-8 (RC Pump 2A1 Oil Tank Level High), 2SA-9 E-2 (RC Pump Vibration Emergency High), 2SA-16, D-1 (RC Pump Motor 2A1 Oil Pot Low Level) and 2SA-16 E-1 (RCP 2A1 Oil Lift Pump Pressure Low) may actuate. These statalarm response guides direct the operators to monitor the affected RCP parameters and to refer to AP/2/A/1700/16, Abnormal Reactor Coolant Pump Operation. Operators may elect to secure the 2A1 RCP based on these failed instruments. Continued operation of this reactor coolant pump is not required for accident mitigation or bringing the unit to a safe shutdown condition.

The effects on Pressurizer Heater Groups 2E and 2H do not add any additional consequences to the MSLB and FWLB inside the East Penetration Room. Statalarm 2SA-6 E-8 (Pressurizer Heaters Ground Fault) would be actuated due to failures of MCC 2XH, 2XI, 2XJ, and 2XK. These MCCs are located inside the east penetration room and are expected to be lost due to environmental conditions resulting from a MSLB or FWLB inside the east penetration room. Pressurizer heaters with power routed through the SSF would remain available.

III. Unit 3

A. Affected Penetrations

RES has identified a number of electrical penetrations inside the east penetration room with contamination on the terminal strips. The affected electrical penetrations include:

- Electrical Penetration 3EB8
- Electrical Penetration 3EC4
- Electrical Penetration 3ED8
- Electrical Penetration 3ED10
- Electrical Penetration 3ED11
- Electrical Penetration 3ED13
- Electrical Penetration 3EF10

The following equipment is served by the above electrical penetrations and would therefore be vulnerable to failure following MSLB and FWLB inside the East Penetration Rooms:

Component	Penetration	Drawing
RB Telephone System	3EB8	O-2767-A36
RB Fuel Handling System	3EB8	O-2767-A36
RC Pump Oil Drain Standpipe Press Switches	3EB8	O-2767-A36
Power Range Detector NI-5	3EC4	O-2767-A21
RC Wide Range Pressure (3PT-21P)	3EC4	O-2767-A21
RC Narrow Range Pressure (3PT-17P)	3EC4	O-2767-A21
RC Outlet Temperature (3RD-1A)	3EC4	O-2767-A21
RC Loop A Flow (3FT-14B)	3EC4	O-2767-A21
RC Loop B Flow (3FT-15B)	3EC4	O-2767-A21
3A & 3B RB Aux Fans	3ED8	O-2767-A6
RB Elevator	3ED8	O-2767-A6
RB Emergency Lighting	3ED8	O-2767-A6
3A1 RCP Current Transformer	3ED8	O-2767-A6
3A Steam Generator Sample (3FDW-105)	3ED10	O-2767-A10
3A1 RCP Seal Return Valve	3ED10	O-2767-A10
3A2 RCP Seal Return Valve	3ED10	O-2767-A10
3A & 3B RB Aux Fans Vib Switches	3ED10	O-2767-A10
3A & 3B RBCU Fans Vib Switches	3ED10	O-2767-A10
3A & 3B RBCU Fan Motor Heaters	3ED10	O-2767-A10
RC Loop A High Point Vents (3RC-155 & 3RC-156)	3ED10	O-2767-A10
RB Hydrogen Sample Valves (SV210 – SV214)	3ED10	O-2767-A10
3A1 RCP Cooler Outlet Valve (3CC-5)	3ED10	O-2767-A10

Quench Tank Vent Valve (3GWD-12)	3ED10	O-2767-A10
3B Letdown Cooler Outlet (3HP-4)	3ED11	O-2767-A11
3A2 RCP Cooler Outlet Valve (3CC-6)	3ED11	O-2767-A11
RB Purge Outlet Valve (3PR-1)	3ED11	O-2767-A11
3C RBCU Fan Vib Switch	3ED11	O-2767-A11
3C RBCU Fan Motor Heater	3ED11	O-2767-A11
RB Sampling Inlet & Outlet Valves (3PR-7 & 3PR-9)	3ED11	O-2767-A11
3A1 & 3A2 RCP Oil Tank Level Alarms	3ED13	O-2767-A13
RB Fuel Handling Transfer System	3ED13	O-2767-A13
Incore Tank Light Relay	3ED13	O-2767-A13
Loose Parts Monitoring System	3ED13	O-2767-A13
3LP-104 Flow Sensor	3ED13	O-2767-A13
RB PA System	3ED13	O-2767-A13
CRD Service Structure Fan Monitor Panel 1	3ED13	O-2767-A13
Pressurizer Heater Groups A, D, & K	3EF10	O-2767-A1

B. Effects on Environmentally Qualified Components

A review of the Equipment Database was performed to identify which equipment was required to be environmentally qualified. The following EQ related components include:

- RC Wide Range Pressure (3PT-21P)
- RC Narrow Range Pressure (3PT-17P)
- 3A SG Sample Isolation (3FDW-105)
- RC Loop A High Point Vent Valves (3RC-155 & 3RC-156)
- Quench Tank Vent Valve (3GWD-12)
- RB Hydrogen Sample Valves (SV210 - SV214)
- 3B Letdown Cooler Outlet (3HP-4)
- RB Sampling Inlet & Outlet Valves (3PR-7 & 3PR-9)

The RC Wide Range Pressure (3PT-21P) provides input to ES Analog Channel A (ref. OSS-0254.00-00-2003). This transmitter also provides input to Statalarm 3SA-2 D-4 (RC Press Emergency Low). Additional inspections were performed on the affected terminal strip. No contamination was detected on the terminals used by this component. Therefore, this component will not be affected by MSLB or FWLB inside the east penetration room.

The RC Narrow Range Pressure (3PT-17P) and RC Outlet Temperature (3RD 1A) provide input to RPS Channel A. Additional inspections were performed on the affected terminal strip. The limited amount of contamination would not impact the function of the components. Therefore, these components will not be affected by MSLB or FWLB inside the east penetration room.

3FDW-105 is normally closed. The valve is opened periodically to sample the 3A SG. The valve receives an automatic closure signal from ES Channel 1, but it does not perform any event mitigation function. The valve is not required to close for containment isolation (ref. OSS-0254.00-00-1036). Therefore, failure of the valve to operate following a MSLB or FWLB inside the east penetration room has no adverse consequence.

The RC Loop A High Point Vent Valves (3RC-155 & 3RC-156) are normally closed with the power removed. However, these valves are required to be capable of being opened to vent non-condensable gases and/or steam from the RCS that might inhibit natural circulation. These valves are also required to be capable of being opened to provide a letdown path to aid in maintaining pressurizer level (ref. OSS-0254.00-00-1033). Additional inspections were performed on the affected terminal strip. No contamination was detected on the terminals used by these valves. Therefore, these valves will not be affected by MSLB or FWLB inside the east penetration room.

The Quench Tank Vent Valve (3GWD-12) is normally closed. The valve may be opened periodically to vent the quench tank to the gaseous waste disposal system. If opened, the valve automatically closes following an engineering safeguards signal to isolate containment. This automatic closure function is credited for large break LOCA, rod ejection accident, and small break LOCA (ref. OSS-0254.00-00-1032). The automatic closure function is not required for MSLB or FWLB inside the east penetration room.

The RB hydrogen sample valves are normally closed with the power removed. The loss of the hydrogen sample valves (SV210 through SV214) would result in the loss of one hydrogen analyzer channel. The hydrogen analyzers are no longer required to mitigate design basis accidents. The hydrogen analyzers have been reclassified as RG 1.97 Category 3 instruments (ref. SLC 16.7.4 Bases). As such the analyzers are no longer required to be environmentally qualified.

The 3B Letdown Cooler Outlet (3HP-4) will not be adversely affected. The cabling connected the affected terminals provide position indication only. The valve power and control cabling are routed through the west penetration room.

The RB sampling inlet and outlet valves (3PR-7 & 3PR-9) are normally open to provide a flow path to monitor radiation levels inside the Reactor Building. The valves are required to close following actuation of ES Channel 1 to provide containment isolation (ref. OSS-0254.00-00-4001). This automatic closure function is credited for large break LOCA, rod ejection accident, and small break LOCA. The automatic closure function is not required for MSLB or FWLB inside the east penetration room.

C. Effects on Non-EQ Components

All of the remaining components that could be affected by the contaminated penetrations are not environmentally qualified and are therefore not expected to function following MSLBs or FWLBs inside the East Penetration Room. With that being said, the effects of possible alarming conditions that may affect the operators, were evaluated as follows:

Numerous components are not normally in service with the power isolated or do not have alarming capability. Therefore, no alarms are expected for these components. These components include:

- RB telephone system
- RB Fuel Handling and Transfer Systems
- RB Elevator
- RB Emergency Lighting
- Incore Tank light relay
- RB PA System

A number of other reactor protective system (RPS) Channel A parameters may be affected. These include NI-5, 3FT-14B, and 3FT-15B. Should the failure mode result in a non-conservative instrument output, RPS Channel A may not be able to actuate on high flux, or flux-flow imbalance. The affected RPS trip functions are not credited for MSLB or

FWLB. Therefore the RPS channel is not considered to be adversely affected and will continue to perform its associated safety function for MSLB or FWLB inside the east penetration room. (ref. OSS-0254.00-00-2002).

Failure of the RCP drain oil standpipe pressure switches and solenoids (3PS-424, 3PS-425, 3SV-233, 3SV-234) may result in computer alarms associated with 3A1 and 3A2 RCP Motor Oil Standpipes (see OEE-350-18). The associated computer points for these alarms are D2235 and D2236. However, there is no alarm response information available for these alarms. Review of the RCP normal operating procedure (OP/1103/006) and the RCP abnormal operating procedure (AP/1700/16) did not reveal any additional information that would provide insight into operator response. Therefore, it may be concluded that the operators would contact Engineering prior to taking any action to respond to these alarms.

Failure of the 3A and 3B RB aux fans and vibration switches may cause computer alarms for high vibration on the affected fans (ref. OSS-0254.00-00-1030). No operator action is expected to occur other than notifying Engineering to evaluate the alarms.

The 3A1 RCP current transformer may be affected. This may result in a loss of amperage indication for the affected RCP. The loss of indication for motor current is acceptable.

The 3A1 & 3A2 RCP seal return valves (3HP-228 and 3HP-226) are normally open. The valves are not required to operate to mitigate any design basis accidents. However, the valves are designed to automatically close when the seal inlet flow to the applicable RC Pump is low coupled with low component cooling flow. In addition, these valves provide input to another interlock to automatically close 3HP-21 when all four RCP seal return valves are closed. Neither of these non-safety automatic closure circuits is required to function for accident mitigation. It should be noted that should an ES Channel 2 signal actuate due to the accident, 3HP-21 will automatically close to isolate all RCP seal return (ref. OSS-0254.00-00-1001).

Failure of the 3A, 3B, and 3C RBCU vibration switches may cause computer alarms for high vibration on the affected fans. The RBCUs are actuated by an engineering safeguards signal on high reactor building pressure. Should these alarms occur during normal operation, the operators may secure all of the RBCUs, if running. MSLB and FWLB outside containment will not actuate engineering safeguards on high reactor building pressure. Therefore, the RBCUs should not be operating in the emergency cooling mode of operation. The operator may secure the affected RBCUs, if it is concluded that they are not needed to mitigate the event. Regardless, if the RBCUs are left operating or tripped by the operator, the RBCUs are not required to mitigate a MSLB or FWLB inside the east penetration room (ref. OSS-0254.00-00-1026).

Failure of the 3A, 3B, and 3C RBCU motor heaters are not expected to result in any additional alarms in the control room.

The 3A1 & 3A2 RCP cooler outlet valves (3CC-5 and 3CC-6) are normally open. The valves are not required to close to mitigate any design basis accidents. However, operators may close the valve(s) following a defective cooling coil on the affected RCP to isolate RCS leakage into the component cooling (CC) system (ref. OSS-0254.00-1022). RCP cooler ruptures are not required to be postulated with a MSLB or FWLB inside the east penetration room.

Failure of the 3A1 & 3A2 RCP oil tank level alarms may result in statalarms inside the control room. Statalarms 3SA-1 E-8 (RC Pump Motor 3A1 Oil Pot Low Level) and 3SA-1 E-9 (RC Pump Motor 3A2 Oil Pot Low Level) may actuate. These statalarm response guides direct the operators to monitor the affected RCP parameters and to refer to AP/3/A/1700/16, Abnormal Reactor Coolant Pump Operation. Operators may elect to secure the 3A1 and 3A2 RCPs based on these failed instruments. Continued operation of these reactor coolant pumps is not required for accident mitigation or bringing the unit to a safe shutdown condition.

Numerous channels in the Loose Parts Monitoring System may be affected. The only operator action would be to determine if the alarms generated were valid. Operator response to the failed channels would be to notify SPOC for repairs (ref. OP/3/A/1105/011).

The RB Purge Outlet Valve (3PR-1) is normally closed and must remain closed for containment isolation (ref. OSS-0254.00-00-4001). The power supply to the valve is normally isolated (ref. PT/3/A/0115/008). Therefore, no alarms are expected for this component.

The 3LP-104 flow sensor (LPIFS0002) provides the operator with indication that flow has been established in the primary boron dilution flow path. Flow can also be verified by monitoring the valve position indications (ref. OSS-0254.00-00-1028). Therefore, loss of the flow sensor would not inhibit the operators from verifying flow through the primary boron dilution flow path. If flow in the primary flow path cannot be verified, the alternate boron dilution flow path could be aligned. However, there is no requirement to open the boron dilution flow path following a MSLB or FWLB inside the east penetration room.

The CRD Service Structure Monitoring Panel 1 may be affected. Statalarms 3SA-2 D-6 (CRD Even Cooling Fan Fail) or 3SA-2 E-6 (CRD Odd Cooling Fan Fail) may actuate. Operators would be directed to monitor the area temperatures. The CRD service structure cooling fans do not provide any accident mitigation function. Failure of any or all of the fans following a MSLB or FWLB inside the east penetration room will not result in any additional actions by the operator.

The effects on pressurizer heater groups A, D, & K do not add any additional consequences to the MSLB and FWLB inside the East Penetration Room. Statalarm 3SA-6 E-8 (Pressurizer Heaters Ground Fault) would be actuated due to failures of MCC 3XH, 3XI, 3XJ, and 3XK. These MCCs are located inside the east penetration room and are expected to be lost due to environmental conditions resulting from a MSLB or FWLB inside the east penetration room. Pressurizer heaters with power routed through the SSF would remain available.

The effect of grounds and shorts on the 120 VDC and 120 VAC systems for circuits routed through penetrations with contaminated terminal blocks is expected to be minimal.

Short circuits (both DC and AC) would be cleared by protective devices. The DC system is normally ungrounded and in the event of DC grounds at the penetration enclosure, the battery chargers would be available to support the DC system voltage. Both the penetration enclosures and the 120 VAC panelboards are grounded through the plant grounding systems. Grounds on the 120 VAC systems at the penetration terminal boards would be cleared by protective devices.

Conclusions:

1. There are no EQ requirements that the electrical penetration enclosures in the penetration room be designed, installed or maintained to meet a NEMA 4 classification.
2. The parameters for the environmental qualification of the penetration enclosures in the penetrations rooms following a pipe rupture outside containment are pressure, temperature, and 100% relative humidity.
3. The affects of missing enclosure covers has resulted in contamination of terminal boards. Assuming that this contamination could have an adverse affect on plant operation during a HELB, evaluation of various failures at the component level has concluded that this condition would not prevent safe-shutdown from a HELB event.
4. While a HELB may affect instrumentation and controls as discussed above, instrumentation and controls necessary for successful event mitigation remain available. Specifically, operators are trained to use RG 1.97 instrumentation for post-accident response.

Attachment 2

Duke Energy Response to Unresolved Item 2005004-08 (Failure to Meet the Reportability Requirements of 10 CFR 50.73 for the East Penetration Room Blow Out Panel Deficiency)

URI 05000269, 270, 287/2005004-8 is concerned with reportability of the possible loss of the High Pressure Injection (HPI) Pumps due to Auxiliary Building (AB) flooding following feedwater line breaks (FWLB) or "critical cracks" in the main feedwater piping located inside the East Penetration Room. Duke concluded that flooding of the AB following a FWLB would be precluded by the automatic trip of the reactor and subsequent isolation of the break by the Automatic Feedwater Isolation System (AFIS). Duke has also concluded that operator action would be required to terminate break flow from a postulated "critical crack" in the main feedwater piping. Using very conservative crack flow rates, calculations showed that the operators have at least 10 minutes to take action. The inspectors questioned these conclusions and provided a differing opinion on the event outcome. Secondly, the inspectors disagreed with the flow pathway to the HPI pump rooms. The bases for Duke's conclusions are provided in the subsequent paragraphs.

The inspectors listed their issues with Duke's analysis based on assumptions regarding how the plant would respond to the event. Duke believes that several of these assumptions are incorrect. Each of these assumptions are addressed below:

1. The flooding evaluation was considered to be inaccurate by the inspectors in that the flooding was not limited by the floor drains. Instead, the inspectors identified that a pipe chase in the high pressure injection (HPI) Pump Rooms would allow direct flow into the room closest to the break.

Response:

The penetration room floor sealing is adequate to prevent gross leakage of water from the east penetration room directly down into the HPI pump rooms via the pipe chase below the east penetration room. These floor seals have been tested to show that they could withstand at least 5 feet of water without failure. This is documented in a memo to file dated 1/16/2003, file no. OS-292. Therefore, any water trapped inside the east penetration will not flow directly into the pipe chase below.

No appreciable water level is expected to accumulate inside the east penetration room. There is a significant amount of non-reinforced wall area in each unit's east penetration room. Failure of these walls would limit the amount of water that could accumulate on the floor of the east penetration room. The floor area of the east penetration room was calculated to be 3085 sq.ft. (ref. OSC-8265, "East Penetration Room Flooding from Feedwater Line Breaks"). Unit 1 has a total length of approximately 79 feet of openings created by failed walls. Unit 2 has a total length of approximately 76 feet of openings created by failed walls. Unit 3 has a total length of approximately 100 feet of openings created by failed walls. These walls are not designed to withstand the resulting pressure from feedwater line breaks or cracks and are expected to fail. Based on an opening of 70 feet, the corresponding water level in the room would be limited to less than 2 inches for the postulated critical crack and less than 4 inches for the terminal end break in the main feedwater piping. Therefore, the penetration room floor seals provide adequate protection to assure a direct flow path does not exist to the pipe chase below. In addition, no submergence of the electrical penetrations in the east penetration room is expected to occur based on the failures of the non-reinforced walls. The lowest electrical penetrations in the east penetration room are at least 2 feet above the floor. Therefore, instrumentation served by these electrical penetrations will not be subjected to submergence and will remain available.

Failure of some non-reinforced walls in the east penetration room can provide a direct flow path to the 3rd floor of the auxiliary building. The pipe chase can be accessed from the 3rd floor corridor of the auxiliary building. However, there are 2-inch high curbs that inhibit the flow of water from the 3rd floor corridor to the pipe chase rooms. Once the water reaches the 3rd floor of the auxiliary building, the floodwater may take several routes. These routes include the stairwells, elevator shaft(s), various rooms on the 3rd floor without curbing, the truck bay, floor drains, and the yard area. The multiple pathways are expected to release water from the 3rd floor before any appreciable level is established on the 3rd Floor Elevation. As such, no direct flow path into the pipe chase exists on the 3rd floor.

Water from the 3rd floor of the auxiliary building can flow to the second floor via leakage under doors to the spiral stairs located at columns R64, R82, and R97. The pipe chase can also be accessed from the 2nd floor of the auxiliary building. However, there are 2-inch high curbs that inhibit the flow of water from the 2nd floor into the pipe chase rooms. No appreciable water level is expected on the 2nd Floor. As such, no direct flow path into the pipe chase exists on the 2nd floor.

Failure of some non-reinforced walls in the east penetration room can provide a direct flow path to the 1st floor of the auxiliary building. In addition, some water from the 3rd floor will drain to the 1st floor via numerous stairwells. Another access point was discovered for water entry into the HPI pump rooms through the pipe chase from the decay heat cooler rooms on each unit. Although there are 2-inch curbs to inhibit water from entering the decay heat cooler rooms from the 1st floor corridor of the auxiliary building, water can enter the decay heat cooler room from the trench if it overflows. The trench runs below the corridor and spans nearly the entire length of the 1st floor (column 64 to column 97). The trench is approximately 614 feet in length, 2.5 feet in width, and approximately 2 feet deep. The trench is equipped with 18 drains, 12 directed to Unit 1&2 waste system and 6 directed to Unit 3 waste system. The decay heat cooler rooms also have floor drains, but some water may enter the HPI pump rooms via the pipe chase in the decay heat cooler room. Entry of water into the decay heat cooler rooms requires the 1st floor corridor to be completely filled with water. Should this occur, it is expected that each room (Unit 1, 2, and 3) will be affected equally. Therefore, there would be no preferential flow to one unit's HPI pump room. Based on the room configurations, a 2/3 to 1/3 flow split is expected between Unit 1 & 2 HPI pump room and Unit 3 HPI pump room, respectively.

Minor leakage into the HPI pump rooms could be expected from leaking penetration room floor seals down through the pipe chase. However, the holdup time for water in the penetration room is very limited due to the wall failures expected to occur following feedwater line breaks and critical cracks. The leakage consideration does not alter the conclusions reached in Oconee Nuclear Station (ONS) flooding analysis.

2. The inspectors have concluded that the licensee is required to postulate the worst case break in accordance with the Giambusso Letter, which the inspectors believe to be larger than the critical crack, but smaller than the terminal end break. Breaks larger than the critical crack but smaller than the terminal end break would invalidate the flooding

analysis and increase the probability of HPI failure due to flooding.

Response:

Contrary to the conclusions drawn by the inspectors, break sizes between the critical crack size and the terminal end line break are not required to be postulated. The Giambusso letter required the following breaks to be analyzed:

- Full Circumferential breaks in piping exceeding 1 inch (i.e, double ended breaks)
- Longitudinal Breaks in piping runs exceeding 4 inches. The break area is equal to the effective cross-sectional flow area upstream of the break location

The Schwencer Letter added the requirement to analyze critical cracks. The Schwencer letter defined the critical crack size as a length equal to ½ the pipe diameter and a width equal to ½ the wall thickness. This forms the licensing basis break size selection. There is no requirement imposed for the postulation of intermediate break sizes for the protection against postulated high energy line breaks outside containment.

Feedwater line breaks are postulated at the locations specified in Duke's response to the Giambusso letter, contained in MDS Report OS-73.2. The only break location postulated in the report is at the terminal end for each main feedwater line (at the penetration downstream of the isolation check valve). Secondly, "critical cracks" are postulated in accordance with the Schwencer letter. Crack locations were not identified in MDS Report OS-73.2. However, Duke considers crack locations upstream of the feedwater isolation check valves to provide the bounding case for AB flooding. The following provides the Duke analysis for the main feedwater break and "critical crack" cases.

CASE 1: AB Flooding Evaluation for Postulated Feedwater Line Breaks in the Penetration Room:

Two cases were performed for the postulated feedwater line break. Case 1a was analyzed with the integrated control system (ICS) not providing any automatic actions, which Duke maintains as the bounding case for AB flooding. Case 1b was analyzed with ICS in automatic and performing all of its design functions. The resultant pressure in the penetration room following the postulated main feedwater line break was sufficient to cause the blowout panels used for flooding protection to open to release water to the outside. However, it was also discovered that portions of the east penetration room walls/doors may fail allowing water to be released to other areas of the AB. In both cases, no credit was taken for any release of water through the open blowout panels. In addition, both cases assumed that the reactor was operating at full power.

Case 1a Results:
The analysis (OSC-7726) showed that the reactor tripped on high reactor coolant system (RCS) pressure at approximately 15 seconds after the feedwater line break. Subsequent to the reactor trip, the (automatic feedwater isolation system) AFIS low steam generator (SG) pressure setpoint was reached at approximately 64 seconds with the feedwater control valves fully closed at approximately 89 seconds after the feedwater line break. The flooding analysis assumed that the main feedwater control valves remained open until closed by AFIS. The total integrated mass of liquid released to the AB was calculated to be approximately 200,800 lbm or the equivalent volume of 25,091 gallons (based on 212°F). The critical volumes for HPI pump flooding is 41,058 gallons (for Unit 1 & 2) and 25,624 gallons (for Unit 3). Therefore, it was concluded that insufficient water would be released to the AB to create a flooding concern for the HPI pumps, regardless of the flow split assumed in the AB floor drain system. Therefore, the HPI system would not be lost following the licensing basis main feedwater line break.

Case 1b Results:
The analysis (OSC-8884) showed that the reactor tripped on high RCS pressure at approximately 21 seconds after the feedwater line break. The AFIS low SG pressure trip setpoint was reached at approximately 45 seconds with the feedwater control valves fully closed at approximately 82 seconds following the line break. Safety Analysis added another 10 seconds to the valve closure for conservatism. Although the trip was delayed by about 6 seconds, the feedwater control valves were closed earlier (even with the additional 10 second conservatism). The total integrated mass of liquid released to the AB was calculated to be approximately 191,300 lbm or the equivalent volume of 23,903 gallons (based on 212°F). Comparison of the integrated liquid mass released from the two cases show that the liquid release was bounded by the ICS in Manual case.

Therefore, the conclusions contained in the operability evaluation remain valid.

CASE 2: AB Flooding Evaluation for Postulated Critical Cracks in the Main Feedwater Line inside the Penetration Room:

A "Critical crack" in the main feedwater piping will result in much lower peak pressures inside the East Penetration Room. The lower blowout panels provided for flood protection may not open due to the lower calculated peak pressure for "critical cracks". However, the upper panels will open to relieve the steam released from the "critical crack". Therefore, it was assumed that the water released from the critical crack would flow to other areas of the AB and no water would be directed to outside.

The plant response following the postulated "critical crack" is different from the feedwater line break in that Operator action is required to trip the reactor and isolate feedwater to the faulted main feedwater line.

Duke stated that at least 10 minutes were available for operator action. This time was based on very conservative crack flow estimates and an assumed flow split between the units waste systems based on the number of floor drains. To more accurately model crack flow, a contraction coefficient was applied to the critical crack flow to reflect the characteristics of flow through an orifice. The contraction coefficient was determined to be 0.6, based on the square root of the ratio in flow areas in the crack and the main feedwater piping and the expected velocity through the main feedwater piping. The contraction coefficient was applied to the critical flow calculation contained in OSC-8036, "Flow from feedwater (FDW) Line Crack into the Penetration Room". The flowrate through the critical crack was calculated to be 528.06 lbm/sec at an enthalpy of 426.1 btu/lbm. Not all of the mass released from the crack will remain in liquid form. In fact, approximately 25% of the liquid will flash to steam. The remaining 75% will remain in the liquid state and be released through the failed walls. The volumetric liquid release rate was calculated to be approximately 3000 gpm.

Based on engineering judgement that approximately 69% of the water released from a crack would flow to Unit 1&2 waste system, while 31% would flow to Unit 3, regardless of the unit with the crack. No detailed analysis is available to support this judgment; however, since no direct pathways exist that would allow water to flow preferentially to one unit's HPI pump rooms via the pipe chase, the judgment is considered to be reasonable. Even if a 50/50 split were taken between the units' waste systems, there would still be at least 10 minutes available for operator action.

Duke could perform more detailed analysis to support the judgment by creating flooding models for the auxiliary building to address the concern for cracks; however, Duke has previously committed to implement flood prevention features that will eliminate the flooding potential to other areas of the auxiliary building following postulated feedwater line breaks and cracks inside the east penetration room. These modifications include improving the flood outlet device in the east penetration room and improving the structural integrity of the non-reinforced walls in the east penetration room (ref. 11/14/2005 letter from Duke to the NRC).