Omaha Public Power District
444 South 16th Street Mall
Omaha, Nebraska 68102-2247
402/636-2000

December 8, 1995
LIC-95-0225

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Reference: Docket No. 50-285

Subject: Licensee Event Report 95-007 Revision 00 for the Fort Calhoun Station

Please find attached Licensee Event Report (LER) 95-007 Revision 00 dated December 8, 1995. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(ii). If you should have any questions, please contact me.

Sincerely,

T. L. Patterson
Division Manager
Nuclear Operations

TLP/epm

Attachment

c: Winston and Strawn
L. J. Callan, NRC Regional Administrator, Region IV
L. R. Wharton, NRC Project Manager
W. C. Walker, NRC Senior Resident Inspector
INPO Records Center

IE22
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NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 4/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO THE INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Fort Calhoun Station Unit No. 1	05000285	1 OF 5

TITLE (4)
Potential Tripping of 480V Circuit Breakers with Digital (RMS-9) Trip Units

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
11	08	95	95	-- 007	-- 00	12	08	95	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)	X	50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		(Specify in Abstract below or in NRC Form 366A)
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Robert F. Mehaffey, Principle Engineer Electrical	(402) 533-6505

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO				

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

General Electric (GE) RMS-9 trip units provided for the Fort Calhoun Station 480V Load Center Busses have been found to be susceptible to spurious tripping. The trips are not due to a fault condition on the circuit, but, appear to be due to grounds occurring on a portion of the 480V three phase delta floating system. Plant experience has shown that the long-time/short-time trip functions installed on the 480V Motor Control Center (MCC) feeder breakers are subject to spurious tripping. The 4160/480 Volt transformers act as filters preventing the effects from going beyond an individual load center. Since engineered safeguards components are potentially affected by this mechanism, which could occur during a design basis event, the plant has been found to be in a condition outside of its design basis.

This event is caused by a circuit breaker subcomponent (GE RMS-9 trip units) not operating as specified by the Omaha Public Power District or represented by the manufacturer.

Corrective actions for this event consist of compensatory actions taken to maintain the plant within its design basis. These compensatory actions will remain in place until the affected circuit breaker trip units are replaced.

BACKGROUND

General Electric Company (GE) RMS-9 trip units are current sensing trip devices used in GE AK type circuit breakers. These devices are used to sense an over current condition on a circuit causing the associated circuit breaker to trip open. The trip units in question provide a long-time and a short-time trip function for their associated circuit breaker.

The RMS-9 trip units were installed in Fort Calhoun Station (FCS) circuit breakers as digital replacements for oil dashpot (EC) type trip devices that were originally used in the circuit breakers. The RMS-9 units were installed starting in December of 1991, and the last installation was completed in November of 1993. The RMS-9 trip units were installed in the plants 480V AK type circuit breakers. The affected circuits supply both safety grade and non-safety grade loads.

As mentioned above, the function of the RMS-9 trip units is to provide the required trip signal to the associated circuit breaker on an over current condition in the circuit that the device is monitoring.

Spurious tripping of circuit breakers with RMS-9 trip units installed in the plant started in April of 1992 at FCS and has continued through this year (1995). The most recent event occurred in August of 1995. There have been a total of nine of these types of trips since 1992 when the RMS-9 trip units installation began. Some of the trips have been associated with events where the circuit was noted as having a ground on it and some events did not have an indicated ground.

DETAILED EVENT DESCRIPTION

In October of 1992, the Browns Ferry Nuclear (BFN) Station issued a 10 CFR Part 21 concerning their experience with GE RMS-9 trip units installed in circuit breakers in the 480V distribution system. BFN reported that they had experienced tripping of circuit breakers containing RMS-9 trip units apparently due to extremely short duration, high amplitude current transients.

The spurious breaker trips at BFN appear to be caused by grounds on the 480V three phase ungrounded distribution systems. A ground can induce a short duration current signal on the 480V system. Breaker tripping appears to be a result of the RMS-9's over sensitivity to short duration current spikes (spikes on the order of 100 microseconds) on the inputs to the RMS-9's. These current spikes are thought to be interpreted by the RMS-9 as an over current condition that requires the circuit breaker to trip.

Omaha Public Power District (OPPD) commenced an investigation, shortly after receiving the BFN Part 21 notification, to determine the potential impact on FCS plant operation using the experience gained at the BFN facility. In discussions during January of 1993 with the manufacturer (GE) they indicated that the spurious trips could be unique to the BFN facility as no other customers had reported spurious tripping.

In August 1993, the Maine Yankee nuclear plant reported in a 10 CFR Part 21 notification that they had experienced several spurious trips of circuit breakers with RMS-9 trip units installed. The circuit breakers at Maine Yankee did not have the instantaneous trip function that was apparently causing the problems at the BFN

facility.

Shortly after the Maine Yankee notification, in August 1993, OPPD's Design Engineering Department began an evaluation of the nuisance tripping issue reported in the Maine Yankee Part 21 notification. The scope of the Engineering Assistance Request (EAR) 93-138 was to determine if a similar problem could occur at FCS and the generic implications of this type of event.

In September of 1993 the NRC issued Information Notice (IN) 93-75 indicating that the problem had been attributed to the improper application of the instantaneous trip feature of the RMS-9 units to feeder breaker circuits. This IN restated the problems discussed in the BFN and Maine Yankee Part 21 notifications and added some material from NRC discussions with GE. The IN was determined not to apply to FCS as the bus feeder breaker did not make use of the instantaneous trip feature of the RMS-9 trip units.

The issue continued to be reviewed and investigated as additional information became available. System Engineering also continued to trend and track the problem as additional incidents of circuit breaker tripping occurred at the station.

In early November 1995 during the performance of an additional review of the situation, Design Engineering came to the conclusion that the interaction of some of the safety related circuit breakers, during certain plant accidents, might constitute a condition outside of the design basis of the plant.

On November 8, 1995, a Plant Review Committee (PRC) meeting was held to discuss this issue and the related conclusions. At 1408 Central Standard Time (CST) the PRC concluded that this condition constituted a condition outside of the design basis of the plant. At 1505 CST on November 8, 1995, a one hour non-emergency notification was made to the NRC pursuant to 10CFR50.72(b)(1)(ii)(B) and (C). This report is being submitted pursuant to 10CFR50.73(a)(2)(ii).

SAFETY SIGNIFICANCE

Based on plant specific failure data and GE's failure mode investigation, it was determined that those circuit breakers which use an RMS-9 trip unit with a long-time/short-time trip function required review. The long-time/short-time trip functions are installed on the 480V Load Center Bus feeder breakers (4160/480V transformer secondary breakers), 480V Load Center Bus Tie breakers, and Motor Control Center (MCC) feeder breakers. Plant experience shows that 480V Load Center Bus feeder breakers and 480V Load Center Bus Tie breakers are not susceptible to current spikes. Plant experience also shows that the effects of a ground are limited to the associated 480V Load Center. The 4160/480 Volt transformers act as filters preventing the effects from being transmitted to other 480V Load Centers.

Plant conditions that are most likely to lead to the potential for the tripping of redundant trains of safety equipment were determined to be those that produced a harsh environment (steam and/or spray) around affected equipment. The Large Break Loss Of Coolant Accident (LBLOCA) and Main Steam Line Break (MSLB) are the limiting Design Basis Accidents (DBA) which were evaluated as having the potential to create a problem with the RMS-9 trip units. These events can cause a harsh environment requiring automatic Engineered Safety Feature (ESF) Response. The MSLB is the limiting Uncontrolled Heat Extraction (UHE) event. The limiting DBA can occur in Containment (UHE or LBLOCA) or Room 81 (UHE). Room 81 is a room adjacent to the

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containment through which the Main Steam lines pass.

Grounds on the 480V system are most likely to originate from equipment located in the Containment or Room 81 with the following characteristics:

1) the equipment is not Environmentally Qualified (EEQ),
2) the equipment is not normally de-energized, or
3) the equipment is not load shed in a DBA.

A list of plant equipment was developed that met these characteristics. The affected 480V Load Centers were reviewed to determine the loads required to mitigate the consequences of a DBA. The plant equipment determined to have the potential to be affected is the control room air conditioning system and the containment sump recirculation valves (HCV-383-3 and HCV-383-4) motor operators.

Plant experience has shown that if an MCC feeder breaker does trip due to current spikes, neither the breaker nor the associated equipment will be damaged. The MCC and associated equipment can be restored by clearing the ground, reclosing the MCC feeder breaker and restarting the required equipment.

The Control Room Heating Ventilation and Air Conditioning (HVAC) system is normally in service and is also designed to be placed in service in the initial stages of a Design Basis Accident (DBA) and to be operated continuously. A ground induced MCC trip and a single active failure could cause the loss of this function. While operator action is required to restart the Control Room HVAC, adequate guidance is provided in existing procedures and adequate time is available to restore the function. Calculation FC06311 Rev.3C (Control Room Heat Gain Without Air Conditioner VA-46A or B Cooling) indicates that in the Control Room the operators will have at least 90 minutes to restore air conditioning prior to exceeding the Technical Specification limit. This provides adequate time for the operators to respond to the event.

The Containment Post Accident Sump Recirculation Valves, HCV-383-3 and HCV-383-4, must operate when the suction source for the Safety Injection (SI) pumps, the Safety Injection Refueling Water Tank (SIRWT), is nearly depleted. A Recirculation Actuation Signal (RAS), operates these valves to allow continued operation of the SI pumps by shifting their suction source from the SIRWT to the containment sump. The SI pumps are used to cool the reactor core. A RAS may occur as early as 24 minutes into a Large Break Loss Of Coolant Accident (LBLOCA).

The time when operation of valves HCV-383-3 and HCV-383-4 is required is break size dependant. For a LBLOCA, all SI pumps are operated, depleting the SIRWT in as little as twenty-four (24) minutes. Twenty-four minutes may not be sufficient time to allow the operators to diagnose the trip of an MCC associated with the RAS valve, and restore the power to the valve operator. A single active failure and a ground could cause the loss of both RAS valves. Without the ability to operate these valves in a timely manner it cannot be assured that the fuel peak centerline temperature limit can be met. Therefore, this event is considered to be potentially significant with regard to nuclear safety.

CONCLUSIONS

Plant and industry experience has demonstrated that the GE RMS-9 trip units do not

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operate in the manner intended by the manufacturer or as specified by OPPD. GE originally represented the RMS-9 trip units as being fully qualified. Experience at BFN, Maine Yankee, and FCS now indicate that the RMS-9 trip units do not operate in a reliable fashion.

The situation discussed in this Licensed Event Report (LER) has been reviewed from a beyond design basis, severe accident perspective. The overall impact upon risk is small. This is due to the fact that severe accident risk is not dominated by events that produce a harsh environment. Spurious opening of circuit breakers would generally tend to occur after components were in their accident positions. Opportunities would generally be available for operator recovery.

CORRECTIVE ACTIONS

Safety Analysis for Operability (SAO) 95-02 was issued to provide the necessary operability justification and required compensatory actions. These actions (1-5 listed below) have been accomplished by an operations memorandum and controlled by appropriate Caution Tag Sheets. The operations memorandum directs that the RCP Motor lift pumps are to be tripped when Containment Spray occurs and then verify that the MCC feeder breakers associated with the Containment Sump Recirculation MOV's are closed. Actions 1 and 2 are post-accident performed instructions, while the breakers discussed in items 3, 4 and 5 are administratively controlled open.

1. Open the contactors (via control switch) to Reactor Coolant Pump Motor Lift Pumps RC-3A on MCC-3B1, RC-3B on MCC-4A1, RC-3C on MCC-3A1 and RC-3D on MCC-4C1 as an action following initiation of Containment Spray.

2. Ensure that the feeder breakers for MCC-3A2 and MCC-4C2 are closed following the completion of 1 above.

3. Open the feeder breakers to the Reactor Coolant Pump Motor RC-3C and RC-3D heaters on MCC-3A1 and MCC-4C1 and RC-3A and RC-3B heaters on MCC-3B1 and MCC-4A1 respectively.

4. Open the feeder breakers to the welding outlet in room 81 or disconnect the Room 81 welding outlet (to reduce the number of outlets out of service).

5. Open the feeder breaker to the refueling equipment in containment.

The following long term corrective action will provide a permanent solution to this problem.

6. The actions listed in SAO 95-02 will remain in effect until the RMS-9 trip units are replaced or modified. The RMS-9 trip units will be replaced no later than the planned 1996 fall refueling outage, currently scheduled to begin on September 21, 1996.

SIMILAR EVENTS

LER 91-007 discusses a previous event where deficiencies in the original design of the 480V distribution system resulted in the plant being outside of its design basis.