LICENSEE EVENT REPORT (LER)

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TITLE (4)

DISCREPANCIES IN APPENDIX R HIGH IMPEDANCE FAULT ANALYSIS

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV. NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	20	98	98	006	01	07	23	98	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	5
POWER LEVEL (10)	0

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

	20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER
	20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		
	20.405(a)(1)(iv)	X	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
	20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
T.J. Powell, Licensing Technical Specialist	(509) 377-4161

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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

ABSTRACT:

Discrepancies were discovered in low voltage bus calculations during a review of the 10 CFR Part 50 Appendix R calculations for high impedance faults. These deficiencies required procedural changes involving operator actions to monitor safe shutdown buses and the removal non-safe shutdown loads in the event that certain low voltage buses become overloaded due to fire induced electrical faults in specified fire areas.

The root cause for the deficient calculations is less than adequate work practices at the time the errors occurred between 4 and 10 years ago.

Event Description

A deficiency with the existing Appendix R high impedance fault (HIF) analysis using a new contractor provided methodology was discovered February 26, 1998. This discovery was not determined to be reportable at the time because, in lieu of using the new contractor HIF analysis methodology (HIF - Rev 3), WNP-2 electrical and fire protection engineers recommended using the original WNP-2 HIF analysis methodology (HIF - Rev 2), which was considered to have enough conservative margin to bound any plant modifications since its last update.

The original WNP-2 Appendix R HIF analysis methodology was taken from NRC Generic Letter 86-10 and subsequent NRC safety evaluations of the WNP-2 FSAR Fire Protection Program description. This methodology requires that the safe shutdown power supply buses remain available during fire conditions assuming that all unprotected loads located in the fire area are affected by the fire in such a way that each circuit faults and loads the safe shutdown bus to the rated value of the branch circuit protective fuse/breaker. These fire induced loads are assumed to be in conjunction with all normal bus loads not affected by the fire. Considering this, the total load on the safe shutdown bus must be maintained below the rating of the upstream bus supply fuse/breaker. This ensures the bus protective device does not trip resulting in a loss of power to the associated safe shutdown bus.

A review of the HIF analysis was conducted as a corrective action resulting from the deficiency discovered on February 26, 1998. This review revealed discrepancies with the original WNP-2 HIF calculation that could lead to overloading certain low voltage buses [EC] due to postulated fire induced faults in specified fire areas. The deficiencies resulted from underestimated or omitted loads that could contribute to the total HIF load on a post-fire safe shutdown (PFSS) bus. These deficiencies required procedural changes to PPM 4.12.4.1 'Fire' and PPM 4.12.1.1 'Control Room Evacuation and Remote Cooldown' including the addition of new or revision of existing operator actions to monitor safe shutdown buses or remove non-PFSS loads in the event that certain low voltage buses become overloaded due to fire induced HIFs in specified fire areas.

Further Evaluation

This event is being reported per the requirement of 10CFR50.73(a)(2)(ii) as a condition found while the reactor is shutdown that involves degradation of a principal safety barrier or unanalyzed condition that could significantly compromise plant safety. The original high impedance fault analysis issued in 1988 was consistent with methodology provided in NRC Generic Letter 86-10; however, it was not updated since Revision 2 (1994).

A 20% sample of the PFSS distribution and power panel buses was conducted to determine the extent and effects of omitted cables from the HIF calculation. From this review, 9 cables (about 8% of the omitted

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cables) were found to have contributing HIF loads and should have been included in the analysis. Each of the 9 cables were reviewed to determine the impact of those additional loads on the calculational results. Since considerable load margin exists within the calculation for most of the safe shutdown buses, there was no impact to the calculational results by the inclusion of these new loads. Because of available bus load margins, it is not likely that any other omitted cables that might have HIF contributing loads will affect the analysis or result in the necessity for additional operator actions to remove these loads to protect the integrity of the PFSS buses.

Root Cause

The majority of the deficiencies were the result of inadequate work practices occurring between 4 and 10 years ago. These contributing work practice deficiencies included the application of undocumented assumptions, not considering the effect of unscheduled cables, use of information from Electrical Wiring Diagrams (EWDs) which contained errors, mathematical errors in totaling loads, and the use of unverified information. There have been several improvements in engineering procedures, work reviews, work practices and drawing control, coupled with an increased emphasis on following procedures over the past few years. With these changes in place, it is unlikely that the same conditions evaluated in this report will occur again.

Further Corrective Action

Changes have been made in PPM 4.12.4.1 'Fire' and PPM 4.12.1.1 'Control Room Evacuation and Remote Cooldown' that added new or revised existing operator actions to monitor safe shutdown buses or remove non-safe shutdown loads in the event that certain low voltage buses become overloaded due to fire induced faults.

Hourly fire tours have been initiated in affected areas as a compensatory measure to reduce the potential for fire induced cable faults.

A 20% sample of the PFSS distribution and power panel buses was conducted to determine the possible extent and effects of omitted cables (loads).

Due to the identification of input data errors (omission of cable/loads) from the results of the 20% sample, a review of all safe shutdown bus load lists, prioritized by bus susceptibility of HIF induced failure, will be conducted. This review will verify the accuracy of cables listed in the HIF calculation. A new revision to the HIF calculation will then be issued using the methodology of Generic Letter 86-10 which incorporates the results of this HIF cable list review. The estimated completion date for these tasks is January 15, 1999.

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Completion of these tasks is being tracked by corrective actions (#8 and #9) approved for closure of Problem Evaluation Request #298-0173.

Assessment of Safety Consequences

The WNP-2 HIF calculation errors could have resulted in loss of safe shutdown capability during a design basis fire event due to loss of power to safe shutdown equipment. However, with hourly fire tours to compensate for HIF calculation deficiencies and the addition of PPM 4.12.4.1 and PPM 4.12.1.1 operator actions, PFSS buses are capable of performing their safety function by supplying safe shutdown loads.

The HIF analysis is an Appendix R requirement as specified by Generic Letter 86-10. The purpose of this analysis is to assure that electrical power to fire safe shutdown equipment remains available throughout the fire event even when the safe shutdown power supply buses are subjected to multiple, fire induced HIFs. To preclude such power supply failures, Generic Letter 86-10 allows written procedures that contain operator actions to remove non-safe shutdown loads and thus reduce the total load on the PFSS buses such that adequate power is continuously available to required PFSS equipment (Reference: GL 86-10, Section 5.3.8). The HIF requirement is only applicable to Appendix R fire events and does not apply to any other design basis events. Fires need not be postulated concurrent with other design basis events (except LOOP).

As stated above, available bus load margin should preclude the need for identification of any further operator actions. However, the sample set of omitted cables described above did contain some loads that reduced the available margin in the calculation. For this reason, until all omitted loads have been identified and individually reviewed for their impact on the PFSS bus availability, fire tours will be implemented in vital plant areas most susceptible to HIF. This compensatory measure will help to ensure the potential for plant fires is minimized.

Similar Events

There have been no recent LERs involving potential equipment inoperability as a result of deficient bus load calculations.