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Palisades Nuclear Plant: 27780 Blue Star Memorial Highway, Covert, MI 49043

November 2, 1995

U S Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT
LICENSEE EVENT REPORT 95-012 - UNQUALIFIED ELECTRICAL CONNECTION IN CONTAINMENT SERVICE WATER OUTLET VALVE CONTROLLER

Licensee Event Report (LER) 95-012 is attached. This event is reportable to the NRC per 10 CFR 50.73(a)(2)(ii)(B) as a condition outside of the design basis.

SUMMARY OF COMMITMENTS

This letter contains no new commitments and no revisions to existing commitments.

Richard W. Smedley
Manager, Licensing

CC Administrator, Region III, USNRC
Project Manager, NRR, USNRC
NRC Resident Inspector - Palisades

Attachment

000697

IE22

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

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TITLE (4) LICENSEE EVENT REPORT 95-012, UNQUALIFIED ELECTRICAL CONNECTION IN CONTAINMENT SERVICE WATER OUTLET VALVE CONTROLLER

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (8)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	
									N/A	0 5 0 0 0
0 7	0 1	9 5	9 5	- 0 1 2	- 0 0	1 1	0 2	9 5	N/A	0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 0	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 (Specify in Abstract below and in Text, NRC Form 366A)
		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
Philip D Flenner	AREA CODE 6 1 6 7 6 4 - 8 9 1 3

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

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	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 fifteen single-space typewritten lines) (16)

On July 1, 1995, at 0800 hrs, with the plant shut down for refueling, an unqualified electrical connection was discovered on cables leading to the containment service water outlet valve solenoid valve (SV-0824). An initial determination was made that this was not reportable, based on the belief that the postulated failure would only result in the affected valves failing in the safe (open) position. Subsequent evaluation completed on October 3, 1995 concluded that there was one accident scenario in which a particular combination of equipment failures would require the affected valves to be closed. This scenario was a large break LOCA with significant fuel failures, a loss of off-site power, and failure of the right channel diesel generator. This condition was determined to be reportable.

The unqualified electrical connection (wire nuts) of concern was located in a pull box in the Component Cooling Water Room (CCW) outside of containment. This area is not affected by the LOCA pressure/temperature environment but it would be exposed to radiation effects due to shine through the containment wall. The connection was replaced with environmentally qualified connections.

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EVENT DESCRIPTION

In 1982 a number of position switches were added to the list of equipment that required environmental qualification. At that time no walkdowns were done so it was not recognized that some of these position switch circuits contained wire nut connections. A wire nut electrical connection is not qualified for use in a harsh environment.

During the 1992 refueling outage, unqualified wire nut electrical connections were found in safety related position switch circuits that could be subject to a harsh environment during a design basis accident. These connections were located in various rooms in the Auxiliary Building. In order to ensure that all the wire nut connections had been found, a thorough review was completed. First the electrical connection drawings (E-618 series) for the qualified position switch circuits were reviewed to locate where in the plant a wire nut connection existed. Then, in order to validate that the electrical drawings showing the connections were correct, an inspection walkdown was conducted of a random sampling of 31 position switch junction boxes identified by the drawings as having wire nut connections. The results of the review determined that the electrical drawings correctly depicted wire nut connections. Also, as a result of this review, 39 position switch circuits were identified (using the drawings) as having wire nut connections. These wire nut connections were replaced with qualified electrical connections during the 1992 refueling outage. Because the drawings were verified as being correct, all junction boxes potentially containing wire nut connections were not physically inspected.

On July 1, 1995, at 0800 hrs, with the plant shut down for refueling, an electrical connection with wire nuts was discovered on cables leading to the containment service water outlet valve solenoid valve. The unqualified electrical connection (wire nuts) was found within a pull box in the Component Cooling Water Room outside of containment. The wire nut connection was replaced with environmentally qualified connections.

The wire nuts found during the 1995 refueling outage were not discovered by the 1992 investigation because there was no electrical drawing (E-618 series) for the pull box that was found in 1995 to contain the wire nuts. Since the electrical drawings were the basis for the 1992 investigation, and no electrical drawing existed which depicted this connection, it was not discovered by the 1992 effort. The 1995 effort used the Cable and Raceway Schedule (E-33 series), which indicates the existence of a connection regardless of the box type designation.

EVENT ANALYSIS

SV-0824 controls the operation of the containment service water outlet valve CV-0824. Service water is needed for the post accident operation of the containment air coolers for containment heat removal. Wire nuts in this circuit are a concern, as the circuit contains equipment that must be environmentally qualified. Wire nuts have never been qualified for use in a harsh environment. The failure mode of the containment service water outlet solenoid valve (loss of power) and the control valve (loss of air) is to an open, full flow position. This position

is the desired position for all events except for certain combinations of equipment failures during a Large Break LOCA.

A LOCA inside of containment would leave the CCW room dry, but would subject it to radiation shine through the containment wall. SV-0824 and the remaining solenoid valves and position switches in the circuit would remain operable until the wire nut insulation failed due to radiation.

In the event of the loss of right channel safeguards equipment during a large break LOCA, it is necessary to close CV-0824, containment service water outlet valve, to assure adequate service water flow to the CCW heat exchangers. This necessity is reflected in various EOP actions and in Off Normal Procedure (ONP) 6.1. Failure to close CV-0824 under these circumstances will result in containment cooling capability which is less than that assumed in the safety analysis. Operation under these conditions will result in a challenge to the EEQ temperature qualification envelope and possible additional equipment failures.

For an accident causing a harsh environment in the Component Cooling Water Room, failure of SV-0824 due to a loss of power would fail CV-0824 to the open position, which is also the safe position for this event.

There are four other solenoid valves and five valve position switches that are powered from the same power supply as SV-0824. A failure of the SV-0824 wiring could result in a short, causing the fuses protecting the power supply to open, resulting in a loss of power to all the solenoid valves and position switches in the circuit. These position switches have indicating lights in the Control Room which are RG 1.97, Type D, Category 2 and are used for determining the status (open or closed) of the containment heat removal system service water valves following an accident inside of containment. This information is used by the control room operator to make sure valve alignments are correct. None of these additional failures would have safety significance.

SAFETY SIGNIFICANCE

For a MSLB or LOCA inside containment, the subject wire nuts would not be exposed to harsh pressures or temperatures that could have a direct mechanical effect by causing shorts, etc. The only mechanism that would exist to degrade the insulating properties of the wire nuts would be from radiation shine through the containment wall. This would only be present following a LOCA, and then only if large scale fuel damage were to occur.

The Service Water System supply to containment is an essential system that automatically continues to operate post-LOCA. Failure of the wire nuts could cause a short which could blow the fuses in the circuit. The most significant result would be that the containment Service Water System outlet valve (CV-0824) air solenoid valve would fail open, causing the CV to fully open. Since this would assure service water flow to containment, it is the desired position for most

accident scenarios. This is not the desired position, however, for one combination of equipment failures. If a LOCA is coupled with a loss of both independent sources of offsite power and the failure of the right channel (1-2) diesel generator, only one service water pump would be available for equipment cooling. One pump is not sufficient for all cooling needs after safety injection is shifted to the recirculation mode with CV-0824 failed open. In this scenario, Emergency Operating Procedures (EOP) direct that CV-0824 be closed to assure sufficient flow to the Component Cooling Water (CCW) heat exchangers. CCW provides cooling for the containment sump water being recirculated for safety injection and containment spray. Several factors make this a highly unlikely scenario with little safety significance.

First, the length of time in which both off site power sources and 1-2 Diesel generator are all unavailable would be expected to be very short (minutes or, at most, hours). Restoration of power to a vital electrical bus would be a priority for the operators and is addressed in EOP-9.

Second, radiation-induced damage to the wire nut insulation is not instantaneous, but would occur over a significant period of time. Any damage to the insulating properties of the wire nut would result from a cumulative gamma dose over hours. The subject wire nuts are located in junction boxes, and are shielded from physical movement or abrasion. It is likely, therefore, that insulation failure would not occur.

Third, even if the circuit containing the wire nuts were to fail during this scenario, there would be no short term effect on LOCA mitigation. The time at which safety injection shifts to the recirculation mode is well past the peak containment pressure and temperature, so operation with less than desired service water flow to the CCW heat exchanger will not challenge containment integrity. The somewhat warmer safety injection water (as a result of less cooling of the sump water) would also have no effect on core cooling. Since the temperature of the containment spray water would be higher, however, heat would be removed from containment at a slower rate. Following recirculation actuation signal (RAS) this will result in somewhat higher containment temperature and pressure than were specified to establish equipment qualification. In other words the cumulative effects of exposure to pressure and temperature could be reached sooner than the nominal qualification period (typically 30 days) of equipment qualified for the LOCA environment.

It is concluded, therefore, that the presence of the subject unqualified wire nuts is of little safety significance.

CAUSE OF THE EVENT

The cause of the event was the failure of assigned engineers to use all available information during the 1992 search for wire nuts.

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CORRECTIVE ACTIONS

An Engineering Design Change (EDC) to the Service Water System Facility Change, FC-959, replaced the wire nuts with inline butt connections covered with Raychem WCSF-070-6-N heat shrink tubing. This EDC also created drawing E-618 sh. 164, Connection Diagram JL164, to document the connections.

There are a total of 116 junction and pull boxes for environmentally qualified circuits in harsh environments. A walkdown was conducted that checked 55 of the junction boxes in 1992 and 1994. Another walkdown was conducted as a result of this event that checked 57 boxes not checked in 1992 or 1994. This brings the total number of boxes inspected to 112 of 116. The remaining 4 boxes would have required the erection of scaffolding and/or picking up significant radiation dose to check. The Cable and Raceway Schedule (E-33 series) does not indicate the presence of a connection and all cross referenced drawings support this position. No other wire nut connections were found in this or previous walkdowns. Therefore, inspection of the remaining four boxes is not considered necessary.

PREVIOUS EVENTS

This event is the same as that described in the Palisades Plant Licensee Event Report 92-019, Electrical Connections Not Environmentally Qualified In Position Switch Circuits Requiring Environment Qualification.