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SUBJECT: LER 91-013-01:on 940622,containment isolation provisions for monitoring sys were inoperable.Caused by design of electrical circuitry was error.Sample return lines was modified to eliminate deficiency.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 • 3000 George Washington Way • Richland, Washington 99352

September 16, 1994
GO2-94-214

Docket No. 50-397

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

Subject: **NUCLEAR PLANT WNP-2, OPERATING LICENSE NPF-21 LICENSEE EVENT REPORT NO. 94-013-01**

Transmitted herewith is Licensee Event Report No. 94-013-01 for the WNP-2 Plant. LER 94-013-00 reported a design deficiency in the containment isolation logic for the Containment Monitoring System (CMS). As part of the associated corrective actions, engineering was assigned to review other containment isolation logics to verify acceptable design. This review was scheduled for completion by September 2, 1994; however, the scope of this review has necessitated extending this date to October 28, 1994. Presently, over 60% of the review is complete.

Should you have any questions or desire additional information, please call me or D.A. Swank at (509) 377-4563.

Sincerely,

J. V. Parrish (Mail Drop 1023)
Assistant Managing Director, Operations

JVP/CJF/my
Enclosure

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IE22

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Washington Nuclear Plant - Unit 2	0 5 0 0 0 3 9 7	1 OF 4

TITLE (4)

DESIGN ERROR IN ELECTRICAL CIRCUITRY FOR CONTAINMENT ISOLATION

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 NAMES	DOCKET NUMBERS(S)
0 6	2 2	9 4	9 4	0 1 3	0 1	0 9	1 6	9 4		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): 5

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)	_ 77.71(b)
_ 20.405(a)(1)(i)	_ 50.36(c)(1)	X 50.73(a)(2)(v)	_ 73.73(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)	_ 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
C.J. Foley, Licensing Engineer	AREA CODE 5 0 9 — 3 7 7 - 4 3 2 5

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
NA									
NA									

SUPPLEMENTAL REPORT EXPECTED (14)

_ YES (If yes, complete EXPECTED SUBMISSION DATE) X NO

EXPECTED SUBMISSION DATE (15): MONTH / DAY / YEAR

ABSTRACT (16)

On June, 22, 1994, it was determined that containment isolation provisions for both Containment Monitoring Systems were inoperable because the design of the electrical circuitry was such that failure of a single electrical relay could prevent closure of the solenoid-operated containment isolation valves associated with those particular systems. The plant was in an annual refueling and maintenance outage. The root cause is design error during initial plant construction. A plant modification was executed to revise the electrical circuitry to eliminate the design flaw causing the deficiency.

Event Description

On June 22, 1994, the plant was in operational mode 5 (refueling) at 0% power. An electrical engineer, evaluating a report provided by INPO about a condition discovered at another nuclear plant, determined that a single failure of an electrical relay [RLY] used in containment isolation logic circuits [JM] could prevent closure of solenoid-operated containment isolation valves [ISV] for the WNP-2 Containment Monitoring System [IJ] (CMS). The NRC was immediately notified per 10CFR50.72(b)(1)(ii)(B) because this condition was a violation of the single-failure criterion.

Immediate Corrective Action

The Containment Monitoring System was declared inoperable on June 22, 1994.

Further Evaluation

Two Containment Monitoring Systems serve as reactor coolant pressure boundary [AD] leak detection systems in conformance with Regulatory Guide 1.45. The closed loop systems, installed in cabinets located in the secondary containment area, draw samples of primary containment [NH] atmosphere through radiation monitors [MON], and return the samples to the primary containment. Containment isolation valves are provided for each system pursuant to GDC 56 as follows: 1) two solenoid-operated valves located outside of primary containment are installed in series in the sample supply line, and 2) a single solenoid-operated valve located outside of containment plus a check valve located inside containment provides isolation for the sample return line.

The solenoid operated valves are spring-loaded to close upon interruption of power to the solenoid [SOL].

The electrical circuitry that controls the position of these valves involves a one-out-of-two "taken twice" logic requiring receipt of either a 'high' drywell pressure or 'low' reactor water level signal in two separate circuits to interrupt power to the solenoids to allow the valves to close. Division 1 power is used to operate the logic associated with the isolation valves for one of the monitoring systems, and Division 2 power is used for the other. Each set of three valves is controlled by two electrical relays that must change position to allow the valves to close; the two relays for each set are within a single division. With this arrangement, failure of one of the two relays in the logic could prevent closure of its associated three isolation valves, which does not satisfy the single failure criterion as applied to containment isolation.

Root Cause

The root cause is design error during initial plant construction. The original design, released in 1979, included appropriate divisional separation, and consequently was not subject to this deficiency. However, a design change in 1982 eliminated the divisional separation, thereby causing the deficiency as it existed when found. No records have been located documenting the rationale for the 1982 change.

Further Corrective Actions

The configuration of the control and indication circuitry for the solenoid-operated valves in the sample return lines was modified to eliminate the deficiency. The modification exchanged the control and indication circuits for one of the solenoid valves in each of the sample supply lines with that of the other electrical division, so that one of the two valves in series is actuated by the Division 1 logic and the other by the Division 2 logic. With this arrangement, failure of a single relay in either division's logic cannot prevent containment isolation.

A representative sample of containment isolation valves was reviewed to determine if a single failure in control logic could prevent valve closure. No other cases were identified. A complete review of all containment isolation logics will be completed by October 28, 1994, to verify acceptable design.

Safety Significance

The equipment and tubing [TBG] comprising the Containment Monitoring Systems is a leak-tight closed loop boundary isolating the primary containment atmosphere from secondary containment. These systems are not qualified as extensions of primary containment, but are equipped with pressure switches [PS] to isolate the sample supply and return lines from the system if the system pressure should rise to 2 psig. Leakage from the supply and return tubing or from the monitoring systems would enter the secondary containment which is designed to mitigate radioactive releases. Consequently, two barriers exist to limit the release of radioactivity in the event of a LOCA and concurrent failure of the containment isolation valves to close (the closed loop systems and secondary containment).

An existing analysis was available to assess the radiological consequences of a postulated accident involving the following assumed simultaneous failures: a LOCA involving core damage, failure of the containment isolation valves in the sample return line to close, and a breach of the closed loop system outboard of the open containment isolation valves. Based on the assumptions, the analysis showed that the 10CFR100 reference values for thyroid exposure at the exclusion boundary and GDC 19 thyroid limits for the control room would be exceeded. The assumptions included one open path from primary containment, while the deficiency described in this LER could involve two open paths which also result in exceeding 10CFR100 reference values and GDC 19 limits.

Using figures from WNP-2 probabilistic risk studies, the probability of a LOCA with accompanying release of radioactivity to the containment atmosphere is 1.78×10^{-5}/year and the probability for a single relay to fail to open is 6×10^{-3}/year. The aggregate probability for radioactive release from primary containment is $(1.78 \times 10^{-5}) \times (6 \times 10^{-3}) \times 2 = 2 \times 10^{-7}$/year; the factor of 2 is used because two relays must change position to effect containment isolation.

While the Containment Monitoring System is not qualified as an extension of containment, it does consist of closed loops that function as a pressure boundary during normal plant operations. The probability of failure of the pressure boundary of those systems is low, but not quantifiably so, because the monitoring systems have not previously been considered in probabilistic risk studies at WNP-2. However, those boundaries do provide further reduction of the aggregate failure probability of 2×10^{-7}/year.

Based on the above, it is concluded that the design error involving the electrical circuitry used to control containment isolation valves for the Containment Monitoring Systems was of low safety significance.

Similar Event

LER 94-009 "Incorrect Isolation Valve Component Selection," reported installation of excess flow check valves as inboard isolation valves in the sample return lines for the Containment Monitoring Systems. This type of check valve was determined to be unable to satisfy requirements for the particular installation since such valves could open without operator action when primary containment pressure had declined below approximately 3.5 psid after a LOCA. The corrective action was to replace the excess flow check valves with ordinary check valves. However, that corrective action could not have been expected to address the deficiency of this LER because it involved a passive mechanical device problem, while the present event involves an electrical design error.