CATEGORY 1

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FACIL:50-397 WPPSS Nuclear Project, Unit 2, Washington Public Powe 05000397
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SUBJECT: LER 97-001-00:on 970211,reactor water cleanup sys blowdown flow isolation setpoint slightly above TS allowable valve occurred due to calculation error.Switches LD-FS-15 & LD-FS-16 were declared inoperable.W/970313 ltr.

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CATEGORY 1 DOCUMENT

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
P.O. Box 968 • Richland, Washington 99352-0968

March 13, 1997
GO2-97-049

Docket No. 50-397

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

Gentlemen:

Subject: **NUCLEAR PLANT WNP-2, OPERATING LICENSE NPF-21**
LICENSEE EVENT REPORT NO. 97-001-00

Transmitted herewith is Licensee Event Report No. 97-001-00 for WNP-2. This report is submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) and discusses the items of reportability, corrective action taken, and action to preclude recurrence.

Should you have any questions or desire additional information regarding this matter, please call me or Ms. Lourdes Fernandez at (509) 377-4147.

Respectfully,

G.O. Smith /for

P.R. Bemis
Vice President, Nuclear Operations
Mail Drop PE23

Enclosure

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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 6

TITLE (4) REACTOR WATER CLEANUP SYSTEM BLOWDOWN FLOW ISOLATION SETPOINT SLIGHTLY ABOVE TECHNICAL SPECIFICATION ALLOWABLE VALUE DUE TO CALCULATION ERROR

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 NUMBER(S)
02	11	97	97	- 0 0 1 -	0 0	03	13	97	N/A	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	1
POWER LEVEL (10)	0 9 4

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)

__ 20.402(b)	__ 20.405c	__ 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)	X 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 AREA CODE	TELEPHONE NUMBER
J.D. Arbuckle, Licensing Technical Specialist	509	377-4601

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 (16)

On February 11, 1997 at 1314 hours with the plant in Mode 1 at 94 percent reactor power, it was determined that WNP-2 did not comply with a Technical Specification action requirement for Reactor Water Cleanup (RWCU) System Isolation Actuation Instrumentation.

During the revision of a Leak Detection (LD) System calculation, Design Engineering personnel determined that the RWCU high blowdown flow isolation trip signal was calculated incorrectly and set non-conservative to the Technical Specification allowable value. The calculation was being revised to provide the basis for an RWCU high blowdown flow time-delay in support of conversion to the Improved Technical Specifications. The root cause of this event was an analysis deficiency in that the setpoint calculation and subsequent flow switch settings would not have limited RWCU System blowdown flow to $\leq$271.1 gpm. An incorrect formula was used to convert the differential pressure flow measurement term to a voltage setpoint that was then utilized to calibrate and set the flow switches. Due to the error in the setpoint calculation, the components (flow switches) had been set at 275.7 gpm. The setpoint calculation and surveillance procedures did not satisfy the Technical Specification requirement. The surveillance procedures were developed with the setpoint calculation as a basis.

The setpoints were recalculated using a more appropriate design input. Following applicable procedural revisions, the flow switches were recalibrated to the new setpoint value and the system was returned to service. Further corrective action includes performing a detailed review of instrument setpoint calculations for those that include differential pressure transmitters as the flow monitoring method.

This event posed no threat to the health and safety of either the public or plant personnel. The small difference between the actual and required setpoint of the flow switches did not affect the ability of the system to perform its intended safety function of mitigating a high energy line break.

Event Description

On February 11, 1997 at 1314 hours with the plant in Mode 1 at 94 percent reactor power, it was determined that WNP-2 did not comply with a Technical Specification action requirement for Reactor Water Cleanup (RWCU) System [CE] Isolation Actuation Instrumentation.

During the revision of a Leak Detection (LD) System [IJ] calculation, Design Engineering personnel determined that the RWCU high blowdown flow isolation trip signal was calculated incorrectly and set non-conservative to the Technical Specification allowable value. The calculation was being revised to provide the basis for an RWCU high blowdown flow time-delay in support of conversion to the Improved Technical Specifications.

It was determined that an improper DC voltage setpoint for Leak Detection System Flow Switches LD-FS-15 and LD-FS-16 [FS] had been used in the original calculation. These flow switches initiate primary containment and reactor coolant pressure boundary isolation through closure of either RWCU Inboard Isolation Valve RWCU-V-1 or RWCU Outboard Isolation Valve RWCU-V-4 [V]. An incorrect formula was used to convert the differential pressure flow measurement term to a voltage setpoint that was then utilized to calibrate and set the flow switches. The formula included a square root extractor in the instrument loop, which provides a linear relationship between differential pressure and flow output in terms of voltage. The actual design of the instrument loop does not include a square root extractor. The as-designed configuration results in a non-linear relationship between differential pressure and flow.

The Technical Specification allowable value for these flow switches is $\leq$271.1 gpm. Due to the error in the setpoint calculation, the components had been set at 275.7 gpm. Setting the flow switches at greater than 271.1 gpm resulted in not meeting Technical Specification 3.3.2. This condition existed since initial calibration of the switches following installation during the Spring 1995 (R-10) Maintenance and Refueling Outage. The Technical Specification amendment that added the blowdown flow-high function was issued by the NRC on September 19, 1996.

Contrary to Isolation Actuation Instrumentation Technical Specification 3.3.2, action was not taken to declare the channel inoperable or perform Actions 22 or 27 of Table 3.3.2-1 because the inoperable condition had not been previously identified. Action 22 requires that the affected system isolation valves be closed within one hour and declare the affected system inoperable. Action 27 requires that RWCU Blowdown Flow Isolation Valve RWCU-V-32 [V] be closed within one hour or perform Action 22.

Since the condition was not identified until February 11, 1997, compensatory actions were not taken in accordance with the Technical Specifications until then. Accordingly, this event is being reported as a condition prohibited by the WNP-2 Technical Specifications pursuant to 10 CFR 50.73(a)(2)(i)(B).

Immediate Corrective Action

On February 11, 1997 at 1314 hours, Leak Detection System Flow Switches LD-FS-15 and LD-FS-16 were declared inoperable. Reactor Water Cleanup System blowdown flow was isolated by closure of RWCU-V-32 as required by the Technical Specifications on February 11, 1997 at 1334 hours.

Further Evaluation

The blowdown flow-high signal is provided to detect a postulated High Energy Line Break (HELB) at the four-inch piping connection to RWCU System Blowdown Flow Control Valve RWCU-FCV-33 [FCV]. Flow switches LD-FS-15 and LD-FS-16 are used to actuate this signal.

During preparation of the design change to install the leak detection instrument loop, the flow switch setting formula was selected by the calculation preparer using a linear method for converting from differential pressure to flow. The formula was used to convert the differential pressure flow measurement term to a voltage setpoint that was then utilized to calibrate and set the flow switches.

The individuals involved in development and approval of the original calculation were not aware that the conversion formula used to set the flow switches did not accurately represent the instrument loop. The conversion formula in the original calculation included a square root extractor. With a square root extractor included, the one-five volt setting range of the flow switch varies as a simple linear function of flow. In this particular design, the instrument loop actually consists of a flow element, flow transmitter, signal resistor unit and a flow switch. As a result, the one-five volt setting range of the flow switch varies as a square function of flow (gpm). Self checking was not applied to assure that calculation of the flow switch setting using a linear conversion method was correct for this application.

Due to the error in the setpoint calculation, the trip setpoint for the flow switches was incorrectly determined to be 4.38 VDC. This setpoint actually corresponded to a flow value of 275.7 gpm, which exceeded the required 271.1 gpm. Considering the setpoint tolerances for the flow switches, the lowest acceptable setpoint in the original calculation corresponded to 273.7 gpm, which also exceeded the Technical Specification allowable value.

The following table represents a description of the conversion differences and the impact to flow switch settings. For ease of reference, the table also includes data from the current revision to the calculation. A square root extractor was included in the original calculation. The followup revision does not include a square root extractor.

Flow (GPM)	Calculated Voltage (Revision 0: 12/21/94)	Calculated Voltage (Revision 1: 02/12/97)
300	5.00	5.00
290	4.87	4.74
280	4.73	4.49
270	4.60	4.24
260	4.47	4.01
250	4.33	3.78

Based on the revised calculation, a flow value of 271.1 gpm corresponds to a voltage setting of 4.28 VDC.

Root Cause

The root cause of this event was an analysis deficiency in that the setpoint calculation and subsequent flow switch settings would not have limited RWCU System blowdown flow to $\leq$271.1 gpm. The analysis deficiency was the result of a lack of self-checking and verification to an appropriate level of detail. As a result, an inappropriate design input was used to derive the setpoint values. The setpoint calculation and surveillance procedures did not satisfy the Technical Specification requirement. The surveillance procedures were developed with the setpoint calculation as a basis.

Further Corrective Action

The calculation for setting the range determination for LD-FS-15 and LD-FS-16 was revised to provide for corrected setpoints using the appropriate flow conversion formula.

Applicable channel calibration, channel functional test and response time testing procedures were modified to incorporate the corrected setpoints from the revised calculation.

Flow switches LD-FS-15 and LD-FS-16 were recalibrated to the correct value. Following restoration of the flow switches to operable status and realignment of the RWCU System, RWCU-V-32 was re-opened on February 28, 1997 at 2018 hours.

The individuals involved were counseled concerning the importance of attention to detail and self-checking during the preparation and verification of calculations.

A preliminary review of flow-related setpoint calculations was performed. No additional discrepancies were identified.

A followup detailed review of instrument setpoint calculations, and associated master data sheets, will be performed for those that include differential pressure transmitters as the flow monitoring method. These will be reviewed to ensure a correct calculation method has been used that is appropriate for the loop design.

Management expectations pertaining to calculational methodology will be reinforced with those individuals who perform and verify calculations.

A self assessment will be performed on setpoint calculation methods.

Assessment of Safety Consequences

There were no unacceptable consequences associated with this event. The small difference between the actual and required setpoint of the flow switches did not affect the ability of the system to perform its intended safety function. Accordingly, the event posed no threat to the health and safety of either the public or plant personnel.

Based on the setpoint calculation for flow switches LD-FS-15 and LD-FS-16, the break flow for the postulated HELB at the upstream piping connection to RWCU Blowdown Flow Control Valve RWCU-FCV-33 would reach 1,500 gpm within 0.1 second of the occurrence of the break. The blowdown calculation assumes a peak flow of 2186 gpm in 0.14 second. Considering the small time interval for the break flow to ramp up to 1,500 gpm, the increase in RWCU System high blowdown flow actuation response time associated with the difference between the Technical Specification maximum allowable setpoint value and the maximum setpoint value is insignificant (0.00032 second).

The increase in flow switch setting for the HELB event is bounded by the calculated uncertainty values for the instrument loop. Since the flow switches remained within process limits of 220 gpm and 1500 gpm, the switches would be expected to perform their design basis function. Exceeding the Technical Specification maximum allowable setpoint value for LD-FS-15 and LD-FS-16 would not have prevented the RWCU System high blowdown flow isolation function from performing its design basis function. The environmental effects of the postulated HELB at the piping connection to flow control valve RWCU-FCV-33 also remained within analyzed limits. The environmental qualification of equipment located in the Reactor Building would be maintained.

The capability of the RWCU System high blowdown flow isolation function to perform its design basis function also provides assurance that the radiological effects of an HELB and loss of coolant are bounded by the accident analysis for the design basis main steam line break outside of containment.

Furthermore, no credit is taken for an RWCU System high blowdown flow isolation in any design basis accident analysis. The assumptions for design basis accident analyses remain valid.

Similar Events

Licensee Event Report 96-009 reported a problem involving the use of an inappropriate design input for the derivation of instantaneous overcurrent setpoints for Standby Service Water (SSW) System Pump SSW-P-1A. The settings were calculated using inaccurate vendor locked rotor current data and a non-conservative selection of the associated multiplication factor. The settings were inadequate to account for possible variations in starting currents.

This condition, which had existed since implementation of a design change in November 1996, was discovered following a pump trip during a start attempt from the control room. Corrective action includes providing appropriate personnel with formal guidance pertaining to vendor data validation and conducting a formal assessment of instantaneous overcurrent relay setpoint methodology and the use of locked rotor test data. The corrective actions taken in response to LER 96-009 would not have precluded the RWCU high blowdown flow isolation setpoint problem described in this report since the RWCU calculation was performed prior to the event described in that LER.

There were also ten similar events pertaining to setpoint problems from the period 1987 through 1993 where the cause was attributed to an analysis deficiency (LERs 87-026, 87-032, 88-023, 92-002, 92-006, 92-009, 92-010, 92-014, 92-041 and 93-011).

A number of these previous events were the direct result of a Supply System effort to improve the level of confidence in Technical Specification related setpoints. The events were identified as part of a Setpoint Methodology Program which was implemented to incorporate necessary conservatism and modern analytical setpoint calculation techniques.

The corrective actions taken in response to the previous events would also not have been expected to preclude this event. Those corrective actions were not designed to address causal factors such as self-checking and attention to detail during the preparation and verification of calculations.