

Virginia Electric and Power Company  
North Anna Power Station  
P. O. Box 402  
Mineral, Virginia 23117

May 23, 1994

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

NAPS: MPW  
Docket Nos. 50-338  
50-339  
License Nos. NPF-4  
NPF-7

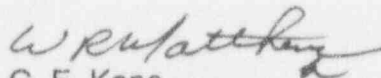
Dear Sirs:

Pursuant to North Anna Power Station Technical Specifications, Virginia Electric and Power Company hereby submits the following Voluntary Licensee Event Report applicable to North Anna Units 1 & 2.

Report No. 50-338/94-002-00

This Report has been reviewed by the Station Nuclear Safety and Operating Committee and will be forwarded to the Management Safety Review Committee for its review.

Very truly yours,



G. E. Kane  
Station Manager

Enclosure:

cc: U.S. Nuclear Regulatory Commission  
101 Marietta Street, N.W.  
Suite 2900  
Atlanta, Georgia 30323

R. D. McWhorter  
NRC Senior Resident Inspector  
North Anna Power Station

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# LICENSEE EVENT REPORT (LER)

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HOURS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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.

FACILITY NAME (1)  
North Anna Units 1 & 2

DOCKET NUMBER (2)  
05000338

PAGE (3)  
1 OF 6

TITLE (4)  
POSTULATED FAILURE OF HIGH HEAD SAFETY INJECTION PUMP DISCHARGE CHECK VALVE

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
04	20	94	94	002	00	05	24	94	North Anna Unit 2	05000339
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9) 1	THIS REPORT IS 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)
POWER LEVEL (10) 100	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)	<input checked="" type="checkbox"/> OTHER
	20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)
	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)	
			VOLUNTARY	

LICENSEE CONTACT FOR THIS LER (12)

NAME  
Greg Kane, Station Manager

TELEPHONE NUMBER (Include Area Code)  
(703) 894-2101

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)

NO

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

On April 20, 1994, with Units 1 & 2 in Mode 1 (100 percent power) a concern that the single failure of the "A" charging pump discharge check valve failing to seat could prevent adequate High Head Safety Injection (HHSI) flow to the reactor core was identified. A Safety Injection (SI) signal automatically starts the "B" and "C" charging pumps and trips the "A" charging pump if it is in operation. If the discharge check valve for the "A" charging pump fails to close this could result in a major portion of the SI flow being diverted through the idle "A" charging pump. This scenario was identified during a review of the Unit 2 "C" charging pump discharge check valve, 2-CH-208, which momentarily failed to seat during a charging pump swap over evolution on April 18, 1994. This event is being reported as a Voluntary Licensee Event Report due to possible industry impact.

The cause of 2-CH-208 to momentarily hold open could not be positively determined during subsequent inspections.

No significant safety consequences resulted from this event because sustained failure of a check valve to close simultaneously with a Design Basis Accident was determined to be improbable. Therefore, the health and safety of the public are not affected by this event.

**LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION**

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
North Anna Units 1 & 2	05000338	94	002	00	2 OF 6

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

1.0 Description of the Event

On April 20, 1994, with Units 1 & 2 in Mode 1 (100 percent power) a concern that the single failure of the "A" charging pump discharge check valve (EISS System CB, Component ISV) failing to seat could prevent adequate High Head Safety Injection (HHSI) (EISS System BQ) flow to the reactor core (EISS System AC, Component RCT) was identified. A Safety Injection (SI) signal automatically starts the "B" and "C" charging pumps and trips the "A" charging pump if it is in operation. If the discharge check valve for the "A" charging pump fails to close this could result in a major portion of the SI flow being diverted through the idle "A" charging pump. This scenario was identified during a review of the Unit 2 "C" charging pump discharge check valve, 2-CH-208, which momentarily failed to seat during a charging pump swap over evolution on April 18, 1994. This event is being reported as a Voluntary Licensee Event Report due to possible industry impact.

On April 18, 1994, at 1356 hours, while swapping the inservice charging pumps for performance of an ISI Periodic Test (PT) on the Unit 2 "A" pump, a momentary transient occurred. It was determined the "C" charging pump discharge check valve hung open while the pump was being secured resulting in a momentary decrease of charging header pressure to approximately 2100 psi and a subsequent reduction in charging and seal injection flow. During the Unit 2 charging pump swap over evolution an operator in the auxiliary building (EISS System NF) heard the "C" charging pump discharge check valve, 2-CH-208, close. The "C" pump discharge check valve was subsequently disassembled, inspected and measurements taken to determine if any abnormal wear or interference existed. During the inspection it was noted the dimensional tolerances were satisfactory. Slight wear was observed on the anti-rotation pins and on one side of the swing arm in the bushing area. Efforts to intentionally bind the check valve, by manual stroking, in the open position could not produce a similar situation. During the manual stroking the disc stud was observed in close proximity to the valve body. However, it is not believed to be a factor in causing the check valve to hang open. The entire internal valve assembly was replaced as a precautionary measure due to the importance of the check valve to core cooling. Post-maintenance testing of the check valve, which included an open verification and a full closed verification, was performed satisfactory.

A work history review was performed on 3" bolted bonnet swing check valves manufactured by Velan and supplied by Westinghouse as part of the Nuclear Steam Supply System (NSSS). This type of valve is used throughout the high pressure portion of the Chemical

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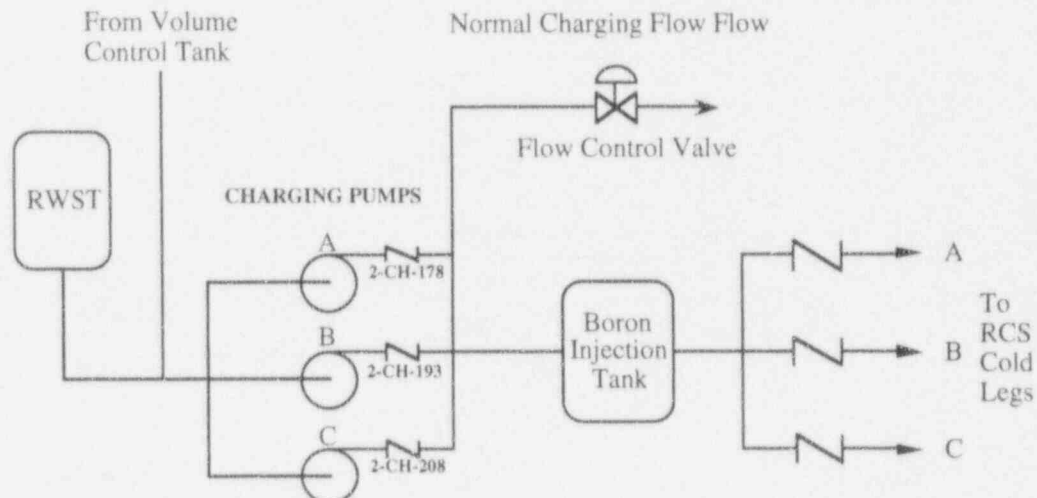
TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

Volume Control System (CVCS) (EISS System CB) and in the High Head Safety Injection (HHSI) system. The review noted that of the 24 check valves identified, failures of the check valve to fully close have been encountered with two Unit 2 charging pump discharge check valves, 2-CH-178 ("A" pump) and 2-CH-208 ("C" pump). The Unit 2 "C" charging pump discharge check valve, 2-CH-208 had similar failures on March 25, 1986 and March 23, 1987. A voluntary LER, 87-002-00, was submitted on the latter event due to the potential for loss of high head safety injection flow path. The Unit 2 "A" charging pump discharge check valve, 2-CH-178, had similar failures on October 29, 1987 and November 17, 1987.

2.0 Significant Safety Consequences and Implications

No significant safety consequences resulted from this event because sustained failure of a check valve to close simultaneously with a Design Basis Accident was determined to be improbable. The momentary hang-up that the check valve experienced would cause a temporary transient flow situation, but would be of minor consequence with respect to Emergency Core Cooling System (EISS System JE) performance. Therefore, the health and safety of the public are not affected by this event.

**UNIT 2 HIGH HEAD SAFETY INJECTION  
NORMAL FLOW PATH**





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Based on the guidance provided in ANSI 51.1-1983 "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants," the charging pump discharge check valves are considered to be active valves. However, since these check valves are included in the station's pump and valve IST program, in which the operability of the valves is demonstrated by routine testing, they continue to support the original design exemption from the active failure criteria per ANS 58.9-1981, "Single Failure Criteria for Light Water Reactor Safety-Related Fluid Systems." Of the five failures where the valve did not fully close immediately, four occurred in 1986 and 1987. The four failures were limited to two valves and there was little or no maintenance associated with the first failures in each case. The second failure resulted in a more thorough inspection and repair/replacement of internal components. Since that time there have been no problems with the discharge check valve on the Unit 2 "A" charging pump. There have been no transients during pump swaps as a result of the "A" discharge check valve, all inspections have been completed satisfactory and the flow and backflow PTs have been completed satisfactory. Failure of the check valve to seat to prohibit flow in the reverse direction, simultaneous with a DBA, is not considered to be a credible event.

3.0 Cause of the Event

Cause of "C" pump discharge check valve to momentarily hold open could not be positively determined during subsequent inspections. The check valve was disassembled and inspected and did not reveal any definitive problems with binding. Dimensional checks performed to ensure proper clearances did not reveal any out of tolerance measurements. The valve internal parts were replaced with new parts as a preventative measure.

4.0 Immediate Corrective Actions

Operations has taken actions that would ensure the continued high reliability of the HHSI system. These actions prohibit placing the "A" charging pump in operation when the "B" and "C" pumps are available.

5.0 Additional Corrective Actions

Subsequent to the 2-CH-208 check valve return to service, discussions were held with Velan Engineering concerning the potential for disc hanger jamming of the 3"-1500 lb. swing check valve design. Velan indicated that a 10 CFR Part 21 notification was submitted on November 5, 1980, to advise the NRC about 4" and 6" swing check valve hanger jamming against a machined relief in the valve body when in the full open position.

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Velan determined that this problem was not generic, but rather a function of an accumulation of machining tolerances in the valve. The failure potential described in the Velan Part 21 was issued by the NRC via IEIN 81-30. In response to this issue, North Anna Power Station inspected a random sample of the 6" check valves on both units in 1982 and found no signs of disc hanger jamming. Discussion with Velan Engineering on May 2, 1994 indicated that the 3"-1500 lb. check valve also had an internal valve body design similar to Figure 1 of the subject Part 21 notification. The recent inspection of the 2-CH-208 check valve indicated that only a very small clearance existed between the end of the disc stud and the machined relief area in the valve body.

6.0 Actions to Prevent Recurrence

The Velan Swing Check Valve repair procedure will be revised to include additional inspections related to disc hanger jamming (IEIN 81-30) and to ensure adequate disc stud-to-valve body clearance exist.

The preventative maintenance inspection frequency for the six charging pump discharge check valves will be increased from 5 years to every 18 months. The frequency will be monitored and modified as indicated by valve performance.

The Unit 2 "A" charging pump discharge check valve was disassembled and all internal parts were replaced due to excessive clearances.

Unit 1 "A" charging pump discharge check valve internals will be disassembled and inspected using the revised repair procedure to check for binding and proper clearances. Following the inspection, the operational restrictions on the charging pumps will be removed.

7.0 Similar Events

Unit 2 LER, N2-87-002-00, "C" charging pump discharge check valve hung open due to insoluble granular type substance in hanger bracket bushing.

8.0 Additional Information

As a result of the events in 1986 and 1987 actions were initiated to revise procedures to inspect the charging pump discharge valves every refueling outage. This action was closed to a similar action which required the development of a check valve program in response to SOER 86-3 "Check Valve Failures or Degradation". The inspection frequency of the valves

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was revised to once every 18 months. Inspections were performed on the Unit 2 "A" pump discharge check valve in 1989, 1990, and 1991 with no problems noted. The "C" pump discharge check valve was inspected in 1990 with no problems noted. The inspection in 1992 was voided because the inspection frequency had been decreased to once every five years. This frequency change was a result of a review performed by the Check Valve Coordinator based on past inspection results, past performance, and ISI testing.

Velan Valve Corporation submitted a 10 CFR Part 21 notification on this design check valve due to the potential for the valve to stick open if the tolerances between the pin bushings and hanger block and arm are inadequate. The Part 21 was sent out in 1992 and Virginia Power addressed its impact on both North Anna and Surry under OER WEST 92-12 "Potential for Velan Check Valve Failures". The procedure for disassembly and inspection of the check valves had been revised to incorporate the dimensional checks between the bushings and arm/block. These checks were performed on the "C" charging pump discharge check valve for both the original internal assembly and the replacement assembly and found to be within specification. It was determined the Part 21 failure mode was not applicable to this case.

**Charging Pump Discharge Check Valve Data:**

Component - Bolted Bonnet Swing Check Valve  
 Manufacturer - Velan Valve Corporation  
 ID Number - 3C58  
 Valve Size - 3 inch forged