

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

April 25, 1994

U. S. Nuclear Regulatory Commission
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Docket No. 50-339
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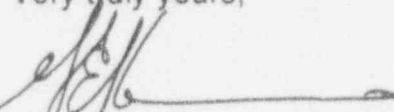
Dear Sirs:

Pursuant to North Anna Power Station Technical Specifications, Virginia Electric and Power Company hereby submits the following Supplemental Licensee Event Report applicable to North Anna Unit 2.

Report No. 50-339/93-007-01

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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|---|--------|--|----------------|---|-----------------|------------------|-----------|--|-------------------------------|---|------------------|--|--|
| NRC FORM 366 <small>(5-92)</small> | | | | U.S. NUCLEAR REGULATORY COMMISSION | | | | APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95 | | | | | |
| LICENSEE EVENT REPORT (LER) <small>(See reverse for required number of digits/characters for each block)</small> | | | | | | | | | | ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNB 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 Unit 2 | | | | | | | | DOCKET NUMBER (2) 05000 339 | | PAGE (3) 1 OF 4 | | | |
| TITLE (4) HIGH HEAD SAFETY INJECTION FLOW BELOW TECHNICAL SPECIFICATION MINIMUM | | | | | | | | | | | | | |
| 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) | | |
| 10 | 14 | 93 | 93 | 007 | 01 | 04 | 25 | 94 | | | 05000 | | |
| | | | | | | | | | | | 05000 | | |
| OPERATING MODE (9) | | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11) | | | | | | | | | | | |
| 1 | | 20.402(b) | | | | 20.405(b) | | | | 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) | | 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)(C) | | | |
| | | 20.405(a)(1)(v) | | | | 50.73(a)(2)(iii) | | | | 50.73(a)(2)(x) | | | |
| 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) | | | | | | | | | | | | | |
| YES (If yes, complete EXPECTED SUBMISSION DATE) | | | | X NO | | | | EXPECTED SUBMISSION DATE (15) | | MONTH | DAY | YEAR | |
| | | | | | | | | | | | | | |
| ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16) <p>On October 14, 1993, with Unit 2 in Mode 5 (Cold Shutdown), during High Head Safety Injection (HHSI) flow balance testing, the "as-found" cold leg branch line flow was found to be below the Technical Specifications (TS) minimum requirement. The sum of the branch line flows, excluding the highest flow rate, is required by TS 4.5.2.h to be greater than or equal to 359 gpm. However, the sum of the two lowest measured branch flow rates was found at 356 gpm. The cold leg Safety Injection throttle valves were adjusted so that sum of the two lowest flow rates was equal to 384 gpm.</p> <p>On November 8, 1993, concerns were identified about the flow balancing data due to instrument inaccuracies. All three charging pumps were twice declared inoperable, and TS 3.0.3 was entered. At 1402 hours on November 9, 1993, seal injection flow was decreased to allow two charging pumps to meet the requirement of the TS, and TS 3.0.3 was exited. This event is reportable pursuant to 10 CFR 50.73 (a)(2)(i)(B) as a condition prohibited by Technical Specifications.</p> <p>The primary suspected cause of the event is previously unaccounted for uncertainties in the Unit 2 HHSI flow balance measurements due to adverse system piping geometry's.</p> <p>No significant safety consequences evolved as a result of this event because a previous analysis has shown that the existing HHSI branch flows are within the design basis limits. Therefore, the health and safety of the public were not affected.</p> | | | | | | | | | | | | | |

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. 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) | DOCKET NUMBER (2) | LER NUMBER (6) | | | PAGE (3) |
|-------------------|-------------------|----------------|-------------------|-----------------|----------|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| North Anna Unit 2 | 05000 339 | 93 | 007 | 01 | 2 OF 4 |

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

1.0 Description of the Event

On October 14, 1993, with Unit 2 in Mode 5 (Cold Shutdown), during High Head Safety Injection (HHSI) (EISS System Identifier BQ) flow balance testing, the "as-found" cold leg branch line flow was found to be below the Technical Specifications (TS) minimum requirement. The sum of the branch line flows, excluding the highest flow rate, is required by TS 4.5.2.h to be greater than or equal to 359 gpm. However, the sum of the two lowest measured branch flow rates was found at 356 gpm. The cold leg Safety Injection throttle valves (EISS Component Identifier INV) were adjusted so that sum of the two lowest flow rates was equal to 384 gpm.

On November 8, 1993, concerns were identified about the flow balancing data due to instrument inaccuracies. These instrument inaccuracies were a result of the adverse system geometry's. All three charging pumps were declared inoperable at 0930 hours because they could not meet the requirements of TS 4.5.2.h and TS 3.0.3 was entered. Based on a preliminary Engineering calculation, the seal injection flow rates were then adjusted to allow the HHSI flow balance to meet the TS requirement, and two of the charging pumps were declared operable at 1006 hours. The computer HHSI System model showed that seal injection flow would have to be reduced more than predicted in the preliminary calculation to allow the HHSI flow balance to meet the TS requirements. At 1445 hours, all three charging pumps were again declared inoperable, and TS 3.0.3 was entered. NRC discretionary enforcement from TS 4.5.2.h was requested, and a 24 hour extension to restore two charging pumps to operable status was received. At 1402 hours on November 9, 1993, seal injection flow was further decreased to allow two charging pumps to meet the requirement of the TS, and TS 3.0.3 was exited. This event is reportable pursuant to 10 CFR 50.73 (a)(2)(i)(B) as a condition prohibited by Technical Specifications.

2.0 Significant Safety Consequences and Implications

No significant safety consequences evolved as a result of this event because a previous analysis has shown that the existing HHSI branch flows are within the design basis limits. Therefore, the health and safety of the public were not affected.

3.0 Cause of the Event

The Root Cause Evaluation (RCE) for this event has been completed. The primary cause is previously unaccounted for uncertainties in the Unit 2 HHSI flow balance measurements due to adverse system piping geometry. The HHSI system piping geometry contributes to a swirl flow to which the ultrasonic flow measurement equipment is extremely sensitive. A lack of understanding concerning the affect swirl flow has on flowmeter accuracy has, in the past, resulted in erroneous data.

The use of new technology (i.e. strap-on ultrasonic flowmeters) was based on an approved vendor's assessment that desired accuracy could be achieved. Available vendor information and vendor training of station personnel were relied upon to ensure proper application of the equipment. The vendor manual did not provide complete information concerning limitations of the ultrasonic flowmeters. It has been determined, depending on piping geometry that the flowmeters should be located as much as 100 pipe diameters downstream of any pipe fitting in order to remove the fluid swirl affect. In addition, multiple versus single beam transducer measurement techniques may be required to achieve the desired accuracy. It has also been determined, by in-house testing, that variation in the ultrasonic flowmeter transmit frequency has a large effect on the measured flow rate. The station procedure controlling the use of the flowmeters was generic and did not provide guidance on site specific problems which may be encountered.

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| FACILITY NAME (1) North Anna Unit 2 | DOCKET NUMBER (2) 05000 339 | LER NUMBER (6) | | | PAGE (3) |
| | | YEAR 93 | SEQUENTIAL NUMBER 007 | REVISION NUMBER 01 | 3 OF 4 |

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

3.0 Cause of the Event (continued)

In addition, the current Technical Specification requirements for acceptable HHSI flow balancing are extremely restrictive. After allowing for minor performance differences among individual HHSI pumps, and the reactor coolant pump seal injection flow, there is a very narrow band of allowable flow rates. Achieving flows with this narrow band requires very accurate flow measurement. Also, the restrictive flow band does not recognize the considerable margin to the safety analysis limits.

4.0 Immediate Corrective Actions

The cold leg Safety Injection throttle valves were adjusted so that the sum of the two lowest flow rates was equal to 384 gpm.

Loctite 290 Threadlocker® was installed on the valve stem to yoke bushing to prevent valve stem movement.

The throttle valves were x-rayed and reviewed with the vendor for defects. It was determined that the valves were intact.

The seal injection flow rates were adjusted to allow the HHSI flow balance to meet the TS requirement.

NRC enforcement discretion from TS 4.5.2.h was requested and received.

5.0 Additional Corrective Actions

An emergency TS change consistent with the NRC's enforcement discretion policy has been submitted.

Further evaluation of the TS will be conducted to determine whether additional enhancements may be warranted.

6.0 Actions to Prevent Recurrence

Management has reviewed the recommendations of the completed root cause evaluation and determined the following actions are necessary to prevent recurrence.

The safety analysis will be evaluated for minimum acceptable emergency core cooling system flow rates to justify a larger band of allowable flow rates.

A TS revision to Section 4.5.2.h has been submitted to the NRC to specify flow balance acceptance criteria values based on the results of the safety analysis evaluation rather than specific values. This allows for fuel cycle and equipment specific considerations to be accounted for in the balancing test without requiring frequent TS changes.

The flow instruments for the cold leg branch lines will be replaced or supplemented with instruments that measure flow more accurately.

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|-------------------|----------------------|----------------|----------------------|--------------------|----------|
| FACILITY NAME (1) | DOCKET NUMBER (2) | LER NUMBER (6) | | | PAGE (3) |
| North Anna Unit 2 | 05000 ³³⁹ | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | 4 OF 4 |
| | | 93 | — 007 — | 01 | |

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

If continued use of strap-on ultrasonic flowmeters is anticipated for Safety Related applications, engineering training will be administered for their use.

The station controlling procedure for strap-on ultrasonic flowmeters will be updated to incorporate findings from the RCE with regard to proper use and the limitations of this technology.

An Operating Experience entry will be made to alert the industry on the results of the root cause evaluation.

7.0 Similar Events

LER 50-339/90-008-00 documents the sum of the two lowest branch flows being less than the TS minimum requirement (Unit 2). The cause of this event was instrument uncertainties and improper methods for measuring flow.

LER 50-339/92-010-00 documents the sum of the two lowest branch flows being below the TS minimum requirement (Unit 2). The cause of this event was valve mispositioning.

LER 50-338/93-009-00 documents the sum of the two lowest branch flow lines being below the TS minimum requirement (Unit 1). The cause of this event was too narrow of a TS allowable flow rate to be consistently met with instrumentation uncertainties.

8.0 Additional Information

Unit 1 was at 100% power (Mode 1) and was not directly affected by this event. Corrective actions for Unit 2 will also be performed on Unit 1 as applicable.