NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMD NO. 3150-0104
EXPIRES: 04/30/98
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.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit One	05000 269	1 OF 8

TITLE (4) Valve Fails To Close Requiring Unit Shutdown Due To Inadequate Procedure

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(S) 05000
02	15	98	98	-	005	-	01	03	23	98		05000

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)	8%	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)	X 50.73(a)(2)(i)(A)	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	
J. E. Burchfield, Regulatory Compliance Manager	(864)	885-3292

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 (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines) (16)

On February 14, 1998, at 2210 hours, Unit 1 was at approximately 57% full power and reducing power for unrelated maintenance. During scheduled Engineered Safeguards (ES) testing on High Pressure Injection ES channels 1 and 2, valve 1HP-27 (B Loop Injection Valve), only traveled approximately one inch in the closed direction. A Technical Specification (TS) Limiting Condition for Operation (LCO) was entered and trouble shooting began. On February 15, 1998, at 1830 hours, with Unit 1 at 8% full power, the NRC was notified of the TS shutdown. In accordance with TSs, Unit 1 was taken subcritical and the LCO was exited at 0926 hours, on February 16, 1998, when the Reactor Coolant System temperature was less than 350 degrees F. Engineering and maintenance personnel continued investigation of the erratic operation. The actuator was removed from the valve and the stem/stem nut was cleaned and relubricated. The packing was replaced and lubricated. The actuator was reinstalled, alignment checked, and the valve tested satisfactorily. The root cause of the required shutdown is Written Communication; Content; Technical Inaccuracies. Corrective actions include revising the procedure and reviewing other Valve Maintenance procedures for similar deficiencies.

EVALUATION:

BACKGROUND

Valve 1HP-27 is a normally open motor operated valve in the flow path that provides emergency High Pressure Injection (HPI) [EIIS:BG] flow to the B1 and B2 cold legs of the Reactor Coolant System (RCS) [EIIS:AB]. A spring return switch is available to open or close the valve. Torque switch contacts are provided in the open and close circuits to deenergize the valve motor in the event of excessive operating torque that may be caused by an obstruction or valve failure. In the event of a reactor accident, valve 1HP-27 receives an automatic open signal from Engineered Safeguards [EIIS:JE] Channel 2 to provide emergency injection through train B of the HPI System. Throttling is needed for High Pressure Injection (HPI) pump protection against run out and protection against repressurizing the RCS after a Design Basis Accident (DBA).

Technical Specification (TS) 3.3.1 requires two independent trains of HPI to be operable when the RCS is above 350 degrees F and Reactor power is less than 60% full power. Per TS 3.3.1, one train of HPI may be inoperable for 24 hours. If not returned to an operable status within 24 hours, the Reactor must be taken to hot shutdown within 12 hours. If not restored to an operable condition within 24 hours of the hot shutdown condition, the reactor must be placed in a condition with RCS temperature below 350 degrees F within an additional 24 hours.

DESCRIPTION OF EVENT

On February 14, 1998, at 2210 hours, Unit 1 was at approximately 57% full power. Preparations were being made to take Unit 1 off line to work on Main Feedwater (MFDW) [EIIS:SJ] Control Valves. Instrument and Electrical (I&E) personnel were performing scheduled testing of Engineered Safeguards Systems. Valve 1HP-27 (B Loop Injection Valve) only traveled approximately one inch in the closed direction and, therefore, could not throttle flow. A Technical Specification (TS) Limiting Condition for Operation (LCO) was entered. An investigation by I&E personnel indicated that the valve would operate smoothly in the open direction. I&E determined the problem was not in the electrical

circuitry of the valve. Mechanical and Engineering personnel were contacted to assess the problem with valve 1HP-27. While the investigation was in progress, operations was reducing power to repair MFDW Control Valves.

On February 15, 1998, at 1730 hours, Unit 1 was at approximately 8% full power. Mechanical and Engineering personnel inspected and uncoupled the valve and valve operator in an attempt to identify the source of the problem. While manually stroking the valve with the actuator uncoupled from the stem, the valve was difficult to operate in the close direction. Investigations could not determine the cause of the failure. Therefore, a TS required shutdown of Unit 1 to investigate and repair valve 1HP-27 was initiated. At 1830 hours, a one hour non-emergency notification to the NRC was made that Unit 1 would be placed in a subcritical condition with the Reactor Coolant System (RCS) temperature less than 350 degrees F to support repair activities of 1HP-27.

On February 16, 1998, at 0926 hours, Unit 1 RCS was less than 350 degrees F and the TS LCO was exited. The actuator was removed and the inspection did not reveal any significant abnormal conditions in the stem alignment or valve components. However, Engineering has determined that some misalignment was probably realized and accentuated by not using a packing lubricant during the initial installation.

Engineering personnel also performed a review of the work history of 1HP-27. The review indicated that in November 1995, valve 1HP-27 (B Loop Injection Valve) was replaced with a balanced plug globe valve. Preventive maintenance (PM) was performed prior to the valve installation. The valve and operator were installed and the valve was diagnostically tested with satisfactory results. PM was also performed in June and September 1997.

On February 17, 1998, the valve PM was performed in accordance with Maintenance procedures. Existing grease was completely removed and the stem cleaned. The actuator and valve were re-assembled and diagnostic testing was completed with satisfactory results. The thrust available to the valve stem increased by approximately 2500 pounds without adjusting the actuator torque switch.

Further Engineering evaluations determined that due to the balanced design of the valve plug, a pressurized line can require more force to operate the valve than a high differential pressure across the valve. This effect is a result of the high static pressure under the plug which acts on the cross sectional area of the stem and results in a high stem ejection load. In 1995, the Engineering organizational structure allowed valves to be purchased by valve engineers without review by the Motor Operated Valve (MOV) engineers. The current organization has the valve engineers and MOV engineers in the same group. Therefore, current valve purchases would include the inter-organizational reviews necessary to account for the impact of static pressure. An Engineering analysis indicated that the valve should have closed against the worst case pressurized static line. However, the margin was less than previously predicted. Engineering reviewed the other valves of this type and determined that the margins were acceptable.

On February 18, 1998, Unit 1 was returned to Hot Shutdown conditions and valve 1HP-27 stroke tested satisfactorily. The ES test was successfully completed and activities were initiated to return to power operations.

CONCLUSION

The cause of the failure of valve 1HP-27 is most likely due to stem misalignment. The effects of misalignment were accentuated by a previously allowed practice of not lubricating the packing area. From the time of initial installation of valve 1HP-27 in November 1995, the valve has exhibited a high Coefficient of Friction (COF). The COF after installation was 0.19. Current valve and actuator procedures are more precise in the alignment requirements and revised Generic Letter (GL) 89-10 packing procedures allow for the use of packing lubricant.

The valve failure described above could have been prevented if the initial installation of the valve and operator in 1995 had been performed according to current procedures. Unit 1 had to be shut down to repair the valve. Therefore, the root cause of the Technical Specification shutdown is Written Communication; Content, Technical

Inaccuracies. The 1995 valve and operator installation procedure had the alignment accomplished after the valve packing was tightened. Coupling the valve and operator with the packing tightened could lead to misalignment. The procedures have been revised to require alignment before the packing is tightened. The high COF condition could have been reduced if the revised alignment and packing lubricant processes had been utilized.

Also, diagnostic testing should have been performed in September 1997. The required testing was not performed due to a procedural deficiency that had action steps contained in notes and cautions. Since this valve should have been diagnostically tested in late September during 1EOC-17, the high COF would have been recognized at that time and the necessary corrective actions would have been completed.

The corrections that were implemented in February of 1998 included: 1) cleaning and relubricating the stem/stem nut region after removal of the actuator, and 2) repacking and lubricating the packing rings and verifying correct stem alignment. These steps alone resulted in a COF improvement to 0.11 with a overall thrust increase of approximately 2500 pounds with no change in the torque switch setting.

A historical search of events over the last two years indicates there have been four other Technical Specification (TS) required shutdowns; TS Required Shutdown Due To Inadequate Work Planning (LER 270/96-03), Unisolable RCS Leak Due To Inadequate Surveillance Program (LER 270/97-01), Steam Generator Leak Results in Technical Specification Unit Shutdown Due to Inadequate Process Control (LER 269/97-11) and, Non-Isolable Weld Leak On Pressurizer Surge Line Drain Pipe Causes Shutdown (LER 269/98-02). Even though these four events involved TS required shutdowns, one was due to exceeding the Limiting Condition for Operation time frame and the other three were leaks that exceeded the TS limits. Therefore, the event described in this report is considered non-recurring.

There were no personnel injuries, radiation over exposures, or releases of radioactive materials associated with this event.

CORRECTIVE ACTION:

Immediate:

1. Operations personnel safely shutdown the Unit to a Reactor Coolant System temperature of less than 350 degrees F.

Subsequent:

1. The actuator was removed from valve 1HP-27 and corrective maintenance performed.

2. Valve 1HP-27 was diagnostically tested with satisfactory results.

3. The previous diagnostic test data on the other valves of this type in Units 1, 2, and 3 was reviewed and found satisfactory.

4. Reviewed past preventive maintenance procedures for mixed lubricants and verified completion of diagnostic testing.

5. Reviewed and revised other GL 89-10 valve maintenance, installation, and packing procedures to ensure the current packing lubrication and alignment processes are included.

Planned:

1. The actuators for valves 1,2,3 HP-27 will be replaced to provide increased closing margin.

2. Procedures will be enhanced to change caution statements to action statements that require sign off steps.

Planned corrective action number 2 is considered to be a NRC Commitment Item. This is the only NRC Commitment item contained in this LER.

SAFETY ANALYSIS:

Valve 1HP-27 failed to close when performing Engineered Safeguards testing on February 14, 1998. Valve 1HP-27 is normally open when the Reactor Coolant System (RCS) is above 350 degrees F. An Engineered Safeguards actuation sends a signal and automatically opens valve 1HP-27 if it is closed. Throttling is needed for High Pressure Injection (HPI) pump protection against run out and protection against repressurizing the RCS after a Design Basis Accident (DBA).

Valve 1HP-27 is tested monthly by an Engineered Safeguards test. During the last operating cycle prior to the last refueling outage, the valve was tested at full RCS pressure without any recorded failures or problems. Therefore, there is a high level of confidence the valve had throttling capability prior to September 1997. Since it is difficult to establish the exact time at which the throttling capability was affected, the safety analysis has considered operation since the time of initial installation in November 1995.

Although valve 1HP-27 was incapable of performing a throttling function with higher downstream system pressures, the Unit 1 High Pressure Injection (HPI) system is determined to be past operable. The basis for this conclusion is that even in the event of a worst case single failure, the system could have responded to DBAs since throttling of 1HP-27 would only be required for those cases in which:

1. RCS pressure diminished to less than approximately 600 psig and system pressures downstream of valve 1HP-27 correspondingly dropped. Throttling in this case would have been required to prevent pump run-out. However, with lower downstream pressure and relatively higher flow rates through the valve, the throttling capability of valve 1HP-27 would not have been impaired.

2. The RCS rapidly refilled and repressurized such that Pressurized Thermal Shock (PTS) became a concern. For this specific case, a high degree of confidence exists that the operator, upon realizing the inability to throttle flow through valve 1HP-27, would stop HPI pump C as necessary to prevent exceeding proceduralized PTS limits. Considering the current administrative requirement for all three

Oconee HPI pumps to be operable anytime RCS temperature is greater than 350 degrees F, one train with an operable throttle valve would have been available for operator manipulation to provide injected flow even if valve 1HP-27 was incapable of being throttled. For this event, excessive flow as opposed to deficient flow would be the primary concern to the operator.

The health and safety of the public was not affected due to this event.