

LICENSEE EVENT REPORT (LER)

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 500 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), 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)

Harris Nuclear Plant Unit-1

DOCKET NUMBER (2)

50-400

PAGE (3)

1 OF 3

TITLE (4)

Inoperable Main Feedwater Isolation Valves caused by cold weather conditions.

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
2	7	97	97	-- 002	-- 01	07	07	98		
OPERATING MODE (9)		1		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)						
POWER LEVEL (10)		100%		20.2201(b)		20.2203(a)(2)(v)		X	50.73(a)(2)(i)	50.73(a)(2)(viii)
				20.2203(a)(1)		20.2203(a)(3)(i)			50.73(a)(2)(ii)	50.73(a)(2)(x)
				20.2203(a)(2)(i)		20.2203(a)(3)(ii)			50.73(a)(2)(iii)	73.71
				20.2203(a)(2)(ii)		20.2203(a)(4)			50.73(a)(2)(iv)	OTHER
				20.2203(a)(2)(iii)		50.36(c)(1)			50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
				20.2203(a)(2)(iv)		50.36(c)(2)			50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME

Michael Verrilli Sr. Analyst - Licensing

TELEPHONE NUMBER (Include Area Code)

(919) 362-2303

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
B	VF	FAN	J127	Y					

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)

On February 7, 1997, with the plant operating in Mode 1 at 100% power, investigation determined that cold weather conditions resulted in the Main Feedwater Isolation Valves (MFIVs) being potentially inoperable during a period from January 17, 1997 through January 20, 1997. The MFIVs serve as containment isolation valves and are required to stroke closed in 10 seconds or less to provide feedwater isolation in the event of a main steam line break or spurious opening of a feedwater regulating valve. Based on purchase specification documents and discussions with the MFIV vendor, a minimum operating temperature of 60 degrees exists to ensure that the MFIVs will stroke in the required 10 seconds. The MFIV actuators are hydraulic to open and shut with nitrogen pressure, but even the shut sequence utilizes hydraulic oil operation. Therefore, with actuator temperature below 60 degrees the hydraulic oil may be too viscous to provide a valve stroke time of 10 seconds or less. This condition was identified when a nearby instrumentation line was found frozen and brought into question the operability of the safety-related MFIVs. (The frozen instrument line had no adverse effect on plant operation.)

This event was caused by a combination of inadequate design and improper functioning of the HVAC system that serves the Steam Tunnel (area that MFIVs are located in). The steam tunnel HVAC supply fans (S64 Fan and S65 Fan) take a suction from the outside atmosphere and exhaust directly into the area of the MFIVs. They are designed with an automatic low ambient temperature shutoff at 30 degrees, but plant process computer data indicates that the fans continued to operate with outside temperatures well below the 30 degree setpoint. Even if the fans had shutoff as designed at 30 degrees, MFIV actuator temperatures may have dropped to just slightly below the minimum MFIV actuator operating temperature of 60 degrees.

This LER revision is being provided to more accurately describe the initial corrective actions taken to address the steam tunnel low temperature conditions and to incorporate additional actions taken to date.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Shearon Harris Nuclear Plant - Unit #1	50-400	97	002	01	2 OF 3

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

**EVENT DESCRIPTION:**

On February 7, 1997, with the plant operating in Mode 1 at 100% power, investigation determined that technical specification 4.6.3 had been violated. Specifically, cold weather conditions resulted in the Main Feedwater Isolation Valves (MFIVs) being potentially inoperable during a period from January 17, 1997 through January 20, 1997. The MFIVs serve as containment isolation valves and are required to stroke closed in 10 seconds or less to provide feedwater isolation in the event of a main steam line break or spurious opening of a feedwater regulating valve. This isolation function will prevent excessive Reactor Coolant System cooldown and/or Containment over pressurization.

Based on purchase specification documents and discussions with the MFIV vendor, a minimum operating temperature of 60 degrees exists to ensure that the MFIVs will stroke in the required 10 seconds. The MFIV actuators are hydraulic to open and shut with nitrogen pressure, but even the shut sequence utilizes hydraulic oil operation. Therefore, with actuator temperature below 60 degrees the hydraulic oil may be too viscous to provide a valve stroke time of 10 seconds or less.

This condition was identified when a nearby instrumentation line for the "C" main feedwater bypass line flow transmitter was found frozen and brought into question the operability of the safety-related MFIVs. (The frozen flow transmitter instrument line had no adverse affect on plant operation.) Investigation into this condition revealed deficiencies in the design and operation of the HVAC system that serves the steam tunnel area where the MFIVs are located. The steam tunnel HVAC supply fans (S64 Fan and S65 Fan) take a suction from the outside atmosphere and exhaust directly into the area of the MFIVs. They are designed with an automatic low ambient temperature shutoff at 30 degrees, but archived plant process computer data indicates that the S65 fan continued to operate with outside temperatures well below the 30 degree setpoint.

The "C" MFIV actuator is positioned directly in the exhaust path of one of the S65 Fan duct openings and is approximately 10 feet above the area where the flow transmitter line was found frozen. A review of data taken since the event shows that temperatures in the area of the MFIV actuators run approximately 15 to 20 degrees greater than the location of the frozen instrument line. Based on this, using a simplistic engineering approach, the temperature of all three MFIV actuators would have been below the 60 degree minimum operating limit and were therefore potentially inoperable (incapable of performing containment isolation function in 10 seconds).

**CAUSE:**

This event was caused by a combination of inadequate design and improper functioning of the steam tunnel HVAC system. The steam tunnel HVAC supply fans (S64 Fan and S65 Fan) take a suction from the outside atmosphere and exhaust directly into the area of the MFIVs. They are designed with an automatic low ambient temperature shutoff at 30 degrees, but plant process computer data indicates that the fans continued to operate with outside temperatures below the 30 degree setpoint. Additional research has shown that if the fans had shutoff as designed at an outside ambient temperature of 30 degrees, MFIVs actuator operating temperature may have dropped to just slightly below the 60 degree operating band minimum.

**SAFETY SIGNIFICANCE:**

There were no adverse safety consequences associated with this event. This is based on engineering review and probabilistic safety analysis performed for Harris Plant LER #96-006, (submitted April 24, 1996) which determined that the failure of a MFIV to perform its containment isolation function was non-safety significant. The potential consequences of a MFIV failing to close are over-filling the affected Steam Generator and subsequent over-cooling of the Reactor Coolant System. This would be mitigated by plant design features (tripping of the main feedwater pumps or automatic closure of the feedwater regulating valves), or by operator intervention to control the main feedwater system.

This is being reported per 10CFR50.73.a.2.i.B as a violation of Technical Specifications.

**PREVIOUS SIMILAR EVENTS:**

There have been no other previous reports submitted related to MFIVs being rendered inoperable due to cold weather conditions. LER 96-006 (referenced above) was submitted due to a MFIV valve stem failure that occurred during surveillance testing.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Shearon Harris Nuclear Plant - Unit #1	50-400	97	002	01	3	OF 3

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

**CORRECTIVE ACTIONS COMPLETED:**

1. Additional investigation and troubleshooting was performed on the steam tunnel HVAC system design and operational configuration. This resulted in modifications to the system that were implemented by Engineering Service Requests (ESRs) 97-00157 and 97-00785. ESR 97-00157 was a permanent modification that adjusted the high temperature setpoint of the steam tunnel thermocouple that feeds the S-64 and S-65 Supply Fans thermocouple from 90 to 70 degrees. ESR 97-00785 was a temporary modification that: (1) moved the physical location of the thermocouples to eliminate inaccuracies, and (2) adjusted the low temperature setpoint for the Steam Tunnel Fans from 30 to 43 degrees. Although the physical changes have been implemented as described in both ESRs, the temporary modification (ESR 97-00785) will be made permanent and closed out upon completion of a EQ Program evaluation.
2. A Justification for Continued Operation (JCO 98-02) was generated for the steam tunnel temperature control issue while the aforementioned EQ evaluation is in progress. The basis for this JCO was provided by ESR 98-00016. The JCO will also be canceled upon completion of the EQ Program evaluation which will allow close out of the temporary modification ESR 97-00785.
3. Revisions were made to the Daily Surveillance Requirement Operations Surveillance Test procedures (OST-1021 & OST-1022) to ensure that when outside ambient temperature is less than 65 degrees, steam tunnel temperatures will be locally monitored once per 6 hours by Operations personnel.
4. Revisions were made to the Reactor Auxiliary Building HVAC System Operating Procedure (OP-172) and System Description (SD-172) to clarify system operation.
5. As an interim measure, an Operations Night Order was issued to provide additional emphasis on the proper operation of the Steam Tunnel HVAC System.