LICENSEE EVENT REPORT (LER)

FACILITY NAME (1): Washington Nuclear Plant - Unit 2

DOCKET NUMBER (2): 0 5 0 0 0 3 9 7

PAGE (3): 1 OF 5

TITLE (4): INOPERABILITY OF HIGH PRESSURE CORE SPRAY SYSTEM DUE TO PARTIAL FAILURE OF PUMP MOTOR UPPER AIR DEFLECTOR

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 NUMBERS(S)
05	28	92	92	-- 025	-- 01	08	20	92		05000
										05000

OPERATING MODE (9): 5

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

POWER LEVEL (10): 000

20.402(b)	20.405(C)	50.73(a)(2)(iv)	77.71(b)
20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.73(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)	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: M.P. Reis, Compliance Supervisor

TELEPHONE NUMBER: AREA CODE 509 377-4152

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	BG	MO	G083	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) | X NO

EXPECTED SUBMISSION DATE (15): MONTH | DAY | YEAR

ABSTRACT (16)

On May 22, 1992, during an inspection of the High Pressure Core Spray (HPCS) pump motor, a small piece of the aluminum upper air deflector was found lodged inside the motor stator. Several cracks were also discovered in the air deflector. After further investigation, this problem was determined to be reportable because it could have affected operability of the HPCS System.

The root cause of this event was a plant/equipment related deficiency involving improper work practices used on the HPCS pump throttle bushing during initial plant construction. This condition resulted in tearing of the upper air deflector due to excessive uplift forces. The tear propagated along surface indications that were residual from manufacturing during subsequent operating cycles due to a high frequency, low stress fatigue mechanism. It has been determined that the indications alone could not have initiated air deflector failure.

As corrective action, inspection and testing of the HPCS pump motor was performed, the upper air deflector was replaced, and the lower air deflector was inspected. Additionally, air deflectors for the Service Water pumps, which are similarly designed, were inspected. An evaluation of Emergency Core Cooling System (ECCS) pump/motor maintenance procedures will be performed in order to determine if adequate guidance is provided to prevent similar damage in the future. This event did not adversely affect the health and safety of the public or Plant personnel.

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TITLE (4)
INOPERABILITY OF HIGH PRESSURE CORE SPRAY SYSTEM DUE TO PARTIAL FAILURE OF PUMP MOTOR UPPER AIR DEFLECTOR

Plant Conditions

Plant Mode - 5 (Refueling)
Power Level - 0%

Event Description

On May 22, 1992, during an inspection of surge ring support brackets and fasteners on the High Pressure Core Spray (HPCS) System Pump Motor (HPCS-M-P/1), a piece of the aluminum upper air deflector was found lodged inside the motor stator. On May 28, 1992, after further investigation, this problem was determined to be reportable because it could have affected operability of pump HPCS-P-1 and the HPCS System. At the time of the event the Plant was shutdown for the annual maintenance and refueling outage.

The inspection that identified this condition was being performed in response to a recommendation in a General Electric Service Information Letter (SIL 484) pertaining to pump motor surge ring support brackets and fasteners. Although no problems were noted with these brackets and fasteners, the 5-inch by 4-inch (nominally 3/32-inch thick) piece of the deflector that was discovered could have resulted in localized areas of motor damage or there could have been excessive heating of the motor windings due to a reduction of proper air flow during operation of the pump. If the entire annulus portion of the deflector would have failed during pump operation, it most probably would have resulted in motor failure. The purpose of the air deflector is to direct cooling air to the motor windings.

The HPCS pump motor is a 3,000 hp, 1800 RPM, 4140 volt, squirrel-cage induction motor that is mounted vertically above the HPCS pump (General Electric, Model 5K6357XC10A/PZ55). The degradation or failure of this pump/motor combination could have affected the safety function of the HPCS System, which is to maintain vessel inventory and cool the reactor core during accident conditions.

Immediate Corrective Action

As immediate corrective action, an investigation into the cause of this event was initiated. No other immediate actions were required because the Plant was shutdown for the annual maintenance and refueling outage at the time of discovery.

Further Evaluation and Corrective Action

Further Evaluation

This event is reportable in accordance with the requirements of 10CFR50.73(a)(2)(v) as an event or condition that alone could have prevented the fulfillment of the safety function of a system that is needed to mitigate the consequences of an accident. This event was also verbally reported to the NRC in accordance with the requirements of 10CFR50.72 as a four-hour, nonemergency notification on May 28, 1992.

Physical examinations and analyses of the failed upper air deflector have been performed by the Supply System's Materials Engineering Group. The scope of these examinations and analyses included fractographic and metallurgical examinations, chemical and modal analyses, and finite element analysis of the static loading condition. Fracture mechanics analysis of the dynamic loading condition was not deemed necessary due to the conclusive nature of results acquired from other examinations and analyses.

Examination of the upper air deflector identified one instance of tearing and several instances of indentation-type deformation corresponding with air deflector hold-down bracket locations. The tearing was several inches long, and formed a part of the main fracture. Other observed features included: 1) fatigue symptoms in the principal cracks that merged with the tear, and 2) surface indications that were residual from the air deflector manufacturing process.

It has been determined that the indentation-type deformations noted at air deflector hold-down bracket locations were the result of normal bracket preload stresses. The existence of air deflector tearing has been attributed to a previous event involving improper uplift of the HPCS pump/motor assembly. A review of equipment history records for the HPCS pump/motor indicates that an event involving excessive uplift force on the rotor of the HPCS pump motor occurred when the HPCS pump throttle bushing was installed during initial plant construction. Other damage resulting from this uplift event was repaired at the time of occurrence.

Based upon the results of examinations and analyses, it was concluded that failure of the upper air deflector was precipitated by stress risers that were created by torn material in the vicinity of the air deflector hold-down brackets. Actual failure of the air deflector resulted when fatigue cracks were initiated at these stress risers and propagated along existing surface indications during succeeding plant operating cycles due to a high-frequency, low-load mechanism. Although manufacturing related surface indications contributed to fatigue crack propagation and subsequent failure of the upper air deflector, it has been determined that these indications alone could not have caused air deflector failure.

The root cause of this event was a plant/equipment related deficiency involving improper installation work practices used on the HPCS pump throttle bushing during initial plant construction. The excessive uplift forces experienced during installation of this component introduced a tear in the upper air deflector. Fatigue cracks were later initiated and propagated along stress risers associated with the tear, and ultimately resulted in failure of the upper air deflector.

Failure of the HPCS pump upper air deflector did not result directly from a manufacturing defect, and is not considered to be reportable under 10CFR21. This event was not contributed to by any systems, structures or components that were inoperable at the start of the event.

Further Corrective Action

As corrective action, visual inspection of the HPCS motor stator windings, and megger and DC high-potential tests of the HPCS motor stator insulation were performed. The visual inspection confirmed that HPCS pump/motor stator windings had not been damaged, and megger and DC high-potential tests demonstrated that the HPCS pump/motor stator insulation had not been degraded.

The failed upper air deflector was replaced with a new deflector, and the HPCS pump/motor lower air deflector was visually inspected. Additionally, air deflectors for the Service Water System Pump Motors were visually inspected. No evidence of cracking was identified during inspection of the HPCS pump lower air deflector or Service Water System pump air deflectors. Based upon these air deflector inspections and discussions with the vendor, it was determined that inspection of air deflectors for Residual Heat Removal (RHR) and Low Pressure Core Spray (LPCS) motors, which are also of a similar design, was not necessary.

The condition described in this report occurred during initial plant construction, and did not involve inadequate maintenance practices or procedures; however, an evaluation of Emergency Core Cooling System (ECCS) pump/motor maintenance procedures will be performed in order to verify that adequate guidance exists to prevent similar air deflector damage in the future. Completion of this evaluation is scheduled for March 31, 1993.

Safety Significance

HPCS is a part of the ECCS. Its purpose is to supply water to the reactor vessel over a wide range of accident conditions. For small-break Loss of Coolant Accidents (LOCAs) that do not result in rapid reactor depressurization, the system is designed to maintain reactor water level. For large breaks, the system provides core spray cooling. The ECCS has built-in redundancy, and is comprised of HPCS, LPCS, ADS, and the RHR - LPCI Mode. Failure of HPCS is bounded within the ECCS single failure analysis.

The condition described in this report did not result in actual failure of HPCS during an event where it was required to operate. Consequently, this event did not affect the health and safety of either the public or Plant personnel. However, even if failure or unavailability of the ECCS function associated with HPCS had occurred during the period when air deflector damage was unrecognized, either the RCIC or ADS System could have been used as a backup to the HPCS System.

Similar Events

There have been LERs written due to the inoperability of the HPCS System; however, none of these reports pertained to failure of pump motor air deflectors.

EIIS Information

Text Reference	EIIS Reference System	EIIS Reference Component
High Pressure Core Spray (HPCS) System	BG	--
Motor HPCS-M-P/1	BG	MO
Pump HPCS-P-1	BG	P
Emergency Core Cooling System (ECCS)	BM	--
Reactor Core Isolation Cooling (RCIC) System	BN	--
Low Pressure Core Spray (LPCS) System	BM	--
Residual Heat Removal (RHR) System	BO	--
Automatic Depressurization System (ADS)	BG	--