LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Fermi - 2	0 5 0 0 0 3 4 1	1 OF 5

TITLE (4) Manual Scram in Response to Reactor Power Fluctuations

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MON	DAY	YR	YR	SEQUENTIAL NUMBER	REVISION NUMBER	MON	DAY	YR	FACILITY NAMES	DOCKET NUMBER (S)
9	04	98	98	- 0 0 5 -	0 0	10	05	98		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (11)
1	X 10 CFR 50.73(a)(2)(iv)
POWER LEVEL (10) 0 7 0	OTHER - (Specify in Abstract below and in text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

Kimberly Harsley - Compliance Engineer	TELEPHONE NUMBER AREA CODE	586-1255
	734	

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	
X	T A	F C V	E 2 7 5	Yes							

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
[ ] YES (If yes, complete EXPECTED SUBMISSION DATE)	[X] NO				

ABSTRACT (16)

On September 4, 1998 at approximately 1700 hours, a reactor power reduction was commenced in preparation for the Sixth Refueling Outage (RFO6). Power was reduced to approximately 70% using the reactor recirculation pumps. With the reactor at approximately 70% power, operators observed that reactor power began fluctuating between 61% and 79%. Concurrent fluctuations in reactor water level, main steam line flows, Moisture Separator Reheater (MSR) steam flows, and turbine valve position were also noted.

The reactor mode switch was immediately placed in the Shutdown position, thereby initiating a manual reactor scram. All control rods fully inserted and no Safety Relief Valves lifted. The Emergency Operating Procedures (EOPs) were entered based on reactor water level decreasing to a Level 3 condition, an expected response following the scram. All safety equipment functioned properly in response to the scram. Plant conditions were such that no Emergency Core Cooling Systems (ECCS) were required to initiate. Reactor vessel water level was restored and the EOPs were then exited.

The cause of the reactor power fluctuations was determined to be spindle/tongue degradation of the No. 3 High Pressure Turbine Control Valve (HPTCV). A complete inspection of the No. 3 HPTCV and No. 4 HPTCV was completed during RFO6. In addition, the spindle/tongue inspections of the No. 1 HPTCV and No. 2 HPTCV, Turbine Stop Valves (TSVs), and the Turbine Bypass Valves (TBPVs) were completed in RFO6.

INITIAL PLANT CONDITIONS:

Operational Condition:	1	Power Operation
Reactor Power:	70	Percent
Reactor Pressure:	990	psig
Reactor Temperature:	545	degrees Fahrenheit

DESCRIPTION OF THE EVENT:

On September 4, 1998, at approximately 1700 hours, a reactor power reduction was commenced in preparation for RFO6. Power was reduced to approximately 70% using the reactor recirculation pumps. Due to possible HPTCV spindle/tongue degradation and potential changes in HPTCV positions, the control room staff had been prepared and briefed on contingency actions if fluctuations in power occurred that were similar to the July 19, 1998 scram. At 1827 hours, control room operators observed reactor power fluctuations approaching ± 10% on the Average Power Range Monitor (APRM) [MON] recorders. These were accompanied by fluctuations in reactor water level, main steam line flows and Moisture Separator Reheater (MSR) [MSR] steam flows. Fluctuations were also noted in the turbine valve position summation recorder.

The reactor mode switch was immediately placed in the Shutdown position, thereby initiating a manual reactor scram. All control rods fully inserted. The Emergency Operating Procedures (EOPs) were entered based on reactor water level decreasing to a Level 3 condition, an expected response following the scram. The operators took manual control of the North Reactor Feed Pump [P] to feed the reactor and returned level to the normal operating band, in accordance with EOPs. Power level at the time of the scram was approximately 70%.

The event resulted in a manual reactor scram and automatic actuation of the Engineered Safety Features (ESF) Level 3 Primary Containment Isolations for Groups 4 (Shutdown Cooling/Head Spray), 13 (Drywell Sumps), and 15 (Traversing In-Core Probe). Safety equipment functioned as designed. This event is being reported in accordance with 10CFR50.73(a)(2)(iv).

CAUSE OF THE EVENT:

The cause of the reactor power fluctuations was determined to be spindle/tongue degradation of the No. 3 HPTCV [FCV]. Investigation has revealed that the root cause for the spindle/tongue degradation was improper torque and improper valve reassembly during the Fifth Refueling Outage (RFO5). A review of the specified torque for the HPTCVs tongue/spindle connection showed that 150 ft-lbf was the value specified by General Electric Company (GEC) in 1983. This value was used in the HPTCV and TSV maintenance procedures. A review of this torque specification showed that the actual torque specification should be 1000-1200 ft-lbf.

Minor fluctuations in reactor power had been observed on May 31, 1998 during a control rod pattern adjustment. The May event was investigated but the exact cause was not determined. It was noted that the minor fluctuation occurred at reduced power, in the range of 60% to 70% power. As a result, enhanced monitoring was implemented for use during subsequent power reductions.

Power fluctuations were also observed on July 19, 1998 during the final scheduled control rod pattern adjustment for Cycle 6. At approximately 1727 hours, with the reactor at 64% power, the reactor mode switch was placed in the Shutdown position initiating a manual reactor scram. Data taken by the enhanced monitoring program was reviewed after the scram and it was determined that a problem existed in one of the HPTCVs. Further review revealed that the most probable cause of the reactor power fluctuations was unstable steam flow through the No. 4 HPTCV [FCV]. Looseness beyond that which was expected from normal operation was noted in the valve stem linkage. Investigation also revealed that the stem linkage on the No. 3 HPTCV [FCV] was found to have some looseness, but less than that found on the No. 4 HPTCV [FCV]. An engineering evaluation was performed for evaluating the No. 3 HPTCV [FCV] and it was determined that as long as reactor power was above 70% the No. 3 HPTCV would not be detrimental to power operations. RFO6 was scheduled to begin in approximately 6 weeks, therefore, it was decided not to disassemble the valves until the outage. Operation for the remainder of the cycle with the No. 4 HPTCV [FCV] closed was evaluated and it was determined that the plant could be operated safely at reduced power with the valve closed.

During the subsequent plant startup on July 23, 1998 with the No. 4 HPTCV [FCV] closed, a minor power fluctuation was experienced at approximately 73% power. The minor fluctuation was expected during power accession because of the stem linkage looseness on the No. 3 HPTCV. Subsequent post scram investigation showed that the No. 3 HPTCV [FCV] stroke length measurement had increased from post Fifth Refueling Outage (RFO5) values. It was also noted that turbine speed/valve position summation recorder showed fluctuations between 46% and 52%.

When the September 4, 1998 scram occurred, turbine speed/valve position summation recorder showed fluctuations between 42% and 49%, which reflects a change in the effective stroke length of the No. 3 HPTCV due to spindle/tongue degradation. Subsequent post scram investigation showed that the No. 3 HPTCV [FCV] stroke length measurement had increased from the values obtained from the July 19, 1998 scram. Investigation of the September 4, 1998 scram has revealed that the root cause for the spindle/tongue degradation was improper torque and improper valve reassembly during the RFO5.

ANALYSIS OF THE EVENT:

Control room operators took conservative and timely actions when confronted with the anomalous reactor conditions. A manual scram was inserted shortly after the onset of sustained power fluctuations. Operators adequately utilized procedures for scram recovery actions and to reconfigure plant systems and equipment to support Operational Condition 3. All safety systems and components challenged by this event responded as designed. All reactor parameters were maintained well within design limits, and responded as expected during and following the scram.

The condition of the HPTCVs, TSVs, and TBPVs would not have impacted their ability to perform their design trip and turbine bypass functions.

Therefore, the health and safety of the public was not adversely affected during or as a result of this event.

CORRECTIVE ACTIONS:

A complete inspection and repair of the No. 3 HPTCV [FCV] and No. 4 HPTCV [FCV] was completed as a part of RFO6. In addition, the spindle/tongue inspections of the No. 1 and No. 2 HPTCV, TSVs, and TBPVs were completed during RFO6. The inspections revealed that the torque specification for the tongue/spindle connection on the HPTCVs, TSVs, and TBPVs was too low, and the method used to apply the torque was incorrect. Based on the results of these inspections, the spindle on the No. 3 HPTCV [FCV] and No. 4 HPTCV [FCV] was replaced, the tongues and locking plates on the HPTCVs were replaced, the HPTCVs, TSVs, and TBPVs tongue/spindle connections were torqued to the appropriate specification, and work requests and procedures that referenced the incorrect spindle/tongue torque specification were revised. Installation of monitoring equipment on the HPTCVs and associated Unitized Actuators (UAs) is also planned for RFO6 to quantify the vibration and stress at the HPTCVs . The monitoring equipment includes strain gages and accelerometers on the HPTCVs, accelerometers on the associated HPTCV UAs and Linear Variable Differential Transformers (LVDTs) on the valve components.

Problems identified during RFO6 HPTCV, TSV, and TBPV work activities will be investigated and resolved prior to reactor startup from RFO6.

ADDITIONAL INFORMATION:

A. Failed Components:

No. 3 High Pressure Turbine Control Valve
English Electric
Mark No. N3021F004C

B. Previous LERs on Similar Problems:

LER 98-004: On July 19, 1998, at approximately 1000 hours, a reactor power reduction was commenced in preparation for a control rod pattern adjustment. Power was reduced to approximately 64% using the reactor recirculation pumps and the control rods. With the reactor at approximately 64% power, the operator noticed that reactor power began fluctuating between 50% and 75%. Main steam flow, flow to both Moisture Separator Reheaters, and reactor power were also fluctuating. The reactor mode switch was immediately placed in the Shutdown position, thereby initiating a manual reactor scram. The most probable cause of the reactor power fluctuations was determined to be unstable flow through the No. 4 HPTCV. Operation for the remainder of the cycle with the No. 4 HPTCV closed was evaluated and it was determined that the plant could be operated safely in that condition with the resultant reduction in power required to accommodate it.