NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION
(6-1998)

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
River Bend Station	05000458	1 of 4

TITLE (4)
Division I Diesel Generator Automatic Start and Emergency Core Cooling System injection due to an electrical transient caused by a capacitor failure.

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
										05000
05	10	1999	1999	--011--	00	06	09	1999	FACILITY NAME	DOCKET NUMBER 05000

OPERATING	5
POWER LEVEL (10)	000

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

	20.2201(b)		20.2203(a)(2)(v)		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)	X	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	TELEPHONE NUMBER (Include Area Code)
D. N. Lorfing, Supervisor – Licensing	225-381-4157

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	JC	PS	Rosemount, Inc.	N					

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

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On May 10, 1999, at 1658 with the plant in Mode 5 for a refueling outage, an initiation of the Division I diesel generator (DG) (*EK*) and Emergency Core Cooling System (ECCS) injection into the reactor vessel (RPV) occurred. Main control room (MCR) operators verified reactor cavity level and closed the injection valves to stop the injection.

An electrical transient in one of the ECCS power supplies (*JE*) was experienced which caused the initiation of the Division I DG and injection to the RPV via low pressure core spray (LPCS) (*BM*) and low pressure coolant injection (LPCI) 'A' (*BO*). When the LPCS injection valve (*INV*) was closed, the minimum flow valve (*20*) did not open as expected. MCR operators manually opened the minimum flow valve to provide proper protection for the LPCS pump. Additionally, indication for the LPCI/RHR 'A' injection check valve (*V*) closure failed during the event.

The root cause of the electrical transient was determined to be a failed, unsealed capacitor (*CAP*) on a Rosemount trip unit (*PS*) (*JC*). Corrective actions include replacement of the failed trip unit and evaluation of methods to reduce the consequences of similar failures.

These events are not safety significant.

REPORTED CONDITION

On May 10, 1999, at 1658 with the plant in Mode 5 for a refueling outage, an initiation of the Division I diesel generator (DG) (*EK*) and Emergency Core Cooling System (ECCS) injection into the reactor vessel (RPV) occurred. Main control room (MCR) operators verified reactor cavity level and closed the injection valves to stop the injection. About two inches of water were added to the reactor cavity from the suppression pool. This condition is reportable as an unplanned actuation of an engineered safety feature (ESF) according to 10 CFR 50.72(b)(2)(ii) and 10 CFR 50.73(a)(2)(iv).

BACKGROUND

River Bend Station (RBS) is a General Electric boiling water reactor (BWR) with a Mark III containment. Emergency core cooling systems include low and high pressure core spray systems and three low pressure coolant injection paths which are functions of the residual heat removal (RHR) system.

The logic for the ECCS systems has a common power supply, which provides voltage to the trip units. The trip units generate trip signals based on process parameters.

INVESTIGATION

An electrical transient in one of the ECCS power supplies (*JE*) was experienced which caused the initiation of the Division I DG and injection to the RPV via low pressure core spray (LPCS) (*BM*) and low pressure coolant injection (LPCI) 'A' (*BO*). The MCR operators appropriately verified the reactor cavity level and secured the injection by closing the injection valves. An operator was dispatched to monitor the Division I DG. When the LPCS injection valve (*INV*) was closed, the minimum flow valve (*20*) did not open as expected. MCR operators manually opened the minimum flow valve to provide proper protection for the LPCS pump. Additionally, indication for the LPCI/RHR 'A' check valve (*V*) closure failed during the event.

Engineering personnel investigated the event to assess the root cause and impact of the failures observed. The failure review included an assessment of the cause of the electrical transient, the minimum flow valve failure to open and the indication failure on the RHR check valve.

ROOT CAUSE

The root cause of the electrical transient was determined to be a failed, unsealed capacitor (*CAP*) on a Rosemount trip unit (*PS*) (*JC*). The vendor failure analysis indicated that the capacitor failure caused a short from the positive 24 volt DC (VDC) power supply to the chassis ground. The short then caused a fuse to blow that initiated the transient to the power supplies in a control room panel.

The root cause of the failure of the minimum flow valve was determined to be hydraulic saturation of the associated flow transmitter. Hydraulic saturation is a phenomenon that occurs when an instrument experiences an input that significantly exceeds its design range. The saturation manifests itself as a delay in transmitter response relative to changes in input. As determined by testing, this delay can be approximately 5 to 21 seconds. The flow transmitter must recover from the saturation prior to initiation of any subsequent transmitter response. This delayed response is a performance characteristic of a Rosemount transmitter used in this or similar applications.

The failure of the open indication for the LPCI/RHR 'A' check valve was determined to be due to a limit switch that was out of alignment.

CORRECTIVE ACTIONS

Immediate corrective actions:

- The failed trip unit was replaced.
- The LPCS minimum flow valve was tested per plant procedures to verify proper function.
- The LPCI/RHR 'A' check valve was verified to be closed by Operations and Maintenance personnel.
- The LPCI/RHR 'A' check valve limit switch was reset.

Long-term corrective actions:

- Replace unsealed capacitor on affected safety-related trip units with a sealed capacitor. Industry experience indicates an improvement in reliability when sealed capacitors are used.
- Evaluate the methods to reduce the consequences of blowing a 24 VDC fuse on the Rosemount trip units. Implement actions as determined by the evaluation.
- Review the application and function of similar Rosemount transmitters to further evaluate the impact of the saturation phenomena.

SAFETY EVALUATION

These events are not safety significant. Shutdown cooling was not adversely impacted by this event. Considering the failure experienced, the systems functioned as expected, except for the minimum flow valve and check valve anomalies. The RPV injection added water to the reactor vessel cavity causing an increase of approximately two inches in cavity level. Operators responded properly to the event. If this event had occurred during power operation, injection would not have occurred due to the inability of the RHR and LPCS systems to inject at operating pressure. The trip unit failure did not prevent a safety function from occurring.

Based on vendor documents and discussion, the delay in the opening of the minimum flow valve did not affect the reliability of the LPCS pump or the minimum flow valve or ability to perform its safety

function. Subjecting the flow transmitter to a saturation signal has only a momentary effect and does not alter the calibration of the unit. Based on the sequence of events, there was no impact on the LPCS pump or system instrumentation.

The RHR check valve operated as expected during the event. The failure of the position indication has no impact on the safety function of the check valve.

PREVIOUS OCCURRENCE EVALUATION

A review of recent licensee event reports (LERs) was performed to identify events with similar causes. No previous LERs were found which involved similar trip unit failures.

The Energy Industry Identification System (EIIS) component/system number is indicated by a parenthesis after the affected component/system. (Example: (*XX*))