

TENNESSEE VALLEY AUTHORITY

Browns Ferry Nuclear Plant
Post Office Box 2000
Decatur, Alabama 35609-2000

NOV 15 1989

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

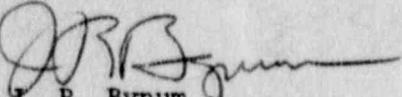
Dear Sir:

TVA - BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 1 - DOCKET NO. 50-259 - FACILITY
OPERATING LICENSE DPR-33 - REPORTABLE OCCURRENCE REPORT BFRO-50-259/89027

The enclosed report provides details concerning the deenergization of reactor
protection system bus by motor generator circuit protector operations caused
by inadequate design of protector setpoints. This report is submitted in
accordance with 10 CFR 50.73(a)(2)(iv).

Very truly yours,

TENNESSEE VALLEY AUTHORITY



J. R. Bynum
Vice President
Nuclear Power Production

Enclosures

cc (Enclosures):

Regional Administration
U.S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region II
101 Marietta Street, Suite 2900
Atlanta, Georgia 30323

INPO Records Center
Suite 1500
1100 Circle 75 Parkway
Atlanta, Georgia 30339

NRC Resident Inspector, BFN

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) BROWNS FERRY UNIT 1 DOCKET NUMBER (2) 0500025910F04 PAGE (3) 04

TITLE (4) DEENERGIZATION OF REACTOR PROTECTION SYSTEM BUS BY MOTOR GENERATOR CIRCUIT PROTECTOR OPERATIONS CAUSED BY INADEQUATE DESIGN OF PROTECTOR SETPOINTS

EVENT DAY (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES			DOCKET NUMBER(S)
10	16	89	027	00	11	15	89	BROWNS FERRY UNIT 2			050002610
								BROWNS FERRY UNIT 3			050002916

OPERATING MODE (9) N THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following)(11)

<u>20.402(b)</u>	<u>20.405(c)</u>	<input checked="" type="checkbox"/> <u>50.73(a)(2)(iv)</u>	<u>73.71(b)</u>
<u>20.405(a)(1)(i)</u>	<u>50.36(c)(1)</u>	<u>50.73(a)(2)(v)</u>	<u>73.71(c)</u>
<u>20.405(a)(1)(ii)</u>	<u>50.36(c)(2)</u>	<u>50.73(a)(2)(vii)</u>	<u>OTHER (Specify in Abstract below and in Text, NRC Form 366A)</u>
<u>20.405(a)(1)(iii)</u>	<u>50.73(a)(2)(i)</u>	<u>50.73(a)(2)(viii)(A)</u>	
<u>20.405(a)(1)(iv)</u>	<u>50.73(a)(2)(ii)</u>	<u>50.73(a)(2)(viii)(B)</u>	
<u>20.405(a)(1)(v)</u>	<u>50.73(a)(2)(iii)</u>	<u>50.73(a)(2)(x)</u>	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
<u>Denzel A. Housley, Engineer, Compliance Licensing</u>	<u>205729-2874</u>

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)

YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	<input checked="" type="checkbox"/>					

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

On October 16, 1989 at 1658, unit 1 reactor protection system (RPS) bus 1B was deenergized resulting in the completion of the actuation logic for several plant engineered safety features (ESFs). ESFs affected by this event include standby gas treatment system and primary containment isolations. Investigation revealed that RPS motor generator (MG) set circuit protectors had tripped because of short duration output voltage fluctuations.

The cause of the voltage fluctuations experienced during this event has not been determined. However, the root cause of the RPS bus deenergization has been previously identified in LER 259/89024. The root cause of these events is an inadequate design of the setpoints for the circuit protectors for the RPS MG sets. This results in the lack of an adequate operating margin for the RPS MG set voltage regulation.

Following this event, the voltage regulator for RPS MG set 1B was replaced to ensure that it was not causing the voltage fluctuations. As the result of LER 259/89024, appropriate corrective actions were in progress at the time of this event. An evaluation of the circuit protection setpoints is being performed to determine appropriate changes. Additionally, design changes have been initiated to replace the voltage adjustment potentiometers for all the RPS MG sets and to add a time delay to the actuation circuitry.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH(P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, D.C., 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON D.C. 20503

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)							
		SEQUENTIAL	REVISION									
		YEAR	NUMBER	NUMBER								
BROWNS FERRY UNIT 1	0500025989	--	0	2	7	--	0	0	0	2	OF	4

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

DESCRIPTION OF EVENT

On October 16, 1989 at 1658, unit 1 reactor protection system (RPS) [JC] bus 1B was deenergized resulting in the completion of the actuation logic for several plant engineered safety features (ESFs). ESFs affected by this event include standby gas treatment system [BH], control room emergency ventilation system [VI], and primary containment isolations [JM]. The affected components were verified to have actuated/isolated as required and investigation into the cause for the RPS bus deenergization was initiated.

Operations personnel responding to this event discovered that RPS circuit protectors 1B1 and 1B2 were tripped. This removes the normal power source, RPS motor generator (MG) set 1B, from RPS bus 1B. The alternate power supply was aligned to RPS bus 1B and the affected actuations/isolations were reset.

Following this event, data was retrieved from a voltage disturbance analyzer which was connected to the output voltage on RPS MG set 1B. This data indicated that a short duration voltage peak of approximately 140 volts occurred prior to the circuit protector trips. The voltage disturbance analyzer had been installed in September 1989 following a RPS bus deenergization event which resulted from voltage fluctuations on RPS MG set 1B. In the time period between the September event and this event, the analyzer had detected infrequent, short-duration voltage fluctuations of relatively low magnitude. These fluctuations were not of sufficient magnitude and time duration to result in tripping the RPS MG set circuit protectors. However, immediately prior to this event, the frequency of the short duration fluctuations increased and a high voltage peak occurred which tripped the circuit protectors.

At the time of this event, unit 2 was in a cold shutdown condition with irradiated fuel in the reactor vessel. Units 1 and 3 were defueled. No fuel handling or operations over spent fuel were in progress during this event. The unplanned actuations of the ESF systems are reportable in accordance with 10 CFR 50.73 (a)(2)(iv).

ANALYSIS OF EVENT

Prior to the September 1989 event, a task force to evaluate the circuit protector performance of the RPS MG sets was established due to the number of RPS deenergization events which had occurred. This task force identified that a

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

small margin exists between the allowable setpoints for the overvoltage/ undervoltage trips of the circuit protectors and the accuracy range of the voltage regulation for the RPS MG set. The resulting small operating margin is due to the conservatisms in the calculations used to determine these setpoints. Normal equipment degradation from minor wear or aging can cause the operating RPS MG set output voltage to exceed this margin and result in the deenergization of the RPS bus.

The voltage excursions which occurred during this event are not considered to be within the normally expected characteristics of the RPS MG set. An unspecified hardware problem in the RPS MG set voltage regulator assembly is suspected as the cause of these infrequent fluctuations; however, the cause of these fluctuations has not been identified. Following this event, the voltage regulator for RPS MG set 1B has been replaced to ensure that the voltage regulator was not causing the output voltage fluctuations.

The systems affected during this event are designed to shut down the reactor, contain and process any radioactive releases, and to fulfill their safety functions upon loss of initiation logic power. The systems responded correctly to the loss of power; therefore, plant safety was not adversely affected. The plant's safe shutdown capabilities would not have been diminished had the unit been in power operation.

CAUSE OF EVENT

The cause of the voltage fluctuations experienced during this event has not been determined. However, the root cause of the RPS bus deenergization has been previously identified in LER 259/89024. The root cause of these events is an inadequate design of the setpoints for the circuit protectors for the RPS MG sets. This results in the lack of an adequate operating margin for the RPS MG set voltage regulation. Therefore, short duration voltage fluctuations, as experienced during this event, can result in inadvertent deenergization of a RPS bus.

PREVIOUS SIMILAR EVENTS

Three previous LERs (259/86031, 296/88008, and 259/89024) document RPS bus deenergizations which were caused by dirty or pitted output voltage adjustment potentiometers. These problems caused drifting or oscillating of the RPS MG set output voltage and resulted in tripping of the circuit protectors. As a result of these events, preventative maintenance procedures have been implemented which require periodic cleaning and discontinuity checking of the RPS MG set output voltage adjustment potentiometers.

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TEXT CONTINUATION

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BROWNS FERRY UNIT 1	0500025989	--	0	2	7	--	0	0	0	4	0	4

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

LER 259/89024 documents two RPS bus deenergization events that occurred on August 26, 1989 and September 20, 1989. It was determined that voltage fluctuations in the RPS MG set output voltage caused the trips of the circuit protectors. As a result of the problems identified during the previous task force evaluation, the root cause of this LER was determined to be an inadequate design of the setpoints for the circuit protectors.

As a result of LER 259/89024, actions are underway to evaluate the design basis for the RPS MG set circuit protection setpoints and to initiate appropriate changes. An evaluation to determine if the existing RPS MG set voltage adjustment potentiometers should be replaced with new ones of a different type has been performed. Based on this evaluation, design changes have been initiated to replace the open design voltage adjustment potentiometers for all the RPS MG sets with ones having an enclosed design that would be less susceptible to dust deposition. These design changes will also add a time delay to the circuit protector actuation circuitry to reduce the number of spurious circuit protector trips.

CORRECTIVE ACTIONS

Following this event, the voltage regulator for RPS MG set 1B was replaced to ensure that the voltage regulator was not causing the output voltage fluctuations. As the result of LER 259/89024, appropriate corrective actions were in progress at the time of this event. An evaluation of the design basis for the RPS MG set circuit protection setpoints is in progress to determine appropriate changes. Additionally, an evaluation of the RPS MG set voltage adjustment potentiometers has been performed. Based on this evaluation, design changes have been initiated to replace the potentiometers for all the RPS MG sets. These design changes will also add a time delay to the circuit protector actuation circuitry to reduce the number of circuit protector trips caused by short duration voltage fluctuations. These actions are being tracked as commitments to LER 259/89024.

COMMITMENTS

The corrective actions to address the root cause of this event are listed as commitments in LER 259/89024.

Energy Industry Identification System (EIIS) Codes are identified in the text as [XX].