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 FACIL: STN-50-530 Palo Verde Nuclear Station, Unit 3, Arizona Publi 05000530
 AUTH. NAME AUTHOR AFFILIATION
 GRABO, B.A. Arizona Public Service Co. (formerly Arizona Nuclear Power
 LEVINE, J.M. Arizona Public Service Co. (formerly Arizona Nuclear Power
 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 93-003-00: on 930703, determined EDG inoperable in manual
 test mode due to shorted relay. Repaired EDG-B & returned to
 svc on 930710.W/930924 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 10
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES: Standardized plant.

05000530

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	RGNS FILE 01	1 1		
EXTERNAL:	EG&G BRYCE, J.H	2 2	L ST LOBBY WARD	1 1
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PALO VERDE NUCLEAR GENERATING STATION
P.O. BOX 52034 • PHOENIX, ARIZONA 85072-2034

JAMES M. LEVINE
VICE PRESIDENT
NUCLEAR PRODUCTION

192-00863-JML/BAG/KR

September 24, 1993

U. S. Nuclear Regulatory Commission
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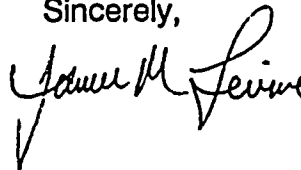
Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 3
Docket No. STN 50-530 (License No. NPF-74)
Licensee Event Report 93-003-00
File: 93-020-404

Attached please find Licensee Event Report (LER) 93-003-00 prepared and submitted pursuant to 10CFR50.73. This LER reports an event where Unit 3's Emergency Diesel Generator 'B' (EDG-B) was determined to be inoperable from July 3, 1993 to July 10, 1993. Since EDG-B would not have been able to satisfactorily complete the Technical Specifications Surveillance Requirement (TS SR) 4.8.1.1.2.a.4 in Manual Test mode, a condition prohibited by TS had occurred when the unit did not comply with TS Limiting Condition for Operation (LCO) 3.8.1.1 ACTION b (i.e., restore the EDG to OPERABLE status within 72 hours). In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region V.

If you have any questions, please contact Burton A. Grabo, Supervisor, Nuclear Regulatory Affairs, at (602) 393-6492.

Sincerely,



JML/TRB/KR/rv

Attachment

cc: W. F. Conway (all with attachment)
B. H. Faulkenberry
J. A. Sloan
INPO Records Center

9310010051 930924
PDR ADDCK 05000530
S PDR

TE22

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Palo Verde Unit 3	DOCKET NUMBER (2) 0 5 0 0 0 5 3 0	PAGE (3) 1 OF 09
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TITLE (4) Emergency Diesel Generator Unable to Start and Run in Manual Test Mode		
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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 NUMBER(S)				
0	7	0	3	9	3	9	3	0	9	2	4	9	3	N/A	0 5 0 0 0 0
0	7	0	3	9	3	9	3	0	9	2	4	9	3	N/A	0 5 0 0 0 0

OPERATING MODE (9) 1		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)									
POWER LEVEL (10) 1 0 0		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)			
		20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)			
		20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vi)		OTHER (Specify in Abstract below and in Text, NRC Form 388A)			
		20.405(a)(1)(iii)	X	50.73(a)(2)(vii)		50.73(a)(2)(viii)(A)					
		20.405(a)(1)(iv)		50.73(a)(2)(viii)		50.73(a)(2)(viii)(B)					
		20.405(a)(1)(v)		50.73(a)(2)(ix)		50.73(a)(2)(x)					

LICENSEE CONTACT FOR THIS LER (12)							
NAME Burton A. Grabo, Supervisor, Nuclear Regulatory Affairs						TELEPHONE NUMBER 6 0 2 3 9 3 - 6 4 9 2	

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)											
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS		
X	E	K	R	L	Y	X	9	9	9	N	

SUPPLEMENTAL REPORT EXPECTED (14)						EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO									

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

On August 26, 1993, APS management determined that Unit 3's Emergency Diesel Generator 'B' (EDG-B) had been inoperable from July 3, 1993 to July 10, 1993. From July 3, 1993 to July 10, 1993, Palo Verde Unit 3 was in Mode 1 (POWER OPERATION) operating at approximately 100 percent power. During that period, EDG-B was not capable of satisfying the Technical Specifications Surveillance Requirement (TS SR) 4.8.1.1.2.a.4 in Manual Test mode. However, EDG-B remained capable of performing its specified safety function in Emergency mode (i.e., standby power source that is capable of starting and loading as required by an emergency automatic start signal to provide the power required for safe shutdown). On July 27, 1993, the event was determined not to be reportable under 10CFR50.73 as a condition that could have prevented the safe shutdown of the plant or as a condition prohibited by TS. On August 19, 1993, it was identified that the current licensing basis for the EDG provides for manual starting control and demonstration of operability by starting in the Manual Test mode. Based on the apparent discrepancy between the specified safety function and the current licensing basis, APS management determined that EDG-B had been inoperable from July 3, 1993 to July 10, 1993. Therefore, a condition prohibited by TS had occurred when the unit did not comply with TS Limiting Condition for Operation (LCO) 3.8.1.1 ACTION b (i.e., restore the EDG to OPERABLE status within 72 hours).

There have been no previous similar events reported pursuant to 10CFR50.73.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE		
Palo Verde Unit 3		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		09	3	0	0	3	0
		0	5	0	0	0	5
		0	9	3	0	0	3
		0	0	0	0	0	0
		0	2	0	F	0	9

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I. DESCRIPTION OF WHAT OCCURRED:

A. Initial Conditions:

From July 3, 1993 to July 10, 1993, Palo Verde Unit 3 was in Mode 1 (POWER OPERATION) operating at approximately 100 percent power.

B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: Condition prohibited by the plant's Technical Specifications.

On August 26, 1993, APS management (utility, non-licensed) determined that Unit 3's Emergency Diesel Generator 'B' (EDG-B) (EK) had been inoperable from July 3, 1993 to July 10, 1993. During that period, EDG-B was not capable of satisfying the Technical Specifications Surveillance Requirement (TS SR) 4.8.1.1.2.a.4 in Manual Test mode. However, EDG-B remained capable of performing its specified safety function in Emergency mode (i.e., standby power source that is capable of starting and loading as required by an emergency automatic start signal to provide the power required for safe shutdown). On July 27, 1993, the event was determined not to be reportable under 10CFR50.73 as a condition that could have prevented the safe shutdown of the plant or as a condition prohibited by TS. On August 19, 1993, it was identified that the current licensing basis for the EDG provides for manual starting control and demonstration of operability by starting in the Manual Test mode. Based on the apparent discrepancy between the specified safety function and the current licensing basis, APS management determined that EDG-B had been inoperable from July 3, 1993 to July 10, 1993. Therefore, a condition prohibited by TS had occurred when the unit did not comply with TS Limiting Condition for Operation (LCO) 3.8.1.1 ACTION b (i.e., restore the EDG to OPERABLE status within 72 hours).

At approximately 1840 MST on July 3, 1993, EDG-B local and Control Room (NA) annunciators alarmed while EDG-B was in its normal "standby" condition. No apparent abnormalities were found on the EDG-B control panel or the engine itself. Troubleshooting determined that a shorted relay in the EDG-B Starting System Check circuitry caused a fuse to open on a local non-class 1E power supply and a transistor to fail on the 'G' fiber optics card located in the EDG-B Starting System Check circuitry. When the relay and fuse were replaced, all of the alarms did not clear. The 'G' fiber optics card was determined to have a single channel out of service due to the damaged transistor. A replacement fiber

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE		
Palo Verde Unit 3		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
	0 5 0 0 0 5 3 0	9 3	- 0 0 3	- 0 0	0 3	OF	0 9

TEXT

optics card was not readily available. Control Room personnel had validated with Engineering personnel that the affected circuitry was non-Class 1E and that EDG-B was capable of performing its specified safety function in the Emergency mode of operation.

On July 4, 1993, EDG-B annunciator problems were partially fixed. Engineering personnel evaluated the degraded condition and determined that the remaining alarms did not impact the operability of EDG-B. The damaged channel on the 'G' fiber optics card provided annunciation/alarm functions only. Control Room personnel initiated compensatory measures (i.e., monitor the local annunciator panel every 2 hours) until repairs could be completed. Based on engineering judgement and following consultation with Unit 3 Operations management, Control Room personnel determined that a test (i.e., the performance of TS SR 4.8.1.1.2 to demonstrate EDG operability) was not necessary. Engineering personnel assured Control Room personnel that the affected circuitry was non-Class 1E and that EDG-B was capable of starting in the Manual Test or Emergency mode of operation.

At approximately 0843 MST on July 9, 1993, Control Room personnel declared EDG-B inoperable and entered TS LCO 3.8.1.1 ACTION b and TS LCO 3.3.3.5 (Remote Shutdown System Instrumentation) ACTION a to perform preplanned maintenance to resolve the remaining annunciator problems (i.e., replace the fiber optics card). EDG-B was declared inoperable because the Control Room Manual Test mode start capability was removed from service to perform the repairs. EDG-B remained functional in Emergency mode (i.e., still capable of emergency start).

Following the replacement of the fiber optics card, at approximately 1124 MST on July 9, 1993, EDG-B was started for post maintenance test purposes from the EDG-B local control panel using the ESF actuation test signal in Emergency mode. During the Emergency mode start, a momentary Incomplete Sequence annunciation occurred. EDG-B did not trip on Incomplete Sequence because that protective device alarm/trip is bypassed during Emergency mode operation and functions only to shut down the EDG during Manual Test Mode operation [Note: the Incomplete Sequence alarm/trip would have prevented EDG-B from starting and running in Manual Test mode.]

After EDG-B successfully started and accelerated to the required generator voltage and frequency within 10 seconds, the local EDG-B annunciator was reset to remove the alarms, and EDG-B was placed in the Manual Test mode of operation and continued to run satisfactorily. At approximately 1145 MST, when Control Room personnel attempted to shut down EDG-B from the Control Room, EDG-



91

14

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE	
Palo Verde Unit 3		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		93	003	00	04	OF 09

TEXT

B immediately stopped without going through the expected cooldown cycle. Following additional troubleshooting, at approximately 1752 MST on July 9, 1993, EDG-B was started for post maintenance test purposes from the Control Room using the Manual Test mode. EDG-B tripped almost immediately on Incomplete Sequence. Engineering personnel determined that EDG-B had been in a condition since July 3, 1993 that would have prevented it from starting and running in Manual Test mode. However, EDG-B remained capable of performing its specified safety function in Emergency mode (i.e., standby power source that is capable of starting and loading as required by an emergency automatic start signal to provide the power required for safe shutdown).

No apparent abnormalities were found in the Incomplete Sequence circuitry. At approximately 0200 MST on July 10, 1993, a defective diode located in the EDG-B Starting System Check circuitry was found and replaced. At approximately 0503 MST on July 10, 1993, Control Room personnel started EDG-A in accordance with TS LCO 3.8.1.1.b (i.e., if the EDG became inoperable due to any cause other than preplanned preventative maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE EDG) due to the expansion of the EDG-B work scope. At approximately 0927 MST on July 10, 1993, EDG-B successfully started and accelerated to the required generator voltage and frequency within 10 seconds. At approximately 1546 MST on July 10, 1993, following the successful completion of the surveillance testing and the manufacturer's recommended 4 hour run, Control Room personnel declared EDG-B operable and exited TS LCO 3.8.1.1 ACTION b and TS LCO 3.3.3.5 ACTION a.

An evaluation of the event was performed by Engineering personnel under the PVNGS Incident Investigation Program. The evaluation determined that EDG-B remained functional in Emergency mode (i.e., still capable of starting and loading as required by an emergency automatic start signal) from July 3, 1993 to July 10, 1993 and that EDG-B remained capable of performing its specified safety function. On July 27, 1993, Nuclear Regulatory Affairs personnel (utility, non-licensed) evaluated the event and determined that the event was not reportable under 10CFR50.73 as a condition that could have prevented the safe shutdown of the plant or as a condition prohibited by TS. In accordance with Regulatory Guide 1.108, "Period Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants," if the EDG was started in Manual Test mode and tripped on Incomplete Sequence (a trip bypassed in Emergency operating mode), the surveillance test would not have been considered a valid test or failure.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE		
Palo Verde Unit 3		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		0 5 0 0 0 5 3 0	9 3 - 0 0 3 - 0 0	0 5 0 5	OF	0 9	

TEXT

However, on August 19, 1993, Quality Monitoring personnel (utility, non-licensed) reviewing the evaluation documented a concern that EDG-B had been considered operable when it was not capable of starting and running in Manual Test mode as required by TS SR 4.8.1.1.2.a.4. The concern referenced Generic Letter 91-18, "Operable/Operability: Ensuring the Functional Capability of a System or Component," which states that "In addition to providing the specified safety function, a system is expected to perform as designed, tested, and maintained. When system capability is degraded to a point where it cannot perform with reasonable assurance or reliability, the system should be judged inoperable, even if at this instantaneous point in time the system could provide the specified safety function."

On August 26, 1993, APS management determined that EDG-B had been inoperable from July 3, 1993 to July 10, 1993. During this period, EDG-B was not capable of satisfactorily completing the TS SR 4.8.1.1.2.a.4 in Manual Test mode. Therefore, a condition prohibited by TS had occurred when the unit had not complied with TS LCO 3.8.1.1 ACTION b (i.e., restore the EDG to OPERABLE status within 72 hours). During this period, EDG-B remained capable of performing its specified safety function in Emergency mode (i.e., standby power source that automatically provides the power required for safe shutdown in the event of loss of the Class 1E bus voltage).

- C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

As described in Section I.B, EDG-B local and Control Room annunciators alarmed when a shorted relay in the EDG-B Starting System Check circuitry caused a fuse to open on a local non-class 1E power supply and a transistor to fail for the 'G' fiber optics card located in the EDG-B Starting System Check circuitry.

- D. Cause of each component or system failure, if known:

An independent investigation of this event was conducted in accordance with the PVNGS Incident Investigation Program. As part of the investigation, a root cause of failure analyses of the 'G' fiber optics card and the diode were performed. The evaluation has determined that the apparent failures (i.e., damaged 'G' fiber optics card, the blown fuse, and the defective diode) were caused by a fault of a suppression varistor across the coil of a Starting System Check Circuitry relay (i.e., the relay shorted). The cause of the relay shorting is due to normal component aging.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE	
Palo Verde Unit 3		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9 3	- 0 0 3	- 0 0	0 6	OF 0 9

TEXT

- E. Failure mode, mechanism, and effect of each failed component, if known:

When the fault of a suppression varistor across the coil of a Starting System Check Circuitry relay occurred (i.e., the relay shorted), the fuse blew and the transistor on the 'G' fiber optics card failed. The resulting electrical surge of current damaged electrical components on the fiber optics card. The diode was also physically connected to the same control circuitry as the 'G' fiber optics card. Engineering personnel have assumed that the diode was damaged when the relay shorted.

- F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - no failures of components with multiple functions were involved.

- G. For a failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

EDG-B was declared inoperable at approximately 0843 MST on July 9, 1993 to perform preplanned maintenance. Following the determination that EDG-B had been unable to start and run in Manual Test mode at approximately 1752 MST on July 9, 1993, and following subsequent repairs, EDG-B was returned to service at approximately 1546 MST on July 10, 1993, after the successful completion of the surveillance testing and the manufacturer's recommended 4 hour run. The estimated time elapsed from the discovery of the failure until the train was returned to service was approximately 21 hours and 54 minutes.

- H. Method of discovery of each component or system failure or procedural error:

The damage to 'G' fiber optics card, the blown fuse, and the defective diode were discovered during troubleshooting. There were no procedural errors which contributed to this event.

- I. Cause of Event:

An investigation was performed under the PVNGS Incident Investigation Program. The investigation determined that had an EDG test been performed to verify operability following the corrective maintenance performed on July 3 and July 4, 1993, the discrepancy in EDG-B's Starting System Check circuitry and its adverse affect on the Manual Test mode start capability would have

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME*	DOCKET NUMBER	LER NUMBER			PAGE		
Palo Verde Unit 3		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		09	3	0	0	7	OF

TEXT

been identified. However, based on the information known at the time, the operability determination made by Control Room personnel on July 3 and July 4, 1993, was within the guidelines provided in Generic Letter 91-18. When the ability of EDG-B to perform its specified safety function was first questioned at approximately 1840 MST on July 3, 1993 (EDG-B local and Control Room annunciators alarmed while EDG-B was in its normal "standby" condition), Control Room personnel had validated with Engineering personnel that the affected circuitry was non-Class 1E and that EDG-B was capable of performing its specified safety function in the Emergency mode of operation. Based on engineering judgement, Control Room personnel had reasonable expectation that EDG-B was operable. On July 4, 1993, Engineering personnel reevaluated the condition and determined that the remaining alarms did not impact the operability of EDG-B (i.e., did not render EDG-B unable to perform its specified safety function if called upon) and that EDG-B was capable of starting in the Manual Test or Emergency mode of operation. Appropriate corrective actions were implemented to restore EDG-B to its full qualification.

On August 19, 1993, Quality Monitoring personnel presented additional information based on the current licensing basis for the emergency diesel generators that EDG-B had been inoperable from July 3, 1993 to July 10, 1993. During this period, EDG-B was not capable of satisfactorily completing TS SR 4.8.1.1.2.a.4 in Manual Test mode. In accordance with TS SR 4.0.1, surveillance requirements shall be applicable during the operational modes. Therefore, even though EDG-B remained capable of performing its specified safety function in Emergency mode (i.e., standby power source that is capable of starting and loading as required by an emergency automatic start signal to provide the power required for safe shutdown), a surveillance requirement exists that the diesel generator demonstrate operability by starting in the Manual Test mode. In addition, the current licensing basis for the emergency diesel generator provides for manual starting control. Based on the apparent discrepancy between the specified safety function and the current licensing basis, APS management determined that EDG-B had been inoperable from July 3, 1993 to July 10, 1993 (SALP Cause Code X: Other).

No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to this event. There were no personnel or procedural errors which contributed to this event.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE	
Palo Verde Unit 3		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		0 5 0 0 0 5 3 0	9 3 - 0 0 3 - 0 0	0 8	OF	0 9

TEXT

J. Safety System Response:

Not applicable - there were no safety system responses and none were necessary.

K. Failed Component Information:

The 48A-SAS/45 relay in the EDG Starting System Check circuitry is manufactured by AGASTAT and the model number is GPDR740. The 1 ampere D-A33 diode, also in the EDG Starting System Check circuitry, is manufactured by ITT and the model number is IN4005.

II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

Emergency diesel generators function as an independent standby source of AC power to the two trains of ESF equipment for safe plant shutdown and decay heat removal in the event of a loss of offsite power.

Technical Specification Surveillance Requirement (TS SR) 4.8.1.1.2.a.4 states that each EDG shall be demonstrated OPERABLE by verifying the EDG can start using one of the following signals on a STAGGERED TEST BASIS: a) Manual; b) Simulated loss of offsite power by itself; c) Simulated loss of offsite power in conjunction with an ESF actuation test signal; or d) An ESF actuation test signal by itself. Only the Manual starting capability is a Test mode operation. The remaining three starting capabilities are Emergency mode operations. Although the Incomplete Sequence alarm/trip would have prevented EDG-B from starting and running in Manual Test mode, the evaluation determined that EDG-B remained functional in Emergency mode (i.e., still capable of starting and loading as required by an emergency automatic start signal) from July 3, 1993 to July 10, 1993 and that EDG-B remained capable of performing its specified safety function. Therefore, there were no adverse safety consequences or implications as a result of this event. This event did not adversely affect the safe operation of the plant or the health and safety of the public. The event did not result in any challenges to the fission product barriers or result in any releases of radioactive materials.

III. CORRECTIVE ACTION:

A. Immediate:

EDG-B was returned to service on July 10, 1993 following repairs.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME	DOCKET NUMBER	LER NUMBER			PAGE						
Palo Verde Unit 3		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER							
		0 9	3	-	0	0	3	-	0	0	0 9

TEXT

B. Action to Prevent Recurrence:

Nuclear Regulatory Affairs will evaluate removing Manual Test mode as one of the EDG start signals for the performance of TS SR 4.8.1.1.2. This action is being tracked to completion under the PVNGS Commitment Action Tracking System.

IV. PREVIOUS SIMILAR EVENTS:

No other previous events have been reported pursuant to 10CFR50.73.