Nuclear Operating Company
South Texas Project Electric Generating Station PO Box 289 Wadsworth, Texas 77483

April 30, 2003
NOC-AE-03001503
File No.: G25
10CFR50.73

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

South Texas Project
Unit 1
Docket No. STN 50-498
Licensee Event Report 03-002
Manual Reactor Trip Due to Reduced Deaerator Level

Pursuant to 10CFR50.73, the South Texas Project submits the attached Unit 1 Licensee Event Report 03-002 regarding a manual reactor trip that occurred on March 1, 2003, due to a reduction in the deaerator water level following loss of condensate flow. This event did not have an adverse effect on the health and safety of the public.

Commitments are listed in the Corrective Actions section of the attached report.

If there are any questions on this submittal, please contact S. M. Head at (361) 972-7136 or me at (361) 972-7849.

E. D. Halpin
Plant General Manager

plw

Attachment: LER 03-002 (South Texas, Unit 1)

IE22

cc:
(paper copy)

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LICENSEE EVENT REPORT (LER)

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

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4 TITLE

Manual Reactor Trip Due to Reduced Deaerator Level

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
03	01	2003	2003	02	00	04	30	2003	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	1
10. POWER LEVEL	100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

	20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
	20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)
	20.2203(a)(1)		50.36(c)(1)(i)(A)	X	50.73(a)(2)(iv)(A)		73.71(a)(4)
	20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)
	20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER
	20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)		
	20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)		
	20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)		
	20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)		

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Philip L. Walker	361-972-8392

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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

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

At 0149 on March 1, 2003, a 24-volt DC (VDC) power supply in the Unit 1Condensate Polishing System failed. This failure caused the Condensate Polishing service vessel outlet valves to close, as well as failure of the system bypass valve to open on high Condensate System differential pressure. The pressure transmitter signal that is required for opening the bypass valve was also not available due to the failed power supply. With all Condensate Polishing service vessel outlet valves closed and the system bypass valve closed, condensate flow to the deaerator was isolated. The Unit 1 reactor was manually tripped because of the ensuing decrease in deaerator level.

The cause was a design characteristic in which loss of one power supply disabled the differential pressure signal required to open the system bypass valve and the signal required to maintain the output valves open for the normal system flow path. The power supply was determined to have failed due to age-related degradation.

The affected power supply units have been replaced. A lock-up feature will be incorporated to ensure the Condensate Polishing Service Vessel outlet valves are locked in place in the event of a power supply failure. A fault tolerant power circuit will be developed and installed to prevent recurrence.

This event resulted in no personnel injuries, offsite radiological releases, or damage to safety-related equipment. There were no challenges to plant safety.

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

DESCRIPTION OF EVENT

At 0149, on March 1, 2003, Unit 1 was operating at 100% power when alarms annunciated on all three Unit 1 turbine-driven Main Feedwater Pumps for low seal water differential pressure. Over the subsequent 90 seconds, the "Hotwell Standpipe Level Hi / Low", "Flash Tanks 11, 12 and 13 Level Hi / Low", "Gland Steam Condenser Vacuum Low", and the "Low Pressure Heater Drip Pump 12 and 13 Trip" alarms also annunciated. Condensate pumps 11 and 13 were running at the time.

The control room staff observed the following indications:

- Decreasing deaerator water level;
- Mini-flow recirculating valves for the running Condensate Pumps cycling open;
- Higher than normal condensate header pressure; and
- No condensate flow.

The control room staff took manual control of deaerator level to ensure that the normal Level Control Valve was receiving a "full open" signal. The normal Level Control Valve was confirmed to be fully open.

At 0154, with deaerator level at 37% and continuing to decrease, the reactor was manually tripped. All equipment operated as designed following the reactor trip except pressurizer heater group 1B which failed to energize in automatic, but did energize manually. Based on indications and the short response time available, operator response was appropriately conservative and in accordance with station expectations.

At approximately 0205, the control room was notified that bypass valve CD-MOV-0132 was closed. This valve enables the Condensate Polishing Demineralizer System to be bypassed in the event of high differential pressure. The control room alarm for high condensate polishing system differential pressure did not annunciate at any time during the event. The control room staff directed that valve CD-MOV-0132 be opened manually. With CD-MOV-0132 open, flow was restored to the deaerator.

Event investigation found that Power Supply #1 in the Condensate Polishing Control Panel had failed, disabling Pressure Differential Indicating Transmitter (PDIT) 5701. The function of this pressure transmitter is to provide an input function to two alarms for system differential pressure, as well as an "open" permissive for bypass valve CD-MOV-0132. The alarm card circuit is powered from Power Supply #2, which remained energized throughout this event. The card is designed to provide both alarm and valve actuation in the event of a loss of power. However, the pressure transmitter input function to these alarm cards fails low when its power supply (Power Supply #1) is de-energized. Although the differential pressure had exceeded the alarm card setpoint (105 psid for valve actuation), there was no signal for CD-MOV-0132 to open.

Power Supply #1 also supplies the Condensate Polishing Manual/Auto Control Stations. On loss of power (Power Supply #1) to the Manual / Auto Control Stations for each CP Service Vessel Outlet Valve, no signal is provided to enable pneumatic output to the valve positioner. This resulted in the outlet valves being closed by the positioner, cutting off flow to the deaerator.

Event Significance

There were no adverse safety or radiological consequences associated with this event. No equipment damage occurred as a result of this event. This event did not affect the operability of any safety-related equipment, and all safety-related equipment performed as designed. This event is reportable pursuant to 10CFR50.73(a)(2)(iv) because it was resolved by manual actuation of the reactor protection system.

This event was not risk significant for nuclear safety. The Conditional Core Damage Probability for this event is 1.9E-07. This probability value demonstrates that this event was not risk significant, and the value is

substantially below the 1E-06 threshold used in the Nuclear Regulatory Commission Significance Determination Process.

Causes of the Event

The original design was not fault tolerant for individual power supply failures. The design description states, "The service inlet and outlet valves are provided with lock-up devices. These valves will remain in the position held at the time of an electric failure." The "electric failure" portion of the design statement refers to a loss of 120 Volts AC (VAC) to the entire distribution panel for the Condensate Polishing Control Panels, and not for an individual 24 VDC Power Supply failure. The solenoid that actuates the lock-up devices receives its actuation signal from a relay powered from Power Supply #2. The lock-up devices will not perform their function of holding the CP Service Vessel Inlet and Outlet Valves in place if Power Supply #1 fails. This is addressed by Corrective Actions 1, 5, 6, and 7.

Failure analysis of Power Supply #1 determined that the voltage regulator card in the power supply failed due to age-related degradation. This is addressed by Corrective Actions 2, 3, and 4.

Corrective Actions

1. Revise plant procedures to add steps to check for condensate polishing system differential pressure and open the system bypass valve if required. This action has been completed.
2. Replace Power Supply #1 in Unit 1 with a new power supply. This action has been completed.

   After replacement, an alarm input was simulated that resulted in an alarm in the Control Room, on ICS and at the CP Watch Station. In addition, the new Power Supply #1 was momentarily de-energized and no alarms were received in either the Control Room or the CP Watch Station. These results match the expected response.
3. Review Master Equipment Database for other applications of similar power supplies. This action has been completed.
4. Replace Power Supply #1 in Unit 2 with a new power supply. This action has been completed.
5. Provide a lock-up feature for the Unit 1 CP Service Vessel Outlet Valves that will lock the CP Service Vessel outlet valves in place in the event of a Power Supply #1 failure to ensure against loss of condensate flow. This action has been completed.
6. Provide a lock-up feature for the Unit 2 CP Service Vessel Outlet Valves that will lock the CP Service Vessel outlet valves in place in the event of a Power Supply #1 failure to ensure against loss of condensate flow. This action has been completed.
7. Develop and install a fault-tolerant power circuit for the Condensate / CP System interface in Unit 1 and Unit 2 to prevent recurrence.

   This action is scheduled to be completed by 09/30/2003.

Generic Implications

The Master Equipment Database was reviewed (Corrective Action 3) to identify other applications of these power supplies. There are presently four such power supplies in place at the South Texas Project. Their locations are as follows:

- Unit 1 CP Control Panel ZLP147 (9S212ZLP147)
- Unit 2 CP Control Panel ZLP 147 (9S211ZLP147)

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

- Make-up Demineralizer Building Panel ZLP140 (9Q210ZLP140)
- Plant Yard Water System Control Panel ZLP139 (9Q210ZLP139).

There are no significant plant effects from loss of the power supplies in the Make-Up Demineralizer and Yard Water Systems. The Unit 1 and Unit 2 Condensate Polishing Control Panel applications are addressed under Corrective Actions 2 and 4.

Additional Information

There have been no previous plant trips at the South Texas Project caused by loss of flow through the CP System and failure of the Condensate Polishing System Bypass MOV to open.

A review of industry operating experience found no other failures of this model power supply unit.