Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

April 26, 2007
NOC-AE-07002151
File No.: G25
10 CFR 50.73

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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Rockville, MD 20852-2738

South Texas Project
Unit 1
Docket No. STN 50-498
Licensee Event Report 1-07-001
Turbine-Driven Auxiliary Feedwater Pump Failed to Start During Surveillance Testing

Pursuant to 10 CFR 50.73, the STP Nuclear Operating Company (STPNOC) submits the attached Unit 1 Licensee Event Report 1-07-001 to address an incident in which the turbine-driven auxiliary feedwater pump failed to start during surveillance testing.

The Unit 1 turbine-driven auxiliary feedwater pump failed to start during surveillance testing on December 12, 2006. The pump was returned to operability on December 14 within the 72 hours allowed by Technical Specifications. Subsequent review determined that the cause of the failure to start originated during the previous surveillance test. As a result, the pump is considered to have been inoperable from November 16, 2006, to December 14, exceeding the allowed outage time of 72 hours. Consequently, this condition is reportable under 10 CFR 50.73(a)(2)(i)(B) for operation or condition prohibited by Technical Specifications.

This event did not have an adverse effect on the health and safety of the public.

There are no commitments in this letter. Corrective measures will be processed in accordance with the STP Corrective Action Program.

If there are any questions on this submittal, please contact either P. L. Walker at (361) 972-8392 or me at (361) 972-8902.

K L Coates

Ken L. Coates
Plant General Manager

PLW
Attachment: LER 1-07-001, Turbine-Driven Auxiliary Feedwater Pump Failed to Start During Surveillance Testing

STI: 32148231

IE22

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NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

I. APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Turbine-Driven Auxiliary Feedwater Pump Failed to Start During Surveillance Testing

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
									N/A	
12	12	2006	2007	- 001 -	00	04	26	2007	FACILITY NAME	DOCKET NUMBER

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©(1)(i)(A)	50.73(a)(2)(iv)(A)	73.71(a)(4)
	20.2203(a)(2)(i)		50.36©(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)
	20.2203(a)(2)(ii)		50.36©(2)	50.73(a)(2)(v)(B)	OTHER – None
	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)	X	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, Staff Licensing Engineer	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
A	AF	SCV	T147	N						

14. SUPPLEMENTAL REPORT EXPECTED				15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
X	YES (If yes, complete EXPECTED SUBMISSION DATE)		NO		06	21	2007

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

On December 12, 2006, the Unit 1 turbine-driven auxiliary feedwater pump failed to start during a surveillance test. It had previously passed surveillance testing on November 16, 2006. A motor-operated valve controlling steam flow to the turbine did not open. Subsequent review determined that the cause of the failure to start originated during the previous surveillance test. As a result, the pump is considered to have been inoperable from November 16, 2006, to December 14, 2006.

Technical Specification 3.7.1.2.b requires that, with the turbine-driven auxiliary feedwater pump inoperable, it is to be restored to operability within 72 hours or the unit is to be in hot standby within the next 6 hours and in hot shutdown in the following 6 hours. Because this pump was inoperable longer than allowed under the Technical Specifications without entering the appropriate action statements, this event is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B).

The closed motor-operated steam inlet valve was found with the valve actuator in the open position. Subsequent review determined that the latching mechanism had not been fully engaged. The root causes were determined to be inadequate maintenance instructions and a latching mechanism that was not easily set correctly. For corrective actions, maintenance instructions will be revised and determination will be made if modification of the latching mechanism is feasible.

Only Unit 1 was affected. This event resulted in no personnel injuries, no offsite radiological releases, and no damage to other safety-related equipment.

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

I. DESCRIPTION OF EVENT

A. REPORTABLE EVENT CLASSIFICATION

This event is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B). South Texas Project (STP) Technical Specification 3.7.1.2 requires that all three motor-driven pumps and one turbine-driven auxiliary feedwater (TDAFW) pump are to be operable when the unit is in Modes 1, 2, or 3. However, the Unit 1 TDAFW pump was inoperable longer than the allowed outage time and plant shutdown was not accomplished within the required time. This placed STP Unit 1 in a condition prohibited by Technical Specifications.

B. PLANT OPERATING CONDITIONS PRIOR TO EVENT

STP Unit 1 was in Mode 1 at 100% power.

C. STATUS OF STRUCTURES, SYSTEMS, AND COMPONENTS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT

No other inoperable structures, systems, or components contributed to the event.

D. NARRATIVE SUMMARY OF THE EVENT

On December 12, 2006 at 1046 hours, a surveillance test of Unit 1 TDAFW pump 14 was performed. However, when the Control Room Operator attempted to open the steam flow control valve for steam flow to the turbine, the valve did not open, and the TDAFW pump did not start.

Plant personnel were stationed at the TDAFW pump for the surveillance run and test equipment was installed to collect turbine start-up data. As part of the pre-start procedure requirements, the turbine was verified to be properly set-up for the surveillance test including visual inspection of the latch-up lever and trip hook engagement. Visual inspection of the latch-up lever and trip hook found that the two faces were not fully engaged, but the condition was deemed to meet minimum interface requirements documented by previous engineering assessment.

After the attempted start, it was determined that, based on information from the personnel stationed at the pump and the fact that the test equipment did not record any movement of the governor valve or speed indication from the turbine, steam had not been supplied to the turbine. The pump was declared inoperable.

Examination revealed that the trip and throttle valve latch-up lever at the valve actuator had disengaged from the trip hook and the steam flow control valve had remained closed.

Items susceptible to wear and degradation were inspected, including the latch-up lever and trip hook mating surfaces. The mating surfaces showed no wear, but were found to be coated with a layer of grease that was more than the vendor-recommended light coating. The excess grease was removed and a light coating applied. The rod end (ball joint) assembly located at the turbine end of the overspeed mechanical trip linkage was suspect based on the fault tree review and was replaced. Inspection of the replaced part found no degradation that would have affected the operation of the assembly or mechanical trip linkage.

The mechanical overspeed trip linkage was inspected for proper assembly and the impact space for the clevis pin at the trip and throttle valve slip link was found to be incorrect. The procedure for the mechanical trip linkage reassembly lacked adequate detail that may be required to consistently achieve satisfactory impact space set-up.

The overspeed mechanical linkage was disassembled and cleaned, the impact space was adjusted, and testing demonstrated repeatable test results.

The motor-driven auxiliary feedwater pumps were not affected by this condition.

The Unit 1 TDAFW pump was declared operable at 0125 on December 14, 2006.

E. METHOD OF DISCOVERY OF EACH COMPONENT FAILURE, SYSTEM FAILURE, OR PROCEDURAL ERROR

This condition was identified during a planned surveillance test of the Unit 1 TDAFW pump.

II. COMPONENT FAILURE

The trip linkage is the interconnecting hardware between the turbine mechanical overspeed trip mechanism and the trip and throttle valve. It translates movement of the tappet nut / head lever into unlatching the trip and throttle valve trip hook and closing the valve upon actuation of the mechanical overspeed trip.

The trip linkage consists of a connecting rod with a clevis and pin on one end and a ball-type swivel rod end on the other. The clevis mates with a slip link lever attached to a common shaft with the trip hook on the trip and throttle valve, and the swivel rod end is attached to the turbine head lever. When the trip tappet is raised, either by the action of the overspeed trip pin or the manual trip lever, the head lever is released. Releasing the head lever allows the trip spring to pull the connecting rod towards the tappet / tappet nut. The slip link lever then rotates the common shaft to the trip hook, disengaging the hook from the latch-up lever and allowing the trip and throttle valve to trip closed.

Impact space is provided between the trip rod pin and the trip rod side of the trip arm slot. The purpose of the impact space is to allow for relative movement between the trip and throttle valve and the mechanical overspeed trip assembly (linkage). Impact space between the clevis pin and the slip link lever inside face allows the connecting rod to build up speed before impacting (i.e., hammer blow) the slip link lever. This hammer blow to the slip link lever is to ensure the trip hook unlatches upon overspeed trip operation (i.e., overspeed trip by turbine shaft-mounted counter weight or manual actuation of hand trip lever). Inadequate impact space can make the linkage more sensitive to factors such as spring force relaxation or additional drag forces due to latch-up lever face corrosion.

Lack of full engagement is an indication that the overspeed trip mechanism linkage does not have sufficient impact space; this can cause the latch-up lever and trip hook to separate when the valve is opened. Once the valve begins to open, the latch-up lever transfers the valve spring pack load to the trip hook. Should the trip hook disengage, the valve spring pack immediately closes the valve.

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III. ANALYSIS OF THE EVENT

A. SAFETY SYSTEM RESPONSES THAT OCCURRED

No safety systems were required to respond during this event.

B. DURATION OF SAFETY SYSTEM TRAIN INOPERABILITY

The Unit 1 TDAFW pump is considered to have been inoperable beginning November 16, 2006. Repairs to the TDAFW pump were completed and the pump was declared operable at 0125 on December 14, 2006. Consequently, the TDAFW pump was inoperable for approximately 28 days.

C. SAFETY CONSEQUENCES AND IMPLICATIONS

Technical Specification Requirements:

South Texas Project (STP) Technical Specification 3.7.1.2 requires three motor-driven pumps and one TDAFW pump to be operable when the Unit is in Modes 1, 2, or 3. With the TDAFW pump inoperable, or with any two auxiliary feedwater pumps inoperable, the affected auxiliary feedwater pump(s) are to be restored to operable status with 72 hours. If the required action and associated allowed outage time are not met, the unit is to be in at least Hot Standby within the next six hours and in Hot Shutdown within the following six hours.

Because the Unit 1 TDAFW pump was inoperable longer than allowed under the Technical Specifications without entering the appropriate action statements, this event is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B).

Risk Assessment:

A risk assessment was performed to estimate the core damage risk associated with the event. The assessment assumes that the TDAFW pump was not functional from November 16, 2006, to December 13, 2006. The incremental conditional core damage probability (ICCDP) for this event was determined to be 1.8E-06.

The conditional core damage frequency (CCDF) with the TDAFW pump failed is dominated by the Loss of Electrical Auxiliary Building (EAB) HVAC initiator. This initiator contributes approximately 45% to the CCDF. The Loss of EAB HVAC initiator was previously identified as a conservative key source of uncertainty in the STP PRA model. STPNOC has commissioned a study to determine the EAB room temperatures versus time following a complete loss of EAB HVAC. From this study information, STPNOC expects to be able to remove at least part of this conservative key source of uncertainty from the PRA model. The risk assessment will be revised as necessary to incorporate insights from the Loss of EAB HVAC room heatup study. If the conservative effects of the Loss of EAB HVAC initiator can be reduced or removed from the PRA model, STPNOC expects the ICCDP for this event can be shown to be less than 1.0E-06.

The results of the study are expected to be available by May 30, 2007. A supplement to this LER documenting the results is expected to be submitted to the NRC by June 21, 2007.

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IV. CAUSE OF THE EVENT

Two factors were identified as being root causes because they both contributed to the event:

1. Inadequate maintenance instructions; and
2. The design of the trip and throttle valve linkage leaves no margin for variability.

V. CORRECTIVE ACTIONS

1. Enhanced detail / guidance for adjusting / setting latch-up lever and trip hook interface gap and impact space has been included in maintenance procedures. The enhanced impact space set-up instructions will be incorporated into the training materials to include how to optimize the impact space setting, applicable lessons learned and operating experience. Currently certified personnel will be retrained.
2. An evaluation will be performed to determine if a modification to the linkage will improve its reliability. If this modification is not feasible, additional actions will be assessed to address the configuration of the latching mechanism.
3. An operator aid has been developed to assist plant operators in determining that the latch-up lever and trip hook linkage is properly latched.
4. The requirement for 75% latch-up lever and trip hook interface has been reviewed, and is consistent with the vendor manual for generic applications of this type of valve.

VI. PREVIOUS SIMILAR EVENTS

Over the preceding five years, there have been no reportable events involving the TDAFW pump due to similar linkage misalignment.