



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
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November 8, 2006

James J. Sheppard, President and  
Chief Executive Officer  
STP Nuclear Operating Company  
P.O. Box 289  
Wadsworth, Texas 77483

SUBJECT: SOUTH TEXAS PROJECT ELECTRIC GENERATING STATION - NRC  
SUPPLEMENTAL INSPECTION REPORT 05000498/2006010 AND  
05000499/2006010

Dear Mr. Sheppard:

On September 28, 2006, the NRC completed a supplemental inspection at your South Texas Project Electric Generating Station, Units 1 and 2. On August 31, 2006, you informed the NRC of your readiness for this inspection to be performed. The enclosed report documents the inspection findings which were discussed on September 27, 2006, with you and other members of your staff.

As required by the NRC Reactor Oversight Process Action Matrix, this supplemental inspection was performed in accordance with Inspection Procedure 95001. The purpose of the inspection was to examine the causes and actions taken resulting from the mitigating systems performance indicator for the emergency AC power system crossing the threshold from Green (very low risk significance) to White (low to moderate risk significance) for Unit 2. This supplemental inspection was conducted to provide assurance that the root causes and contributing causes of the events resulting in the White performance indicator are understood, to independently assess the extent of condition, and to provide assurance that the corrective actions for risk significant performance issues are sufficient to address the root causes and contributing causes and to prevent recurrence. The inspection consisted of selected examination of representative records and interviews with personnel.

As discussed in NRC Regulatory Issue Summary 2006-07, "Changes to the Safety System Performance Indicators," the NRC, on April 1, 2006, replaced the safety system performance indicators with the mitigating system performance indicator (MSPI). The White mitigating systems performance indicator result was significantly influenced by the unavailability associated with the prolonged repair of Unit 2 Standby Diesel Generator 22 which failed on December 9, 2003. Because of the differences in the way the former safety system unavailability performance indicator and the current MSPI are calculated, the second quarter 2006 mitigating system performance indicator result reflects the unavailability associated with the repair of Standby Diesel Generator 22.

Based on the results of this inspection, no findings of significance were identified.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

/RA/

Claude E. Johnson, Chief  
Project Branch A  
Division of Reactor Projects

Dockets: 50-498  
50-499  
Licenses: NPF-76  
NPF-80

Enclosure:  
NRC Inspection Report 05000498/2006010 and 05000499/2006010  
w/Attachment: Supplemental Information

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SUNSI Review Completed: CEJ ADAMS:  Yes  No Initials: CEJ  
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**ENCLOSURE**

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Dockets: 50-498  
50-499

Licenses: NPF-76  
NPF-80

Report No: 05000498/2006010  
05000499/2006010

Licensee: STP Nuclear Operating Company

Facility: South Texas Project Electric Generating Station, Units 1 and 2

Location: FM 521 - 8 miles West of Wadsworth  
Wadsworth, Texas 77483

Date: September 25 through September 28, 2006

Inspector: T. Farnholtz, Senior Project Engineer

Approved By: C. E. Johnson, Chief  
Project Branch A  
Division of Reactor Projects

Enclosure

## SUMMARY OF FINDINGS

IR05000498/2006010; IR05000499/2006010; 09/25/2006-09/28/2006; South Texas Project Electric Generating Station; Units 1 & 2. 95001 Supplemental Inspection.

The report covered a four-day period of inspection by a region-based inspector. No violations were identified. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

### Cornerstone: Mitigating Systems

The U.S. Nuclear Regulatory Commission (NRC) performed this supplemental inspection to assess the licensee's evaluations associated with the mitigating systems performance indicator for the emergency AC power system crossing the threshold from Green (very low risk significance) to White (low to moderate risk significance) for Unit 2. This performance indicator was reported as White in the second quarter 2006. The primary reason for this performance indicator being characterized as White was a major mechanical failure of Standby Diesel Generator 22 on December 9, 2003. During this supplemental inspection, performed in accordance with Inspection Procedure 95001, the inspector determined that the licensee performed a comprehensive evaluation of the failure of this component. An adequate root cause evaluation was performed and appropriate corrective actions were taken to address the issue. In addition, the licensee revised parts of the licensed and non-licensed operator training and the fire brigade training programs to focus on specific aspects of this event.

## Report Details

### 01 INSPECTION SCOPE

The U.S. Nuclear Regulatory Commission (NRC) performed this supplemental inspection to assess the licensee's evaluation associated with the mitigating systems performance indicator (MSPI) for the emergency AC power system crossing the threshold from Green (very low risk significance) to White (low to moderate risk significance) for Unit 2. This performance indicator was reported as White in the second quarter 2006. As discussed in NRC Regulatory Issue Summary 2006-07, "Changes to the Safety System Performance Indicators," the NRC, on April 1, 2006, replaced the safety system unavailability performance indicators with MSPI.

South Texas Project (STP) Unit 2 experienced a significant mechanical failure of Standby Diesel Generator 22 on December 9, 2003 during a scheduled surveillance test. A significant amount of time was required to make the necessary repairs to this component. This resulted in significant unavailability time that was used in calculating the MSPI which was the primary cause of the performance indicator crossing the Green-White threshold. Because of the differences in the way the former safety system unavailability performance indicator and the current MSPI are calculated, the second quarter MSPI result reflects the unavailability associated with the repair of Standby Diesel Generator 22. The focus of this inspection was the failure of this diesel generator with emphasis on operator actions to the event and the changes made as a result of this event. The inspectors reviewed the licensee's actions associated with this event and conducted interviews of licensee personnel.

As a result of this event, the NRC conducted a special inspection to examine the licensee's response to the failure of Standby Diesel Generator 22. NRC Inspection Report 05000498/2004-006; 05000499/2004-006 was issued on March 23, 2004 to document the results of this special inspection. This inspection analyzed in detail the technical issues and the actions of the operators at the time of the event.

### 02 EVALUATION OF INSPECTION REQUIREMENTS

#### 02.01 Problem Identification

- a. Determination of who (i.e., licensee, self-revealing, or NRC) identified the issue and under what conditions

The primary cause of the Unit 2 MSPI crossing the Green-White threshold was the failure of Standby Diesel Generator 22 during a scheduled surveillance test on December 9, 2003. The cause of this failure was high cycle, low stress fatigue made possible by pre-existing microcracking below the surface at a location of stress concentration of the number nine master connecting rod. This failure was considered self-revealing.

- b. Determination of how long the issue existed, and prior opportunities for identification

The licensee conducted a detailed fatigue theory analysis to attempt to date the crack initiation. While the ability to date crack initiation is limited, the licensee determined the

initiation to near the time of manufacture of the connecting rod. The inspectors that conducted the special inspection following this event determined that this appeared reasonable.

The licensee issued a Licensee Event Report (LER 2003-03-01) to describe this event. In this LER, the licensee used a date of November 10, 2003 for risk evaluation purposes. This date corresponds to the satisfactory completion of a Standby Diesel Generator 22 24-hour surveillance test run. The inspector considered this to be reasonable as the most recent date that the unit was proven to be operable and capable of performing its safety function prior to failure.

The inspector did not identify any prior opportunities for identification of this condition. There were no examinations of internal engine components in place that would have identified this flaw and none were required prior to this event.

- c. Determination of the plant-specific risk consequences (as applicable) and compliance concerns associated with the issue

To determine if a special inspection was warranted following this event, the NRC determined that two deterministic criteria was met: (1) the diesel generator failure involved possible adverse generic implications, and (2) the failure appeared to involve repetitive failures of safety-related equipment.

In addition, an NRC senior reactor analyst performed a preliminary assessment. This assessment assumed an exposure time of 15 days and resulted in an incremental conditional core damage probability (ICCDP) of  $4.7E-6$ .

Based on the deterministic criteria and the ICCDP, NRC management determined that a special inspection was warranted. The inspection was conducted December 15, 2003 through March 4, 2004 and documented in NRC inspection report 05000498/2004-006; 05000499/2004-006.

The inspector reviewed LER 2003-03-01 dated May 3, 2004 that was issued to describe this event. In this document, the licensee determined the ICCDP to be  $3.3E-6$  assuming a 29 day exposure time (November 10, 2003 through December 9, 2003).

## 02.02 Root Cause and Extent of Condition Evaluation

- a. Evaluation of methods(s) used to identify root cause(s) and contributing cause(s)

The licensee used a fault-tree analysis method to evaluate the failure of the Standby Diesel Generator 22. The inspectors that performed the special inspection following this event determined that this method was appropriate for evaluating an equipment failure. However, it was noted that this method is not useful in evaluating human performance aspects of an event.

The inspector questioned licensee personnel on this observation. The licensee indicated that human performance was ruled out very early in the process as a major

contributor to this failure. Therefore, the analysis focused on the cause of the equipment failure. The inspector concluded that this approach was reasonable and that no human performance issues directly contributed to this event. The licensee's use of fault-tree analysis was appropriate in this case.

The inspector reviewed the licensee's Root Cause Investigator's Manual to determine if this document was adequate to address issues that require a root cause analysis. This manual provides for six methods that the analyst can use to evaluate specific issues. Included in this manual are detailed descriptions on the use of each method. The inspector considered this manual to be complete and sufficiently detailed to result in adequate root cause evaluations using the available methods.

b. Level of detail of the root cause evaluation

The inspector reviewed the root cause evaluation that was performed for the failure of Standby Diesel Generator 22. This evaluation was also reviewed in detail during the special inspection conducted shortly after the event.

The inspector considered the evaluation to be adequately detailed and complete. The evaluation examined possible causes and established a root cause based on available data.

The inspector compared this root cause evaluation with the standards outlined in the Root Cause Investigator's Manual. In general, the evaluation was consistent with the manual. However, the inspector noted that no contributing causes were identified in the evaluation but that no statement to this effect was made. A statement such as this would provide a level of assurance that contributing causes were considered but that none were identified. The inspector agreed that, in this case, no contributing causes were associated with this event.

c. Consideration of prior occurrences of the problem and knowledge of prior operating experience

The special inspection report detailed a 1989 event on this same diesel engine in which the Number 4 Connecting Rod failed due to high-cycle fatigue failure. The cause of this event was identified as an improperly drilled and repaired lubrication hole that created a stress riser. This root cause was different than the cause of the 2003 event. It was concluded that there were no prior occurrences that could have reasonably predicted the 2003 event.

The inspector reviewed the licensee's use of industry operating experience. The licensee utilized operating experience from internal sources, nuclear industry sources, and non-nuclear industry sources. The inspector considered the use of operating experience from these varied sources to have been useful in establishing the correct root cause.

- d. Consideration of potential common cause(s) and extent of condition of the problem

The inspector reviewed the licensee's actions to establish any potential common causes for the failure of the diesel generator connecting rod. Extensive examination of all other connecting rods in the other five standby diesel generators and of the rods used in the rebuilt Standby Diesel Generator 22 revealed that no detectable cracking existed in the area of the failure. The licensee committed to conducting phased array ultrasonic testing of all in service connecting rods every 5 years or 500 run-time hours. To date, five diesel generators have been examined under this commitment with no indications identified. The inspector concluded that there was adequate assurance that any potential common cause issues could be identified before failure occurred.

In the root cause evaluation performed by the licensee in response to the failure of Standby Diesel Generator 22, extent of condition was considered and evaluated. A thorough examination as described above was performed with no other problems identified in any of the other five diesel engines. The inspector considered the licensee's extent of condition to be adequate.

During the course of this inspection, the inspector compared the root cause investigation report with the requirements contained in the Root Cause Investigator's Manual. It was noted that the licensee did an adequate extent of condition evaluation but did not address the extent of cause as specified in the manual. The inspector concluded that an extent of cause evaluation was not applicable in this case but that to be complete, a note to this effect would have been appropriate.

#### 02.03 Corrective Actions

- a. Appropriateness of corrective action(s)

The inspector reviewed the corrective actions established by the licensee in response to the Standby Diesel Generator 22 failure. As described in the special inspection report, the corrective actions were comprehensive and appropriate.

The inspector reviewed actions taken by the licensee as a result of any lessons learned from this event. These actions were primarily in the area of licensed and non-licensed operator training and fire brigade training. No major changes in these areas were made but additional focus was placed on tripping a diesel generator using the methods described in operations procedure 0PSP03-DG-0002, "Standby Diesel 12(22) Operability Test," Revision 28. Also, fire brigade training now includes specific direction for fire brigade members, who are also non-licensed plant operators, to place plant equipment that they are working with in a stable and safe condition and then report to the fire brigade staging area. The inspector considered this additional focus to be appropriate and that emphasis on actions to be taken during quickly developing situations was well placed.

b. Prioritization of corrective actions

The licensee's prioritizations of corrective actions were appropriate. The majority of specific corrective actions were focused on the required actions to repair the damaged diesel engine.

The inspector noted that, by default, all the specified corrective actions for this event were associated with the single root cause since no other root causes or contributing causes were identified. However, no specific reference was made. The inspector reviewed RCA-0001, "Root Cause Investigator's Manual," Revision 8 to determine if there was a requirement to reference corrective actions to specific root or contributing causes. No such requirement or expectation was included in the manual. However, the inspector noted that such a requirement was included in the ACE-0001, "Apparent Cause Evaluator's Manual," Revision 1. The licensee indicated that this requirement was planned for the next revision of the root cause investigator's manual.

c. Establishment of schedule for implementing and completing the corrective actions

The inspector examined the schedule for implementing specified corrective actions. In this case, virtually all of the corrective actions were in relation to the repair of the diesel engine. As a result, the schedule was driven by the repair efforts. The inspector considered the established schedule to have been adequate.

d. Establishment of quantitative or qualitative measures of success for determining the effectiveness of the corrective actions to prevent recurrence

The inspector noted that corrective action 04-986-1 was included in the root cause investigation report as an effectiveness review. The action specified that no significant cracks (i.e., a crack crossing more than 50 percent of the master rod connecting rod ligament) should be found during the first 5 year overhaul on each engine. The inspector considered this review to be adequate.

### 03 MANAGEMENT MEETINGS

#### Exit Meeting Summary

The results of the supplemental inspection were presented to Mr. J. Sheppard, President and CEO, and other members of licensee management and staff on September 27, 2006.

The inspectors asked the licensee representatives whether any materials examined during the inspection should be considered proprietary. No proprietary information was reviewed.

On October 26, 2006, Mr. Claude Johnson, Chief, Projects Branch A discussed the results of this inspection with Mr. Scott Head, Licensing Manager.

ATTACHMENT: SUPPLEMENTAL INFORMATION

ATTACHMENTS

**KEY POINTS OF CONTACT**

Licensee Personnel:

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S. Thomas, Manager, Engineering Units 3 and 4  
K. Taplett, Senior Engineer, Licensing  
J. Winters, Consulting Engineer, Systems  
D. Zink, System Engineer

NRC Personnel:

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J. Taylor, Resident Inspector

**LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

Opened

None

Opened and Closed

None

Closed

None

Discussed

None

## LIST OF DOCUMENTS REVIEWED

### Condition Reports (CR):

CR 03-18103  
CR 03-18159  
CR 03-18414  
CR 04-3260

### Preventative Maintenance (PM):

PM 04000707

### Procedures:

RCA-0001, Root Cause Investigator's Manual, Revision 8  
ACE-0001, Apparent Cause Evaluator's Manual, Revision 1  
0PSP03-DG-0002, Standby Diesel 12(22) Operability Test, Revision 25  
0PSP03-DG-0002, Standby Diesel 12(22) Operability Test, Revision 28

### Engineering Evaluations:

Root Cause Investigation Report 03-18103-4  
Mitigating System Performance Indicator (MSPI) Derivation Report

## LIST OF ACRONYMS

CCDP	Conditional Core Damage Probability
CR	Condition Report
LER	Licensee Event Report
MSPI	Mitigating System Performance Indicator
NRC	Nuclear Regulatory Commission