

# The Light company

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U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

South Texas Project Electric Generating Station  
Unit 1  
Docket No. STN 50-498  
Special Report Regarding  
Three Diesel Generator Nonvalid Failures

Pursuant to the South Texas Project Electric Generating Station Technical Specifications 4.8.1.1.3 and 6.9.2, Houston Lighting & Power submits the attached Special Report regarding three diesel generator nonvalid failures.

If you should have any questions on this matter, please contact Mr. C. A. Ayala at (512) 972-8628.

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Vice President  
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by *W. H. H. H. H.*

GEV/BEM/eg

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I. Description of Event

On May 23, 1989, Unit 1 was in Mode 1 at 100% Reactor Power. At 1854 hours Standby Diesel Generator (SDG) #13 was started to verify operability following maintenance. After starting in the emergency mode, the SDG was transferred to the test mode to parallel it with 4.16 KV bus E1C and load it as required by the surveillance test. After paralleling, the operator began to load the SDG. He noted that load continued to increase even after he released the load adjust switch. When it reached 2000 kW, the operator attempted to reduce the load. When he released the load adjust switch, the load continued to decrease. With load less than 200 kW, the operator attempted to open the generator output breaker, however, the SDG tripped on reverse power. This occurred at 1858 hours.

Troubleshooting was conducted by the system engineer. The governor and control circuits and associated relays were checked to determine if any obvious failures had occurred. Since no problems could be identified, the SDG was started locally at 2127 hours and ran without incident. It was secured at 2205 hours and control was transferred back to the control room. At 2225 hours the SDG was started remotely and paralleled to its bus. It again exhibited good speed control and transferred load normally with no problems. Since the SDG ran normally it was unloaded and secured at 2257 hours.

At 0906 hours on May 24, 1989, SDG #13 was started in the test mode to support scheduled engine analysis. The engine started and immediately tripped. The trip was accompanied by a "High Temp Main and Conn Rod Brg or Gen Brg" alarm. This is a non-emergency trip which is bypassed in the emergency mode.

Troubleshooting was conducted, consisting of calibration of the associated pressure switch and checking the control air lines associated with the trip for leaks or a bleed path which would indicate an actual bearing high temperature condition has occurred. No problems were identified. The SDG was started again at 1354 hours. This time the SDG started normally. It was paralleled and loaded to allow engine analysis, then unloaded and secured at 1502 hours. No abnormalities or problems were identified during this run.

At 0822 hours on June 8, 1989, SDG #13 was started in the test mode in preparation for maintenance on a transformer. It immediately tripped and the "High Temp Main and Conn Rod Brg or Gen Brg" alarm was received. This alarm had also been received during the May 24, 1987 nonvalid failure. Once it was determined that no actual high bearing temperature condition existed, further troubleshooting was performed to determine the cause of the trip.

A pressure gauge was installed on the engine shutdown air header to monitor pressure during starting. Upon receipt of a start signal, the shutdown air header is pressurized to reset the engine trip pressure switches. Until sufficient pressure is built up to pneumatically reset the pressure switches, the trips are electrically blocked to allow engine start. At an engine speed of 280 rpm, the block is removed. If the pressure switches have reset, the engine will continue to accelerate without tripping. The engine was started in the emergency mode and the pressure gauge was monitored. At 280 rpm, the gauge read approximately 18.5 psig and the trip alarm was received. This value is close to the measured pressure switch reset value of 16.2 psig. The shutdown air header air filter, regulating valve, and the pressure switch which actuated were replaced. The SDG was again started. The measured shutdown air header pressure was 22 psig. No trip alarms were received. Subsequent starts were performed with no problems noted.

## II. Cause of Event

The cause of the first failure was increased resistance across the contacts of the "Unit Parallel Control Mode" (3UP) relay and the "Emergency Mode Master Run" (4EX3) relay. Based upon analysis of the May 23, 1989 failure, contact resistance measurements were made on the 3UP and 4EX3 relays. It was discovered that the resistance was excessive. These relays determine the load sensing and speed adjustment characteristics of the engine governor. A slight change in contact resistance has a large effect on the load response of the engine. These two relays are uniquely applied in the resistance-sensitive diesel generator control circuit at STPEGS.

The second and third failures were caused by inadequate air flow to the shutdown air header, which prevented the pneumatic trip switch from resetting before the electric trips were unblocked at 280 rpm. This delay was caused by either a clogged air filter, a faulty regulating valve, excessive drift of the pressure switch reset value, or a combination of these factors. The removed air filter was inspected and found to have some debris in it, but not to the degree that would be expected to cause problems.

### III. Analysis of Event

The first trip occurred while paralleling SDG #13 with offsite power. The SDG is not paralleled during emergency operation and would have started and operated properly in the isochronous mode. The second and third trips occurred due to a trip signal which is bypassed in the emergency mode. Per the criteria in Regulatory Guide 1.108, these events are classified as non-valid failures. In the event of an actual challenge of the SDG, it would have performed its safety function without tripping.

### IV. Corrective Actions

The following corrective actions are being taken as a result of the May 23, 1989 event:

1. The 3UP and 4EX3 relays have been examined and measured for resistance, and their contacts have been burnished and cleaned to ensure proper operation.
2. A maintenance activity will be added to the existing diesel generator preventative maintenance program for both Units to burnish and clean the contacts on the 3UP and 4EX3 relays at each refueling outage. This action will be completed by the end of the Unit 1 first refueling outage.

The following corrective action has been taken as a result of the May 24, 1989 and June 8, 1989 events:

1. The air filter, air regulating valve, and pressure switch in the shutdown air header were replaced and tested with satisfactory results.

### V. Additional Information

Per the criteria of Regulatory Guide 1.108, the failures described in this report have been classified as non-valid failures. Therefore, the test interval for SDG #13 remains at 31 days. There have been 39 valid tests performed on SDG #13 since completion of the diesel generator reliability demonstration. There have been no valid failures.