GULF STATES UTILITIES COMPANY

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Gentlemen:

River Bend Station - Unit 1
Docket No. 50-458

Please find enclosed Gulf States Utilities' Informational Report regarding a recent discovery of a condition at River Bend Station - Unit 1. This report is being submitted to provide information regarding calibration of the feedwater flow instrumentation.

Sincerely,

J. E. Booker

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Manager-River Bend Oversight
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JEB/TFP/RGW/JHM/CAF/ch

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INFORMATIONAL REPORT

REPORTED CONDITION

On 8/1/89 with the unit at full power in Operational Condition 1 while performing an investigation into the feedwater flow instrumentation accuracy as outlined in Supplement 1 to General Electric Company's (GE) Service Information Letter No. 452, errors were identified in the feedwater flow instrumentation calibration practices at River Bend Station (RBS) which may have resulted in the plant operating at greater than the licensed limit of 2984 MWt. However, the cumulative effect of these errors was less than the instrumentation accuracy of two percent. Therefore, it is indeterminate as to whether RBS had actually exceeded the licensed maximum power limit. However, this informational report is being provided to inform the NRC and other BWR utilities of the condition identified and corrective actions taken.

INVESTIGATION

Prior to discovery of the reported condition, the RBS Engineering Department had initiated a modification request to procedurally implement the recommendations of GE Service Information Letter (SIL) No. 452, Supplement 1. This SIL provided recommendations for calibration of the feedwater flow transmitter. The feedwater flow transmitters were re-calibrated in accordance with the revised calibration procedure during the second refueling outage. However, the full effect of the feedwater flow transmitter re-calibration was not discovered until the reactor returned to full power operation following the second refueling outage.

Upon reaching 100 percent rated thermal power, a shortfall of turbine-generator output was observed. This prompted the Field Engineering Department to investigate the effect of feedwater flow transmitter re-calibration. The investigation revealed that the previous calibration was in conformance with prior vendor recommendations. However, after reviewing the previous instrument calibration record, Field Engineering concluded that the feedwater flow transmitter had been calibrated incorrectly prior to the implementation of the recommendations of the SIL.

The investigation performed by the Field Engineering Department revealed that the calculational method for the original feedwater flow transmitter span was in conformance with the method described in the feedwater control system design specification with the exception of the thermal expansion factor (Fa). The original calibration of the feedwater flow transmitter used a thermal expansion factor for a carbon steel flow element instead of a stainless steel flow element which is installed at RBS. This resulted in a calculated -0.16 percent error in the indicated feedwater flow. This error was in the non-conservative direction which would result in a feedwater flow indication slightly lower than actual flow.

Additionally, several other minor improvements were made in the calculation of the instrument span for the feedwater flow transmitter. These improvements included the following:

1) The value for gravity (g) of 32.2 ft/sec^2 used in the calculation was made more accurate by correcting for plant elevation as recommended by GE. The revised value for g is 32.1311 ft/sec^2.

2) A more accurate static pressure used for density compensation at full power was calculated for the transmitter. This value was revised from 1054.7 psig to 1079.6 psig.

3) GSU contacted the transmitter supplier and obtained a more precise pressure adjustment factor. This factor was revised from 1.0 percent/1000 psig to 1.45 percent/1000 psig.

These three improvements were calculated to result in approximately -0.21 percent change in the indicated feedwater flow. With the above improvements in combination with the correction for the thermal expansion factor, the span of the feedwater flow transmitter was reduced by approximately 0.77 percent. This reduced span was calculated to result in a -0.37 percent change in the indicated feedwater flow.

The GE recommended calibration procedure also calls for a zero adjustment of the flow transmitter at a static pressure of 1079 psig. This adjustment is to compensate for the system pressure effect on the transmitter zero when operating at 100 percent power. This adjustment was not previously performed but was included in the revised calibration procedure. A -0.61 percent change in the indicated feedwater flow was calculated as a result of this zero offset effect.

A cumulative total of -0.98 percent change in the indicated feedwater flow was calculated as a result of the effects of these improvements. Based on the calculated changes, the heat balance calculated reactor thermal power would be 100.93 percent at an indicated reactor thermal power of 100 percent. However, since the cumulative effect of the errors identified were within the accuracy of the feedwater flow instrumentation, it is indeterminate whether RBS had actually exceeded the licensed maximum power limit.

In summary, the cause of this condition has been attributed to the following:

1) The original calibration of the feedwater flow transmitter used a thermal expansion factor for a carbon steel flow element instead of a stainless steel flow element. This was calculated to have resulted in a -0.16 percent error in the feedwater flow measurement.

2) The improvements in the calculation of the instrument span identified above, in combination with the correction for the thermal expansion factor, was calculated to have resulted in a -0.37 percent error in the feedwater flow measurement.

3) A zero adjustment of the flow transmitter was not performed at operating static pressure. This adjustment compensates for the system pressure effect on the transmitter zero when operating at 100 percent power. This was calculated to have resulted in a -0.61 percent error in the feedwater flow measurement.

CORRECTIVE ACTIONS

As corrective action, a review of the calculation for the instrument span was performed. This review verified that all known factors which can cause errors in the feedwater flow transmitter calibration were eliminated. Additionally, a review of the current feedwater flow transmitter calibration procedures was

performed. This review verified that all GE recommendations have been incorporated into the procedure. As identified above, the feedwater flow transmitters were re-calibrated during the second refueling outage using the revised calibration procedure.

SAFETY ASSESSMENT

A review of plant process computer daily core performance summary log indicated that the plant had been operated at full power for approximately 446 days between 5/9/86 and 3/14/89. During this period, the indicated daily average power was at or below the licensed limit. However, the calculated maximum power level that could have been achieved during any instantaeous peak during steady-state operation was 101.24 percent during the first operating cycle and 101.14 percent during the second operating cycle based on the corrections to the indicated feedwater flow as discussed above.

The following assessment was made regarding the impact of this condition on the transient analyses and operating thermal limits:

1) An evaluation of the impact on the heat balance calculation with respect to the limits established by the transient analysis for the first and second operating cycles was performed. This evaluation concluded that no safety limits could have been exceeded.

2) The calculated feedwater flow error is within the uncertainty assumed for the feedwater measurement system accuracy in the process computer core thermal power calculation. The calculated magnitude by which actual core thermal power could have exceeded the licensed limit is within the core thermal power uncertainty established in the General Electric Thermal Analysis Basis (GETAB) analyses. Therefore, the fuel cladding integrity-safety limit minimum critical power ratio (MCPR) could not have been violated because of the inherent margins contained in the safety analyses.

3) The operating limit MCPR is established for the most limiting transient which yields the largest delta MCPR. The analysis was based on 104.18 percent rated thermal power for the first operating cycle and 102 percent rated thermal power for the second operating cycle. The calculated maximum power level during the first and second operating cycles did not exceed these values. Thus, the delta MCPR for the limiting transient was not affected. Therefore, the operating limit MCPR could not have been violated.

4) The maximum average planar linear heat generation rate (MAPLHGR) operating limit established by the emergency core cooling system (ECCS) performance analysis was based on reactor operation at 104.18 percent rated thermal power. As stated above, the calculated maximum power level during the first and second operating cycles did not exceed this value. Therefore, the MAPLHGR operating limit could not have been violated.

5) A review of process computer daily core performance summary log between 5/9/86 and 3/14/89 confirmed that the Technical Specification power distribution limits (i.e., MCPR, maximum linear heat generation rate MLHGR and MAPLHGR), were not exceeded during full power operation during the first two operating cycles.

Based on the above assessment, it is concluded that no Updated Safety Analysis Report analyzed safety limits or Technical Specification operating limits could have been exceeded during the the first two operating cycles. Therefore, there was no impact on the health and safety of the public as a result of this condition.