

A-196

GPC Exhibit II- ^{DOCKETED} 996
Hill/Ward Exhibit B _{SHRC}

3. VOGTLE EXPERIENCE WITH CALCON SENSORS IN 20 P 4:45
DIESEL GENERATOR TRIP CIRCUITS

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

3.1 Vogtle 1 (8/14/85)

Appendix I states: "A lube oil pressure sensor (Model B4400) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This date appears to be in error. Refer to Line 3.4 below.

3.2 Vogtle 1 (8/17/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) was discovered during construction acceptance testing with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This appears to be a duplicate of line 3.7 below.

3.3 Vogtle 1 (8/17/85)

Appendix I states: "A Calcon lube oil low pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This date appears to be in error. Refer to line 3.4 below

3.4 Vogtle 1 (8/19/85)

Appendix I states: "A Calcon lube oil low pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: All five of the lube oil pressure switches (1PS-4749 A, B, C, D, and E) for DG1A received their initial calibration under Construction Acceptance Test procedure CAT 85-2204. This procedure established the correct VEGP setpoints on these new switches; thus there was no setpoint drift since there was no previous setpoint.

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NUCLEAR REGULATORY COMMISSION
Docket No. 50-424/425-OLA-3 EXHIBIT NO. II-196
In the matter of Georgia Power Co. et al., Vogtle Units 1 & 2
 Staff Applicant Intervenor Other
 Identified Received Rejected Reporter SD
Date 9/19/85 Witness Hill and Ward

3.5 Vogtle 1 (8/19/85)

Appendix I states: "A Calcon jacket water low pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This was the initial calibration of 1PSL-19114 for DG1A, under Procedure CAT 85-2204. No setpoint drift could have occurred.

3.6 Vogtle 1 (8/20/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) during construction acceptance test was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This was the initial calibration of 1TSH-19110 for DG1A, under Procedure CAT 85-2204. No setpoint drift could have occurred.

3.7 Vogtle 1 (8/20/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) during construction acceptance testing was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This was the initial calibration of 1TSH-19111 for DG1A, under Procedure CAT 85-2204. No setpoint drift could have occurred.

3.8 Vogtle 1 (8/24/85)

Appendix I states: "A Calcon low turbo oil pressure sensor (Model B4400) during construction acceptance testing was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This date appears to be in error. Refer to Line 3.4 above for 1PSL-4749C.

3.9 Vogtle 1 (10/28/85)

Appendix I states: "Three Calcon jacket water high temperature sensors (Model A-3500-W3) were discovered with a setpoint out of calibration low and were recalibrated. The cause of the setpoint drift was not determined."

Response: During construction testing of the DG, the System Engineer wrote MWO 18511662 to perform an in-place calibration of DG1B switches 1TSH-19117, 1TSH-19118, and 1TSH-19119, using the permanently installed air tubing instead of a bench test rig in the shop. They were found out-of-specification low (180, 185, and 176 F), when compared to the previous bench calibration setpoints. This change could have been due to the difference in calibration techniques, drift, or a combination of these factors.

3.10 Vogtle 1 (11/14/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) failed and was replaced. The cause of the failure was not determined."

Response: MWO 18512461 was written on this date, during construction testing, and states to replace switch 1TSH-19119 on DG1B with an acceptable switch. MWO 18512094 was written on 11/5/85 and states that the switch is venting continually; a new switch was calibrated and installed on 12/12/85 to resolve both MWOs. Since the switch had been readjusted upward a few days earlier (see 3.9) but was still venting, a plausible cause was leakage due to debris in the valve, which was later determined to be a problem.

3.11 Vogtle 1 (12/10/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: The System Engineer wrote MWO 18513689 to perform an in-place calibration of DG1A switch 1TSH-19111 during construction testing of the DG. It was found out-of specification low (185F) when compared to the previous satisfactory bench test. That change could have been due to a difference in calibration techniques, drift, or a combination of these factors.

3.12 Vogtle 1 (12/11/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This was the initial calibration of 1TSH-19112 for DG1A, under Procedure CAT 85-2204. No setpoint drift could have occurred.

3.13 Vogtle 1 (2/11/86)

Appendix I states: "A Calcon lube oil low pressure sensor (Model A-3500-W3) was found with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This was the initial calibration of 1TSH-19146 for DG1A under Procedure CAT 85-2204. No setpoint drift could have occurred. This switch is a temperature sensor and not a pressure sensor, as stated in the NUREG, and the calibration was actually performed on 1/3/86.

3.14 Vogtle 1 (12/22/86)

Appendix I states: "A Calcon lube oil low pressure sensor (Model B4400) would not calibrate in specification and was replaced. The cause of the malfunction was not determined."

Response: MWO 18624684 states to obtain a new turbocharger low pressure turbo oil trip sensor and to replace 1PS-4749D on DG1A. The MWO does not state that the sensor "would not calibrate in specification." The source of this statement in the NUREG could not be determined.

3.15 Vogtle 2 (1/24/88)

Appendix I states: "A Calcon vibration switch sensor (Model E4600) was found defective and replaced with new vibration switch. The cause of the malfunction was not determined."

Response: This occurred during the construction testing period. This switch is different than Calcon temperature sensors and was not involved in the Site Area Emergency in 1990.

3.16 Vogtle 2 (2/5/88)

Appendix I states: "A Calcon low turbo oil pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This occurred early during the construction testing period. No further information was found.

3.17 Vogtle 2 (2/26/88)

Appendix I states: "A Calcon lube oil high temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: The System Engineer wrote MWO 28801450 to perform an in-place calibration check of 2TSH-19153 on DG2B during construction testing. The as-found setpoint for this switch was out-of-specification low (190F). This occurred about one month after the initial calibration of the switch and, most likely, occurred due to differences in calibration techniques.

3.18 Vogtle 2 (4/13/88)

Appendix I states: "A Calcon vibration detector sensor (Model E4600) was replaced due to a defective switch. The cause of the defective switch was not determined."

Response: This occurred during construction testing period. This switch is different than Calcon temperature sensors, and was not involved in the Site Area Emergency in 1990.

3.19 Vogtle 2 (4/21/88)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: The System Engineer wrote MWO 28803452 to recalibrate switch 2TSH-19119 on DG2B, because it was observed to be continuously venting. This occurred about one month after initial installation of the switch. The switch had an as-found setpoint of 158.6F, which was approximately 40F lower than the initial setpoint one month earlier. This difference could have been due to drift, as assumed in the NUREG, but was more likely a result of differences in calibration techniques.

3.20 Vogtle 2 (4/24/88)

Appendix I states: "Three Calcon high jacket water temperature sensors (Model A-3500-W3) were discovered with setpoint out of specification low and were recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 28803648 reported that three JW temperature switches (2TSH-19110, 2TSH-19111, and 2TSH-19112) on DG2A were venting. As-found setpoints were 180.0F, 185.1F and 181.5F, respectively. This difference could have been due to drift, as assumed in the NUREG, but was more likely a result of difference in calibration techniques. This problem occurred during construction testing.

3.21 Vogtle 2 (7/22/88)

Appendix I states: "Three Calcon jacket water high temperature sensors (Model A-3500-W3) were discovered with a setpoint out of calibration low and were recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 28807390 reported that two JW temperature sensors tripped while running a startup test of DG2B involving the JW temperature control valve, and stated that one switch tripped at a process temperature of about 172°F; the second switch tripped at a process temperature of about 179°F. The as-found setpoints were 181.5F (2TSH-19117), 173.4F (2TSH-19118), and 189.1F (2TSH-19119). The change from previous setpoints could have been due to drift, but was more likely a result of differences in calibration techniques. This problem occurred during construction testing.

3.22 Vogtle 1 (9/30/88)

Appendix I states: "Three Calcon jacket water header outlet temperature sensors (Model A-3500-W3) were discovered with a setpoint out of calibration (2 high, 1 low) and were recalibrated. The cause of the setpoint drifts was not determined."

Response: MWO 18806910 performed routine calibration on several instruments on DG1B during the first refueling outage. 1TSH-19117, 1TSH-19118, and 1TSH-19119 were all found out of calibration high at 220.1F, 213F, and 221.3F, respectively, on 10/20/88. These readings were obviously obtained using a different calibration technique than normal, since a water calibration bath cannot achieve the above temperatures at atmospheric pressure. Thus, using this inappropriate technique not only yielded suspicious test results, but was used to improperly reset the switches downward.

3.23 Vogtle 1 (10/10/88)

Appendix I states: "Ten Calcon bearing high temperature sensors were found to be defective and were replaced. The cause of the malfunction was not documented."

Response: This problem was caused by destructively testing the sensors during routine calibration during the first refueling outage. No defective sensors nor malfunctions were observed.

3.24 Vogtle 1 (10/18/88)

Appendix I states: "A Calcon jacket water high temperature sensor was discovered out of calibration high and was recalibrated. The cause of the calibration drift was not determined."

Response: MWO 18806902 performed routine calibration on several instruments on DG1A during the first refueling outage. 1TSH-19110 and 1TSH-19111 had as-found setpoints of 226.5F and 229.5F, respectively. The high out-of-specification readings were obviously obtained using a different calibration technique than normal, since a water calibration bath cannot achieve the above temperatures at atmospheric pressure. Thus, using this inappropriate technique not only yielded suspicious test results, but was used to improperly reset the switches downward.

3.25 Vogtle 1 (10/19/88)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) was not working properly and was replaced. The reason for the switch malfunctioning was not documented."

Response: MWO 18806902 (reference 3.24 above) determined that 1TSH-19112 on DG1A was defective during the first refueling outage routine calibration. On 10/18/88, the switch was replaced using MWO 18805581. The documentation does not explain what was wrong with the old switch.

3.26 Vogtle 1 (10/20/88)

Appendix I states: "A Calcon low lube oil pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 18806914 was written to perform routine calibration of several instruments on DG1A during the first refueling outage. All five of the lube oil pressure sensors (1PS-4749 A, B, C, D, and E) were found in-specification on 10/10/88 and 10/11/88.

3.27 Vogtle 1 (10/20/88)

Appendix I states: "A Calcon jacket water header pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 18806831 was written to perform routine calibration of several instruments on DG1A during the first refueling outage. Jacket water header pressure switch 1 PSL-19114 was found in-specification, but was readjusted to the nominal setpoint on 10/18/88.

3.28 Vogtle 1 (10/21/88)

Appendix I states: "A Calcon low lube oil pressure sensor (Model B4400) was discovered with setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This appears to be a duplicate of 3.26 above. No lube oil pressure switches were out of calibration.

3.29 Vogtle 1 (10/23/88)

Appendix I states: "Two Calcon normal trip pressure sensors (Model B4400) failed. One sensor would not respond and the other failed to reset within tolerance. The cause of the failures were not documented."

Response: MWO 18807465 was written to verify the correct setpoint for logic switch 1PSL-4903 on DG1B. The switch would not trip within tolerance and was replaced on 10/25/88. MWO 18807466 was written to verify the correct setpoint for logic switch 1PSL-4902 on DG1A. The switch would not reset within tolerance and was replaced on 11/3/88. Both of these problems occurred during the first refueling outage.

3.30 Vogtle 1 (10/26/88)

Appendix I states: "A Calcon jacket water header outlet temperature sensor (Model A-3500-W3) switch would not calibrate. The cause of the failure was not determined."

Response: MWO 18807637 stated that 1TSH-19119 on DG1B was leaking and should be replaced. A new switch was obtained but would not calibrate satisfactorily. Another new switch was calibrated and installed. This work was performed on 10/27/88, which was only a few weeks after the installed switch had been reset downward about 20F (see Item 3.22 above). No explanation is provided for failure of the first replacement switch to be calibrated, but in subsequent years some new switches were determined to have foreign material in the valve poppet area which prevented the switch from being set correctly. The original switch setpoint discrepancy appears to be very similar to later observations that note the importance of using consistent calibration techniques.

3.31 Vogtle 1 (10/30/88)

Appendix I states: "Two Calcon jacket water temperature sensors (Model A-3500-W3) were found to be defective and were replaced. The cause of the failures was not documented."

Response: MWO 18807746 stated that, during a run of DG1A on 10/30/88, an annunciator indicated a malfunction of jacket water temperature switches. Switches 1TSH-19110, -19111, and -19112 were checked with air and found not to be leaking. Switches 1TSH-19110 and 1TSH-19111 were removed and calibration checked in the shop with as-found setpoints of 193.7F and 193.4F, respectively, on 11/3/88, which was only slightly out of specification. They

were then reinstalled to support DG operability. On 11/19/89, three new switches were obtained, and all three JW high temperature switches were replaced. No explanation was provided for the initial DG annunciator problem in the documentation, but foreign material in one of the switches is one potential explanation, based on subsequent observations with those components. However, the NUREG statement does not appear to be an accurate representation of the actual problem.

3.32 Vogtle 1 (10/31/88)

Appendix I states: "Two Calcon jacket water header outlet temperature sensors (Model A-3500-W3) were replaced. The reason was not documented."

Response: For no documented reason, MWO 18807793 was written on 10/31/88 to replace DG1B switches 1TSH-19117 and -19118. New switches were calibrated and installed on 11/1/88. This problem occurred only a few weeks after the installed switches had been reset downward by 12-20F (see Item 3.22 above), and only a few days after the third switch was replaced on the same DG (see Item 3.30 above). The setpoint problems appear to be very similar to later observations that note the importance of using consistent calibration techniques.

3.33 Vogtle 2 (12/9/88)

Appendix I states: "A Calcon vibration sensor (Model E4600A) was malfunctioning causing the emergency diesel generator to trip. The sensor was replaced. The cause of the malfunction was not documented."

3.33 (continued)

Response: This occurred during startup testing of Unit 2. This switch is different than Calcon temperature sensors, and was not involved in the Site Area Emergency in 1990.

3.34 Vogtle 1 (11/19/89)

Appendix I states: "A Calcon high jacket water temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This appears to be a duplicate of the problem discussed in Item 3.31 above (final switch replacement date).

3.35 Vogtle 1 (12/5/89)

Appendix I states: "A Calcon lube oil pressure sensor (Model B4400) was found defective during a calibration check and was replaced with a new switch. The cause of failure was not documented."

Response: No record of the above problem was found on this date.

3.36 Vogtle 1 (1/3/90)

Appendix I states: "A Calcon turbo oil pressure sensor (Model B4400B) was venting and was replaced. Cause of the failure was not determined."

Response: No record of the above problem was found on this date. Also, the switch model number is not correct for VEGP switches.

3.37 Vogtle 1 (1/25/90)

Appendix I states: "A Calcon lube oil temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 19000439 was written on 1/25/90 to perform routine outage calibration of many instruments on DG1A. On 3/3/90, during the outage, 1TSH-19146 was found to be set at 211F and was reset to approximately 200F. Since the switch was calibrated at 200F in January, 1986, and checked at 202F in October, 1988, but three weeks later was found to be set 10F low, it appears that a different calibration technique was used on 3/3/90.

3.38 Vogtle 1 (1/25/90)

Appendix I states: "Three Calcon jacket water header outlet temperature sensors (Model A-3500-W3) were discovered with set points out of calibration high and were recalibrated. The cause of the setpoint drifts was not determined."

Response: MWO 19000439 was written on 1/25/90 to perform routine outage calibration of many instruments on DG1A. On 3/1/90 and 3/2/90, during the outage, jacket water temperature switches 1TSH-19110, -19111, and -19112 were found to be set at 210F, 206.2F, and 210.4F, respectively. They were reset to the correct setpoints and were reinstalled on the engine. Each of the calibration data sheets contains a note by the technician that states, "...the values indicated above are an average taken of three cycles." These switches

were in place on DG1A and tripped the engine approximately three weeks later during the Site Area Emergency on 3/20/90. The calibration method used during this procedure would have maintained the switch at an elevated temperature while the setpoint was adjusted downward and while the new setpoint was verified three times. Subsequent evaluation has shown that thermal growth of the switch at elevated temperatures will result in an improperly suppressed final setpoint.

3.39 Vogtle 1 (3/3/90)

Appendix I states: "A Calcon jacket water low pressure trip sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 19000439 performed routine outage calibration on DG1A switch 1PSL-19114. The switch was found to be about 2 psig out of specification and was reset.

3.40 Vogtle 1 (3/4/90)

Appendix I states: "A new Calcon high temperature main bearing sensor (Model 3434) switch was installed. The reason the new switch was needed was not documented."

Response: This sensor was destructively tested during the 1R2 outage on DG1A and was replaced with a new switch.

3.41 Vogtle 1 (3/23/90)

Appendix I states: "Three Calcon jacket water header outlet temperature sensors (Model A-3500-W3) were checked for calibration. Two switches were found out of calibration. One switch did not pass the bubble test and was replaced. The other two were recalibrated."

Response: MWO 19001511 documents work that was performed on DG1B during its 1R2 overhaul immediately following the Site Area Emergency. All three jacket water temperature switches (1TSH-19117, -19118, and -19119) were found set about 10F low, and two of them exhibited some leakage and were replaced. Subsequent examination showed that leakage was caused by foreign material in the switch poppet valve.

3.42 Vogtle 1 (3/25/90)

Appendix I states: "A Calcon lube oil high temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 19001511 states that switch 1TSH-19153 on DG1B was venting continuously and was defective. This work occurred as part of the restoration of DG1B following the Site Area Emergency on 3/20/90.

3.43 Vogtle 1 (3/25/90)

Appendix I states: "A Calcon start logic air pressure sensor (Model B4400) was found malfunctioning during a surveillance procedure. The defective sensor was replaced. The defective switch was subsequently tested satisfactorily. The cause of the malfunction was not determined."

Response: MWO 19001542 replaced defective P3 switch 1PS-4903 on DG1B as part of restoration from the routine overhaul following the Site Area Emergency. This switch was subsequently tested and tripped within specification at the same setpoint three consecutive times; therefore, the sensor was determined to not be defective.

SUMMARY:

The above data review reinforces that different calibration techniques used on the temperature switches had a major impact on the switch settings. Several instances are seen where a switch would be found set too high and would be adjusted downward, then a few days later would be reported leaking and would be found set too low. This is the same exact sequence that occurred on DG1A on 3/3/90 and 3/20/90, resulting in the Site Area Emergency (see 3.38 and 3.41 above).