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Georgia Power
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LCV-0272

Docket Nos. 50-424,
50-425

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

VOGTLE ELECTRIC GENERATING PLANT
CONTAINMENT COOLER TUBE LEAK REPAIR

By letter MSV-01415 dated April 16, 1993, Georgia Power Company (GPC) submitted a request to the NRC for Vogtle Electric Generating Plant (VEGP), Unit 1 which sought temporary relief from the repair requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. Specifically, a pinhole leak was identified in the base material of one of the tubes in VEGP-1 containment cooler 1-1501-A7-001-000 during the fourth maintenance/refueling outage which was in progress at the time. It was believed that a Code-acceptable repair could not be accomplished because the Code-acceptable repair options were either impractical or introduced the likelihood of creating a larger problem than that which existed. The burden and problems associated with meeting the Code requirements were documented in our April 16, 1993 letter. While not believed to be Code-compliant at the time, a repair of the pinhole leak was accomplished using solder and reinforcement of the affected tubing. GPC committed to perform a Code-acceptable repair or other long-term resolution during the next maintenance/refueling outage at VEGP-1 which is scheduled for September 1994. In addition, it was indicated that any leakage from the repaired tube would be monitored in accordance with the appropriate plant procedure(s) and Technical Specification requirements. After review, the NRC granted temporary relief from the Code requirements in accordance with 10 CFR 50.55a (g) (6) (i) and documented its approval in an April 16, 1993 letter to GPC.

The NRC letter of April 16, 1993 granted relief until completion of GPC's stated commitment to perform a Code-acceptable repair or other long-term resolution during the Fall 1994 maintenance/refueling outage at VEGP-1. The subject letter further indicated

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that should relief need to be continued beyond the aforementioned maintenance/refueling outage that GPC must provide a relief request with adequate information to support the relief requested.

After subsequent review, GPC has determined that when compared to the Code-compliant repair options available as identified in our April 16, 1993 letter, the repair performed during the fourth maintenance/refueling outage at VEGP-1 on containment cooler 1-1501-A7-001-000 is the preferable method for repair of the pinhole leak and any subsequent leaks. In addition, we have determined that the repair which was performed does not violate the Code requirement to which the containment cooler was originally designed. We consider the repair to be technically sound for the application involved and, as a result, consider its continued use to be acceptable. Our justification for this assessment is enclosed and is hereby submitted for NRC review and concurrence. Further, we believe that the repair technique utilized for VEGP-1 is also suitable for VEGP-2 should any possible repair of containment cooler tube leaks of a similar nature be required.

Should the NRC not agree with our assessment of the continued acceptability of the repair for VEGP-1 containment cooler 1-1501-A7-001-000 and any similar future leaks on either VEGP unit, please notify this office by June 15, 1994. A response by that date is requested in order to minimize any impact on outage planning activities for the upcoming VEGP-1 maintenance/refueling outage.

Should there be any questions in this regard, please contact this office.

Sincerely,

C.K.M'C

C. K. McCoy

CKM/JAE/jae

Enclosure: Justification for Continued Use of VEGP-1 Containment Cooler Tube Leak Repair

GeorgiaPower

xc: <u>Georgia Power Company</u>
Mr. J. B. Beasley, Jr. (w/encl.)
Mr. S. H. Chesnut (w/o encl.)
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<u>U. S. Nuclear Regulatory Commission</u>
Mr. S. D. Ebneter, Regional Administrator (w/encl.)
Mr. D. S. Hood, Licensing Project Manager, NRR (w/encl.)
Mr. B. R. Bonser, Senior Resident Inspector, Vogtle (w/encl.)

ENCLOSURE
(JUSTIFICATION FOR CONTINUED USE OF VEGP-1
CONTAINMENT COOLER TUBE LEAK REPAIR)

TO

GEORGIA POWER COMPANY
LETTER LCV-0272,
"CONTAINMENT COOLER TUBE LEAK REPAIR"

VOGTLE ELECTRIC GENERATING PLANT
NRC DOCKET NOS. 50-424, 50-425

JUSTIFICATION FOR CONTINUED USE OF VEGP-1
CONTAINMENT COOLER TUBE LEAK REPAIR

BACKGROUND

During the fourth maintenance/refueling outage (1R4) at Vogtle Electric Generating Plant (VEGP), Unit 1, a pinhole leak was detected in essential containment cooler 1-1501-A7-001-000. The leak was repaired at that time by placing a split coupling around the tube at the leak and soldering the coupling with Harris Stay-Brite 8 solder (silver solder) to the cooling coil (tube). At that time, this was considered a non-ASME Code repair. Because the repair which was performed during VEGP-1 Outage 1R4 was considered not to be Code-compliant, GPC submitted a request to the NRC seeking temporary relief from the repair requirements of ASME Section XI pending the performance of a Code-compliant repair or other long-term resolution during the fifth maintenance/refueling outage at VEGP-1 which is scheduled for Fall 1994. The temporary relief and the bases therefor were documented in GPC letter MSV-01415 dated April 16, 1993. After review, the NRC granted the requested relief from the Code requirements in accordance with 10 CFR 50.55a (g) (6) (i) and documented its approval in an April 16, 1993 letter to GPC.

Subsequent to VEGP-1 Outage 1R4, GPC reviewed the ASME Code for using soldered joints in Class 2 systems, the Design Specification, and the Nuclear Service Cooling Water (NSCW) System configuration and operating conditions in more detail to determine if the repair using a coupling and solder is an acceptable permanent repair.

The cooling coil joints in the essential containment coolers are brazed. Brazing consists of using filler metals with melting temperatures greater than 840 degrees Fahrenheit (840^{O}F) while soldering consists of using filler metals with melting temperatures less than 840^{O} F. The cooling coils are closely spaced and when brazed, either the adjacent tubes or the brazed tube ends are heated which could possibly cause additional leaks due to the high heat input involved with the brazing process. During initial plant start-up, this problem was identified when leaks at the tube joints were repaired. To prevent this from occurring, repair of the leak using solder is preferred. The solder melts at a temperature less than 840^{O} F which will not have an adverse effect on the brazed joints; therefore, additional problems are not created when making the repair.

The essential containment cooling units are classified as Engineered-Safety-Features (ESF) equipment. The pressure components for VEGP-1 and 2 are designed to ASME Section III, 1977 Edition including Addenda through Winter 1977, Class 2, Article NC-3300. The pressure components are the cooling coils and associated piping. The cooling coils are 5/8" outside diameter, 90/10 copper-nickel tubes. The design pressure and temperature of the coils is 200 pounds per square inch gage (psig) and 300^{O} F. The inlet connection for the containment coolers is located at elevation 240'-10". The cooling coils are located above the inlet and outlet connections.

The leak will require repairing in conformance with the 1980 ASME Section XI Article IWA-4000 requirements. Per IWA-4120, the repair shall be made in conformance with the Owner's Design Specification and Construction Code of the component or system; however, later editions of the Construction Code or ASME Section III, either in the entirety or portions thereof, may be used. If repair welding cannot be performed in accordance with the Construction Code or ASME Section III, then IWC-4000 for Class 2 components may be used. The applicable Construction Code for the cooling coils is the ASME Section III, 1977 Edition including Addenda through Winter 1977.

Article NC-3300 of ASME Section III does not address repairs using either soldering or brazing; therefore, ASME Section III, Article NC-3300 is not applicable to this repair other than the design considerations required during the original design. The Design Specification only addresses repairs made during manufacture and requires that a Manufacturer's repair program be used that has been accepted by the Purchaser. The only requirement in the Design Specification for brazing is the connection between the coil header and tubes. It does not address repairing leaks during operation using either soldering or brazing. In lieu of this, the repair must be made with good technical bases and should not violate the design considerations as applicable per ASME Section III, 1977 Edition, Article NC-3300.

Article NC-3671.6 of ASME Section III does address soldered joints; therefore, in lieu of no other requirements, this Article was used as guidance in evaluating the usage of solder for repair of the VEGP-1 containment cooler tube leak. ASME Section III, 1977 Edition, Article NC-3671.6 allows soldered joints of the socket-type to be made in accordance with ASME Section III, Table NC-3132-1 for ASME Section III Class 2 lines. Paragraph NC-3671.6.c.5 states that " Soft soldered joints shall not be used at pressures in excess of 150 psi (1030kPa) or at temperatures in excess of 212° F."

Paragraph NC-3671.6.c.5 in the Summer 1980 Addenda to ASME Section III was revised and stated that "Soldered joints shall be pressure and temperature rated in accordance with the applicable standards in Table NC-3132-1, except that they shall not be used at pressures in excess of 175 psi (1210 kPa) or at temperatures in excess of 250° F (121° C)". All other related requirements in the Summer 1980 Addenda (Articles NC-4000, 5000, & 6000) were reviewed against the 1977 Edition of the ASME Section III Code and were found to remain the same.

The NSCW System provides cooling water to the containment coolers and consists of two separate, 100-percent redundant trains. During normal plant operation, one train is designed to be in service at all times. During all other plant operating conditions, including accident conditions and post-accident coincident with a loss-of-offsite power, both trains of NSCW are designed to be operating, if available; however, one train is sufficient to satisfy the requirements to bring the plant to and maintain the plant at cold shutdown conditions. The NSCW System is designed to perform its cooling function following a loss-of-coolant accident (LOCA) automatically and without operator action, assuming a single failure coincident with a loss-of-offsite power. The design of the system is such that boiling will not occur in the containment coolers during a LOCA event.

The NSCW flow is from the NSCW cooling tower basin, through the NSCW pumps and the various components, and finally back to the NSCW cooling tower basin. Various manual valves are located throughout the NSCW flow path to allow isolation of components supplied by NSCW; however, these valves are locked in the open position. Motor operated valves (MOVs) are used in the inlet and outlet NSCW piping to the essential containment coolers and the NSCW tower return piping. The MOVs in the inlet and outlet NSCW piping to the essential containment coolers are considered containment isolation valves; however, they receive a safety injection (SI) signal to open. The NSCW cooling tower return valves are interlocked so that both valves cannot be closed at the same time. This ensures that a flow path exists for the NSCW System so that the pumps will not be operated at no flow conditions. The only postulated accident condition where the two valves would both be closed is a control room fire. For the postulated condition where both valves may be isolated, a pressure relief valve is located upstream of the two valves. During this postulated condition, the minimum NSCW flow rate will be approximately 7120 gallons per minute (gpm) (approximately 3560 gpm per pump) assuming a full NSCW cooling tower basin (elevation 217'-9" per Updated Final Safety Analysis Report Section 9.2.5.5). This corresponds to an NSCW pump discharge pressure of approximately 150 psig (345 feet) per the NSCW pump curves. The NSCW pump curves also show that the maximum pressure of the NSCW pumps at no flow condition is approximately 173 psig (400 feet).

The maximum expected NSCW temperature from the essential containment coolers during normal plant operation is 97° F, and during accident conditions is 242° F for recirculation mode following a LOCA, 255° F for a main steam line break (MSLB), and 266° F for a LOCA.

DISCUSSION

The containment cooler inlet piping is located at elevation 240'-10" and the normal NSCW cooling tower basin water level is 217'-9". Based on the elevation difference and the maximum expected system pressure (flow through the tower return relief valve), the maximum pressure at the containment cooler inlet piping would be approximately 140 psig.

The essential containment cooler coils are located above the inlet piping; therefore, the cooling coils will not experience a pressure greater than 140 psig under any normal or accident condition.

For the temperature requirement, the maximum calculated NSCW temperature during a LOCA is 266° F and during an MSLB is 255° F. This is 6.4% (16° F) and 2% (5° F) above the 1980 ASME Section III Code maximum allowable temperature for the LOCA and MSLB, respectively.

The NSCW outlet temperature from the essential containment coolers following a LOCA for one and two-train operation has been calculated and shows that a temperature of 266° F occurs at 116 seconds into the LOCA for both one and two-train operation. The NSCW outlet temperature at the initiation of the LOCA is 102° F for both one and two-train operation; however, NSCW is not assumed to be operating. NSCW is assumed to start at 101 seconds into the LOCA. At that time, the NSCW outlet temperature will be 265° F for both one and two-train operation. The temperature will increase to a maximum temperature of 266° F which will occur at 116 seconds for both one and two-train operation. At 150 seconds into the LOCA for one-train operation, the NSCW outlet temperature will be 255° F and at 1800 seconds, the temperature will be 248° F. Based on this, during a LOCA for one-train operation, the NSCW outlet temperature will be above the ASME Section III, 1980 Edition, Paragraph 3671.6.c.5 maximum limit of 250° F for less than thirty minutes. At 300 seconds into the LOCA for two-train operation, the NSCW outlet temperature will be 245° F. Based on this, during a LOCA for two-train operation, the NSCW outlet temperature will be above the ASME Section III, 1980 Edition, Paragraph 3671.6.c.5 maximum limit of 250° F for less than five minutes.

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(continued)

The NSCW outlet temperature from the essential containment coolers following a MSLB has been calculated and shows that a temperature of 255° F occurs at 1800 seconds into the MSLB. The NSCW outlet temperature at the initiation of the MSLB is 102° F; however, NSCW is not assumed to be operating. NSCW is assumed to start at 101 seconds into the MSLB. At that time, the NSCW outlet temperature will be 230° F. At 1200 seconds into the MSLB, the NSCW outlet temperature will be 249° F and, at 2330 seconds, the temperature will be 234° F. Based on this, during an MSLB, the NSCW outlet temperature will be above the ASME Section III, 1980 Edition, maximum limit of 250° F for less than twenty minutes.

Based on the above, the cooling coils will experience a maximum temperature of 266° F which will only occur for a maximum of thirty minutes. This exceeds both the 1977 and 1980 ASME Section III, Paragraph 3671.6.c.5 requirements; however, the requirements of Paragraph 3671.6.c.5 were used only as guidance. Even though the temperature limit specified in Paragraph 3671.6.c.5 was exceeded, the existing repair is acceptable as discussed in the following paragraph.

The existing repair to the cooling coil (tube) for VEGP-1 essential containment cooler 1-1501-A7-001-000 used a Harris Stay-Brite 8 solder which is equivalent to an Engelhard Silvabrite S solder. These solders have a solidus (melting point) temperature of 430° F and a liquidus (completely fluid) temperature of 535° F which give a plastic range of 105° F. These temperatures are much higher than 266° F which shows that the joint will not be adversely affected during a LOCA or MSLB. Per manufacturers literature, the tensile strength of the sleeve joint with the aforementioned brands of solder is 15,000 psi and the shear strength is 11,000 psi which are certainly adequate for this application. The tube was not cut when the leak was repaired during VEGP-1 Outage 1R4. The coupling was cut in half and placed over the tubing so that the hole in the tubing was located approximately in the center of the coupling (NOTE: The coupling does not have a center stop). This stopped the leak and provided reinforcement for the area around the hole in the tubing. The maximum expected temperature of the NSCW (266° F) is well below the melting temperature (430° F) of the solder, therefore, the maximum NSCW temperature will not have an adverse effect on the solder. The design considerations as applicable per ASME Section III, 1977 Edition, Article NC-3300, were reviewed and determined not to be adversely affected as a result of this repair and therefore, this does not violate any ASME Section III requirements.

Leak repair using either a Harris Stay-Brite 8 or Engelhard Silvabrite S solder will not have an adverse effect on the performance of the essential cooler to perform its function and will not violate the ASME Section III Code requirement to which the cooling coils were designed and manufactured. The maximum expected temperature for the essential coolers during a LOCA and MSLB will not have an adverse effect on the solder. Based on the foregoing, the potential for a failure of the essential cooler will not be increased.

The foregoing discussion is also applicable to any future possible repairs of containment cooler tube leaks at VEGP-2 which might be of a similar nature.

CONCLUSIONS

The essential containment cooler 1-1501-A7-001-000 leak at VEGP-1 was repaired by placing a split coupling around the tubing over the hole and soldering the coupling to the tubing using Harris Stay-Brite 8 solder. This repair does not reduce the strength of the components nor affect the performance of the essential coolers. The repair does not violate the design requirements of ASME Section III, 1977 Edition, Article NC-3300. Soldering also does not increase the potential for further damage to the coils which brazing would cause. Therefore, soldering a coupling to the tube using either a Harris Stay-Brite 8 or Engelhard Silvabrite S solder provides the preferable repair to this leak and for any future leaks of this type which may occur.

During VEGP-1 Outage 1R4, GPC notified the NRC by letter MSV-01415 dated April 16, 1993 that the repair performed did not constitute an ASME Section XI, Article IWA-4000 Code-compliant repair. GPC committed to perform an ASME Code-compliant repair or other long-term resolution as a permanent repair to the leak during the Fall 1994 maintenance/refueling outage. Due to time constraints during VEGP-1 Outage 1R4, a conservative approach was taken and the repair was evaluated using the requirements of ASME Section III, Article NC-3600 since they appeared to be more stringent than Article NC-3300. Subsequent to VEGP-1 Outage 1R4, a more thorough review of the original design of the cooling coils was performed and it was determined that Article NC-3300 applied and not NC-3600. The temporary repair conducted during VEGP-1 Outage 1R4 was approved by the NRC in their letter dated April 16, 1993. The NRC letter identified the commitment made by GPC to perform an ASME Code-compliant repair or other long term resolution during the next scheduled maintenance/refueling outage. Further, the NRC letter indicated that should relief need to be continued beyond the Fall 1994 maintenance/refueling outage at VEGP-1, GPC must provide a relief request with adequate information to support the relief requested. While GPC considers the repair to

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(continued)

be Code-compliant based on the foregoing discussion, this assessment is submitted for the review and approval of the NRC before declaring the existing repair on VEGP-1 essential cooler 1-1501-A7-001-000 to be permanent and suitable for any future tube leak repairs of a similar nature regardless of which VEGP unit it might be utilized.