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LCV-0681-F

Docket Nos.: 50-424
50-425

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

Gentlemen:

VOGTLE ELECTRIC GENERATING PLANT
GENERIC LETTER 95-07
SUPPLEMENTAL SUBMITTAL

The NRC performed an inspection of the Vogtle Electric Generating Plant (VEGP) Generic Letter 95-07 (GL 95-07) program in conjunction with the Generic Letter 89-10 (GL 89-10) Close-Out Inspection performed March 24-27, 1997. The NRC subsequently issued Inspection Report 50-424/97-04, 50-425/97-04 which outlines the results of these inspections. The inspection report requested additional information concerning the pressure locking and/or thermal binding evaluations performed for a total of 24 valves.

The enclosure to this letter provides additional information concerning the evaluation and disposition of potential concerns relative to pressure locking and/or thermal binding for the 24 valves identified in the inspection report. In addition, valves 1/2HV-8994A/B have been abandoned in place and are no longer covered by the recommendations contained in Generic Letter 95-07.

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Should you require any additional information regarding this response, please contact my office.

Sincerely,

C.K. McCoy

C. K. McCoy

CKM/HET/het

Enclosure

xc: Southern Nuclear Operating Company, Inc.
Mr. J. B. Beasley, Jr.
Mr. M. Sheibani
NORMS

U. S. Nuclear Regulatory Commission
Mr. L. A. Reyes, Regional Administrator
Mr. D. H. Jaffe, Senior Project Manager, NRR
NRC Senior Resident Inspector, Vogtle

Enclosure

Generic Letter 95-07
Supplemental Response

1. RHR Pump Miniflow Valves

Valves 1/2FV-0610 and 1/2FV-0611 were identified as being potentially susceptible to both pressure locking and thermal binding in the original VEGP GL 95-07 submittal transmitted to the NRC by letter LCV-0681-B dated February 8, 1996. To preclude susceptibility to these phenomena, the control scheme for these valves has been revised to control the closing function with the limit switch rather than the torque switch. Utilizing the limit switch for control in the closing direction allows the valve to be setup without hard wedging, thereby eliminating the potential for both pressure locking and thermal binding.

The NRC agreed with this approach conceptually, but questioned the controls which had been established to verify that the valves were not hard seating. In order to alleviate this concern, procedure 26871-C, Attachment 5 has been revised to require that the diagnostic traces for these valves be reviewed to verify that no unwedging load is present.

2. Pressurizer Power-Operated Relief Valve (PORV) Block Valves

Valves 1/2HV-8000A/B were identified as being potentially susceptible to thermal binding in the original VEGP GL 95-07 submittal. Additional information concerning these valves was transmitted to the NRC in letter LCV-0681-C dated June 28, 1996 and letter LCV-0681-E dated July 26, 1996. The NRC had concerns relative to the thermal binding evaluation and requested additional information in this regard.

As stated in letter LCV-0681-E, the safety functions performed by the PORV(s) and associated PORV block valve(s) are enveloped by the temperature transients associated with the steam generator tube rupture (SGTR) event . The analysis summarized in the above referenced letter concluded that a maximum temperature differential of 86° F could occur prior to opening these valves in response to a SGTR event. This is less than the 100° F threshold which has been established for susceptibility to thermal binding.

In addition, operating experience at VEGP has been reviewed to provide additional assurance that these valves are not susceptible to thermal binding. During a normal unit shutdown the PORV block valves close automatically on decreasing pressure at 2185 psig, which corresponds to a pressurizer temperature of approximately 650° F. The valves are normally re-opened to establish Cold Over Pressure Protection (COPS) at an RCS temperature of approximately 350° F. This corresponds to a pressurizer temperature of approximately 450° F based on the guidance provided in Operations Procedure 12006-

C which recommends that the RCS temperature be maintained approximately 100° F below the pressurizer steam space temperature. A review of operating data identified 30 shutdowns in which the PORV block valves would have been closed at a temperature of approximately 650° F, and then re-opened to establish COPS at a temperature of approximately 450° F. Repeatedly opening these valves following cooldowns of approximately 200° F provides assurance that the valves will be capable of opening following the relatively minor temperature transients associated with performing the valves safety functions.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermal binding.

3. RHR Loop Suction Isolation Valves (RCS Side)

Valves 1/2HV-8701B and 1/2HV-8702B are 12 inch, 1525 lb Westinghouse flexible wedge gate valves. The valves are normally closed and have a safety function to open when aligning the RHR system for safety grade cold shutdown. The valves were identified as being potentially susceptible to hydraulic and thermally induced pressure locking as well as thermal binding in the original VEGP GL 95-07 submittal. To address the NRC s concerns relative to these valves, the valves have been re-evaluated to ensure that they will be capable of performing their safety function.

Thermally Induced Pressure Locking

These valves are not required to operate in response to a large break LOCA and are exposed to a maximum ambient temperature of 120° F during normal operation. This ambient temperature is not sufficient to present concerns relative to thermally induced pressure locking.

These valves are closed in conjunction with a unit start-up when the RCS temperature is less than 350° F. The valves are connected to the RCS by approximately twenty feet of insulated piping. Data contained in WCAP-14834, "Structural Evaluation of VEGP RHR Lines Considering the Effects of Thermal Stratification", dated January 1997, indicates that as the RCS temperature is increased to normal operating conditions, the temperature on the upstream side of these valves approaches the hot leg temperature which is approximately 620° F at 100% power. Therefore, the valves experience a significant heat-up following closure which could result in an increase in bonnet pressure, assuming the bonnet is leak tight and water solid. However, prior to opening these valves to place the RHR system in service, the RCS must be cooled to less than 350° F. The reduction in RCS temperature, and the corresponding reduction in valve body temperature, will cause any fluid trapped in the bonnets of these valves to cool and contract. This contraction of the fluid will relieve any pressure which may have existed in the bonnet at the elevated temperatures associated with normal operation. An analytical evaluation performed by

Westinghouse, and documented in report V-EC-1620, "Thermally Induced Pressurization Rates", dated May 1996 indicates that bonnet pressure variations of up to 100 psi/° F are theoretically possible. These studies were performed primarily to assess the potential for pressure locking to occur following temperature increases, but the converse is also true. While an increase in temperature can potentially increase bonnet pressure, depending on a variety of factors such as the leak tightness of the valve, a decrease in temperature will clearly cause a reduction in bonnet pressure, and alleviate any pressure locking concerns.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermally induced pressure locking.

Hydraulic Pressure Locking

These valves are closed in conjunction with a unit start-up when the RCS pressure is less than 365 psig. The valves are connected to the RCS and are exposed to a pressure of 2235 psig during normal operation. The valves are opened in conjunction with a unit shutdown when the RCS pressure is less than 365 psig. Therefore, pressure may enter the valve bonnet during normal operation, and may become trapped in the bonnet during the depressurization of the RCS. However, as cited in the discussion concerning thermally induced pressure locking, the depressurization of the RCS is also accompanied by a decrease in RCS temperature. The decrease in RCS temperature will cause a corresponding decrease in the valve body temperature which will cause any fluid trapped in the valve bonnet to cool and contract. The contraction of this fluid will eliminate any pressure locking loads, whether they be hydraulically or thermally induced.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to hydraulic pressure locking.

Thermal Binding

These valves are closed at a maximum temperature of approximately 350° F in conjunction with a unit start-up, and are opened to place the RHR system in service at a temperature of 350° F or less in conjunction with a unit shutdown. The valves in the initial train of the RHR system being placed in service are opened at a temperature very close to 350° F, therefore, the operation of these valves does not present any concerns relative to thermal binding. However, switching trains of RHR, following initial RHR system operation, could require the valve in the train being placed in service to be opened at temperatures substantially lower than 350° F, thereby raising concerns relative to thermal binding. The RHR trains are switched routinely during refueling outages and no problems have been experienced with respect to thermal binding. A further review of the valves identified the following characteristics which minimize the potential for thermal binding:

1. The valve disk is of the flex-wedge design which minimizes the potential for thermal binding.

2. The valve body and valve disk are manufactured from the same material and have the same coefficient of thermal expansion which minimizes the potential for thermal binding.

3. The valve body is insulated which prevents rapid changes in the valve temperature and tends to minimize temperature gradients across the valve assembly, thereby minimizing the potential for thermal binding.

4. The original Limitorque SMB operators, which utilized torque switch control in the closing direction, have been converted to SB operators with limit switch control. This configuration tends to reduce closing loads while allowing the valve stem freedom to move axially against the compensator spring, thereby minimizing the potential for thermal binding.

Based on the results of this evaluation, in combination with the fact that these valves have been opened to facilitate at least 30 unit cooldowns without problems, it was concluded that these valves are not susceptible to thermal binding.

4. RHR Loop Suction Isolation Valves (Pump Side)

Valves 1/2HV-8701A and 1/2HV-8702A are 12 inch, 1525 lb Westinghouse flexible wedge gate valves. The valves are normally closed and have a safety function to open when aligning the RHR system for safety grade cold shutdown. The valves were identified as being potentially susceptible to hydraulic and thermally induced pressure locking as well as thermal binding in the original VEGP GL 95-07 submittal. To address the NRC's concerns relative to these valves, the valves have been re-evaluated to ensure that they will be capable of performing their safety function.

<u>Thermally Induced Pressure Locking</u>

These valves are not required to operate in response to a large break LOCA and are exposed to a maximum ambient temperature of 120° F during normal operation. This ambient temperature is not sufficient to present concerns relative to thermally induced pressure locking.

These valves are closed in conjunction with a unit start-up when the RCS temperature is less than 350° F. The valves are separated from the RCS by greater than sixty feet of insulated piping and the 1/2HV-8701B or 1/2HV-8702B valve. As the RCS temperature is increased to normal operating conditions these valves experience some temperature increase, however, the heat-up is not as significant as that which would occur on the 1/2HV-8701B and 1/2HV-8702B valves. Temperature measurements taken on the piping between the A and B valves, to support the preparation of WCAP-14834, indicate that the piping temperature stabilizes at approximately 250° F to 300° F during normal operation. Therefore, the valve temperature may increase following closure, however, the increase would be substantially less than that experienced by the B valve. Prior to opening these valves to place the RHR system in service, the RCS must be cooled to less than 350° F. Although a substantial temperature gradient exists between the RCS and the 1/2HV-8701A and 1/2HV-8702A valves, the reduction in RCS temperature will also result in a reduction in valve body temperature, which will cause any fluid trapped in the bonnets of these valves to cool and contract. This contraction of the fluid will relieve any pressure which may have existed in the bonnet at the elevated temperatures associated with normal operation. An analytical evaluation performed by Westinghouse, and documented in report V-EC-1620, indicates that bonnet pressure variations of up to 100 psi/° F are theoretically possible. These studies were performed primarily to assess the potential for pressure locking to occur following temperature increases, but the converse is also true. While an increase in temperature can potentially increase bonnet pressure, depending on a variety of factors such as the leak tightness of the valve, a decrease in temperature will clearly cause a reduction in bonnet pressure, and alleviate any pressure locking concerns.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to thermally induced pressure locking.

Hydraulic Pressure Locking

These valves are closed in conjunction with a unit start-up when the RCS pressure is less than 365 psig. The valves are separated from the RCS by the 1/2HV-8701B or 1/2HV-8702B valves, however, if these valves are postulated to leak, the 1/2HV-8701A and 1/2HV-8702A valves may be exposed to a pressure of 2235 psig during normal operation. The valves are opened in conjunction with a unit shutdown when the RCS pressure is less than 365 psig. Therefore, pressure may enter the valve bonnet during normal operation, and may become trapped in the bonnet during the depressurization of the RCS. However, as cited in the discussion concerning thermally induced pressure locking, the depressurization of the RCS is also accompanied by a decrease in RCS temperature. The decrease in RCS temperature will cause a corresponding decrease in the valve body temperature which will cause any fluid trapped in the valve bonnet to cool and contract. The contraction of this fluid will eliminate any pressure locking loads, whether they be hydraulically or thermally induced.

Based on the results of this evaluation, it was concluded that these valves are not susceptible to hydraulic pressure locking.

Thermal Binding

These valves are closed at a maximum temperature of approximately 350° F in conjunction with a unit start-up, and are opened to place the RHR system in service at a temperature of 350° F or less in conjunction with a unit shutdown. Temperature measurements taken on the piping between the A and B valves indicate that the piping temperature stabilizes at approximately 250° F to 300° F during normal operation , and cools an additional 20° F to 50° F in conjunction with a unit shutdown prior to placing the RHR system in service. While the data indicates that the valves do experience some cooling following closure, the change in temperature is not of sufficient magnitude to present concerns relative to the operation of these valves in placing the initial train of the RHR system in service. However, switching trains of RHR, following initial RHR system operation, could require the valves in the train being placed in service to open at temperatures substantially lower than 350° F, thereby raising concerns relative to thermal binding. The RHR trains are switched routinely during refueling outages and no problems have been experienced with respect to thermal binding. A further review of the valves identified the following characteristics which minimize the potential for thermal binding:

1. The valve disk is of the flex-wedge design which minimizes the potential for thermal binding.

2. The valve body and valve disk are manufactured from the same material and have the same coefficient of thermal expansion which minimizes the potential for thermal binding.

3. The valve body is insulated which prevents rapid changes in the valve temperature and tends to minimize temperature gradients across the valve assembly, thereby minimizing the potential for thermal binding.

4. The original Limitorque SMB operators, which utilized torque switch control in the closing direction, have been converted to SB operators with limit switch control. This configuration tends to reduce closing loads while allowing the valve stem freedom to move axially against the compensator spring, thereby minimizing the potential for thermal binding.

Based on the results of this evaluation, in combination with the fact that these valves have been opened to facilitate at least 30 unit cooldowns without problems, it was concluded that these valves are not susceptible to thermal binding.

5. Boron Injection Tank Discharge Isolation Valves

Valves 1/2HV-8801A/B were identified as being potentially susceptible to hydraulic pressure locking in the original VEGP GL 95-07 submittal. The potential pressure locking condition would occur as a result of a loss of coolant accident (LOCA) coincident with a loss of offsite power (LOSP). In this scenario the upstream and downstream side of the valve would be depressurized, thereby establishing the conditions for a potential pressure locking event to occur. In performing the detailed evaluations for these valves it was determined that in the event of an LOSP, the centrifugal charging pumps (CCPs) and the 1/2HV-8801A/B valves would receive simultaneous signals to start and open respectively. The starting of the pump and the resulting pressurization of the upstream side of the valves would be sufficient to relieve a pressure locking condition, should it exist. However, the CCPs could require approximately 3 seconds to pressurize the piping system, and the operator motor may experience a locked rotor condition until the pressurization occurs.

The NRC expressed concerns relative to the motor capability following the stalled condition. Although SNC believes the above argument provides reasonable assurance that the valves will be capable of opening in the event of a pressure locking condition, test data is not available to verify motor capabilities following a locked rotor condition. Therefore, an analytical evaluation was performed utilizing the PRESLOK software developed by Commonwealth Edison to quantify the potential loads associated with a pressure locking condition. Utilizing system operating pressures and valve friction coefficients measured in differential pressure tests, it was determined that the potential pressure locking loads were within the degraded voltage capability of the existing operator. To provide additional assurance that these valves will be capable of operating against potential pressure locking loads, the existing Limitorque SB-00-15 operators are scheduled to be replaced with Limitorque SB-0-25 operators during the Unit 2 refueling outage in 1999 and during the Unit 1 refueling outage in 2000. The larger operators will allow a long-term analysis to be developed which utilizes the more conservative design pressures and valve friction coefficients.

6. Containment Spray Pump Discharge Isolation Valves

Valves 1/2HV-9001A/B were identified as being potentially susceptible to hydraulic pressure locking in the original VEGP GL 95-07 submittal. The potential pressure locking condition would occur following the performance of an inservice test, in which case the upstream side of the valve would be depressurized following the completion of the test. In performing the detailed evaluations for these valves it was determined that in the event containment spray was required, the containment spray pump, and associated discharge valve, would receive simultaneous signals to start and open respectively. The starting of the pump, and the resulting pressurization of the upstream side of the valve, would be sufficient to relieve a pressure locking condition, should it exist. However, the containment spray pump could require approximately 1.5 seconds to pressurize the piping system, and the operator motor may experience a locked rotor condition until the pressurization occurs.

The NRC expressed concerns relative to the motor capability following the stalled condition. Although SNC believes the above argument provides reasonable assurance that the valves will be capable of opening in the event of a pressure locking condition, test data is not available to verify motor capabilities following a locked rotor condition. Therefore, procedures 14806-1 and 14806-2 have been revised to require that the 1/2HV-

9001A/B valves be stroked following the performance of inservice testing on the respective containment spray pump. Stroking the valves following inservice testing will eliminate the possibility of these valves being pressure locked, and will ensure that they are capable of performing their safety function.