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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING RECLASSIFICATION OF GENERIC LETTER 89-10

MOTOR-OPERATED VALVE ACTIVE SAFETY FUNCTIONS

GEORGIA POWER COMPANY, ET AL.

EDWIN I. HATCH NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-321 AND 50-366

1. INTRODUCTION

By letter dated February 3, 1994, and supplemented March 14, 1995, Georgia Power Company, et al. (the licensee or GPC), requested NRC staff review of the active safety function reclassification of motor-operated valves (MOVs) included in the Hatch Generic Letter (GL) 89-10 program. The staff issued GL 89-10 requesting licensees to develop programs to verify safety-related MOV capability under design-basis conditions. The licensee has determined that certain valves are no longer classified as having active safety functions and has reduced the number of valves covered by the GL 89-10 program.

The review of the licensee's analysis focused on determining whether the reclassified valve active safety functions are consistent with the valve safety functions required to accommodate the design-basis accidents (DBAs) and transients. A valve is considered to have a safety function if it may be called upon to actuate (open, close, or modulate) in order to mitigate a DBA, perform a safe shutdown, or maintain safe shutdown. Valves may have a safety function to close in order to isolate leaks downstream of the valve.

Valve system safety functions are evaluated in paragraphs "a" through "m" below. Some MOVs in emergency core cooling systems (ECCS) may also have containment isolation functions which must be evaluated in accordance with paragraph "p" of this Safety Evaluation (SE).

2. EVALUATION

a. E11-F003A&B and E11-F047A&B, Residual Heat Removal (RHR) Heat Exchanger Outlet and Inlet Valves

These valves were initially classified by the licensee as having an active safety function to open and close. Subsequently, the licensee reclassified them to have no active safety function. These valves are located on the RHR heat exchanger shell side inlet and discharge in each of the two RHR injection lines. The licensee's submittals stated that these valves are normally open and remain open while low pressure coolant injection (LPCI) and containment cooling are required, and are not required to be closed by RHR operating

procedures or emergency operating procedures (EOP) when LPCI is required. The licensee stated that these valves may be closed momentarily while transitioning to shutdown cooling or suppression pool cooling. However, the licensee has stated that closure is not required and will not be performed during EOP operation.

Based on its review, the NRC staff agrees with the licensee's reclassification that the close active safety function is acceptable for deletion because these valves are not required to close for any design-basis event and are not required to be closed by the plant emergency operating procedures. The open active safety function is acceptable for deletion because these valves are normally open, and must be open as a necessary condition for the RHR heat exchanger to be considered operable.

b. E11-F006A-D, RHR Shutdown Cooling Suction Valves

These valves were initially classified by the licensee as having an active safety function to open and close. Subsequently, the licensee reclassified them to have no active safety function. These valves are located downstream of the E11-F008 and E11-F009 valves which are in the common path for shutdown cooling suction. The E11-F008 and E11-F009 valves are used for isolation of the shutdown cooling lines and are included in the GL 89-10 program as having an active safety function to close. The E11-F006 valves are located outside the drywell and do not have a similar system isolation requirement. The E11-F006 valves are normally closed valves, and must open to allow flow from the reactor recirculation line (via the common shutdown cooling suction path) to support shutdown cooling operation. The licensee states that if the common shutdown cooling suction path is lost, alternate shutdown cooling is required. Alternate shutdown cooling involves using the second RHR loop, which will be pre-aligned to LPCI mode for injection to the vessel from the suppression pool. With the second RHR loop already aligned to draw coolant from the suppression pool, use of the common shutdown cooling suction path and opening of the E11-F006 valves is not required for the loss of shutdown cooling event.

Based on its review, the NRC staff agrees with the licensee's reclassification that deletion of the open active safety function is acceptable because it is not required for the loss of shutdown cooling event due to the licensee's use of alternate shutdown cooling. The staff also agrees with the licensee that the close active safety function is acceptable for deletion because these valves do not need to close for the loss of shutdown cooling event. During power operation, these valves are already normally closed.

c. E11-F004A-D, RHR Torus Suction Valves

These valves were initially classified by the licensee as having an active safety function to open and close. Subsequently, the licensee reclassified them to have no active safety function. These normally open valves are generally closed only during shutdown cooling operation, when the E11-F004 valves are closed on the RHR loop providing shutdown cooling. The licensee states that during shutdown cooling operation, the second RHR loop will be pre-aligned for the LPCI mode of RHR with the E11-F004 valves already open. Therefore, these valves will not be required to reposition (open) during a

loss of shutdown cooling event. However, these valves may also have a system isolation function if required to close for isolation of leakage downstream in the RHR lines.

Based on its review, the NRC staff disagrees with the licensee's reclassification. The close active safety function should be retained because these valves may have a system isolation function if required to close for isolation of leakage downstream in the RHR lines. The staff agrees with the licensee that the open active safety function is acceptable for deletion because these valves are normally open and are required to be open for the LPCI mode of RHR system to be considered operable, and are not required to move from the normal (open) operating position to satisfy design-basis events.

d. E21-F001A&B, Core Spray Pump Suction Valves from the Suppression Pool

These valves were initially classified by the licensee as having an active safety function to close. Subsequently, the licensee reclassified them to have no active safety function. The licensee's submittal stated that these normally open valves remain open for all modes of plant operation. With regard to the close active safety function, these valves may have a system isolation function if required to close to isolate downstream leakage in the core spray lines.

Based on its review, the NRC staff disagrees with the licensee's reclassification. The close active safety function should be retained because these valves may have a system isolation function if required to close for isolation of leakage downstream in the core spray lines. The staff agrees with the licensee that the open active safety function is acceptable for deletion because these valves are normally open and are required to be open for the core spray system to be considered operable, and are not required to move from the normal (open) operating position to satisfy design-basis events.

e. E41-F041,42, High Pressure Coolant Injection (HPCI) Pump Suction Valves from the Suppression Pool

These valves were initially classified by the licensee as having an active safety function to open and close. Subsequently, the licensee reclassified them to only have an active safety function to open. These normally closed valves have an active safety function to open to provide a HPCI suction path from the suppression pool in the event of a low level in the condensate storage tank, or a high level in the suppression pool. With regard to the close active safety function, these valves may have a system isolation function if required to close to isolate downstream leakage in the HPCI line from the suppression pool.

Based on its review, the NRC staff disagrees with the licensee's reclassification. The close active safety function should be retained because these valves may have a system isolation function if required to close for isolation of leakage downstream in the HPCI suction line from the suppression pool. The staff agrees with the licensee that the open active safety function should be retained.

f. **E11-F007A&B, RHR Minimum Flow Valves**

These valves were initially classified by the licensee as having an active safety function to open and close. Subsequently, the licensee reclassified them to have an active safety function to close. These normally open valves must close to provide sufficient LPCI and/or containment cooling flow. Therefore, the close active safety function is retained.

Based on its review, the NRC staff disagrees with the licensee's reclassification. These valves have a safety function to open because after closure, these valves may be required to re-open to support an RHR pump restart and prevent pump damage due to deadheading. The staff agrees with the licensee that the close active safety function should be retained.

g. **E21-F031A&B, Core Spray Minimum Flow Valves**

These valves were initially classified by the licensee as having an active safety function to open and close. Subsequently, the licensee reclassified them to have an active safety function to close. These normally open valves must close to provide sufficient core spray flow. Therefore, the close active safety function is retained.

Based on its review, the NRC staff disagrees with the licensee's reclassification. These valves have a safety function to open because after closure, these valves may be required to re-open to support a core spray pump restart and prevent pump damage due to deadheading. The staff agrees with the licensee that the close active safety function should be retained.

h. **E11-F024A&B, RHR Full Flow Test Line Valves**

These valves were initially classified by the licensee as having an active safety function to open and close. Subsequently, the licensee reclassified them to have an active safety function to open. The open active safety function is to be retained because the E11-F024 valves are normally closed and must open to provide suppression pool cooling for design-basis events. The E11-F024 valve is a globe valve which is used for throttling flow to the suppression pool. The licensee states that termination of suppression pool cooling is attained through the closure of the E11-F028A&B valves, which have both open and close safety functions and are included within the scope of the GL 89-10 program.

Based on its review, the NRC staff disagrees with the licensee's reclassification. The E11-F024 valves are redundant to the E11-F028 valves, and have an active safety function to close if the E11-F028 valves fail to close to terminate flow to the suppression pool. The staff agrees with the licensee that the open active safety function should be retained because this valve is required to open to support suppression pool cooling.

i. **E11-F103A&B, RHR Heat Exchanger Vent Isolation Valves**

These valves were initially classified by the licensee as having an active safety function to close. Subsequently, the licensee reclassified them to

have no active safety function. The licensee's submittal states that these valves are closed and remain closed for all design-basis events. By telecon on September 14, 1995, the licensee stated that these valves are open while transitioning to shutdown cooling, and during surveillance testing.

Based on its review, the NRC staff agrees with the licensee's reclassification that the close function is acceptable for deletion, because these valves are not required to reposition from the normally closed position for any design-basis event. However, in accordance with the staff position on test valves, if the vent valves are open, the heat exchanger must be declared inoperable or the valves must be demonstrated capable of returning to their design-basis position (closed) and consequently, must be considered to have an active safety function to close.

j. E11-F017A&B, LPCI Outboard Injection Valves

These valves were initially classified by the licensee as having an active safety function to close. Subsequently, the licensee reclassified them to have no active safety function. The licensee's analysis stated that these normally open valves originally had a safety function to close to assure sufficient containment cooling flow by diverting flow from the LPCI mode. If containment cooling is desired, and the E11-F017 valves do not close, the E11-F015 (inboard LPCI injection valves) may be closed. The LPCI mode of RHR may also be required for long-term core cooling, and the E11-F017 valve would be required to re-open to support long-term core cooling if previously closed to support containment cooling.

Based on its review, the NRC staff disagrees with the licensee's reclassification. The LPCI outboard injection valves maintain an active safety function to open because these valves may be closed to support containment cooling. If closed, the valves may need to be re-opened for long-term core cooling. The open function should be added to the scope of valves considered to have an active safety function, or additional justification should be provided by the licensee on the basis for exclusion of this function from the GL 89-10 scope. The staff also disagrees with the licensee's classification of the close active safety function. The E11-F017 valves are redundant to the E11-F015 valves, and have an active safety function to close if the E11-F015 valves fail to close so that LPCI flow can be diverted to containment cooling.

k. E41-F006, HPCI Injection Valve

This valve was initially classified by the licensee as having an active safety function to open and close. Subsequently, the licensee reclassified it to have an active safety function to open because this normally closed valve must open to allow HPCI injection. This valve was previously determined to have a safety function to close for isolation of vessel pressure from the HPCI injection line. The licensee also states that during an anticipated transient without scram (ATWS) situation, if HPCI flow is required to be throttled or isolated to control water level, the HPCI trip and throttle valves control steam flow to the HPCI turbine to regulate the HPCI injection rate, and that the E41-F006 valve is not used to control HPCI injection rate.

Although the HPCI injection valve does not appear to have a systems active safety function to close because it is not required to close to control HPCI flow rate, this valve may have a containment isolation function, which must be evaluated in accordance with paragraph "p", as mentioned earlier. The staff agrees with the licensee that the open safety function should be retained.

l. E51-F013, Reactor Core Isolation Cooling (RCIC) Injection Valve

This valve was initially classified by the licensee as having an active safety function to open and close. Subsequently, the licensee reclassified it to have an active safety function to open because this normally closed valve must open to allow RCIC injection. Similar to the HPCI injection valve, the licensee previously determined this valve to have an isolation function. During an ATWS situation, this valve is not required to be throttled to control RCIC injection rate.

Although the RCIC injection valve does not appear to have a systems active safety function to close because it is not required to close to control RCIC flow rate, this valve may have a containment isolation function, which must be evaluated in accordance with paragraph "p", as mentioned earlier. The staff agrees that the open safety function should be retained.

m. E51-F524, RCIC Turbine Trip/Throttle Valve

This valve was initially classified by the licensee as having an active safety function to close. Subsequently, the licensee reclassified it to have no active safety function. The closure of the valve, when tripped, is spring actuated. The motor operator is used only to open the valve following a turbine trip. The valve will need to open after closure if re-injection with RCIC is needed. The licensee states that the open function can be deleted because re-injection with RCIC is desirable but not necessary as the Automatic Depressurization System (ADS) followed by low pressure injection can provide sufficient makeup.

Based on its review, the NRC staff disagrees with the licensee's reclassification. The RCIC trip/throttle valve maintains an active safety function to open because re-injection with the RCIC is preferred to using the ADS during an accident/transient and also because the RCIC system can be powered from the DC battery system, so that the system becomes particularly important during station blackout scenarios. The open function should be added to the scope of valves considered to have an active safety function, or additional justification should be provided by the licensee on the basis for exclusion of this function from the GL 89-10 scope. The staff agrees with the licensee that the close active safety function for this valve can be deleted because the close function is spring actuated, rather than motor-operated.

n. E11-F016A&B Containment Spray System Safety Function

The licensee stated that the containment spray isolation valves (E11-F016A&B) are normally closed and would be opened only in the event containment spray were required. Previously, the licensee considered these valves as having an active safety function to open and close. Subsequently, the licensee

determined that these valves have no active safety function. The licensee's basis for the reclassification is that containment spray (wetwell and drywell) is not required in the mitigation of any design-basis accident. The Final Safety Analysis Report analyses indicate that containment spray heat removal function is not needed to prevent the containment from exceeding its design temperature and pressure. The licensee also stated that the containment spray system provides no fission product control function. The licensee did state that the containment spray system is assumed to function for purposes of Environmental Qualification (EQ), but noted that if containment spray failed to initiate when needed for EQ purposes, the operators would be able to depressurize the reactor and cool the containment by using the qualified ADS. This depressurization action would presumably remove the driving force for further containment heatup and prevent the containment temperature from exceeding the qualification temperature of equipment whose safety function would subsequently be needed. The licensee has not actually analyzed the containment response to a small main steamline break (MSLB) without spray.

The NRC staff agrees that analyses would indeed indicate that containment spray capability is not needed to prevent the containment itself from exceeding design conditions in the event of a design-basis loss-of-coolant accident (LOCA). However, containment spray capability is considered an important safety feature. In NEDO-24782, the BWR Owners acknowledged the spray mode of the RHR system in BWRs as "essential." Containment spray, while not "analytically" required for mitigation of a DBA-LOCA, provides a potentially important means of reducing containment pressure and temperature, and for reducing structural loads due to steam vent chugging phenomena (Ref: "Initiation of wetwell spray at the Suppression Chamber Spray Initiation Pressure," OEI Document 8390-4A Emergency Procedure Guideline). In addition, the licensee has taken credit for use of containment spray cooling in the qualification of electrical equipment in containment. Without a high level of assurance of spray system operability, compliance with 10 CFR 50.49 must be re-evaluated.

In view of the above, it is the staff's position that OPEN capability be considered an active safety function for containment spray isolation valves. Also, because containment spray fluid is, during an accident, RHR fluid that is diverted from decay heat removal, it is the staff's position that a CLOSE capability of the isolation valves is also a system safety function since core cooling is considered a higher priority cooling requirement than is the containment. Accordingly, it is the staff position that containment spray isolation valves be demonstrated capable of opening and closing under all postulated normal operating conditions and accident conditions.

o. Recombiner System Safety Function

The licensee stated that Hatch Unit 2 is provided with post-accident hydrogen recombiners. These recombiners are located outside of the primary containment. Most of the valves associated with the recombiners were initially considered by the licensee to have active safety functions. Subsequently, all were redefined to have no safety function. The licensee's basis for this action is that the recombiner system is not required to function for any design-basis event encompassed by the Nuclear Safety

Operational Analysis (NSOA), but serves only to satisfy a Unit 2 licensing requirement.

The recombiners provided for Unit 2 are requirements of the Hydrogen Rule (10 CFR 50.44). The Hydrogen Rule states:

> For facilities whose notice of hearing on the application for a construction permit was published on or after November 5, 1970, purging and/or repressurization shall not be the primary means for controlling combustible gases following a LOCA. However, the capability for controlled purging shall be provided. For these facilities, the primary means for controlling combustible gases following a LOCA shall consist of a combustible gas control system, such as recombiners, that does not result in a significant release from containment.

The intent of the above requirement is to reduce the potential need to vent the containment as a means to reduce post-accident containment pressure. Therefore, it is the staff's position that the recombiners have an active safety function.

p. Containment Isolation Safety Function

In Attachment 3 of its February 3, 1994 letter, the licensee provided the criteria used to assess the MOV safety functions. Criterion 2 states "Valve operability requirements, as defined by GL 89-10, are limited to changing position(s) from normal operating position(s) required to mitigate design-basis events." The licensee has applied this criterion in its assessment of active safety functions of ECCS valves.

In assessing the active safety functions of a valve, the staff has independently considered both the system safety function and the isolation safety function. A valve's containment isolation safety function will always be a safety function to close. Non-essential systems that penetrate containment are provided with isolation valves that automatically close in the event of an accident, unless the valves are normally "sealed-closed." These valves are considered to have an active isolation safety function to close. The containment isolation valves provided in essential systems also have an active isolation safety function to close, but the automatic closure instrumentation is not required (remote manual operation is acceptable in cases where automatic closure might adversely affect an ECCS safety function). Containment isolation valves that are not sealed-closed must be capable of closure during all plant MODEs for which operability is required. The fact that a valve is defined as "normally closed" does not exempt it from its operability requirement. (It must be sealed-closed to be exempt from operability.)

q. P41-F115A&B for Unit 2 Only - LPCI Inverter Room Cooler Isolation Valve

The LPCI inverter room cooler isolation valve is located in the Seismic Category I plant service water system. This valve, which is upstream of the LPCI inverter room cooler, is normally closed and must open to provide cooling

upon an automatic start of the room cooler. The licensee stated in their February 3, 1994, letter that these valves (F115A and B[1]) formerly had active safety functions to both open and close, but now they only have an active safety function to open. The licensee's original intent for declaring closing of the valve as an active safety function was that passive failure of the piping downstream of the LPCI inverter room cooler was within the design-basis.

The licensee re-evaluated the valve's operational requirement and concluded that the valve is not required to close to isolate flow for a downstream line break because a passive failure of the downstream piping is considered to be a "long-term passive failure" and is therefore beyond the design-basis. The licensee based this conclusion on Footnote 2 of the single failure[2] definition in 10 CFR Part 50, Appendix A, which states that the conditions under which a single failure of a passive component in a fluid system should be considered in designing the system against a single failure are under development.

The staff guidance in Standard Review Plan (SRP) 3.6.1, "Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment," NUREG-0138, Issue 7, "Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3, 1976 Memorandum from Director, NRR to NRR Staff," and SECY-77-439, "Single Failure Criterion," supports the licensee's conclusion on the passive failure criterion of fluid systems. The implementation of the passive failure criterion on fluid systems does not require significant ruptures of moderate-energy piping subsequent to a LOCA, as this combined event would be extremely unlikely. A moderate-energy system is defined in SRP 3.6.1 as having a maximum operating temperature of 200° F or less, and a maximum operating pressure of 275 psig or less. Since the plant service water system is a moderate-energy system, the licensee is not required to postulate a pipe break downstream of the LPCI inverter room cooler after a LOCA.

Based on its review, the staff agrees with the licensee that a passive failure of the piping downstream of the LPCI inverter room cooler is beyond the design-basis. Thus, the closing of the isolation valve some time after it has been opened in response to an automatic start signal is not considered an active safety function. Therefore, removal of these valves' requirement to be tested for automatic closure in the GL 89-10 test program is acceptable.

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[1] A and B denotes train A and train B, respectively.

[2] A single failure means an occurrence which results in the loss of capability of a component to perform its intended safety functions. Fluid and electric systems are considered to be designed against an assumed single failure if neither (1) a single failure of any active component (assuming passive components function properly) nor (2) a single failure of a passive component (assuming active components function properly), results in a loss of the capability of the system to perform its safety functions.

r. **All 2E32 for Unit 2 Only - Main Steam Isolation Valve (MSIV) Leakage Control System Valves**

The licensee requested that the MSIV leakage control system valves, which have active safety functions to open and close, be removed from the GL 89-10 MOV program. The staff has approved the licensee's recent design of an alternate leakage path and proposed changes to the Technical Specifications to increase MSIV leak rate limits. The licensee intends to remove the MSIV leakage control system. The staff considers the MSIV leakage control system valves to no longer have active safety functions when these approved changes are implemented. Therefore, following implementation of these changes, removal of these valves from the GL 89-10 program is acceptable.

s. **P41-F312 for Unit 1 and P41-F310 for Unit 2 - Plant Service Water Dilution Line Isolation Valves**

The plant service water (SW) dilution line is used to dilute with water effluent discharged from the intake tunnel and radwaste system. The licensee stated in their February 3, 1994, letter that the isolation valve for this line formerly had an active function to automatically close but it now has no active safety function since the valve's normal position is closed. In a letter dated March 14, 1995, the licensee provided additional information to verify that the valves are closed and remain closed for all design-basis events. The valves are opened during logic system functional testing (LSFT), performed once per 18 months for each unit.

The licensee stated that the valves are opened for LSFT only during an outage. During this test, the plant is in Mode 4 or 5, preparing for startup. The service water system is required to be operable during these modes. With the valve in its nonsafety position, the service water system remains capable of performing its safety function in Modes 4 and 5. The breakers are closed to provide power to the valve, the valve is opened, and then sent a signal to close. The valve is verified to close, and the breakers are then opened so the valve will remain closed.

Based on its review, the staff agrees that the SW dilution line isolation valve no longer has an active safety function to close and it can be removed from the GL 89-10 program.

t. **Test valves**

In its March 14, 1995 letter, the licensee stated that valve operability is not required during testing because these valves are not assumed to be called upon to operate during the short periods of time the system (or the valve) is in the test mode. Recently, the NRC staff indicated to other plants that an MOV placed in a position that prevents the safety-related system (or train) from performing its safety function must be capable of returning to its safety position, or the system (or train) must be declared inoperable. The licensee's position appears to be inconsistent with the Technical Specification requirements.

3.0 CONCLUSION

The staff has reviewed the licensee's request to reclassify some of the active safety functions of the valves in the GL 89-10 program. Based on its review, the staff disagrees with the licensee's reclassification of the following valve groups: RHR torus suction, core spray suction, HPCI suppression pool suction, RHR and core spray minimum flow, LPCI outboard injection, RHR full-flow test line, RCIC trip/throttle, containment spray, recombiner system, and ECCS containment isolation. The valves under consideration for removal from the GL 89-10 program may also have a containment isolation safety function to close. The containment isolation function of each valve should be considered in accordance with paragraph "p" of this evaluation.

Furthermore, the staff disagrees with the current safety classification of the LPCI outboard injection valve, and the RCIC trip/throttle valve. The safety functions to open for these two valves should be included in the scope of the GL 89-10 program or additional justification should be provided.

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