Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

October 5, 2010
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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Response to Request for Additional Information –
Reactor Coolant System Pressure Transmitter Replacement (TAC ME3967/ME3968)

Reference: G. T. Powell to NRC Document Control Desk, "License Amendment Request for Reactor Coolant System Pressure Transmitter Replacement," dated May 18, 2010 (NOC-AE-10002532) (ML101450414)

By the correspondence referenced above, STP Nuclear Operating Company (STPNOC) has requested a revision to the licensing basis for South Texas Project Units 1 and 2. This proposed change will remove the requirement as stated in the Updated Final Safety Analysis Report that redundant pressure transmitters be used as interlocks for isolation valves between the Reactor Coolant System and the Residual Heat Removal System. Attached is the STPNOC response to questions prepared by NRC reviewers regarding this request.

There are no commitments in this correspondence.

If there are any questions, please contact either Philip L. Walker at 361-972-8392 or me at 361-972-7566.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: October 5, 2010.
Date

G. T. Powell
Vice President, Engineering

PLW

Attachment: Reactor Coolant System Pressure Transmitter Replacement - Response to Request for Additional Information

A001
NRR

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SOUTH TEXAS PROJECT
UNITS 1 & 2
REACTOR COOLANT SYSTEM PRESSURE TRANSMITTER REPLACEMENT –
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

1) Describe STPEGS Unit 1 & 2 compliance to the automatic closure function of BTP 7-1 Position #2 that states that the valve operators should receive a signal to close automatically whenever the primary system pressure exceeds the subsystem design pressure.

   Otherwise, if compliance is not intended then the licensee should either:

   a) Explain the proposed alternative to the SRP criteria and demonstrate that it provides an acceptable method of complying with the Commission's regulations; or

   b) Provide information that demonstrates that the exception allowed by BTP 7-1 Position #5 is applicable.

   RESPONSE:

   Automatic Closure Interlock (ACI) of the Residual Heat Removal suction isolation valves had originally been provided for automatic closure of the valves whenever the Reactor Coolant System (RCS) pressure increased above a level approximating the RHR system design pressure. However, during RHR operation, the presence of the ACI offers the potential for inadvertent closure of the valves and subsequent loss of cooling by residual heat removal. Closure of the suction valves also isolates the RHR system pressure relief valves which help protect the RCS from overpressure transients during water-solid conditions as well as isolate the low-pressure letdown line. These negative aspects of the ACI prompted the NRC staff to reconsider the overall need for the suction valve ACI.

   This was the subject of a Technical Specification change request submitted to the NRC as ST-HL-AE-3485, dated June 12, 1990, and supplemented July 17, 1991 (ST-HL-AE-3828). The NRC issued Amendment 41 (STP Unit 1) and Amendment 18 (STP Unit 2) deleting the ACI from the Technical Specifications. The amendments are dated August 19, 1992, (ML021290151) and September 18, 1991, (ML021330715) for Units 1 and 2, respectively.

   With the current design, the isolation valve operators do not receive a signal to close automatically whenever the primary system pressure exceeds the subsystem design pressure. The inboard isolation valve in each train is power-locked-out at the motor control center in the closed position during Modes 1, 2, and 3 to ensure that the pressure boundary between the Reactor Coolant System and the RHR System is maintained at all times. These inlet valves remain closed until operator action is taken to initiate RHR cooling of the RCS. An alarm actuates if the valve is open and the RCS pressure is greater than the open permissive setpoint and less than the RHR design pressure minus the RHR pump head pressure. The operator is instructed to depressurize the RCS to return to the non-alarmed status, or secure the RHR pumps and ensure all trains of RHR suction isolation valves are closed.

   Based upon the above, the proposed alternative provides an acceptable method for compliance with the Commission's regulations.

2) Describe STPEGS Unit 1 & 2 compliance to the independence, diversity and system pressure criteria of (a) BTP 7-1 Position #2 that states both motor-operated valves should have independent and diverse interlocks to prevent both from opening unless the primary system pressure is below the subsystem design pressure, and (b) BTP 5-4 Position #B.2.A.iii that states that the valves should have independent diverse interlocks to protect against one or both valves being open during an RCS pressure increase above the design pressure of the RHR system, to the extent that such interlocks will not degrade high system reliability during shutdown operations (see Generic letter 88-17). This information should fully describe the independence and diversity of the interlocks in relationship to the system pressure magnitudes.

   Otherwise, if compliance is not intended then the licensee should either:

   a) Explain the proposed alternative to the SRP criteria and demonstrate that it provides an acceptable method of complying with the Commission's regulations; or

   b) Provide information that demonstrates that the exception allowed by BTP 7-1 Position #5 is applicable.

   RESPONSE

   a) The proposed alternative to the Standard Review Plan criteria complies with the requirements of BTP 7-1,Position #2, for independent and diverse interlocks to prevent both isolation valves from opening unless the primary system pressure is below the subsystem design pressure.

      - Each of the three RHR trains has two isolation valves in series on each RHR inlet line. Each isolation valve in a given RHR train is controlled by a different pressure transmitter. A pressure transmitter signal provides a permissive that allows the associated valve to be opened when the combination of the RCS pressure and the RHR pump discharge pressure is less than the RHR system design pressure. Without the required signal, the valve can not be opened from the Control Room. If a pressure transmitter is not functional, a separate transmitter keeps the companion valve closed. The pressure transmitters are independent of each other.

      - The inboard set of RHR suction isolation valves are power-locked-out at the motor control center in the closed position during Modes 1, 2, and 3 to ensure that the pressure boundary between the Reactor Coolant System and the RHR System is maintained at all times. These inlet valves remain closed until operator action is taken to restore power to the valve operators. Power restoration is performed separately for each valve operator. The valves upstream of these valves (on the RCS side) are also closed in Modes 1, 2, and 3.

      - Operator action is required to actuate the valve operators to open the isolation valves. Valve operator actuation is normally performed from the Control Room. Valve operator actuation is performed separately for each valve.

      - Using two independently powered motor-operated valves (MOVs) in each of the three inlet lines, along with independent pressure interlock signals for the "prevent-

open" function, assures that the design meets applicable single failure criteria. In each RHR subsystem, the interlock signal provided to the isolation valve closest to the RCS is independent from the interlock signal provided to the isolation valve closest to the RHRS.

b) The proposed alternative to the SRP criteria complies with the requirements of BTP 5-4 Position #B.2.A.iii for independent diverse interlocks to protect against one or both valves being open during an RCS pressure increase above the design pressure of the RHR system, to the extent that such interlocks will not degrade high system reliability during shutdown operations.

These inlet valves are kept closed until operator action is taken to open the valves and initiate RHR cooling. This feature is independent of the RCS pressure transmitters: they do not initiate isolation valve closure. Automatic Closure Interlock (ACI) of the Residual Heat Removal suction isolation valves was provided for automatic closure of the valves whenever the Reactor Coolant System (RCS) pressure increased above a level approximating the RHR system design pressure. However, during RHR operation, the presence of the ACI offers the potential for inadvertent closure of the valves and subsequent loss of cooling by residual heat removal. Therefore, automatic isolation valve closure is not provided. The requirement for this function was removed by STP License Amendment 41 for Unit 1 and Amendment 18 for Unit 2.

3) The licensee should explain why the manufacturer diversity that is proposed for deletion, and the associated pressure sensing technology diversity, are not necessary for STPEGS Unit 1 & 2 compliance to BTP 7-1 Position #2, and BTP 5-4 Position # B.2.A.iii. Within this explanation, the licensee should:

   a) Provide a deterministic analysis that addresses the adequacy of the remaining diversity to prevent each set of series motor-operated valves in each RHR loop from opening unless the RCS pressure is below the RHR System design pressure. The analysis should identify any vulnerability associated with the proposed change to permit a single pressure transmitter manufacturer, with its associated pressure sensing technology, and should address the plant's ability to cope with the identified vulnerabilities; and

   b) Describe the independence and diversity provided by the operating procedures and manual actions that govern closing the isolation valves and activating/deactivating the power lock out from the motor control center. This information should include the alarms and indications that govern these procedures and actions, identify their sources, and describe the degree of independence and diversity from the RHR system pressure sensors (PT-405, PT-406, and PT-407).

RESPONSE

The branch technical positions require that, where system interfaces have both valves motor-operated, the valves should have independent and diverse interlocks to prevent both from opening unless the primary system pressure is below the subsystem design pressure. There is no specification that the associated pressure sensing technologies be diverse.

a) Diversity provided by using two separate and independent pressure transmitters as interlocks, in combination with other methods of controlling valve operation, is sufficient to ensure separation of the RHR system from the RCS operating pressure. One pressure transmitter above the setpoint interlocks two RHR trains: if the valves are closed the interlock prevents opening from the Control Room, or if the valves are open an alarm is sent to the control room. Two pressure transmitters above setpoint will lock all three RHR trains. The interlocks do not prevent manual valve closure.

   - Multiple valves: Each RHR train is protected by two motor-operated valves mounted in series. Each valve in a given train is prevented from opening by an interlock provided by a different pressure transmitter. Both pressure transmitters would be required to fail for both valves to open against a higher RCS pressure.

   - Power lockout: Power to the inboard motor-operated isolation valve in each RHR train is locked out in Modes 1, 2, and 3. To open the valves, power must be manually restored to the valve motor operators.

   - Manual actuation: RHR isolation valves are not automatically actuated. A plant operator must take action specifically to actuate each isolation valve in a given train.

   - Motor-operator design: The motor operators for the isolation valves are sized to limit their ability to open a valve against full pressure difference between the RCS and RHR system.

Any vulnerability associated with one of the layers of protection is compensated by the independence of the complementing protection provided by the remaining layers. Assuming that two pressure transmitters on the same RHR loop fail to detect a large difference in pressure between the RCS and the RHR system and implement the interlock feature, an operator would have to commit multiple actions to defeat the protection provided the RHR system by the pressure isolation valves.

The possibility of the RHR system being exposed to the operating pressure of the RCS has been considered. Pressure relief valves are provided to ensure pressure does not exceed the RHR system design limit. All credible events were examined for their potential to overpressurize the RHRS. These events included normal operating conditions, infrequent transients, and abnormal occurrences. One relief valve has the capability to keep the RHRS maximum pressure within Code limits. As with other relief valves located inside containment, a discharge line is used to relieve to the pressurizer relief tank.

b) Procedures are in place to provide for isolation of the RHR system from the full RCS operating pressure.

- The procedure for RHR operation has a prerequisite prior to opening RHR suction MOVs to ensure that RCS temperature does not exceed 350 degrees Fahrenheit and pressure does not exceed 350 psig. This requirement must be met before operators open the RHR system to the RCS conditions.

- Alarms are in place for each of the three RHR trains in both units to alert operators if RCS pressure is greater than 475 psig with an RHR suction isolation valve not fully closed. Operator actions in the event of RCS pressure above 475 psig and an RHR suction isolation valve open include:

  1) Reduce RCS pressure to less than 475 psig; or

  2) Secure RHR pumps and ensure all trains of RHR suction isolation valves are closed.

- One inlet isolation valve in each RHR train is power-locked-out at the motor control center in the closed position during modes 1, 2, and 3. This feature ensures that the high/low pressure boundary between the RCS and RHR systems is maintained at all times. These valves do not close automatically when RCS pressure increases. The requirement for this function was removed by License Amendment 41 for Unit 1 and Amendment 18 for Unit 2.

The following discussion of valve operation uses RHR Train A as an example:

During plant heatup, RCS pressure is maintained less than 425 psig until all RHR trains are secured. This is below the 475 psig setpoint of the control board annunciator which will alarm if any of the pressure transmitters on RCS Loop A, B or C hot legs reach 475 psig with either RHR Train A suction valve 0060A or 0061A open. When RHR pump A is stopped, RHR Train A suction valves 0060A and 0061A are then closed. Following

valve closure, the circuit breaker for the motor for valve 0061A is opened and a lock placed on it to secure the circuit breaker in the open position. Position indication is maintained with the circuit breaker open.

When RCS pressure exceeds its setpoint as sensed by the pressure transmitter on RCS Loop B hot leg (PT-0405 powered by Train D), valve 0060A is blocked from opening. When pressure sensed by PT-0406 (located on the RCS Loop C hot leg and powered by Train B) is above its setpoint, valve 0061A is also blocked from opening. This interlock is tested periodically in accordance with Technical Specification 4.5.6.2. In addition, a pump discharge pressure transmitter sensing the pressure exceeds 540 psig when the RHR loop is aligned to the RCS will alarm in the Control Room

During plant cooldown, RCS pressure is lowered to between 325 and 350 psig. The circuit breaker for the motor for valve 0061A is unlocked and closed. When pressure sensed by PT-0405 is below approximately 332 psig, valve 0060A can be opened. When pressure sensed by PT-0406 is below approximately 332 psig, valve 0061A can be opened.