STP Nuclear Operating Company

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

May 18, 2010
NOC-AE-10002532
File No.: G25
10 CFR 50.90

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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Rockville, MD 20852

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
License Amendment Request for
Reactor Coolant System Pressure Transmitter Replacement

STP Nuclear Operating Company (STPNOC) requests Nuclear Regulatory Commission approval to revise a design requirement at the South Texas Project (STP) for diversity of the interlock function separating the Residual Heat Removal (RHR) system from the Reactor Coolant System (RCS). Valves separating the RHR from the RCS are to have independent and diverse interlocks to prevent both from opening unless the RCS pressure is below that of the RHR in compliance with Branch Technical Position ICSB-3, "Isolation of Low Pressure Systems from the High Pressure Reactor Coolant System." The change will allow similarly qualified pressure transmitters to be used in more than one RHR train as necessary regardless of manufacturer.

The proposed change would reduce system/equipment diversity in ensuring isolation of the low pressure Residual Heat Removal System from the high pressure RCS system. This would result in more than a minimal increase in the likelihood of a malfunction of a system, structure, or component important to safety previously evaluated in the UFSAR (10 CFR 50.59(c)(2)(ii)).

STPNOC requests NRC approval of the proposed amendment by September 30, 2010. The requested approval date will allow STPNOC to implement the change during the Unit 1 Spring 2011 refueling outage. Modifications to Unit 2 will occur during the Fall 2011 refueling outage.

The STPNOC Plant Operations Review Committee has reviewed and concurred with the proposed change.

In accordance with 10 CFR 50.91(b), STPNOC is notifying the State of Texas of this request for license amendment by providing a copy of this letter and its attachment.

There are no commitments in this letter.

A001
NRR

STI: 32626009

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 May 18, 2010.
Date

G. T. Powell

G. T. Powell
Vice President, Engineering

PLW

Attachment: 1) Evaluation of the Proposed Change - License Amendment Request for Reactor Coolant System Pressure Transmitter Replacement

2) Updated Final Safety Analysis Page to be Revised

cc: (paper copy)

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ATTACHMENT 1

SOUTH TEXAS PROJECT
UNITS 1 AND 2

Evaluation of the Proposed Change

Subject: License Amendment Request for Reactor Coolant System Pressure Transmitter Replacement

SOUTH TEXAS PROJECT
UNITS 1 AND 2

LICENSE AMENDMENT REQUEST FOR
REACTOR COOLANT SYSTEM PRESSURE TRANSMITTER REPLACEMENT

1.0 SUMMARY DESCRIPTION

Branch Technical Position (BTP) ICSB-3, "Isolation of Low Pressure Systems from the High Pressure Reactor Coolant System," calls for provision of a diverse interlock system for controlling operation of Residual Heat Removal (RHR) isolation valves. This proposed change will revise the design criteria used for compliance with BTP ICSB-3, removing the interpretation that wide-range Reactor Coolant System (RCS) Pressure Transmitter (PT) units be manufactured by different companies to ensure diversity.

2.0 DETAILED DESCRIPTION

Interlock systems important to safety operate to reduce the probability of occurrence of specific events or maintain safety systems in a state to assure their availability in an accident. These systems differ from protection systems in that interlock system safety action is taken prior to, or to prevent accidents. Interlock systems important to safety are discussed in Section 7.6 of the UFSAR.

BTP ICSB-3 recommendation 2 states that the isolation valves should have independent and diverse interlocks to prevent both from opening unless the primary system pressure is no higher than the RHR design pressure. The intent of diversity is to reduce the risk posed by common cause failures resulting in an intersystem LOCA through overpressurization of the RHR system by the RCS. This change removes the requirement to have "diverse interlocks" through use of transmitters provided by different manufacturers. The interlocks will continue to function as described but the transmitters will not be restricted as to the make and model required to perform that function. Diversity is achieved by other means.

Diversity has been provided by having a different manufacturer for each of the three pressure transmitters. However, as they need to be replaced over time, these manufacturers may no longer be able to produce transmitters meeting the required design criteria. Equivalent products from other manufacturers may also not be available, so that maintaining diversity through use of transmitters from different manufacturers may not be possible.

3.0 TECHNICAL EVALUATION

The RHR system transfers heat from the RCS to reduce reactor coolant temperature during plant cooldown. During plant operation, the RHR system is isolated from the RCS on the inlet side by two motor-operated valves in series on each RHR pump suction line. The two motor-operated gate valves in series in each inlet line from the RCS to the RHR system are shown in the schematic on page 11. They are normally closed and can be manually opened from the control room for residual heat removal after RCS pressure and temperature are reduced to approximately 350 psig and 350°F. Each valve is interlocked to prevent its opening if RCS pressure is more than approximately 350 psig.

There are three isolation interlock pressure transmitters, and three RHR trains with two isolation valves on each RHR inlet line. Each pressure transmitter controls two RHR inlet line isolation valves (one closer to the RCS, and one closer to the RHR pump), but on different trains. If a pressure transmitter is not functional, a separate transmitter keeps the companion valve closed when RCS pressure exceeds RHR pressure.

A pressure transmitter signal provides a permissive that allows the associated valve to be opened. Without the required signal, the "open" permissive ensures that the valve does not open when the combination of the RCS pressure and the RHR pump discharge pressure exceeds the RHR system design pressure. The two valves in each RHR train receive "open" signals from different pressure transmitters through the Engineered Safety Features (ESF) actuation train.

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 and from the interlock signal provided to the isolation valve closest to the RHRS. More than one single failure must be postulated to defeat the function preventing exposure of the RHR system to RCS normal operating pressure. The protective interlock design, in combination with plant operating procedures, provides a means of accomplishing the protective function.

The two valves in each RHR system inlet line are powered from different Class IE power sources. Diversity in preventing exposure of the RHR system to the higher RCS pressure is provided by locking out power to the isolation valves in each train at the motor control center when the RHR system is not in service to prevent spurious opening of a valve during plant operation. This power lockout must be disabled before the valves can be opened.

Isolation valve operation is not automatic. Isolation valves are operated via manual control from the Control Room or the Auxiliary Shutdown Panel.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

4.1.1 10 CFR 50.59

The proposed change would reduce system/equipment diversity in ensuring isolation of the low pressure Residual Heat Removal System from the high pressure RCS system. This would result in more than a minimal increase in the likelihood of a malfunction of a system, structure, or component important to safety previously evaluated in the UFSAR (10 CFR 50.59(c)(2)(ii)).

4.1.2 Definition of Diversity

Appendix A to 10 CFR 50 is not specific regarding consideration of redundancy and diversity requirements for fluid systems important to safety. A "system" could consist of a number of subsystems, each of which is separately capable of performing the specified system safety function. The minimum acceptable redundancy and diversity of subsystems and components within a subsystem, and the required interconnection and independence of the subsystems, have not yet been developed or defined.

NUREG-6303, "Method for Performing Diversity and Defense-in-Depth Analyses of Reactor Protection Systems," provides a method for analyzing computer-based nuclear reactor protection systems for discovering and identifying design vulnerabilities to common-mode failure. While not specific to RHR system isolation, the concept of diversity as employed by NUREG-6303 is generally applicable. As noted in the NUREG, equipment diversity is the use of different equipment to perform similar safety functions, in which "different" means sufficiently unlike as to significantly decrease vulnerability to common failure. The fact that equipment is made by different manufacturers does not guarantee diversity, given the potential for commonality of components and design characteristics. Consequently, STP achieves diversity in protecting the RHR system from normal RCS pressure through functional diversity by using a different underlying mechanism; i.e., locking out power to the isolation valves and manual valve operation in addition to isolation provided by a pressure transmitter.

4.1.3 Design Criteria for Valve Isolation Interlock Systems

The acceptance criteria applicable for the review of interlock systems are listed in BTP ICSB-3 as:

- General Design Criterion 13, "Instrumentation and Control"

  Instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems.

  This change does not affect the function of the instrumentation provided. The only change is in the manufacturer and how diversity is achieved.

- General Design Criterion 19, "Control Room"

  A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents.

  This change does not affect the function of the control room.

In addition to the acceptance criteria indicated above, interlock systems important to safety are reviewed for conformance to the following acceptance criteria, where applicable, with regards to performance requirements commensurate with the importance of the safety function to be performed.

- General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena"

Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions.

This change does not affect the qualification requirements of the instrumentation to be used.

- General Design Criterion 4, "Environmental and Missile Design Bases"

  Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents.

  This change does not affect the qualification requirements of the instrumentation to be used.

The following acceptance criteria are applicable to safety systems with which interlock systems may have an interface. These criteria are used as guidance, where applicable, in establishing the importance to safety for functions performed by interlock systems:

- General Design Criterion 10, "Reactor Design"

  The reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.

  Independence and diversity of RHR inlet line isolation valve operation control ensure the RHR design pressure limits are not exceeded by exposure to RCS operating pressure.

- General Design Criterion 15, "Reactor Coolant System Design"

  The reactor coolant system and associated auxiliary, control, and protection systems shall be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences.

  This change does not affect RCS function.

- General Design Criterion 16, "Containment Design"

  Reactor containment and associated systems shall be provided to establish an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment and to assure that the containment design conditions important to safety are not exceeded for as long as postulated accident conditions require.

This change does not affect the function of reactor containment and associated functions.

- General Design Criterion 22, "Protection System Independence"

The protection system shall be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis. Design techniques, such as functional diversity or diversity in component design and principles of operation, shall be used to the extent practical to prevent loss of the protection function.

Compliance with the regulatory requirements and criteria applicable to containment integrity is not affected by the proposed change. The operability requirements for the RHR isolation valve interlock are not changed. The technical requirements of diversity continue to be met and the STP Unit 1 and Unit 2 RHR isolation valve interlocks will continue to meet their design-basis requirements.

Most nuclear plants have RHR systems outside containment. The STP RHR system is located inside containment, so that while an intersystem LOCA can be postulated as for other nuclear plants, the potential for a radioactive release outside containment is not possible without occurrence of additional, unrelated failures.

- General Design Criterion 28, "Reactivity Limits"

The reactivity control systems shall be designed with appropriate limits on the potential amount and rate of reactivity increase to assure that the effects of postulated reactivity accidents can neither (1) result in damage to the reactor coolant pressure boundary greater than limited local yielding nor (2) sufficiently disturb the core, its support structures or other reactor pressure vessel internals to impair significantly the capability to cool the core.

This change does not affect reactivity.

- General Design Criterion 33, "Reactor Coolant Makeup"

A system to supply reactor coolant makeup for protection against small breaks in the reactor coolant pressure boundary shall be provided. The system safety function shall be to assure that specified acceptable fuel design limits are not exceeded as a result of reactor coolant loss due to leakage from the reactor coolant pressure boundary and rupture of small piping or other small components which are part of the boundary.

This change does not affect reactor coolant makeup.

- General Design Criterion 34, "Residual Heat Removal"

A system to remove residual heat shall be provided. The system safety function shall be to transfer fission product decay heat and other residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded.

Independence and diversity of RHR system protection against high RCS pressure continue to meet regulatory requirements.

- General Design Criterion 35, "Emergency Core Cooling"

  A system to provide abundant emergency core cooling shall be provided. The system safety function shall be to transfer heat from the reactor core following any loss of reactor coolant at a rate such that (1) fuel and clad damage that could interfere with continued effective core cooling is prevented and (2) clad metal-water reaction is limited to negligible amounts.

  This change does not affect the functionality of the ECCS portion of the RHR system.

- General Design Criterion 38, "Containment Heat Removal"

  A system to remove heat from the reactor containment shall be provided. The system safety function shall be to reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any loss-of-coolant accident and maintain them at acceptably low levels.

  This change does not affect containment heat removal.

- General Design Criterion 41, "Containment Atmosphere Cleanup"

  Systems to control fission products, hydrogen, oxygen, and other substances which may be released into the reactor containment shall be provided as necessary to reduce, consistent with the functioning of other associated systems, the concentration and quality of fission products released to the environment following postulated accidents, and to control the concentration of hydrogen or oxygen and other substances in the containment atmosphere following postulated accidents to assure that containment integrity is maintained.

  This change does not affect containment atmosphere cleanup.

- General Design Criterion 44, "Cooling Water"

  A system to transfer heat from structures, systems, and components important to safety, to an ultimate heat sink shall be provided.

  This change does not affect transfer of heat to the ultimate heat sink.

4.1.4 NRC Review Criteria

- **Branch Technical Position ICSB-3 – Isolation of Low Pressure Systems from the High Pressure Reactor Coolant System**

  Position B.2:

For system interfaces where both valves are 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.

Position B.5

For those interfaces where the subsystem is required for ECCS operation, the above recommendations need not be implemented. System interfaces of this type should be evaluated on an individual case basis.

Note: The RHR system is for decay heat removal only and does not perform an ECCS function. However, the RHR heat exchangers are used as part of the Low Head Safety Injection System.

- **Branch Technical Position RSB 5-1 - Design Requirements of the Residual Heat Removal System**

  Subsections 1(b) and 1(c) of Position B, RHR System Isolation Requirements, also discuss diverse interlock requirements:

1. (b) "The valves shall have independent diverse interlocks to prevent the valves from being opened unless the RCS pressure is below the RHR system design pressure. Failure of a power supply shall not cause any valve to change position."

   (c) "The valves shall have independent diverse interlocks to protect against one or both valves being open during an RCS increase above the design pressure of the RHR system."

4.1.5 NRC Safety Evaluation (NUREG-0781, April 1986)

The residual heat removal (RHR) system isolation valve interlocks are provided to prevent overpressurization of the RHR system. There are two motor-operated gate valves in series in each inlet line from the reactor coolant system (RCS) to the RHR system. They are normally closed and are manually opened from the control room for residual heat removal after RCS pressure and temperature are reduced to approximately 400 psig and 350°F, respectively. The two valves in each RHR inlet line are powered from different Class 1E power sources. Each valve is interlocked to prevent its opening if RCS pressure is greater than approximately 350 psig during plant cooldown, and to automatically close if RCS pressure exceeds approximately 700 psig. The two valves in each RHR train receive pressure signals from different pressure transmitters which are supplied by different manufacturers. ... The staff finds that the RHR system isolation valve interlock design conforms to the independence, separation, and diversity criteria. The design also satisfies BTP ICSB-3, "Isolation of Low Pressure Systems from the High Pressure Reactor Coolant System." Therefore, the design of the RHR system isolation valve interlock is acceptable.

This license amendment request is to allow pressure transmitters provided from the same manufacturer.

4.1.6 Regulatory Compliance

The only requirement in this regard is that diversity of the isolation function of the RHR system inlet valves be ensured. Use of pressure transmitters from different manufacturers is but one means. Diversity is also assured by using means of isolation valve control that do not rely on functionality of pressure transmitters. Power lockout and manual operation of the valves also provide for RHR protection. Therefore, compliance with regulatory requirements is satisfied with implementation of this change.

4.2 Significant Hazards Consideration

STP Nuclear Operating Company (STPNOC) has evaluated whether a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10CFR50.92, "Issuance of amendment," as discussed below.

1) Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response:

No. The proposed change revising the justification for diversity associated with the RHR isolation valves will not cause an accident to occur and will not result in any change in the operation of the associated accident mitigation equipment. The proposed changes will not revise the operability requirements (e.g., leakage limits) for the RHR system. The design-basis accidents will remain the same postulated events described in the STP Unit 1 and Unit 2 Updated Final Safety Analysis Report, and the consequences of the design-basis accidents will remain the same. Therefore, the proposed changes will not increase the probability or consequences of an accident previously evaluated.

2) Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response:

No. The proposed changes will not alter the plant configuration or require any unusual operator actions. The proposed changes will not alter the way any structure, system, or component functions, and will not significantly alter the manner in which the plant is operated. The response of the plant and the operators following an accident will not be different. In addition, the proposed changes do not introduce any new failure modes. In the event the RHR system is overpressurized by the RCS, all leakages originating from RHR components will be detected by the Reactor Coolant Pressure Boundary Leakage Detection System as discussed in the STP UFSAR. Therefore, the proposed changes will not create the possibility of a new or different kind of accident from any accident previously analyzed.

3) Does the proposed change involve a significant reduction in a margin of safety?

Response:

No. The proposed change to revise the rationale for diversity associated with RHR system isolation valve operation will not cause an accident to occur and will not result in any change in the operation of the associated accident mitigation equipment. The operability requirements for the isolation valves have not been changed, and the RHR system will continue to function as assumed in the safety analysis. In addition, the proposed changes will not adversely affect equipment design or operation, and there are no changes being made to required safety limits or safety system settings that would adversely affect plant safety. Therefore, the proposed changes will not result in a reduction in a margin of safety.

Based on the above, STPNOC concludes that the proposed change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

4.3 Conclusion

Based on the considerations discussed above: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner; (2) such activities will be conducted in compliance with the Commission's regulations; and (3) implementation of the amendment will not be detrimental to the common defense and security or to the health and safety of the public.

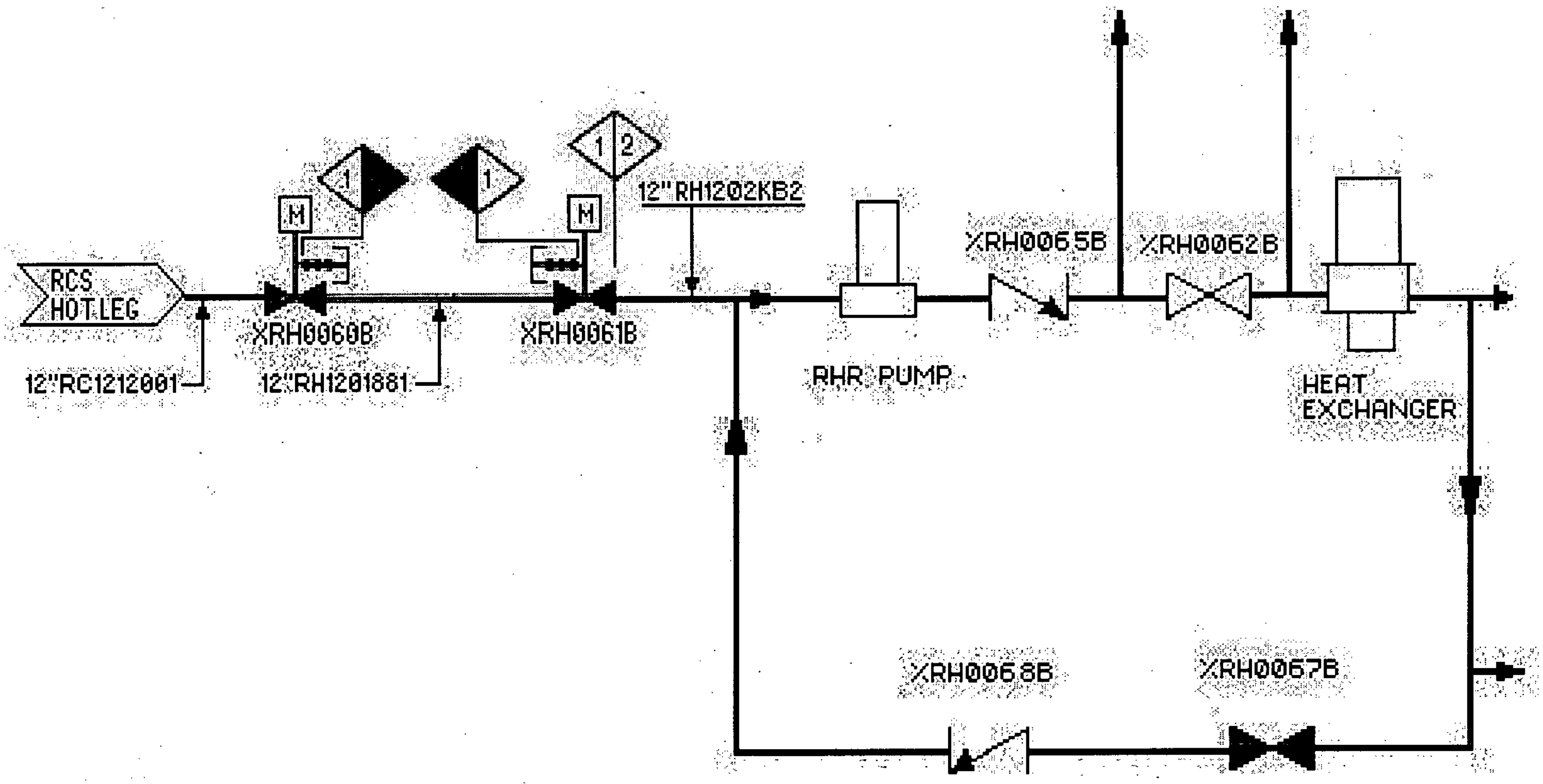
5.0 ENVIRONMENTAL CONSIDERATION

The proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement, or environmental assessment need be prepared in connection with the proposed amendment.

6.0 IMPLEMENTATION

Approval of the proposed amendment is requested by September 30, 2010. The requested approval date will allow STPNOC to implement the change during the Unit 1 Spring 2011 refueling outage. Modifications to Unit 2 will occur during the Fall 2011 refueling outage.

SCHEMATIC OF TYPICAL RESIDUAL HEAT REMOVAL SYSTEM INLET LINE ISOLATION VALVE ARRANGEMENT



ATTACHMENT 2

SOUTH TEXAS PROJECT

UNITS 1 AND 2

UPDATED FINAL SAFETY ANALYSIS REPORT PAGE TO BE REVISED

To Assure Operability of One RHRS Train

For assured plant cooldown, the protective action is the removal of the RHRS interlock when RCS pressure is below a preset pressure.

2. IEEE 279-1971, Paragraph 4.10: The above mentioned pressure interlock signals and logic are testable on-line to the maximum extent possible without adversely affecting safety. This test includes the analog signal through to the associated output bistables in the process equipment. This is done in the best interest of safety since opening the valve at power could potentially leave only one remaining valve to isolate the low-pressure RHRS from the RCS. The pressure interlock signals and logic to the valves are tested routinely when the reactor is shutdown. This test verifies the protective action and assures functionality of the interlock for each RHRS train.

Since the two valves in each RHR train are powered by separate power trains and actuated by separated actuation trains, no single failure can compromise the required RHR functions. Operability for assured plant cooldown is assured because a failure in any one actuation or power train isolates only two trains, leaving the third train still operable. Branch Technical Position (BTP) ICSB 3 is ~~not~~ followed for this interlock system. The interlock system meets the appropriate qualification standards, as discussed in Sections 3.10 and 3.11.

7.6.3 Accumulator Motor-Operated Valves

In considering that the requirements of IEEE 279-1971 apply to protective actions at both the channel level and system level, it is noted that for the accumulator isolation valves, the basis for control and proper functions is administrative control and passivity; the scope of IEEE 279-1971 covering protective action at the system level does not apply, although there is a requirement for protective action at the channel level. The interlock control features of the accumulator isolation valves at the channel level function in a confirmatory manner, and the requirements of IEEE 279-1971 are applied with the following comments:

1. When the pressurizer pressure is above or below the P-11 setpoint (approximately 1,900 psi), there are redundant interlock signals generated that are derived by sensors processed through circuitry designed to IEEE 279-1971 requirements in the analog process control racks and distributed as binary input (voltage/no voltage) signals to the Solid-State Protection System (SSPS) cabinets. Here they become logic signals that produce contact-available outputs from the safeguardscabinets. Signals are generated from each cabinet when two out of three of the presuurizer pressure channels indicate a pressure above or below 1,900 psi, as shown on Figure 7.2-6. When the pressure is above this setpoint, signals are sent to the accumulator isolation valves to automatically open them.

2. In addition to the above signal, which is utilized as part of the interlock control features for the accumulator isolation valves, each safeguards cabinet produces a safety injection (SI) signal which is also utilized in the control features for these valves.