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November 27, 1985

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Docket Nos: 50-369/370

Mr. H. B. Tucker, Vice President
Nuclear Production Department
Duke Power Company
422 South Church Street
Charlotte, North Carolina 28242

Dear Mr. Tucker:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING ELIMINATION OF ARBITRARY INTERMEDIATE PIPE BREAKS FROM THE MCGUIRE STRUCTURAL DESIGN BASES

References: (a) Attachments F and G to a letter from D. E. Swartz, Commonwealth Edison, to H. R. Denton, NRC, Subject: "Byron Station Units 1 and 2 - Elimination of Arbitrary Intermediate Pipe Breaks," dated November 15, 1984

(b) Attachment 1 to a letter from M. R. Wisenburg, Houston Lighting and Power, to G. W. Knighton, NRC, Subject: "South Texas Project Units 1 and 2 - NRC Request for Additional Information," dated March 8, 1985

The NRC staff is reviewing your letter of October 22, 1985, requesting our approval of Duke's decision, based upon its 10 CFR 50.59 analysis, to eliminate from the McGuire structural design bases certain intermediate pipe breaks in high energy piping systems (other than the RCS primary loops) including associated dynamic effects, pipe whip restraints and jet shields. We find that a more detailed discussion of the system design and operating procedures that have been implemented to minimize the potential for waterhammer in the feedwater and auxiliary feedwater systems is needed for completion of our review. An acceptable level of detail for this review is illustrated by references (a) and (b), copies of which are enclosed.

Your response to this request should be made to a schedule providing for completion of our review in time for the forthcoming refueling outage on Unit 2. Contact your Project Manager, Darl Hood, at (301)492-8408 if you have any questions.

The reporting and/or record keeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

Original signed by
B. J. Youngblood

B. J. Youngblood, Director
PWR Project Directorate #4
Division of PWR Licensing-A

Enclosures:
As stated

cc: See next page

D:PWR PD#4	LA:PWR PD#4	DSH PWR:PD#4
BJYoungblood	MDuncan	DHood
11/27/85	11/26/85	11/26/85

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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PWR Project Directorate #4
Division of PWR Licensing-A

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March 8, 1985
ST-HL-AE-1202
File No.: G9.17/G9.10

Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Knighton:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
NRC Request for Additional Information

REFERENCE: NRC letter to HL&P, G. W. Knighton to J. H. Goldberg, January 29, 1985, ST-AE-HL-90534

Attached is the additional information (attachments 1 through 4) requested by the referenced letter and described in the enclosure to that letter. This information should conclude our input and support our request for eliminating arbitrary intermediate pipe breaks (excluding the Reactor Coolant System Primary Loop).

For convenience we are repeating the request for additional information here:

> Provide detailed justification/documentation to show that eliminating arbitrary intermediate pipe breaks in the main feedwater system will not impact the safety of the plants because of special design features and operating procedures adopted by the South Texas Project to preclude or minimize the effects of water-hammer in that system. An acceptable level of detail on this issue is contained in Attachments F and G to a letter from D. E. Swartz, Commonwealth Edison to H. R. Denton, NRC, "Byron Station, Units 1 & 2 - Elimination of Arbitrary Intermediate Pipe Breaks", dated November 15, 1984.

B001
1/1

W2/NRC2/p

The submittal of this additional information will allow the staff to finalize its input for the supplement to the Safety Evaluation Report (SER).

Should you have any questions please call M. E. Powell at (713) 993-1328.

Very truly yours,

M. R. Wisenburg
Manager, Nuclear Licensing

AND/yd

Attachments: (1) Main Feedwater Anti-Water Hammer Provisions
(2) Anticipated Feedwater Startup Procedure
(3) Auxiliary Feedwater Anti-Water Hammer Provisions
(4) STP Main/Auxiliary Feedwater

Houston Lighting & Power Company

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MAIN FEEDWATER ANTI-WATER HAMMER PROVISIONS

The STP Feedwater (FW) system design includes provisions to prevent the condensation-induced water hammer in both the feedwater piping and Steam Generators (S/Gs). Westinghouse (W) concurs that the STP design is in general compliance with the W proposed Main Feedwater Temperature Pegging System. The specific STP anti-water hammer design considerations are described below. (See the STP Main/Auxiliary Feedwater Interface diagram attachment 4).

The STP FW piping employs FW injection into the feed preheater section of each of four Westinghouse Model E2 S/G's rather than employing a feedring type design. Loop seals and the shortest possible horizontal length of piping immediately upstream of the S/G's are in compliance with the W criteria for layout to minimize or eliminate water hammer.

To minimize pressure transient potential (water hammer), it is necessary to prevent the introduction of cold water to the S/Gs through the main FW nozzle at any time when significant voids may be present. Therefore, in the STP design, FW flow is not introduced to the S/G feedwater nozzle during these conditions. The STP control logic for the FW isolation valve does not allow the valve to open until the FW line temperature and water level are above the set limits. An FW temperature pegging system has been incorporated to keep the feedwater above the minimum required temperature and thus minimize the possibility of pressure transients in the S/G preheater and feedwater piping.

Westinghouse studies have shown that pressure transients due to steam void collapse can occur in the S/Gs if feedwater below 250°F is supplied through the main feedwater nozzle concurrent with low S/G water level or low S/G pressure. By use of the W "Main Feedwater Temperature Pegging System" (deaerator pegging) the FW system is designed and operated to ensure the feedwater temperature is always above 250°F.

The FW temperature pegging system uses steam from the auxiliary boiler or from the main steam header (as available) to heat the feedwater in the deaerator to approximately 250°F prior to feedwater system operation. During normal operation, the deaerator is supplied with extraction steam from the turbine second point extraction. If the extraction is lost during normal operation (i.e., extraction valve closure, or turbine trip), the deaerator pegging system is provided with load following logic that pegs the deaerator with main steam within 10 psi of the pre-upset deaeration pressure. This same load following logic has a preset minimum deaerator pressure (35 psg) corresponding to a saturation temperature of approximately 275°F. (This low load preset is also used during startup to approximately 20% turbine load when the turbine extraction steam takes over.) (See our anticipated plant Startup procedure, attachment 2.) It should also be noted here that the STP full flow deaerator storage tanks are sized for 5 minutes storage at the 100% load FW flowrate, which represents longer storage in the event of Main Steam isolation.

The temperature permissives provided to the main feedwater isolation valve (FIV) are a 3 out of 3 logic that verifies that the three temperature elements, one upstream and two downstream of the FIV, located in the feedwater piping each measure greater than 250°F. It should be noted that after the FIVs are opened, the FW temperature elements will have no effect on the FIVs. This is reasonable, since our FW temperature pegging system will assure heated feedwater, above the minimum required FW temperature, over all plant load ranges.

The S/G low pressure and low level interlocks provided to the FIV represent a Westinghouse provided 2 out of 3 low condition in an affected S/G. On any low condition the affected S/Gs FIV will close to prevent the potential for water hammer.

With the STP design, the FIV will be the only valve in the main FW system which receives the feedwater anti-water hammer S/G level and pressure isolation signals. Likewise, the FIV will be the only valve tied into the FW temperature permissives. This has been reviewed and accepted by Westinghouse for the following reasons:

> The Feed Preheater Bypass Valve (FPBV), used during low load and hot standby operations to connect the main feedwater system to the upper nozzle, is not provided with anti-water hammer logic as this nozzle is not as susceptible to water hammer as the feed preheater nozzle (main FW nozzle). Likewise the Feedwater Isolation Bypass Valves (FIBVs) are not provided with S/G low level or low pressure isolation since this valve has a limited flowrate (with redundancy assuring the low flowrate) which would not expose the S/G feed preheater to the potential for water hammer. The FIBVs are used during the forward flushing process which assures that any water less than 250°F is purged downstream of the FIVs prior to getting an FIV open permissive. Note that while only the FIV receives the extensive anti-water hammer logic, all of the feedwater isolation valves (FIVs, FIBVs, and FPBVs) as well as the feedwater flow control valves (FCVs) and the feedwater bypass control valves (FBCVs) receive a safety system generated feedwater isolation signal.

Considering the above anti-water hammer provisions and the FW temperature pegging system, the potential for S/G feedwater preheater and upstream piping water hammer is minimized.

ANTICIPATED FEEDWATER STARTUP PROCESS

Cold Startup

A. Prior to startup, corrosive products and/or contaminants are removed from the FW system before delivery of water to the SGs. Water for cleanup is supplied from the condenser hotwell via the condensate pumps.

B. Condenser vacuum is established using steam from the auxiliary boiler for the gland seal steam supply.

C. During the initial phase of startup, feedwater equipment is in wet layup. The main steam isolation valves (MSIVs), FIVs, and the FCVs are all in the closed position.

D. The deaerator is pegged using steam from the auxiliary boiler. The condensate is heated in the deaerator and drains to the storage tanks. This heated water is used to purge cold water from the feedwater booster pump (FWBP) suction to the discharge header of feedwater heaters No. 11 A and B. The warmed water is recycled through this portion of the system until the water temperature is greater than or equal to 275°F in both storage tanks and all feedwater temperature elements in this portion of the system.

E. The S/U Steam Generator Feedwater Pump (S/U SGFP) is started and allowed to run at minimum flow, recirculating back to the deaerator until FW is required.

F. The SGs are drained to within the normal operating band.

G. No load temperatures are established, in the primary side, using the reactor coolant pump heat and the pressurizer heaters. During this period, feedwater requirements to the system are supplied from the FW system through the feed preheater bypass line to the auxiliary feedwater nozzles on the SGs.

H. As the reactor is taken critical, the main turbine and SGFPs are warmed up and the gland seal steam supply is transferred to main steam.

I. The SGFPs are started as the reactor is brought to 3 percent power with the turbine bypass, using the Automatic Low Power Feedwater Control system to maintain the required SG level.

J. The portion of the FW system from the feedwater heater's discharge header up to the feedwater isolation valve (FIV) is now purged of cold water. The water is circulated through this portion of the system until the water temperature is greater than or equal to 250°F.

K. The last portion of the FW system upstream of the isolation valve to the SGs, is purged of cold water. The water is circulated through this portion of the system until:

   1. The temperatures upstream of the SGs, downstream of the FIV and upstream of the feedwater control valve (FCV) are greater than or equal to 250°F and have been for the required purge times.

   2. The bypass flowrate has been between upper and lower limits for the required purge time.

   3. The SG pressure is above the setpoint.

   4. The SG level is above the setpoint.

   When the above permissives are met, the FIVS are remote manually opened and the feedwater isolation bypass control valves (FIBVs) are manually closed.

L. SG level control is transferred from the low power feedwater control system to the FCV as the NSSS load reaches approximately 20 percent.

M. The turbine is warmed up, brought to speed, and the generator is synchronized with the system. As the turbine load increases above approximately 20 percent, deaerator heating steam is supplied by extraction steam.

Startup From Hot Shutdown

Startup from a hot shutdown is essentially the same operation as a startup from a cold shutdown except steam supply is initially available from the main steam system.

AUXILIARY FEEDWATER ANTI-WATER HAMMER PROVISIONS

The STP Auxiliary Feedwater (AFW) system design features that reduce the potential for condensation-induced water hammer are described below. (See the STP Main/Auxiliary Feedwater Interface diagram attachment 4).

1) The STP AFW system consists of four independent trains that are normally not cross-connected. This eliminates the potential for steam binding or water hammer affecting more than one train from a single event.

2) THe STP programmed water level is above the AFW (upper) nozzle internal extension during all NSSS load conditions. The auxiliary feedwater piping will not drain as a consequence of low SG water level because of the internal extension. These provisions assure that the nozzle and upstream piping will not fill with steam.

3) The STP AFW horizontal piping immediately upstream of the SG nozzle is minimized, with a down turned elbow located near the SG consistent with Westinghouse recommendations.

4) The Auxiliary Feedwater isolation valve (AFIV) is a normally closed stop check valve that opens on an AFW actuation signal. This normally closed valve prevents backleakage to the AFW pump train during low load operations when using the FW/AFW crossconnect. Likewise during normal power operation the AFIV in combination with the normally closed FPBV seal the AFW piping upstream of the AFW check valve inside containment, this "bottles" the upstream piping not allowing backflow.

5) The AFIV and the FPBV being containment isolation valves will be on a scheduled maintenance and leak testing program. The other FW and AFW check valves will be maintained to minimize backleakage.

6) Consistent with Westinghouse recommendations, there are at least two check valves in each flow path by which backleakage could occur into the Auxiliary feedwater or Main Feedwater System.

Considering the above, the potential for condensation induced water hammer in the AFW piping is unlikely.

ATTACHMENT F

PROVISIONS FOR MINIMIZING STEAM/WATER HAMMER EFFECTS

Systems within Westinghouse scope of supply are not in general, susceptible to water hammer. The reactor coolant, chemical and volume control and residual heat removal systems have been specifically designed to preclude water hammer. Preoperational testing and operating experience have verified the Westinghouse design approach and furthermore, have indicated that significant water hammer events have usually been initiated in secondary systems within the Balance of Plant (BOP) scope of supply. In these systems, anticipated hydraulic transients have been included in the design loads and design features have been incorporated to prevent water hammer.

Westinghouse has conducted a number of investigations into the causes and consequences of water hammer events. The results of these investigations have been reported to Westinghouse operating plant customers and have been reflected in design interface requirements to the BOP designer for plants under construction, to assure that water hammer events initiated in the secondary systems do not compromise the performance of the Westinghouse-supplied safety-related systems and components.

Some of the lines in which arbitrary intermediate breaks are to be eliminated have the potential for water/steam hammer effects. These lines have been designed to minimize or preclude such effects. Water hammer in each of the systems involved in the elimination of arbitrary breaks is described below:

1. Safety Injection System

   The safety injection lines are all water solid and at ambient temperature, thus no water hammer is expected.

2. Chemical and Volume Control System (CVCS)

   Normally, the CVCS is water solid. In the low temperature lines (less than 125^{O}F) water hammer would not be expected because of the small probability of steam void formation. In the high temperature lines, the piping has been designed to maintain water solid conditions during normal operation, thus minimizing the possibility of water hammer effects.

3. Reactor Coolant System

   There is a low potential for water hammer in the reactor coolant system, because it is designed to preclude steam void formation. However, excessive cooling of the reactor coolant system, which initiates safety injection, could potentially result in water hammer. If any problems are experienced during preoperational testing, they will be eliminated by modifying operating procedures.

4. Main Steam

The main steam piping from the 5-way restraints just outside containment to the main turbine is sloped at 1/16 of an inch per foot to assure proper drainage during the various phases of operation. 18-inch diameter drip legs approximately five feet long are installed upstream of the main turbine inlet on the 36-inch and 38-inch main steam lines to collect and dispense drainage to the condenser. The branch lines that tee off the main steam lines are properly sloped with drain provisions to eliminate the possibility of water hammer to occur due to condensate-drain water pockets collecting in low points or pipe loops.

5. Steam Generator Blowdown (SGBS)

Blowdown flow from the steam generator is normally two-phase and of 0-10 percent quality. The piping layout is generally routed downward starting from the steam generator blowdown nozzle connection and continuing to the containment penetration thus minimizing the formation of water pockets. Therefore, the potential for water hammer is minimized for the blowdown lines within containment. Water hammer may occur downstream of the isolation valves upon reinitiation of blowdown flow following isolation. Operating procedures will provide for gradual repressurization of the downstream piping before establishing full flow, thereby minimizing any potential water hammer problems.

6. Auxiliary Feedwater

The Auxiliary Feedwater (AF) system provides feedwater to the steam generator auxiliary nozzle via a connection to the feedwater bypass piping. Each steam generator auxiliary nozzle utilizes a 90° elbow connected immediately to a vertical run of pipe to minimize steam voids. Under normal operating conditions, the main feedwater split flow arrangement (described in Section 7) ensures that the bypass line is kept filled with water, and steam is thereby prevented from leaking back into the Auxiliary Feedwater piping.

The following design features are included to avoid a bubble collapse water hammer event:

1. Temperature sensors are installed on the bypass piping close to the auxiliary nozzle to detect backleakage of hot water or steam.

2. If backleakage is detected, the piping will be slowly refilled or the plant brought to a cold shutdown condition, depending on the circumstances. An analytical study

performed by Westinghouse shows that the bypass piping can be slowly refilled safely. The recommended flowrate is on the order of 15 gpm.

3. The steam generator water level should be maintained above the auxiliary nozzle discharge pipe so that if backleakage does occur, water instead of steam will leak back into the pipe.

4. The Auxiliary Feedwater System check valves will be maintained to minimize backleakage.

5. Consistent with Westinghouse recommendations, there are at least two check valves in each flow path by which backleakage could occur into the Auxiliary Feedwater or Main Feedwater System.

7. Main Feedwater

The routing of the main feedwater piping, which varies in temperature from approximately 300°F at low load to 445°F at full load into the steam generators, which operate between 545°F to 557°F during normal operation, is in compliance with the Westinghouse criteria for layout, temperature monitoring/alarm, and operational procedures to minimize or eliminate water hammer. Water hammer prevention features of the main feedwater system are described in detail in Section 10.4.7.3 of the Byron/Braidwood FSAR (Attachment G).

The Byron/Braidwood Stations have Westinghouse Model D preheater type steam generators. The main supply of feedwater enters the preheater through the main 16-inch nozzle in the lower shell. The other supply of feedwater is through the 6-inch diameter auxiliary nozzle located in the upper shell.

The Feedwater Bypass System is designed to prevent the introduction of cold water into the preheater section. In those circumstances where it is necessary to introduce cold water into the steam generator, the Feedwater Bypass System operates to direct the cold water to the upper auxiliary nozzle. This bypass consists of a 6-inch diameter line which connects the main feedwater line to the auxiliary nozzle. The Auxiliary Feedwater System also provides feedwater to the steam generator through the bypass piping and the auxiliary nozzle in the event of a loss of main feedwater.

Steam backleakage into the bypass piping is very unlikely. During power operation, the Byron/Braidwood Stations utilize a split flow scheme which provides a continuous flow through the

bypass piping to the auxiliary nozzle of about 10% of the main feedwater flow. This continuous flow effectively prevents the backflow of steam from the steam generator.

During the normal operations of heatup, cooldown and hot standby (rated flow less than 15% and temperatures less than 250°F), feedwater is supplied only through the 6" auxiliary nozzle. However, only relatively small amounts of feedwater are required, not enough to always permit a continuous flow so that the opportunity for steam backleakage does exist if the check valves fail and the steam generator water level falls below the auxiliary nozzle internal extension. Possible steam backleakage is detected by surface mounted resistance temperature detectors which are provided on each feedwater pipe. These are monitored by the plant process computer and are alarmed in the main control room so that actions can be taken to initiate feedwater flow to the upper nozzle before potential feedwater hammer conditions may develop. Also, the plant operator is instructed to feed continuously rather than intermittently as much as possible. This practice reduces the likelihood of steam backleakage and, therefore, water hammer.

In the eventuality that the presence of steam is suspected in the bypass line of one or more loop, based on temperature data and water level status and history, the recommended course of action is to slowly refill one loop at a time with the Auxiliary Feedwater System. An analytical study by Westinghouse shows that the safe refilling flow rate is in the range of 15 to 123 gpm per steam generator. To be conservative, Westinghouse has recommended the value of 15 gpm or as close to this as can be provided.

Based on another analysis performed by Westinghouse which considered the classical water hammer case of feedwater line break followed by check valve closure, Westinghouse recommended that the valve close to the auxiliary nozzle should be removed and the other check valve in the bypass line should be replaced with a slow closing valve. Commonwealth Edison has implemented this recommendation.

The design features and operating procedures described above will preclude or minimize the effects of water hammer.

ATTACHMENT G

WATER HAMMER PREVENTION FEATURES

(B/B-FSAR AM.44)

10.4.7.3 Water Hammer Prevention Features

Several water hammer prevention features have been designed into the feedwater system. These features are provided to minimize the possibility of various water hammer phenomena in the steam generator preheater, steam generator main feedwater inlet piping and the steam generator upper nozzle feedwater piping. The following discussion is typical for each of the four steam generators and their associated feedwater piping.

10.4.7.3.1 Start-Up, Low Load Conditions

a. Under start-up and low load conditions when NSSS rated flow is less than 15% and temperatures are less than 250°F, feedwater will only be admitted to the upper nozzle of the steam generator by the use of flow through the feedwater bypass tempering line and/or flow through the feedwater preheater bypass line via the feedwater bypass control valve and feedwater preheater bypass valve. The 6-inch diameter upper nozzle is located on the upper shell of the steam generator, below the normal, full power water level. Level control in the steam generator is provided by the feedwater bypass control valve at these conditions.

b. Surface mounted resistance temperature detectors (RTD) are provided on each of the feedwater pipes, leading to and very near the steam generator's upper nozzle to detect during start-up and low load conditions as well as other operating conditions, possible back leakage of steam from the steam generator into the feedwater piping. These RTD's are monitored by the plant process computer and alarmed in the main control room so that actions can be taken to initiate feedwater flow to the upper nozzle before potential feedwater hammer conditions may develop.

10.4.7.3.2 Increasing Load

a. As load increases about 15% of NSSS rated flow and feedwater temperatures rise above 250°F, forward feedwater flushing of the main feedwater piping may be initiated by opening the feedwater isolation bypass valve. A small controlled flow through the 3-inch feedwater isolation bypass line is provided ~~to~~ flush

the main feedwater piping between the isolation valve and the steam generator.

b. Three sets of three RTD's are provided on the main feedwater piping upstream and downstream of the feedwater isolation valve and near the steam generator feedwater nozzle to detect when the feedwater flushing temperature rises above 255°F. Two out of three logic is provided for each set of three RTD's and all three must be satisfied to meet the forward flushing temperature requirements.

c. If flow in the 3-inch feedwater isolation valve bypass line (forward flushing flow) remains above a preset minimum and below a preset maximum and the flushing temperatures remain satisfied, a timed period occurs after which a permissive signal is provided to automatically open the feedwater isolation valves. Automatic opening of a feedwater isolation valve can be blocked by placing its control switch in the main control room in the closed position. This automatic permissive to open occurs after a timed period to allow approximately two volumes of water to be purged from the piping between the feedwater isolation valve and the steam generator main feedwater nozzle. Feedwater flow at the main feedwater flow-element must also be above a preset minimum in order for the feedwater isolation valve to open.

d. After the feedwater isolation valve has opened, the feedwater isolation bypass valve will be manually closed.

e. Prior to opening of the feedwater isolation valve, transfer from the feedwater bypass control valve to the feedwater control valve will occur in order to provide steam generator level control at the higher feedwater flow conditions.

f. If flow to the steam generators remains continuous during a load transient and above a minimum flow rate, feedwater will not be terminated to the main feedwater nozzle even if temperature of the feedwater has dropped below 250°F. Interruption or a reduction in flow below the minimum rate however, will cause the feedwater preheater section of the steam generator to be bypassed.

g. Steam generator low level trips are provided to close all of the feedwater isolation valves, feedwater isolation bypass valves and feedwater preheater bypass valves. Steam generator low pressure trips are provided to close all of the feedwater isolation valves, feedwater isolation bypass valves, feedwater

preheater bypass valves and the feedwater bypass tempering valves.

10.4.7.3.3 Split Feedwater Flow

a. Prior to opening of the feedwater isolation valve, the majority of feedwater flow at the lower power level is introduced to the upper nozzle of the steam generator by the preheater bypass pipe.

b. At higher power levels after the feedwater isolation valve has opened, only a small portion of the feedwater flow bypasses the preheater, with the bypass portion contributing to approximately 10% of full feedwater flow at 100% power. This split feedwater flow arrangement provides an approximate 90% of full flow limit to the main feedwater nozzle at higher power levels in order to minimize the potential for tubing vibration in the steam generator. The feedwater flow rate to the steam generator nozzle is monitored and alarmed, if flow rises above approximately 90%, in order for actions to be taken to reduce flow.

c. The preheater bypass valve remains open throughout the start-up and low load conditions, as well as up to and including full power operation.

10.4.7.3.4 Other Upper Nozzle Feedwater Line Uses

Inasmuch as there is water flowing to the upper nozzle of the steam generator during normal operation, and it is the required location for introducing cold fluid into the steam generator, auxiliary feedwater and chemical feed are connected to the upper nozzle feedwater lines rather than to the main feedwater lines. The chemical feed lines are used to add chemicals directly to the steam generators under low load conditions prior to wet layup. The chemical feed and auxiliary feedwater lines are Safety Category I, Quality Group B out to and including their isolation valves.