STATE OF WASHINGTON)
)
COUNTY OF BENTON)

Subject: Request for Amendment to Technical Specification 3/4.3.2, "Isolation Actuation Instrumentation"

I, J. V. PARRISH, being duly sworn, subscribe to and say that I am the Vice-President, Nuclear Operations for the WASHINGTON PUBLIC POWER SUPPLY SYSTEM, the applicant herein; that I have the full authority to execute this oath; that I have reviewed the foregoing; and that to the best of my knowledge, information, and belief the statements made in it are true.

DATE 25 April, 1995

J. V. Parrish, Vice-President
Nuclear Operations

On this date personally appeared before me J. V. PARRISH, to me known to be the individual who executed the foregoing instrument, and acknowledged that he signed the same as his free act and deed for the uses and purposes herein mentioned.

GIVEN under my hand and seal this 25 day of April 1995.

Notary Public in and for the
STATE OF WASHINGTON

Residing at Kennewick, WA

My Commission Expires 4/28/98

DISCUSSION AND JUSTIFICATION FOR THE PROPOSED CHANGES

Reactor Water Cleanup (RWCU) System Description

The RWCU system continuously purifies reactor coolant water during all modes of reactor operation and is described in WNP-2 Final Safety Analysis Report (FSAR), Subsection 5.4.8. Figure 1, "Simplified Flow Diagram: RWCU System," is enclosed for reference and information. The system takes suction from the inlet of each Reactor Recirculation (RRC) system pump and from the reactor pressure vessel (RPV) bottom head. Processed water is returned to the RPV via the Reactor Feedwater (RFW) system and/or the main condenser or the Radwaste system. The portion of the system located within the primary containment and the small portion located outside of containment up to and including the outboard containment isolation valve are considered part of the reactor coolant pressure boundary (RCPB). The other portions of the system are not part of the RCPB and, in the event of detected reactor coolant leakage, are automatically isolated by closure of an A.C. (inboard) and D.C. (outboard) motor-operated containment isolation valve (RWCU-V-1 and RWCU-V-4). The majority of the RWCU system equipment is located in the Reactor Building and include two RWCU pumps and three regenerative and two nonregenrative heat exchangers. The two filter-demineralizers and supporting equipment are located in the Radwaste Building.

The temperature of the reactor coolant water processed through the filter-demineralizers is limited to 140°F consistent with the resin operating temperature and the piping design limits. Therefore, the reactor coolant must be cooled from a normal RRC loop operating temperature of 534°F to approximately 120°F before it enters the filter-demineralizers. This is accomplished by cooling the water as it passes through the tube sides of the regenerative heat exchangers (from 534° to 233°F) and the nonregenerative heat exchangers (from 233° to 120°F). The nonregenerative heat exchangers transfer the heat from the reactor coolant to the Reactor Closed Cooling Water (RCC) system. After the processed water leaves the filter-demineralizers, it is passed through the shell side of the regenerative heat exchangers to be preheated before it is returned to the reactor via the Reactor Feedwater (RFW) system.

A portion of the reactor coolant water being processed by the RWCU system can be blown down (discharged) to the main condenser or the Radwaste system. Blowdown flow is normally directed to the main condenser, but can be aligned to Radwaste for further processing if the water conductivity is excessive. The RWCU system blowdown components are located in the Reactor Building and consist of the blowdown flow control valve, an orifice and associated motor-operated bypass valve, a manual inlet isolation valve, and two motor-operated outlet isolation valves. During blowdown operations, the amount of water returned to the RPV via the regenerative heat exchangers is reduced. This could cause an increased heat load on the nonregenerative heat exchangers and a resultant increase in the outlet water temperatures as the heat removal capacity of the RCC system flow through the shell sides of the heat exchangers is approached.

Background

As reported in Reference 1, a postulated high energy line break (HELB) at the 4-inch piping connection (RWCU(5)-3-1) to the RWCU blowdown flow control valve (RWCU-FCV-33) had not been fully analyzed. FSAR, Section 3.6, requires that postulated HELBs be analyzed for pipe whip, jet impingement, flooding, and environmental effects. A line break at the postulated location could cause the blowdown flow to increase rapidly, increasing the water temperatures entering the filter-demineralizers. The high temperature water could cause resin degradation and thermal damage to the piping and valves, and some of the water could expand and flash to steam upstream of the break. In addition, high differential pressures could be developed across the filter-demineralizers which could cause filter element (septum) damage and spent resin release. These conditions could ultimately result in high temperature water, steam, and spent resin being released to the Reactor Building environment at the 501 foot floor elevation of the break.

Currently, WNP-2 Technical Specification 3/4.3.2, "Isolation Actuation Instrumentation," prescribes Limiting Condition for Operation (LCO) and surveillance requirements for a RWCU system high differential flow trip function. These requirements include an instrumentation trip setpoint ($\leq$ 58.5 gpm) to ensure isolation of a system HELB. As described in FSAR, Subsections 7.3.1.1.2.b.9 and 7.6.1.3.b.3, redundant differential flow sensors compare the RWCU system inlet and outlet flows and provide inputs to the inboard and outboard containment isolation logic trip channels. In the event of a HELB at the piping connection to the RWCU blowdown flow control valve, an increase in RWCU system differential flow would be detected by the differential flow instrumentation and, upon reaching the trip setpoint, the logic would initiate closure of the RWCU containment isolation valves, RWCU-V-1 and RWCU-V-4. Based on the blowdown calculation for the postulated RWCU HELB, the break flow would reach approximately 2,200 gpm within 0.14 seconds of the occurrence of the line break. At this flow rate, the RWCU system inlet and outlet flow transmitters would produce output signals corresponding to their maximum ranges of 800 gpm and 300 gpm, respectively. As a result, each differential flow sensor would detect a differential flow of approximately 500 gpm immediately after the occurrence of the HELB. Since this differential flow exceeds the RWCU system high differential flow instrumentation trip setpoint, the system isolation logic would be initiated. However, the isolation logic initiation signals are delayed 45 seconds to avoid spurious RWCU system isolation actuations which could be caused by normal operational transients such as pump starts and system alignment changes. Based on projections, this time delay could cause certain equipment located in the Reactor Building to exceed their environmental qualifications for the new postulated line break. The loss of coolant and flooding associated with the new break are bounded by the previously analyzed design basis Main Steam line break (MSLB) outside containment (FSAR, Subsection 15.6.4).

Pipe whip and jet impingement analyses were performed for the new postulated HELB at the piping connection to the RWCU blowdown flow control valve. Previous analyses had been performed for the RWCU blowdown isolation valve (RWCU-V-32) piping connection located just upstream of the postulated flow control valve line break. The jet impingement analysis did not identify any impingement targets in addition to those previously identified for the upstream line break, and none of the previously identified targets could affect safe shutdown capability.

The pipe whip analysis did identify the need for two additional pipe whip restraints for the 6-inch RWCU blowdown line in the area of the HELB to limit pipe travel and prevent damage to the flow transmitter lines used to detect the HELB.

Since previous projections indicated a potential concern, an equipment qualification evaluation of equipment located in the Reactor Building was performed using environmental profiles developed for the postulated HELB. The environmental profiles included a radiation source term of approximately one-half of the spent resin contained in the RWCU filter-demineralizers being released at the break. The evaluation determined that the equipment required to mitigate the HELB or assure safe shutdown could withstand the adverse environmental and radiological effects of the HELB as assumed in the environmental profiles.

Resolution

A design change will be implemented prior to restart from the Spring 1995 (R-10) Maintenance and Refueling Outage to add a RWCU "Blowdown Flow - High" containment isolation trip function. The new trip function implements design features assumed in the analysis that generated the environmental profiles developed for the postulated RWCU HELB. This design change significantly improves the capability to detect and mitigate the effects of the HELB and is necessary to resolve Reactor Building environmental qualification concerns consistent with the new analysis. The design change adds two redundant Bailey Model 745 rack mounted electromechanical relay alarm units (flow switches) and a second redundant Rosemount Model 1153 flow transmitter. An additional square root extractor and flow indicator will also be provided to supplement existing flow indication instrumentation to allow operational channel checks. The design change further adds the two pipe whip restraints identified in the pipe whip analysis as being necessary to prevent damage to the flow transmitter lines used to detect the HELB. The new trip function design will reduce the HELB detection and isolation initiation time from 45 seconds to 2.5 seconds to ensure that the environmental effects of the HELB are bounded by analyses. This also provides assurance that the environmental qualification of equipment located in the Reactor Building is maintained.

The design change complies with applicable codes and standards (discussed in WNP-2 FSAR Sections 1.2 and 3.0, and Appendix C) to meet the safety-related functional objective of providing fast detection and isolation of the postulated RWCU HELB. The instrumentation design meets the single failure criterion, and a flow switch failure causes the relay contacts to open to fulfill the safety function of RWCU system isolation. The instrumentation is not a new type or different kind and is currently being used in similar safety-related applications in such plant systems as Standby Gas Treatment (SGT) and Residual Heat Removal (RHR). The flow instrumentation, piping/tubing, and associated supports have been evaluated to withstand the effects of a design basis earthquake (DBE), and the postulated HELB. A design safety analysis was performed for the design change in accordance with 10 CFR 50.59, "Changes, tests and experiments," and the analysis concluded that the design change does not represent an unreviewed safety question (USQ). Moreover, the design change and associated analyses resolve the previously identified USQ concerning the failure to analyze the postulated HELB at the piping connection to the RWCU blowdown flow control valve.

The Supply System proposes to amend Technical Specification 3/4.3.2, "Isolation Actuation Instrumentation" to add the new RWCU "Blowdown Flow - High" trip function to Tables 3.3.2-1, 3.3.2-2, and 4.3.2.1-1. This proposed amendment incorporates the design features being implemented to reduce the detection and isolation time for the postulated RWCU HELB.

The proposed changes to the Tables are described below (the actual affected pages and proposed change markups are included in Attachment 3):

TABLE 3.3.2-1

Add "Blowdown Flow - High" as Trip Function 3.k. The valve group signal, required number of operable channels, and applicable operational conditions are to be the same as the existing RWCU "Δ Flow - High" trip function (3.a) requirements. Also add "Action 27" to "Close valve RWCU-V-32 within 1 hour or perform Action 22."

TABLE 3.3.2-2

Add "Blowdown Flow - High" as Trip Function 3.k. Also add the associated trip setpoint of ≤ 264.5 gpm and an allowable value of ≤ 271.7 gpm.

TABLE 4.3.2.1-1

Add "Blowdown Flow - High" as Trip Function 3.k. The channel check, channel functional test, and channel calibration surveillance intervals, and applicable operational conditions are to be the same as the existing RWCU "Δ Flow - High" trip function (3.a) requirements.

The proposed amendment does not remove or modify any existing Technical Specification requirements, but imposes additional requirements related to the new "Blowdown Flow -High" trip function. Two channels of the new "Blowdown Flow - High" trip function, one channel in each trip system, will be available and the proposed amendment requires that both channels be operable during plant startup and power operation or when reactor coolant temperatures are greater than 200° F. This ensures that no single instrument failure would preclude the isolation of the postulated RWCU HELB. In the event that a channel becomes inoperable, the inoperable channel will be required to be restored to operable status in accordance with LCO 3.3.2 and proposed Action 27. This new action will require that the RWCU blowdown line manual isolation valve (RWCU-V-32) or at least one of the system isolation valves (RWCU-V-1 or RWCU-V-4) be closed. If the RWCU system isolation valves are closed, the system will be declared inoperable. The subject HELB is postulated at RWCU-FCV-33 because it is the first normally closed valve on the blowdown line. Closure of either valve RWCU-V-32 or the system isolation valves will isolate this break location from the reactor. Closure of RWCU-V-32 does not create a new terminal end because a temporarily closed valve (i.e., a valve closed due to an Action Statement or for maintenance purposes) does not represent a normally closed valve.

As previously discussed, a design change is being implemented to provide the necessary instrumentation for the "Blowdown Flow - High" trip function to reduce the postulated RWCU HELB detection and isolation initiation time from 45 seconds to 2.5 seconds. The 45 second value is the total response time for the "Δ Flow - High" trip function, which includes the 13 second emergency diesel generator starting time as discussed in Bases 3/4.3.2. The 2.5 second response time for the new "Blowdown Flow - High" trip function is consistent with the assumptions in the blowdown analysis of the postulated RWCU HELB. This value includes time delays for instrumentation tolerances and operational flow transients to avoid spurious alarm and isolation actuations. The total isolation time assumed in the blowdown analysis is 18.75 seconds, which includes a 16.25 second valve isolation time consistent with FSAR, Table 6.2-16, but does not include the 13 second diesel generator starting time. The blowdown analysis of the postulated line break does not assume a reactor or turbine trip, and based on FSAR, Subsection 3.6.1.11.2.1, offsite power can be assumed to be available. Thus, the additional delay time for diesel generator starting is not required.

A previous Technical Specification amendment request (Reference 4) has been submitted to relocate the isolation instrumentation response times contained in Table 3.3.2-3 to the WNP-2 FSAR. Therefore, the new "Blowdown Flow - High" trip function is not being proposed for addition to the Table as part of this amendment request, but will be evaluated for inclusion in the FSAR update consistent with 10 CFR 50.59. Response time testing will be performed for the new trip function prior to restart from the Spring 1995 (R-10) Maintenance and Refueling Outage and will be included as a LCS surveillance requirement.

The proposed flow switch trip setpoint of ≤ 264.5 gpm and allowable value of ≤ 271.7 gpm were established based on operational risk (lower limit), acceptable response time (upper limit), and instrument uncertainties. This setpoint was selected such that the value is low enough to detect and initiate isolation of the postulated HELB as assumed in the blowdown analysis, but high enough to prevent spurious isolation actuations from flows anticipated during normal RWCU system operation. Current setpoint methodology ensures that the effects of a harsh environment are included in the instrument uncertainties and corresponding setpoints.

The proposed LCO setpoint, allowable value, and surveillance requirements ensure that the "Blowdown Flow - High" trip function will initiate isolation of a postulated HELB at the piping connection to the RWCU blowdown flow control valve consistent with the assumptions of the associated blowdown analysis. This also provides assurance that the radiological effects of the line break and loss of coolant are bounded by the accident analysis for the design basis MSLB outside containment. FSAR, Sections 6.3 and 15.6.4, discuss the spectrum of Boiling Water Reactor (BWR) system piping failures outside of the primary containment. Offsite and control room dose consequences from the postulated RWCU HELB are limited to less than 10% of the 10 CFR 100 guidelines and meet the acceptance criteria of Standard Review Plan (NUREG-0800) 15.6.4.

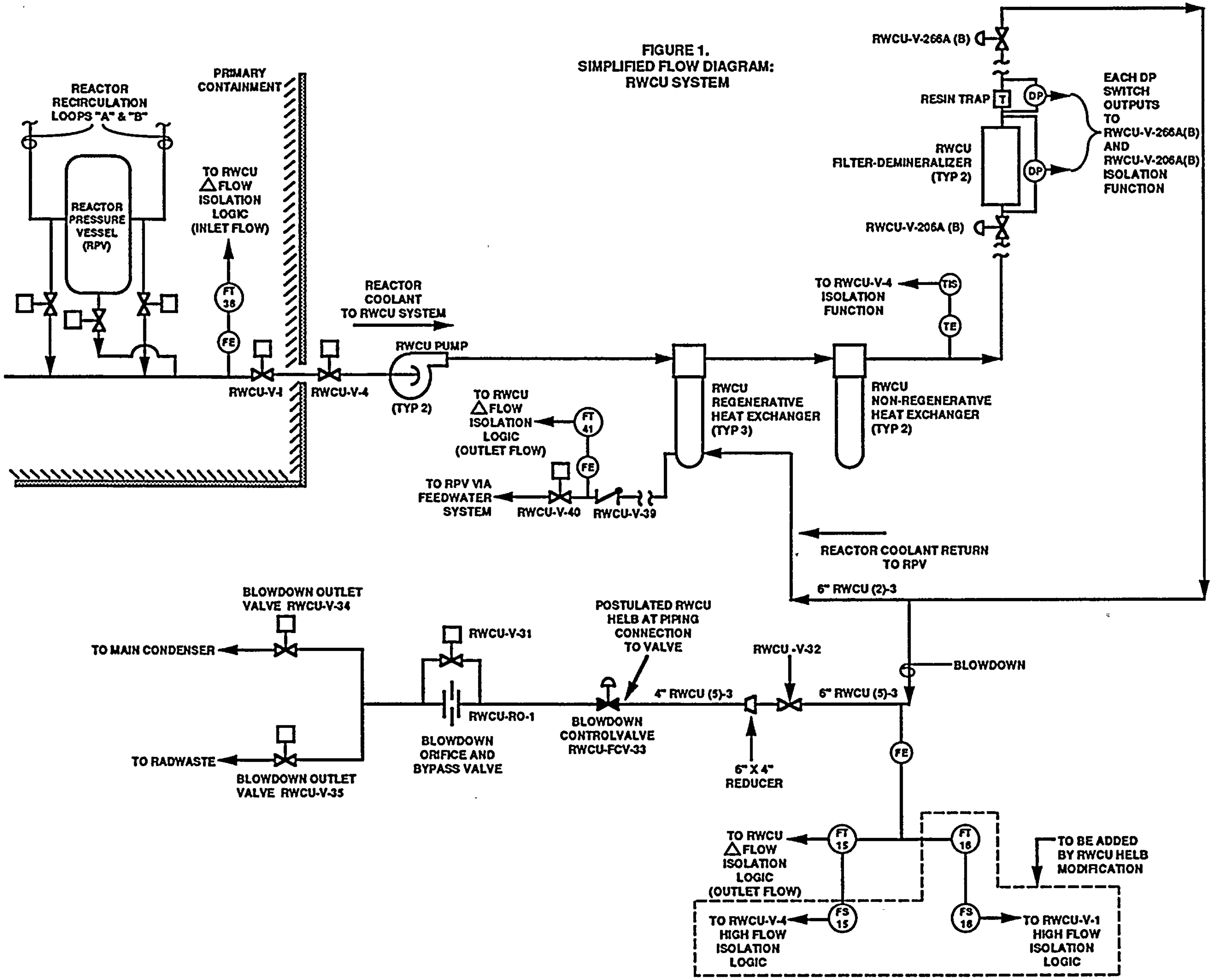

FIGURE 1.
SIMPLIFIED FLOW DIAGRAM:
RWCU SYSTEM

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EVALUATION OF SIGNIFICANT HAZARDS CONSIDERATION

In accordance with the criteria for defining a significant hazards consideration established in 10 CFR 50.92, the Supply System has evaluated the proposed amendment to WNP-2 Technical Specification 3/4.3.2 and determined that it does not represent a significant hazards consideration. The following discussion is provided in support of this conclusion.

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

   This proposed amendment incorporates design features being implemented to reduce the detection and isolation time for a postulated High Energy Line Break (HELB) at the piping connection to the Reactor Water Cleanup (RWCU) system blowdown flow control valve. These design features significantly improve the capability to detect and mitigate the effects of the line break and are necessary to resolve Reactor Building environmental concerns. Since the design features are for accident detection and mitigation, they are not considered an accident initiator in the analyses and will not increase the probability of the accident. Moreover, the instrumentation design ensures that no single failure would preclude isolation of the HELB.

   The proposed amendment does not remove or modify any existing Technical Specification requirements, but imposes additional requirements related to the new "Blowdown Flow - High" trip function consistent with existing Limiting Condition for Operation (LCO) and surveillance requirements, conservative analyses, and instrumentation setpoint methodologies. These requirements will maintain the Reactor Building environment consistent with the current analyses for the postulated RWCU HELB and provide assurance that the radiological effects of the line break are bounded by the accident analysis for the design basis Main Steam line break (MSLB) outside containment. The calculated offsite doses for the MSLB are less than 10% of the 10 CFR 100 guideline values and meet the acceptance criteria of Standard Review Plan (NUREG-0800) 15.6.4.

   On the basis of the information presented above, it is concluded that the change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

This proposed amendment incorporates design features to resolve Reactor Building environmental concerns that resulted from a postulated RWCU HELB that had previously not been fully analyzed. The design features will significantly improve the capability to detect and mitigate the effects of the HELB. The instrumentation design meets the single failure criterion, and a flow switch failure results in fulfillment of the accident safety function of RWCU system isolation. The instrumentation being installed does not represent a new type or different kind than currently used in similar safety-related applications in the plant. Furthermore, the flow instrumentation, piping/tubing, and associated supports have been evaluated to withstand the effects of a design basis earthquake (DBE) and the postulated HELB. An environmental qualification evaluation determined that the equipment required to mitigate the HELB or assure safe shutdown can withstand the adverse effects of the HELB.

The proposed amendment does not remove or modify any existing Technical Specification requirements or change the method of plant operation, but imposes additional requirements related to the new "Blowdown Flow - High" trip function consistent with existing LCO and surveillance requirements, conservative analyses, and instrumentation setpoint methodologies. These requirements will maintain the Reactor Building environment consistent with the assumptions used in current analyses for the postulated RWCU HELB and provide assurance that the radiological effects of the line break are bounded by the accident analysis for the design basis MSLB outside containment.

On the basis of the information presented above, it is concluded that the change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

This proposed amendment incorporates design features being implemented to reduce the detection and isolation time for a postulated RWCU HELB. The design change complies with applicable codes and standards to meet the safety-related functional objective. The instrumentation design meets the single failure criterion, and the flow instrumentation, piping/tubing, and associated supports have been evaluated to withstand the effects of a DBE, and the postulated HELB. Furthermore, an environmental qualification evaluation determined that the equipment required to mitigate the HELB or assure safe shutdown can withstand the adverse effects of the HELB.

The proposed amendment does not remove or modify any existing Technical Specification requirements, but imposes additional requirements related to the new "Blowdown Flow - High" trip function consistent with existing LCO and surveillance requirements, conservative analyses, and instrumentation setpoint methodologies. These requirements will maintain the Reactor Building environment consistent with the new analyses for the postulated RWCU HELB and provide assurance that the radiological effects of the line break are bounded by the accident analysis for the design basis MSLB outside containment. The calculated offsite doses for the MSLB are less than 10% of the 10 CFR 100 guideline values and meet the acceptance criteria of Standard Review Plan (NUREG-0800) 15.6.4.

On the basis of the information presented above, it is concluded that the change does not involve a significant reduction in the margin of safety.