VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

June 30, 1980

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
Attn: Mr. Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Serial No. 562
LQA/WRM:rab

Docket Nos. 50-280
50-281
License Nos. DPR-32
DPR-37

Dear Mr. Denton:

AMENDMENT TO OPERATING LICENSES
SURRY POWER STATION UNIT NOS. 1 AND 2
PROPOSED TECHNICAL SPECIFICATION CHANGE

Pursuant to 10 CFR 50.90, the Virginia Electric and Power Company hereby requests an amendment, in the form of changes to the Technical Specifications, to Operating Licenses DPR-32 and DPR-37 for the Surry Power Station, Unit Nos. 1 and 2.

The proposed Technical Specification changes for Surry Unit No. 1 and Unit No. 2 are discussed in the enclosed attachments. Attachment 1 and Attachment 2 discuss the reasons for the proposed changes as well as the safety impact of the proposed changes. Attachment 3 and Attachment 4 provide the rewritten sections of the Technical Specifications for Unit 1 and Unit 2 respectively.

This request has been reviewed and approved by the Station Nuclear Safety and Operating Committee and the System Nuclear Safety and Operating Committee. It has been determined that this request does not involve an unreviewed safety question.

This request has been reviewed in accordance with the criteria in 10 CFR 170.22. Since this request involves a single safety issue for Unit 1 and Unit 2 which requires an individual review for each unit, it has been determined that this request involves a Class III license

amendment fee for Unit 1 and a Class III license amendment fee for Unit 2. Accordingly, a voucher check in the amount of $8,000.00 is enclosed in payment of the required fees.

Very truly yours,

J. H. Ferguson
Executive Vice President-Power

Attachments:

1. Evaluation of Proposed Technical Specifications Changes for Unit 1
2. Evaluation of Proposed Technical Specifications Changes for Unit 2
3. Proposed Technical Specification Changes - Unit 1
4. Proposed Technical Specification Changes - Unit 2
5. Voucher Check No. 25112 for $8,000.00

cc: Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
Region II

COMMONWEALTH OF VIRGINIA)
) S. S.
CITY OF RICHMOND)

Before me, a Notary Public, in and for the City and Commonwealth aforesaid, today personally appeared J. H. Ferguson, who being duly sworn, made oath and said (1) that he is Executive Vice President-Power of the Virginia Electric and Power Company, (2) that he is duly authorized to execute and file the foregoing Amendment in behalf of that Company, and (3) that the statements in the Amendment are true to the best of his knowledge and belief.

Given under my hand and notarial seal this 30th day of June, 1980.

My Commission expires January 19, 1982.

Evelyn C. [illegible]
Notary Public
I was commissioned as Evelyn Cherry.

(SEAL)

ATTACHMENT NO. 1

EVALUATION OF PROPOSED TECHNICAL SPECIFICATION CHANGES
UNIT NO. 1

INTRODUCTION

The changes discussed below, with the exception of the editorial change on Section 3.6, are a result of concerns associated with the Low Head Safety Injection (LHSI) and the Outside Recirculation Spray (ORS), Pumps Net Postitive Suction Head (NPSH), and Loss of Coolant Accident (LOCA) site boundary dose considerations as related to Containment Spray System performance. Certain modifications have resulted from these concerns and have been addressed in previous correspondence. Each section change to the Technical Specifications being requested will be individually discussed and reasons for the requested changes given.

BACKGROUND

Information concerning LOCA site boundary dose considerations has been provided to the NRC in the following correspondence:

1. Vepco to NRC, S/N 142/090976, 8-31-76; Response to Request for Additional Information

2. Vepco to NRC, S/N 045/020177, 4-6-77; Response to Request for Additional Information

3. Vepco to NRC, S/N 045A/020177, 5-9-77; Followup to Provide Complete Response and Proposed Modifications

4. Vepco to NRC, S/N 042, 1-24-80; Updated Information and Changes to Proposed Modifications

5. Vepco to NRC, S/N 187, 3-20-80; Pretest Report Submittal for Drawdown Test

6. Vepco to NRC, S/N 501, 6-11-80, Documentation of May 22, 1980 Meeting and Presentation of Preliminary Information

7. Vepco to NRC, S/N 535, 6-18-80, submittal of Final Analysis and Test Information

The associated NRC correspondence for the above concerns are as follows:

1. NRC to Vepco, S/N 142/090976, 7-9-76; Request for Reanalysis of Meteorological Data and LOCA Dose Considerations

2. NRC to Vepco, S/N 045/020177, 2-1-77; Request for Additional Information

Information concerning Surry Power Station's NPSH and Containment Integrity requirements has also been presented to the NRC in the following correspondence:

1. Vepco to NRC, S/N 366, 8-24-77; Results of Analyses for NPSH Problem and the Associated Modifications.

2. Vepco to NRC, S/N 374, 8-29-77; Report of Inadequate NPSH for LHSI pumps and Associated Modifications.

3. Vepco to NRC, S/N 374A/082977, 9-1-77; Report of Additional NPSH Modifications for LHSI pumps.

4. Vepco to NRC, S/N 382/082477, 9-12-77; Response to NRC request for Additional Information (8-24-77). This letter provides the NPSH analyses and calculations justifying the interim modifications installed.

5. Vepco to NRC, S/N 382/092477, 11-22-77; Proposal and justifying analyses for permanent solution to NPSH problem.

The NRC's review of the NPSH Problem has been documented in the following correspondence:

1. NRC to Vepco, S/N 367/082477, 8-24-77; the NRC approves Interim NPSH Modifications.

2. NRC to Vepco, S/N 382/082477, 8-24-77; the NRC's "Order for Modification of License" utilizing Interim NPSH Modifications; it includes NRC's request for additional information.

3. NRC to Vepco, S/N 069/013178, 1-31-78; NRC's further request for additional information based on Final NPSH Modification proposal.

Responses to the NRC's request for additional information were made on April 14, 1978 (S/N 069A/013178) and on April 28, 1978 (S/N 069B/013178). The final response to the NRC's request was submitted on November 27, 1978 (S/N 069C/ 013178) with additional information on this response being provided on February 14, 1979 (S/N 085) and June 19, 1980 (S/N 069D/013178).

The above correspondence discussed certain long-term modifications required to alleviate LOCA site boundary dose concerns and certain interim and long-term modifications required to alleviate NPSH concerns. Commitments to install the referenced modifications have been made and are in various stages of completion. The interim modifications associated with NPSH concern have been previously implemented on both units with the long-term modifications to be implemented during each unit's Steam Generator Replacement Outage. The long-term modifications to the Containment Spray system associated with site boundary LOCA dose concerns are to be implemented during each unit's Steam Generator Replacement Outage. The following discussion presents 1) the status of the respective modifications for the unit, 2) the respective changes to the Technical Specifications, and 3) the Safety Evaluation for these changes. The status of modifications for Surry Unit 1 is presented herein. The Surry Unit 2 status is presented in Attachment No. 2.

Status of Modifications - Surry Unit No. 1

As a result of the continuing review of the NPSH and Containment depressurization analyses by our architect engineer, it was discovered that a non-conservative value for spray thermal effectiveness had been used in the interim analysis. This interim NPSH analysis supported the associated NPSH modifications installed. The original values for spray thermal effectiveness used as input to the interim NPSH analysis were based on specific flow rates and spray nozzle differential pressure. The reduced ORS pump flow rates caused a reduction in nozzle differential pressure, thereby reducing the nozzle's thermal effectiveness. The interim NPSH analysis was performed using the most conservative value for spray thermal effectiveness. With a spray thermal effectiveness value of 100% being the most conservative for the NPSH analysis, any value less than 100% would improve system operation. However, it had been determined that any spray thermal effectiveness value below 95% would result in an increased containment depressurization time and increased containment peak pressures. The highest spray thermal effectiveness value is conservative for NPSH considerations but is the least conservative for containment integrity considerations. This condition was reported in LER-79-036-01T-0. Operating limitations on service water temperature were instituted to prevent any possibility for increased containment depressurization time or reduced NPSH available.

To relieve the restrictive operating conditions, analyses were performed to determine what modifications could be implemented. It was determined that specific portions of the final modifications associated with the NPSH and the Containment Spray Modifications should be installed.

These modifications were completed during the recent turbine inspection outage. These changes consisted of the following:

1. Removed and plugged all type 1HH30100 nozzles in the inside and outside recirculation spray systems. This will remain as part of the final NPSH fix.

2. Restricted the outside recirculation spray pump flow rate to 3000 gpm. This will remain as part of the final NPSH fix.

3. Installed the containment spray system bleedlines to the ORS pump suction in the containment sump area. Flow was set for 300 gpm per line with the use of restriction orifices. The installation of the bleedlines will remain as part of the final NPSH fix. The restriction orifices will be changed as a result of the installation of the containment spray system crane wall header.

4. Removed and plugged all type 1HH30100 nozzles in the containment spray system headers. This will remain as part of the final containment spray system modification.

5. Removed type 1/2B40 nozzles and replaced with type 1713A nozzles. This will remain as part of the final containment spray system modification.

6. Removed and plugged 24 type 1/2B40 nozzles on each containment spray header. This will be modified as part of the final containment spray system modification.

The basis for implementing the above modifications was to 1) ensure adequate spray thermal effectiveness, 2) support the latest depressurization analyses, and 3) to ensure adequate available NPSH is available throughout all LOCA transients. Even though the full compliment of modifications associated with the Containment Spray System have not been installed, the site boundary dose conditions have been improved. It should be noted that modifications to the LHSI system as indicated in previous correspondence has not changed.

Changes to Surry Unit 1 Technical Specifications

1. Section 3.3 (A-1) - The Refueling Water Storage Tank minimum level has been increased from 350,000 gallons to 385,200 gallons. This was done in order to ensure that sufficient tank head is available for NPSH considerations for the LHSI pumps and to extend the containment spray duration for depressurization. This limit is the same as specified in the existing Condition of License dated August 14, 1978.

2. Section 3.3 (A-13) - The addition of this section will provide limits on allowable leakages from the various ECCS systems that may contain radioactive fluids following a LOCA. Leakage from these sources will be verified by testing prior to start-up. Acceptance criteria for these tests will be in accordance with leakage values listed in Tables 4.5.1 and 4.11.1. Reference also the revised T.S. 3.3 B-11.

3. Section 3.3 (B-11) - The addition of this section will provide limits on allowable leakages from the various ECCS systems that may contain radioactive fluids following a LOCA. Leakage from these sources will be verified by periodic testing on a quarterly basis or as a special refueling test. Acceptance criteria for these tests will be in accordance with leakage valves listed in Tables 4.5.1 and 4.11.1.

4. Section 3.4.1 (A-3) - The Refueling Water Storage Tank minimum level has been increased from 350,000 gallons to 385,200 gallons. This was done in order to ensure that sufficient tank head is available for NPSH consideration and to extend the Containment Spray duration for depressurization. The upper limit of 398,000 gallons has been established due to tank structural limitations.

5. Section 3.4.1 (A-6) - The addition of this section will provide limits on allowable leakages from the various ECCS systems that may contain radioactive fluids following a LOCA. Leakage from these sources will be verified by testing prior to start-up. Acceptance criteria for these tests will be in accordance with leakage valves listed in Tables 4.5.1 and 4.11.1.

6. Section 3.4.1 (B-4) - The addition of this section will provide limits on allowable leakages from the various ECCS systems that may contain radioactive fluids following a LOCA. Leakage from these sources will be verified by Periodic Testing on a quarterly basis or as a special refueling test. Acceptance criteria for these tests will be in accordance with leakage values listed in Tables 4.5.1 and 4.11.1.

7. Section 3.4.1 (C) - This section has been revised in order to provide consistency with those requirements set forth in revised section 3.8.2-1 (B-4) which delineates containment internal pressure operating parameters.

8. Section 3.4.1 (BASIS) (See item 4 above concerning RWST volumes)

9. Section 3.4.1 (BASIS) Changes have been made as a result of a renalysis associated with NPSH modifications and containment depressurization considerations. As a results of this reanalysis, it was shown that depressurization would take 46.6 minutes. Standard Review Plan 6.2.1.1A allow depressurization within 60 minutes for subatmospheric containments.

10. Section 3.8 - Changes have been made in order to reflect the results of the reanalysis of the Containment Spray and Recirculation Spray subsystems in regards to post-LOCA containment depressurization. Previously, this depressurization time was based on pressure transients as a result of a reactor hot leg break. In order to increase conservatism and bound more restrictive LOCA depressurization transients, reanalyses were performed based on cold leg pump suction doubles ended rupture with minimum engineered safety features. As a result of reanalyses, it was determined that pressure transients would reach a higher peak pressure and at a later time than that of the original analysis, thus increasing the depressurization time to 46.6 minutes.

<u>Safety Evaluation</u>

These changes have been reviewed with respect to an unreviewed safety question. The review has determined the following:

a. The modifications incorporated hardware changes of a passive nature. The function of existing Engineered Safety Features has not been altered. The latest approved analysis techniques have been used to insure the design of the modifications is bounded by previously analyzed accident conditions. This insures that the probability of occurrence or the consequences of an accident of malfunction of equipment important to safety and previously evaluated in the Safety Analysis Report has not increased.

b. The design of the modifications installed incorporated materials equal to or better than those materials previously existing in the affected systems. Also, the modifications installed are associated with the existing equipment only. New equipment and systems necessary to insure safe operation or safe shutdown or to meet the requirements of the latest design criteria have not been added. The analyses and calculations performed insure that the design function of all existing equipment associated with the modifications has not been altered or reduced. The possibility for an accident or malfunction of a different type than any evaluated previously in the Safety Analysis Report is not created.

c. All piping stresses on the containment spray subsystems and the recirculation spray subsystems imposed by this design change have been analyzed and properly supported to insure that normal and upset loading on the associated piping, equipment nozzles and existing supports during all operating and transient conditions has not reduced any margin of safety.

The maximum allowable setpoint for the containment air partial pressure is bounded by both containment average temperature and service water temperature. The containment average temperature and the corresponding containment air partial pressure are based on LOCA peak calculated pressure criteria performed as part of the Containment Integrity Analysis. The maximum service water temperature limits for corresponding containment average temperature and air partial pressure are based on LOCA atmospheric peak pressure criteria. These analyses and the NPSH re-analysis have confirmed that sub-atmospheric conditions are reached and maintained in less than one hour following LOCA. It has also been confirmed through these analyses that the containment peak pressure limit of 45 psig is not exceeded at any time throughout the LOCA.

These modifications and the subsequent confirming analyses have indicated the minimum NPSH available to the Low Head Safety Injection pumps is 22.3 feet. The required NPSH for these pumps is 17.0 feet. The minimum available NPSH for the Outside Recirculation Spray pumps is 12 feet with a required NPSH of 8.4 feet.

Therefore, the margin of safety as defined in the basis for any technical specification is not reduced. The modifications optimize the design function of existing systems through passive hardware changes thereby eliminating the possibility of mechanical equipment failures of an active nature. The optimization of performance and intended function of existing equipment within the bounds of previously evaluated accident conditions does not reduce the margin of safety.

Therefore, the modifications installed and the proposed changes to the Technical Specifications do not constitute an unreviewed safety question.

ATTACHMENT NO. 2

EVALUATION OF PROPOSED TECHNICAL SPECIFICATION CHANGES
UNIT NO. 2

INTRODUCTION

The changes discussed below, with the exception of the editorial change on Section 3.6, are a result of concerns associated with the Low Head Safety Injection (LHSI) and the Outside Recirculation Spray (ORS), Pumps Net Postitive Suction Head (NPSH), and Loss of Coolant Accident (LOCA) site boundary dose considerations as related to Containment Spray System performance. Certain modifications have resulted from these concerns and have been addressed in previous correspondence. Each section change to the Technical Specifications being requested will be individually discussed and reasons for the requested changes given.

BACKGROUND

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1. Vepco to NRC, S/N 142/090976, 8-31-76; Response to Request for Additional Information

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4. Vepco to NRC, S/N 042, 1-24-80; Update Information and Changes to Proposed Modifications

5. Vepco to NRC, S/N 187, 3-20-80; Pretest Report Submittal for Drawdown Test

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3. NRC to Vepco, S/N 069/013178, 1-31-78; NRC's further request for additional information based on Final NPSH Modification proposal.

Responses to the NRC's request for additional information were made on April 14, 1978 (S/N 069A/013178) and on April 28, 1978 (S/N 069B/013178). The final response to the NRC's request was submitted on November 27, 1978 (S/N 069C/ 013178) with additional information on this response being provided on February 14, 1979 (S/N 085) and June 19, 1980 (S/N 069D/013178).

The above correspondence discussed certain long-term modifications required to alleviate LOCA site boundary dose concerns and certain interim and long-term modifications required to alleviate NPSH concerns. Commitments to install the referenced modifications have been made and are in various stages of completion. The interim modifications associated with NPSH concern have been previously implemented on both units with the long-term modifications to be implemented during each unit's Steam Generator Replacement Outage. The long-term modifications to the Containment Spray system associated with site boundary LOCA dose concerns are to be implemented during each unit's Steam Generator Replacement Outage. The following discussion presents 1) the status of the respective modifications on the unit, 2) the respective changes to the Technical Specifications, and 3) the Safety Evaluation for these changes. The status of modifications for Surry Unit 2 is presented herein. The Surry Unit 1 status is presented in Attachment No. 1.

Status of Modifications - Surry Unit No. 2

In accordance with our previous commitments, we have implemented the long-term modifications associated wiht the Low Head Safety Injection (LHSI) and Outside Recirculation Spray (ORS) pumps for NPSH concerns. Concurrent with these modifications, we have made changes to the Containment Spray and related systems to satisfy the latest licensing reuqirements concerning site boundary LOCA dose. These modifications were implemented on the current Steam Generator Replacement Outage. The modifications essentially consisted of the following:

A. NPSH Modifications

1. Inside Recirculation Spray System

   a. Remove and plug all type 1HH30100 nozzles in the spray headers.

   b. Install a 2½ in. bleed line from the discharge of the Recirculation Spray heat exchangers to the suction of the IRS pumps. Design flow is 350 gpm.

2. Outside Recirculation Spray System

   a. Remove and plug all type 1HH30100 nozzles in the containment recirculation spray headers.

   b. Install a restriction orifice on the ORS pump discharge to limit system flow to 3000 gpm.

   c. Install a 2½ in. bleed line from each Containment Spray System supply header to the suction of the ORS pump in the containment sump. Design flow is 300 gpm.

3. Low Head Safety Injection System

   a. Install cavitating venturis in each of the cold leg injection lines to limit LHSI pump flow to 3250 gpm during the recirculation mode of operation.

4. Refueling Water Storage Tank (RWST)

   a. In conjunction with the RWST modifications for the Containment Spray (CS) Modification, elbows were installed inside the RWST on the CS pump suction lines.

B. Containment Spray System Modifications

1. Containment Spray Headers

   a. Install new containment spray header outside the crane wall.

   b. Replace nozzles in existing headers.

2. Caustic Addition Modifications

   a. Resize and reroute Chemical Addition Tank (CAT) outlet line directly to CS pump suction.

3. RWST Modifications

   a. Removal of mixing weir inside RWST

   b. Installation of elbows on CS pump suction lines inside RWST

   c. Upgrade of level instrumentation to provide input to control circuitry for automatic switchover of the LSHI system suction from the RWST to the Containment sump.

The basis for implementing the above modifications was to 1) ensure adequate iodine removal for the most restrictive LOCA for all Engineered Safety Feature pump combinations 2) provide adequate spray to ensure containment depressurization for all pump combinations and 3) ensure adequate NPSH available for all LOCA transients. This has been accomplished by modifications to 1) provide increased caustic spray coverage, 2) reduce the delay time in caustic solution reaching the spray nozzles, 3) add caustic solution at a rate that will assure spray pH and sump pH is within bounds of the licensing requirements for all containment depressurization transients, 4) achieve maximum spray thermal effectiveness for the Containment and Recirculation Spray (RS) Systems, 5) reduce NPSH required for the LHSI and RS Systems by restricting maximum flow conditions, and 6) increase NPSH available for the RS Systems by providing subcooled water to pump suctions.

Changes to Surry Unit 2 Technical Specifications

1. Section 3.3 (A-1) - The RWST Level has been increased from 350,000 gallons to 387,100 gallons in order to ensure that sufficient water is available to operate the C.S. and S.I. systems for the complete duration of a LOCA considering all combinations of SI and CS pumps.

   The upper limit of boron concentration has been established at 2200 PPM in order to maintain a correct pH after mixing with the sodium hydroxide of the CAT for the containment spray.

2. Section 3.3 (A-13) - The addition of this section will provide limits on allowable leakages from the various ECCS systems that may contain radioactive fluids following a LOCA. Leakage from these sources will be verified by testing prior to start-up. Acceptance criteria for these tests will be in accordance with leakage valves listed in Tables 4.5.1 and 4.11.1.

3. Section 3.3 (B-11) - The addition of this section will provide limits on a allowable leakages from the various ECCS systems that may contain radioactive fluids following a LOCA. Leakage from these sources will be verified by Periodic Testing on a quarterly basis or as a special refueling test. Acceptance criteria for these tests will be listed in Tables 4.5.1 and 4.11.1.

4. Section 3.4 (A-3) - The RWST Level increase from 350,000 gallons to 387,100 gallons is required in order to ensure that sufficient water is available to operate the CS and S.I. systems for the complete duration of a LOCA considering all combinations of SI and CS pumps.

   The upper tank volume limit of 398,000 gallons has been established in order to not exceed the tanks structural limits.

5. Section 3.4.2 (A-4) - An increased volume of the Chemical Addition Tank (4200 gallons) is required in order to provide sufficient caustic addition to the increased volume of the RWST which at a 17-18 percent sodium hydroxide concentration will create a containment spray pH band of 8.5 to 11.0 and on ultimate sump pH greater than 8.0 when any combination of CS and SI pumps are utilized to mitigate LOCA conditions.

6. Section 3.4.2 (C) - This section has been revised in order to provide consistency with those requirements set forth in revised section 3.8.2 (B-4) which delineate containment internal pressure operating parameters. (See changes 3.8.2-1 (B-4).)

7. Section 3.4.2 (BASIS) (See Item No. 1)

8. Basis Section 3.4 - Post LOCA pressure transients have been reanalyzed based on cold leg pump suction double ended rupture with minimum engineered safety features. This reanalysis has shown that depressurization of containment will encompass 45.3 minutes. Section 3.4 is required to be changed from 40 to 60 minutes as a result of this reanalysis. Standard Review Plan 6.2.1.1A allows depressurization within 60 minutes for subatmospheric containments.

9. Section 3.8 - Changes have been made in order to reflect the results of the reanalysis of the Containment Spray and Recirculation Spray subsystems in regards to post LOCA containment depressurization. Previously, this depressurization time was based on pressure transients as a result of a reactor hot leg break. In order to increase conservatism and bound more restrictive LOCA depressurization transients, a reanalysis was performed based on cold leg pump suction doubles ended rupture with minimum engineered safety features. As a result of this reanalysis, it was determined that pressure transients would reach a peak pressure at a later time than that of the previous analysis, thus increasing the depressurization time to 45.3 minutes.

10. Section 4.1 (TABLE 4.1-1) - Changes to this table have been made to ensure Refueling Water Storage Tank Levels are maintained in accordance with revised T.S. section 3.4. A check of level instrumentation should be performed once during each shift.

    A functional check of RWST level indication instrumentation should be performed on a monthly basis in order to ascertain any malfunctions which may lead to a violation of T.S. section 3.4 for minimum and maximum RWST levels. In addition, the new level instrumentation provides input to control circuitry for switchover of the LHSI system from the RWST to the containment sump.

Safety Evaluation

The function of the existing Engineered Safeguards Systems has not been altered as a result of the installed modifications. Accepted analytical methods have been utilized to determine the consequences following a LOCA based on the most limiting system parameters. The margin of safety as defined in the basis for technical specifications is not reduced. The modifications optimize the design function of existing systems through hardware changes.

Therefore, the proposed changes to Technical Specification for Surry Unit No. 2 as a result of installed modifications are acceptable and:

a. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety and previously evaluated in the Safety Analysis Report is not increased. The modifications ensure the operation of RS and LHSI pumps throughout all phases of LOCA and ensure proper operation of the CS system for containment iodine removal. Computer analyses have confirmed acceptable containment transient performance in that the peak pressure limit of 45 psig is not exceeded and the pressure returns to subatmospheric conditions in less than 60 minutes and remains subatmospheric. Analyses have also shown acceptable performance of systems to mitigate the consequences of a Design Basis LOCA.

b. The possibility for an accident or malfunction of a different type than any evaluated previously in the Safety Analysis Report is not created. The level of integrity and the function of the CS, SI and RS systems is not changed. Analyses have shown that LOCA is adequately mitigated with the NPSH and Containment Spray Modifications installed. All piping stresses on the SI, CS, and RS systems imposed by this design change are acceptable.

c. The margin of safety, as defined in the basis for any technical specification, is not reduced. As was shown by analyses, the proposed technical specification changes assure acceptable containment performance for worse case transient pressures and show that subatmospheric conditions are reached in less than one hour, remain subatmospheric, and never exceed 45 psig, and also acceptable performance of systems to mitigate Design Basis LOCA consequences.

Therefore, the modifications and associated changes to the Technical Specifications do not create an unreviewed safety question.

ATTACHMENT 3

PROPOSED TECHNICAL SPECIFICATION CHANGES

SURRY POWER STATION-UNIT NO. 1

3.3 SAFETY INJECTION SYSTEM

Applicability

Applies to the operating status of the Safety Injection System.

Objective

To define those limiting conditions for operation that are necessary to provide sufficient borated cooling water to remove decay heat from the core in emergency situations.

Specifications

A. A reactor shall not be made critical unless the following conditions are met:

1. The refueling water storage tank contains not less than 385,200 gal (Unit 1) or 387,100 gal (Unit 2) of borated water. For Unit 1 only, the boron concentration shall be at least 2000 ppm. For Unit 2 only, the boron concentration shall be at least 2000 ppm and not greater than 2200 ppm.
2. Each accumulator system is pressurized to at least 600 psia and contains a minimum of 975 ft^3 and a maximum of 989 ft^3 of borated water with a boron concentration of at least 1950 ppm.
3. The boron injection tank and isolated portion of the inlet and outlet piping contains no less than 900 gallons of water with a boron concentration equivalent to at least 11.5% to 13% weight boric acid solution at a temperature of at least 145°F. Additionally, recirculation between a unit's Boron Injection Tank and the Boric Acid Tank(s) assigned to the unit shall be maintained.

4. Two channels of heat tracing shall be available for the flow paths.

5. Two charging pumps are operable.

6. Two low head safety injection pumps are operable.

7. All valves, piping, and interlocks associated with the above components which are required to operate under accident conditions are operable.

8. The Charging Pump Cooling Water Subsystem shall be operating as follows:

   a. Make-up water from the Component Cooling Water Subsystem shall be available.

   b. Two charging pump component cooling water pumps and two charging pump service water pumps shall be operable.

   c. Two charging pump intermediate seal coolers shall be operable.

9. During power operation the A.C. power shall be removed from the following motor operated valves with the valve in the open position:

Unit No. 1	Unit No. 2
MOV 1980C	MOV 2890C

10. During power operation the A.C. power shall be removed from the following motor operated valves with the valve in the closed position:

Unit No. 1	Unit No. 2
MOV 1869A	MOV 2869A
MOV 1869B	MOV 2869B
MOV 1890A	MOV 2890A
MOV 1890B	MOV 2890B

11. The accumulator discharge valves listed below in non-isolated loops shall be blocked open by de-energizing the valve motor operator when the reactor coolant system pressure is greater than 1000 psig.

Unit No. 1	Unit No. 2
MOV 1865A	MOV 2865A
MOV 1865B	MOV 2865B
MOV 1865C	MOV 2865C

12. Power operation with less than three loops in service is prohibited. The following loop isolation valves shall have AC power removed and be locked in open position during power operation.

Unit No. 1	Unit No. 2
MOV 1590	MOV 2590
MOV 1591	MOV 2591
MOV 1592	MOV 2592
MOV 1593	MOV 2593
MOV 1594	MOV 2594
MOV 1595	MOV 2595

13. The total system uncollected leakage from valves, flanges, and pumps located outside containment shall not exceed the limit shown in Table 4.11-1 as verified by inspection during system testing. Individual component leakage may exceed the design value given in Table 4.11-1 provided that the total allowable system uncollected leakage is not exceeded.

B. The requirements of Specification 3.3-A may be modified to allow one of the following components to be inoperable at any one time. If the system is not restored to meet the requirements of Specification 3.3-A within the time period specified, the reactor shall initially be placed in the hot shutdown condition. If the requirements of Specification 3.3-A are not satisfied within an additional 48 hours the reactor shall be placed in the cold shutdown condition.

1. One accumulator may be isolated for a period not to exceed 4 hours.
2. Two charging pumps per unit may be out of service, provided immediate attention is directed to making repairs and one pump is restored to operable status within 24 hours.
3. One low head safety injection pump per unit may be out of service, provided immediate attention is directed to making repairs and the pump is restored to operable status within 24 hours. The other low head safety injection pump shall be tested to demonstrate operability prior to initiating repair of the inoperable pump and shall be tested once every eight (8) hours thereafter, until both pumps are in an operable status or the reactor is shutdown.
4. Any one valve in the Safety Injection System may be inoperable provided repairs are initiated immediately and are completed within 24 hours. Prior to initiating repairs, all automatic valves in the redundant system shall be tested to demonstrate operability.
5. On channel of heat tracing may be inoperable for a period not to exceed 24 hours, provided immediate attention is directed to making repairs.

6. One charging pump component cooling water pumps or one charging pump service water pump may be out of service provided the pump is restored to operable status within 24 hours.

7. One charging pump intermediate seal cooler or other passive component may be out of service provided the system may still operate at 100 percent capacity and repairs are completed within 48 hours.

8. Power may be restored to any valve referenced in 3.3.A.9 and 3.3.A.10 for the purpose of valve testing or maintenance providing no more than one valve has power restored and provided that testing and maintenance is completed and power removed within 24 hours.

9. Power may be restored to any valve referenced in 3.3.A.11 for the purpose of valve testing or maintenance providing no more than one valve has power restored and provided that testing or maintenance is completed and power removed within 4 hours.

10. Recirculation between a unit's Boron Injection Tank and the Boric Acid Tank(s) assigned to the unit may be terminated for a period not to exceed two hours, provided all other parameters (temperatures, boron concentration, volume) of the Boron Injection Tank are within Specification 3.3.A.3 and immediate attention is directed to making repairs.

11. The total uncollected system leakage for valves, flanges, and pumps located outside containment can exceed the limit shown in Table 4.11-1 provided immediate attention is directed to making repairs and system leakage is returned to within limits within 7 days.

Basis

The normal procedure for starting the reactor is, first, to heat the reactor coolant to near operating temperature by running the reactor coolant pumps. The reactor is then made critical by withdrawing control rods and/or diluting boron in the coolant. With this mode of startup the Safety Injection System is required to be operable as specified. During low power physics tests there is a negligible amount of energy stored in the system; therefore an accident comparable in severity to the Design Basis Accident is not possible, and the full capacity of the Safety Injection System is not required.

The operable status of the various systems and components is to be demonstrated by periodic tests, detailed in TS Section 4.1. A large fraction of these tests are performed while the reactor is operating in the power range. If a component is found to be inoperable, it will be possible in most cases to effect repairs and restore the system to full operability within a relatively short time. A single component being inoperable does not negate the ability of the system to perform its function, but is reduces the redundancy provided in the reactor design and thereby limits the ability to tolerate additional equipment failures. To provide maximum assurance that the redundant component(s) will operate if required to do so, the redundant component(s) are to be tested prior to initiating repair of the inoperable component and, in some cases are to be retested at intervals during the repair period. In some cases, i.e. charging pumps, additional components are installed to allow a component to be inoperable without affecting system redundancy. For those cases

which are not so designed, if it develops that (a) the inoperable component is not repaired within the specified allowable time period, or (b) a second component in the same or related system is found to be inoperable, the reactor will initially be put in the hot shutdown condition to provide for reduction of the decay heat from the fuel, and consequent reduction of cooling requirements after a postulated loss-of-coolant accident. After 48 hours in the hot shutdwn condition, if the malfunction(s) are not corrected the reactor will be placed in the cold shutdown condition, following normal shutdown and cooldown procedures.

The Specification requires prompt action to effect repairs of an inoperable component, and therefore in most cases repairs will be completed in less than the specified allowable repair times. Furthermore, the specified repair times do not apply to regularly scheduled maintenance of the Safety Injection System, which is normally to be performed during refueling shutdowns. The limiting times for repair are based on: estimates of the time required to diagnose and correct various postulated malfunctions using safe and proper procedures, the availability of tools, materials and equipment; health physics requirements and the extent to which other systems provide functional redundancy to the system under repair.

Assuming the reactor has been operating at full rated power for at least 100 days, the magnitude of the decay heat production decreases as follows after initiating hot shutdown.

Time After Shutdown	Decay Heat, % of Rated Power
1 min.	3.7
30 min.	1.6

Time After Shutdown	Decay Heat, % of Rated Power
1 hour	1.3
8 hours	0.75
48 hours	0.48

Thus, the requirement for core cooling in case of a postulated loss-of-coolant accident while in the hot shutdown condition is reduced by orders of magnitude below the requirements for handling a postulated loss-of-coolant accident occurring during power operation. Placing and maintaining the reactor in the hot shutdown condition significantly reduces the potential consequences of a loss-of-coolant accident, allows access to some of the Safety Injection System components in order to effect repairs, and minimizes the exposure to thermal cycling.

Failure to complete repairs within 48 hours of going to hot shutdown condition is considered indicative of unforeseen problems, i.e., possibly the need of major maintenance. In such a case the reactor is to be put into the cold shutdown condition.

The accumulators are able to accept leakage from the Reactor Coolant System without any effect on their availability. Allowable inleakage is based on the volume of water that can be added to the initial amount without exceeding the volume given in Specification 3.3.A.2. The maximum acceptable inleakage is 14 cubic feet per tank.

The accumulators (one for each loop) discharge into the cold leg of the reactor coolant piping when Reactor Coolant System pressure decreases below accumulator pressure, thus assuring rapid core cooling for large breaks. The line from each accumulator is provided with a motorized valve to isolate the accumulator during reactor start-up and shutdown to preclude the discharge of the contents of the accumulator when not required. These valves receive a signal to open when safety injection is initiated.

To assure that the accumulator valves satisfy the single failure criterion, they will be blocked open by de-energizing the valve motor operators when the reactor coolant pressure exceeds 1000 psig. The operating pressure of the Reactor Coolant System is 2235 psig and safety injection is initiated when this pressure drops to 650 psig. De-energizing the motor operator when the pressure exceeds 1000 psig allows sufficient time during normal startup operation to perform the actions required to de-energize the valve. This procedure will assure that there is an operable flow path from each accumulator to the Reactor Coolant System during power operation and that safety injection can be accomplished.

The removal of power from the valves listed in the specification will assure that the systems of which they are a part satisfy the single failure criterion.

Continuous recirculation between the Boron Injection Tank and the Boric Acid Tank(s) ensures that a unit's Boron Injection Tank is full of concentrated boric acid at all time.

3.4.1 SPRAY SYSTEM (UNIT 1)

Applicability

Applies to the operational status of the Spray Systems.

Objective

To define those conditions of the Spray Systems necessary to assure safe unit operation.

Specification

A. A unit's Reactor Coolant System temperature or pressure shall not be made to exceed 350°F or 450 psig, respectively, or the reactor shall not be made critical unless the following Spray System conditions in the unit are met:

1. Two Containment Spray Subsystems, including containment spray pumps and motor drives, piping, and valves shall be operable.
2. Four Recirculation Spray Subsystems, including recirculation spray pumps, coolers, piping, and valves shall be operable.
3. The refueling water storage tank shall contain not less than 385,200 gal and not greater than 398,000 gal of borated water at a maximum temperature as shown in TS Fig. 3.8.1-1.

   If this volume of water cannot be maintained by makeup, or the temperature maintained below that specified in TS Fig, 3.8.1-1, the reactor shall be shutdown until repairs can be made. The water shall be borated to a boron concentration not less than 2,000 ppm which will assure that the reactor is in the refueling shutdown condition when all control rod assemblies are inserted.

4. The refueling water chemical addition tank shall contain not less than 3,360 gal of solution with a sodium hydroxide concentration of not less than 18 percent by weight.
5. All valves, piping, and interlocks associated with the above components which are required to operate under accident conditions shall be operable.
6. The total uncollected system leakage from valves, flanges, and pumps located outside containment shall not exceed the limit shown in Table 4.5-1 as verified by inspection during system testing. Individual component leakage may exceed the design value given in Table 4.5-1 provided that the total allowed system uncollected leakage is not exceeded.

B. During power operation the requirements of Specification 3.4.1-A may be modified to allow the following components to be inoperable. If the components are not restored to meet the requirements of Specification 3.4.1-A within the time period specified below, the reactor shall be placed in the hot shutdown condition. If the requirements of Specification 3.4.1-A are not satisfied within an additional 48 hours the reactor shall be placed in the cold shutdown condition using normal operating procedures.

1. One Containment Spray Subsystem may be out of service, provided immediate attention is directed to making repairs and the subsystem can be restored to operable status within 24 hours. The other Containment Spray Subsystem shall be tested as specified in Specification 4.5-A to demonstrate operability prior to initiating repair of the inoperable system.

2. One outside Recirculation Spray Subsystem may be out of service provided immediate attention is directed to making repairs and the subsystem can be restored to operable status within 24 hours. The other Recirculation Spray subsystems shall be tested as specified in Specification 4.5-A to demonstrate operability prior to initiating repair of the inoperable system.
3. One inside Recirculation Spray Subsystem may be out of service provided immediate attention is directed to making repairs and the subsystem can be restored to operable status within 72 hours. The other Recirculation Spray subsystems shall be tested as specified in Specification 4.5-A to demonstrate operability prior to initiating repair of the inoperable subsystems.
4. The total uncollected system leakage from valves, flanges, and pumps located outside containment can exceed the limit shown in Table 4.5-1 provided immediate attention is directed to making repairs and system leakage is returned to within limits within 7 days.

C. If the containment temperature and pressure cannot be maintained within the limits of TS Fig. 3.8.1-1, the reactor shall be placed in the hot shutdown condition.

Basis

The Spray Systems in each reactor unit consist of two separate parallel Containment Spray Subsystems, each of 100 percent capacity, and four separate parallel Recirculation Spray Subsystems, each of 50 percent capacity.

Each Containment Spray Subsystem draws water independently from the 398,000 gal. capacity refueling water storage tank. The water in the tank is cooled to 45°F or below by circulating the tank water through one of the two refueling water storage tank coolers through the use of one of the two refueling water recirculation pumps. The water temperature is maintained by two mechanical refrigerating units required. In each Containment Spray Subsystem, the water flows from the tank through an electric motor driven containment spray pump and is sprayed into the containment atmosphere through two separate sets of spray nozzles. The capacity of the Spray Systems to depressurize the containment in the event of a Design Basis Accident is a function of the pressure and temperature of the containment atmosphere, the service water temperature, and the temperature in the refueling water storage tanks as discussed in Specification 3.8.1-B.

Each Recirculation Spray Subsystem draws water from the common containment sump. In each subsystem the water flows through a recirculation spray pump and recirculation spray cooler, and is sprayed into the containment atmosphere through a separate set of spray nozzles. Two of the recirculation spray pumps are located inside the containment and two outside the containment in the containment auxiliary structure.

With one Containment Spray Subsystem and two Recirculation Spray Subsystems operating together, the Spray Systems are capable of cooling and depressurizing the containment to subatmospheric pressure in less than 60 minutes following the Design Basis Accident. The Recirculation Spray Subsystems

are capable of maintaining subatmospheric pressure in the containment indefinitely following the Design Basis Accident when used in conjunction with the Containment Vacuum System to remove any long term air inleakage.

In addition to supplying water to the Containment Spray System, the refueling water storage tank is also a source of water for safety injection following an accident. This water is borated to a concentration which assures reactor shutdown by approximately 10 percent $\Delta k/k$ when all control rod assemblies are inserted and when the reactor is cooled down for refueling.

<u>References</u>

FSAR Section 4	Reactor Coolant System
FSAR Section 6.3.1	Containment Spray Subsystem
FSAR Section 6.3.1	Recirculation Spray Pumps and Coolers
FSAR Section 6.3.1	Refueling Water Chemical Addition Tank
FSAR Section 6.3.1	Refueling Water Storage Tank
FSAR Section 14.5.2	Design Basis Accident
FSAR Section 14.5.5	Containment Transient Analysis

450 psig, respectively, residual heat removal requirements are normally satisfied by steam bypass to the condenser. If the condenser is unavailable, steam can be released to the atmosphere through the safety valves, power operated relief valves, or the 4 inch decay heat release line.

The capability to supply feedwater to the generators is normally provided by the operation of the Condensate and Feedwater Systems. In the event of complete loss of electrical power to the station, residual heat removal would continue to be assured by the availability of either the steam driven auxiliary feedwater pump or one of the motor driven auxiliary feedwater pumps and the 110,00 gallon condensate storage tank.

A minimum of 92,000 gallons of water in the 110,000 gallon condensate tank is sufficient for 8 hours of residual heat removal following a reactor trip and loss of all off-site electrical power. If the protected condensate storage tank level is reduced to 60,000 gallons, the immediately available replenishment water in the 300,000 gallon condensate tank can be gravity-feed to the protected tank if required for residual heat removal. An alternate supply of feedwater to the auxiliary feedwater pump suction is also available from the Fire Protection System Main in the auxiliary feedwater pump cubicle.

The five main steam code safety valves associated with each steam generator have a total combined capacity of 3,725,575 pounds per hour at their individual set pressure; the total combined capacity of all fifteen main steam code safety valves is 11,176,725 pounds per hour. The ultimate power rating steam flow is 11,167,923 pounds per hour. The combined capacity of the safety valves required by Specification 3.6 always exceeds the total steam flow corresponding to the maximum steady-state power than can be obtained during one, two or three reactor

3.8.1 CONTAINMENT (UNIT 1)

Applicability

Applies to the integrity and operating pressure of the reactor containment.

Objective

To define the limiting operating status of the reactor containment for unit operation.

Specification

A. Containment Integrity and Operating Pressure

1. The containment integrity, as defined in TS Section 1.0, shall not be violated, except as specified in A2, below, unless the reactor is in the cold shutdown condition.
2. The reactor containment shall not be purged while the reactor is operating, except as stated in Specification A.3.
3. During the plant startup, the remote manual valve on the steam jet air ejector suction line may be open, if under administrative control, while containment vacuum is being established. The Reactor Coolant System temperature and pressure must not exceed 350°F and 450 psig, respectively, until the air partial pressure in the containment has been reduced to a value equal to, or below, that specified in TS Figure 3.8.1-1.
4. The containment integrity shall not be violated when the reactor vessel head is unbolted unless a shutdown margin greater than 10 percent $\Delta k/k$ is maintained.

5. Positive reactivity changes shall not be made by rod drive motion or boron dilution unless the containment integrity is intact.

B. Internal Pressure

1. If the internal air partial pressure rises to a point 0.25 psi above the maximum allowable set point value of the air partial pressure (TS Figure 3.8.1-1), the reactor shall be brought to the hot shutdown condition.
2. If the leakage condition cannot be corrected without violating the containment integrity or if the internal partial pressure continues to rise, the reactor shall be brought to the cold shutdown condition utilizing normal operating procedures.
3. If the internal pressure fall below 8.25 psia the reactor shall be placed in the cold shutdown condition.
4. The minimum allowable set point for the air partial pressure is 9.1 psia. If the air partial pressure cannot be maintained greater than or equal to 9.0 psia, the reactor shall be brought to the hot shutdown condition.

Basis

The Reactor Coolant System temperature and pressure being below 350°F and 450 psig, respectively, ensures that no significant amount of flashing steam will be formed and hence that there would be no significant pressure buildup in the containment if there is a loss-of-coolant accident.

The shutdown margins are selected based on the type of activities that are being carried out. The 10 percent $\Delta k/k$ shutdown margin during refueling precludes criticality under any circumstance, even though fuel and control rod assemblies are being moved.

The maximum allowable set point for the containment air partial pressure is presented in Figure 3.8.1-1 for service water temperatures from 25 to 90°F. The allowable set point varies as shown in Figure 3.8.1-1 for a given containment average temperature. The RWST water shall have a maximum temperature of 45°F.

The horizontal limit lines in Figure 3.8.1-1 are based on LOCA peak calculated pressure criteria, and the sloped line is based on LOCA subatmospheric peak pressure criteria.

The curve shall be interpreted as follows:

> The horizontal limit line designated the maximum air partial pressure set point for the given average containment temperature. The horizontal limit line applies for service water temperatures from 25°F to the sloped line intersection value (maximum service water temperature).

From Figure 3.8.1-1, if the containment average temperature is 112°F and the service water temperature is less than or equal to 81°F, the air partial pressure set point value shall be less than or equal to 9.65 psia. If the average containment temperature is 116°F and the service water temperature is less than or equal to 86°F, the air partial pressure set point value shall be less than or equal to 9.35 psia. These horizontal

limit lines are a result of the higher allowable initial containment average temperatures and the analysis of the pump suction break.

If the containment air partial pressure rises to a point 0.25 psi above the maximum set point value, the reactor shall be brought to the hot shutdown condition. If a LOCA occurs at the time the containment air partial pressure is 0.25 psi above the set point value, the maximum containment pressure will be less than 45 psig, the containment will depressurize in less than 1 hour, and the maximum subatmospheric peak pressure will be less than 0.0 psig.

The minimum allowable set point for the containment air partial pressure is 9.1 psia. If the containment air partial pressure cannot be maintained greater than or equal to 9.0 psia, the reactor shall be brought to the hot shutdown condition. The shell and dome plate liner of the containment are capable of withstanding a internal pressure as low as 3 psia, and the bottom mat liner is capable of withstanding an internal pressure as low as 8 psia.

References

FSAR Section 4.3.2	Reactor Coolant Pump
FSAR Section 5.2	Containment Isolation
FSAR Section 5.2.1	Design Bases
FSAR Section 5.2.2	Isolation Design

MAXIMUM ALLOWABLE AIR PARTIAL PRESSURE

SURRY POWER STATION - UNIT NO. 1

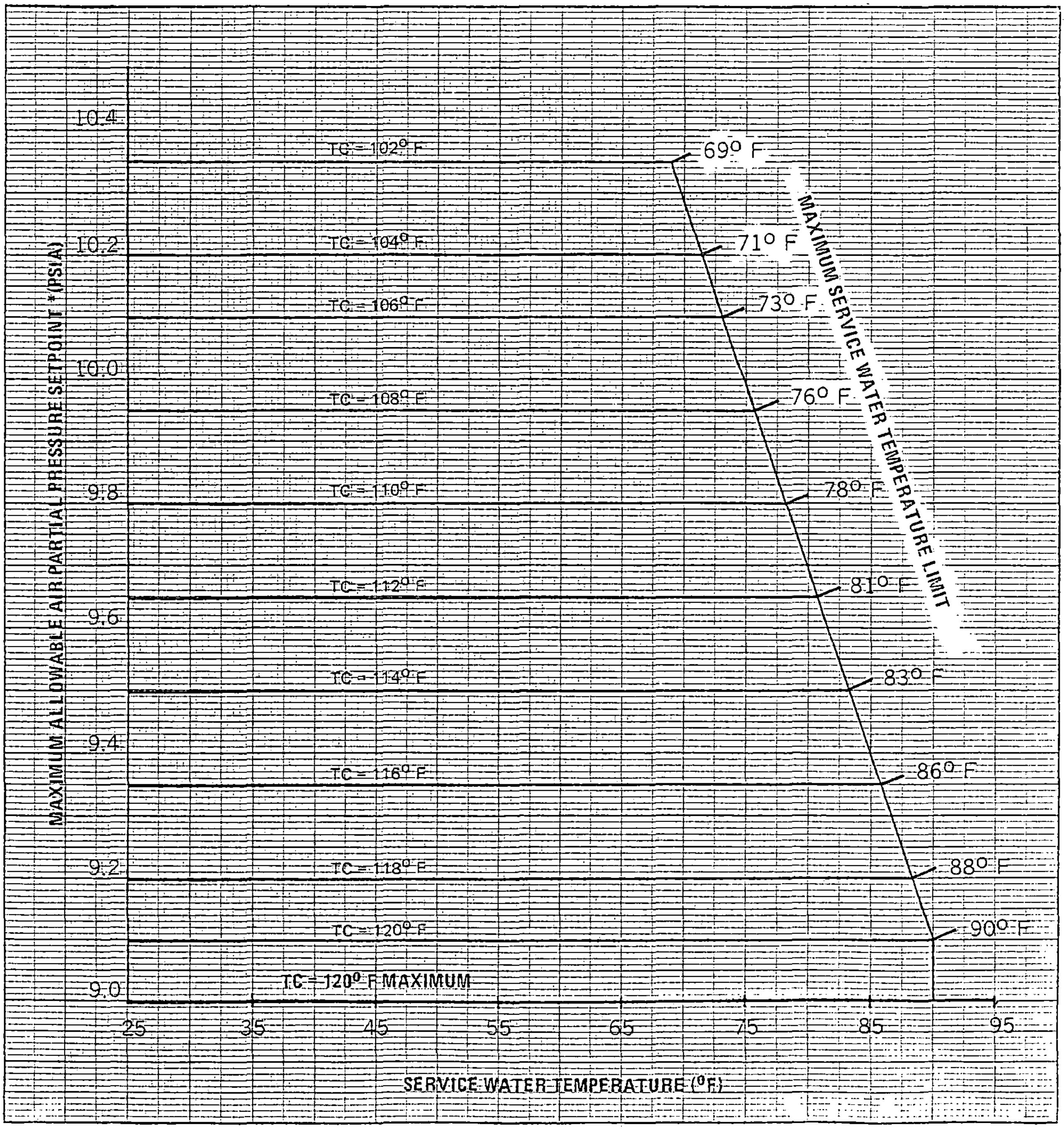

FIGURE 3.8.2-1 (Continued)

FIGURE NOTATION

* - Setpoint value in containment vacuum system instrumentation.

TC - Containment average temperature.

FIGURE NOTES

1. Maximum allowable operating air partial pressure in the containment as a function of service water temperature.
2. Refueling Water Storage Tank temperature $\leq$ 45^{o}F.
3. Horizontal lines designate maximum air partial pressure setpoint per given containment average temperature.
4. Each containment temperature line is a maximum for the given air partial pressure.
5. Hot shutdown is required for containment air partial pressure setpoint increase greater than 0.25 psi or less than 9.0 psia.
6. Cold shutdown is required for containment air partial pressure less than 8.25 psia.

TABLE 4.1-1 (Continued)

	Channel Description	Check	Calibrate	Test	Remarks
10.	Rod Position Bank Counters	S (1,2)	N.A.	N.A.	1) Each six inches of rod motion when data logger is our of service 2) With analog rod position
11.	Steam Generator Level	S	R	M	
12.	Charging Flow	N.A.	R	N.A.	
13.	Residual Heat Removal Pump Flow	N.A.	R	N.A.	
14.	Boric Acid Tank Level	*D	R	N.A.	
15A.	Unit 1 Refueling Water Storage Tank Level	W	R	N.A.	
15B.	Unit 2 Refueling Water Storage Tank Level	S	R	M	
16.	Boron Injection Tank Level	W	N.A.	N.A.	
17.	Volume Control Tank Level	N.A.	R	N.A.	
18.	Reactor Containment Pressure-CLS	*D	R	M (1)	1) Isolation Valve signal and spray signal
19.	Process and Area Radiation Monitoring Systems	*D	R	M	
20.	Boric Acid Control	N.A.	R	N.A.	
21.	Containment Pump Level	N.A.	R	N.A.	
22.	Accumulator Level and Pressure	S	R	N.A.	
23.	Containment Pressure-Vacuum Pump System	S	R	N.A.	
24.	Steam Line Pressure	S	R	M	

TABLE 4.5-1
RECIRCULATION SUBSYSTEM LEAKAGE*

Item	No. of Units	Type of Leakage Control and Unit Leakage Rate	Design Uncollected Leakage, cc per hr**	Leakage to Vent and Drain System, cc per hr
Recirculation spray pumps	2	No leak of spray water due to tandem seal arrangement	0	0
Flanges:		40 drops per min per flange		
a. pump	4		480	0
b. Valves - bonnet to body (larger than 2 in.)	4		460	0
Valves - Stem leakoffs	4	Backseated, double packing with leakoff - 4 cc per hr per in. stem diameter	0	16
Miscellaneous small valves	2	Flanges body, packed stem - 4 drop per min	24	0
		Total	964	16

*Based on two subsystems in operation under DBA conditions.

Total Allowed System Uncollected Leakage is 964.cc/hr.

**Individual component uncollected leakage may exceed the design value provided that the total allowable system uncollected leakage is not exceeded.

TABLE 4.11-1

EXTERNAL RECIRCULATION LOOP LEAKAGE (Safety Injection System Only)

Items	No. of Units	Type of Leakage Control and Unit Leakage Rate	Design Leakage to Atmosphere cc per hr**	Design Leakage to Waste Disposal Tank, cc per hr
Low Head Safety Injection Pumps	2	Mechanical Seal with leakoff - 4 drop per min	0	24
Safety Injection Charging	3	Mechanical Seal with leakoff - 4 drop per min	0	36
Flanges:				
a. Pump	10	Gasket - adjusted to zero leakage following any test - 40 drops per min, per flange	1,200	0
b. Valves Bonnet to Body (larger than 2 in.)	54		2,240	0
Valves - Stem Leakoffs	27	Backseated, double packing with leakoff - 4 cc per hr per in stem diameter	0	108
Misc. Valves	33	Flanges body packed stems - 4 drop per min	396	0
		Totals	3,836	168

Total Allowed System Uncollected Leakage is 3,836 cc/hr

**Individual component uncollected leakage may exceed the design value provided that the total allowable system uncollected leakage is not exceeded.

ATTACHMENT 4

PROPOSED TECHNICAL SPECIFICATION CHANGES

SURRY POWER STATION-UNIT NO. 2

3.3 SAFETY INJECTION SYSTEM

Applicability

Applies to the operating status of the Safety Injection System.

Objective

To define those limiting conditions for operation that are necessary to provide sufficient borated cooling water to remove decay heat from the core in emergency situations.

Specifications

A. A reactor shall not be made critical unless the following conditions are met:

1. The refueling water storage tank contains not less than 385,200 gal (Unit 1) or 387,100 gal (Unit 2) of borated water. For Unit 1 only, the boron concentration shall be at least 2000 ppm. For Unit 2 only, the boron concentration shall be at least 2000 ppm and not greater than 2200 ppm.
2. Each accumulator system is pressurized to at least 600 psia and contains a minimum of 975 ft^3 and a maximum of 989 ft^3 of borated water with a boron concentration of at least 1950 ppm.
3. The boron injection tank and isolated portion of the inlet and outlet piping contains no less than 900 gallons of water with a boron concentration equivalent to at least 11.5% to 13% weight boric acid solution at a temperature of at least 145°F. Additionally, recirculation between a unit's Boron Injection Tank and the Boric Acid Tank(s) assigned to the unit shall be maintained.

4. Two channels of heat tracing shall be available for the flow paths.

5. Two charging pumps are operable.

6. Two low head safety injection pumps are operable.

7. All valves, piping, and interlocks associated with the above components which are required to operate under accident conditions are operable.

8. The Charging Pump Cooling Water Subsystem shall be operating as follows:

   a. Make-up water from the Component Cooling Water Subsystem shall be available.

   b. Two charging pump component cooling water pumps and two charging pump service water pumps shall be operable.

   c. Two charging pump intermediate seal coolers shall be operable.

9. During power operation the A.C. power shall be removed from the following motor operated valves with the valve in the open position:

Unit No. 1	Unit No. 2
MOV 1980C	MOV 2890C

10. During power operation the A.C. power shall be removed from the following motor operated valves with the valve in the closed position:

Unit No. 1	Unit No. 2
MOV 1869A	MOV 2869A
MOV 1869B	MOV 2869B
MOV 1890A	MOV 2890A
MOV 1890B	MOV 2890B

11. The accumulator discharge valves listed below in non-isolated loops shall be blocked open by de-energizing the valve motor operator when the reactor coolant system pressure is greater than 1000 psig.

Unit No. 1	Unit No. 2
MOV 1865A	MOV 2865A
MOV 1865B	MOV 2865B
MOV 1865C	MOV 2865C

12. Power operation with less than three loops in service is prohibited. The following loop isolation valves shall have AC power removed and be locked in open position during power operation.

Unit No. 1	Unit No. 2
MOV 1590	MOV 2590
MOV 1591	MOV 2591
MOV 1592	MOV 2592
MOV 1593	MOV 2593
MOV 1594	MOV 2594
MOV 1595	MOV 2595

13. The total system uncollected leakage from valves, flanges, and pumps located outside containment shall not exceed the limit shown in Table 4.11-1 as verified by inspection during system testing. Individual component leakage may exceed the design value given in Table 4.11-1 provided that the total allowable system uncollected leakage is not exceeded.

B. The requirements of Specification 3.3-A may be modified to allow one of the following components to be inoperable at any one time. If the system is not restored to meet the requirements of Specification 3.3-A within the time period specified, the reactor shall initially be placed in the hot shutdown condition. If the requirements of Specification 3.3-A are not satisfied within an additional 48 hours the reactor shall be placed in the cold shutdown condition.

1. One accumulator may be isolated for a period not to exceed 4 hours.
2. Two charging pumps per unit may be out of service, provided immediate attention is directed to making repairs and one pump is restored to operable status within 24 hours.
3. One low head safety injection pump per unit may be out of service, provided immediate attention is directed to making repairs and the pump is restored to operable status within 24 hours. The other low head safety injection pump shall be tested to demonstrate operability prior to initiating repair of the inoperable pump and shall be tested once every eight (8) hours thereafter, until both pumps are in an operable status or the reactor is shutdown.
4. Any one valve in the Safety Injection System may be inoperable provided repairs are initiated immediately and are completed within 24 hours. Prior to initiating repairs, all automatic valves in the redundant system shall be tested to demonstrate operability.
5. On channel of heat tracing may be inoperable for a period not to exceed 24 hours, provided immediate attention is directed to making repairs.

6. One charging pump component cooling water pumps or one charging pump service water pump may be out of service provided the pump is restored to operable status within 24 hours.

7. One charging pump intermediate seal cooler or other passive component may be out of service provided the system may still operate at 100 percent capacity and repairs are completed within 48 hours.

8. Power may be restored to any valve referenced in 3.3.A.9 and 3.3.A.10 for the purpose of valve testing or maintenance providing no more than one valve has power restored and provided that testing and maintenance is completed and power removed within 24 hours.

9. Power may be restored to any valve referenced in 3.3.A.11 for the purpose of valve testing or maintenance providing no more than one valve has power restored and provided that testing or maintenance is completed and power removed within 4 hours.

10. Recirculation between a unit's Boron Injection Tank and the Boric Acid Tank(s) assigned to the unit may be terminated for a period not to exceed two hours, provided all other parameters (temperatures, boron concentration, volume) of the Boron Injection Tank are within Specification 3.3.A.3 and immediate attention is directed to making repairs.

11. The total uncollected system leakage for valves, flanges, and pumps located outside containment can exceed the limit shown in Table 4.11-1 provided immediate attention is directed to making repairs and system leakage is returned to within limits within 7 days.

Basis

The normal procedure for starting the reactor is, first, to heat the reactor coolant to near operating temperature by running the reactor coolant pumps. The reactor is then made critical by withdrawing control rods and/or diluting boron in the coolant. With this mode of startup the Safety Injection System is required to be operable as specified. During low power physics tests there is a negligible amount of energy stored in the system; therefore an accident comparable in severity to the Design Basis Accident is not possible, and the full capacity of the Safety Injection System is not required.

The operable status of the various systems and components is to be demonstrated by periodic tests, detailed in TS Section 4.1. A large fraction of these tests are performed while the reactor is operating in the power range. If a component is found to be inoperable, it will be possible in most cases to effect repairs and restore the system to full operability within a relatively short time. A single component being inoperable does not negate the ability of the system to perform its function, but is reduces the redundancy provided in the reactor design and thereby limits the ability to tolerate additional equipment failures. To provide maximum assurance that the redundant component(s) will operate if required to do so, the redundant component(s) are to be tested prior to initiating repair of the inoperable component and, in some cases are to be retested at intervals during the repair period. In some cases, i.e. charging pumps, additional components are installed to allow a component to be inoperable without affecting system redundancy. For those cases

which are not so designed, if it develops that (a) the inoperable component is not repaired within the specified allowable time period, or (b) a second component in the same or related system is found to be inoperable, the reactor will initially be put in the hot shutdown condition to provide for reduction of the decay heat from the fuel, and consequent reduction of cooling requirements after a postulated loss-of-coolant accident. After 48 hours in the hot shutdwn condition, if the malfunction(s) are not corrected the reactor will be placed in the cold shutdown condition, following normal shutdown and cooldown procedures.

The Specification requires prompt action to effect repairs of an inoperable component, and therefore in most cases repairs will be completed in less than the specified allowable repair times. Furthermore, the specified repair times do not apply to regularly scheduled maintenance of the Safety Injection System, which is normally to be performed during refueling shutdowns. The limiting times for repair are based on: estimates of the time required to diagnose and correct various postulated malfunctions using safe and proper procedures, the availability of tools, materials and equipment; health physics requirements and the extent to which other systems provide functional redundancy to the system under repair.

Assuming the reactor has been operating at full rated power for at least 100 days, the magnitude of the decay heat production decreases as follows after initiating hot shutdown.

Time After Shutdown	Decay Heat, % of Rated Power
1 min.	3.7
30 min.	1.6

Time After Shutdown	Decay Heat, % of Rated Power
1 hour	1.3
8 hours	0.75
48 hours	0.48

Thus, the requirement for core cooling in case of a postulated loss-of-coolant accident while in the hot shutdown condition is reduced by orders of magnitude below the requirements for handling a postulated loss-of-coolant accident occurring during power operation. Placing and maintaining the reactor in the hot shutdown condition significantly reduces the potential consequences of a loss-of-coolant accident, allows access to some of the Safety Injection System components in order to effect repairs, and minimizes the exposure to thermal cycling.

Failure to complete repairs within 48 hours of going to hot shutdown condition is considered indicative of unforeseen problems, i.e., possibly the need of major maintenance. In such a case the reactor is to be put into the cold shutdown condition.

The accumulators are able to accept leakage from the Reactor Coolant System without any effect on their availability. Allowable inleakage is based on the volume of water that can be added to the initial amount without exceeding the volume given in Specification 3.3.A.2. The maximum acceptable inleakage is 14 cubic feet per tank.

The accumulators (one for each loop) discharge into the cold leg of the reactor coolant piping when Reactor Coolant System pressure decreases below accumulator pressure, thus assuring rapid core cooling for large breaks. The line from each accumulator is provided with a motorized valve to isolate the accumulator during reactor start-up and shutdown to preclude the discharge of the contents of the accumulator when not required. These valves receive a signal to open when safety injection is initiated.

To assure that the accumulator valves satisfy the single failure criterion, they will be blocked open by de-energizing the valve motor operators when the reactor coolant pressure exceeds 1000 psig. The operating pressure of the Reactor Coolant System is 2235 psig and safety injection is initiated when this pressure drops to 650 psig. De-energizing the motor operator when the pressure exceeds 1000 psig allows sufficient time during normal startup operation to perform the actions required to de-energize the valve. This procedure will assure that there is an operable flow path from each accumulator to the Reactor Coolant System during power operation and that safety injection can be accomplished.

The removal of power from the valves listed in the specification will assure that the systems of which they are a part satisfy the single failure criterion.

Continuous recirculation between the Boron Injection Tank and the Boric Acid Tank(s) ensures that a unit's Boron Injection Tank is full of concentrated boric acid at all time.

3.4.2 SPRAY SYSTEMS (UNIT 2)

Applicability

Applies to the operational status of the Spray Systems.

Objective

To define those conditions of the Spray Systems necessary to assure safe unit operation.

Specification

A. A unit's Reactor Coolant System temperature or pressure shall not be made to exceed 350°F or 450 psig, respectively, or the reactor shall not be made critical unless the following Spray System conditions in the unit are met:

1. Two Containment Spray Subsystems, including containment spray pumps and motor drives, piping, and valves shall be operable.
2. Four Recirculation Spray Subsystems, including recirculation spray pumps, coolers, piping, and valves shall be operable.
3. The refueling water storage tank shall contain not less than 387,100 gal and not greater than 398,000 gal of borated water at a maximum temperature as shown in Fig. 3.8.2-1.

   If this volume of water cannot be maintained by makeup, or the temperature maintained below that specified in TS Fig. 3.8.2-1, the reactor shall be shutdown until repairs can be made. The water shall be borated to a boron concentration not less than

2,000 ppm and not greater than 2200 ppm which will assure that the reactor is in the refueling shutdown condition when all control rod assemblies are inserted.

4. The refueling water chemical addition tank shall contain not less than 4,200 gal of solution with a sodium hydroxide concentration of not less than 17 percent by weight and not greater than 18 percent by weight.

5. All valves, piping, and interlocks associated with the above components which are required to operate under accident conditions shall be operable.

6. The total uncollected system leakage from valves, flanges, and pumps located outside containment shall not exceed the limit shown in Table 4.5-1 as verified by inspection during system testing. Individual component leakage may exceed the design value given in Table 4.5-1 provided that the total allowed system uncollected leakage is not exceeded.

B. During power operation the requirements of specification 3.4.2-A may be modified to allow the following components to be inoperable. If the components are not restored to meet the requirements of Specification 3.4.2-A within the time period specified below, the reactor shall be placed in the hot shutdown condition. If the requirements of Specification 3.4.2-A are not satisfied within an additional 48 hours the reactor shall be placed in the cold shutdown condition using normal operating procedures.

1. One Containment Spray Subsystem may be out of service, provided immediate attention is directed to making repairs and the subsystem can be restored to operable status within 24 hours. The other Containment Spray Subsystem shall be tested as specified in Specification 4.5-A to demonstrate operability prior to initiating repair of the inoperable system.
2. One outside Recirculation Spray Subsystem may be out of service provided immediate attention is directed to making repairs and the subsystem can be restored to operable status within 24 hours. The other Recirculation Spray subsystems shall be tested as specified in Specification 4.5-A to demonstrate operability prior to initiating repair of the inoperable system.
3. One inside Recirculation Spray Subsystem may be out service provided immediate attention is directed to making repairs and the subsystem can be restored to operable status within 72 hours. The other Recirculation Spray subsystems shall be tested as specified in Specification 4.5-A to demonstrate operability prior to initiating repair of the inoperable subsystems.
4. The total uncollected system leakage from valves, flanges, and pumps located outside containment can exceed the limit shown in Table 4.5-1 provided immediate attention is directed to making repairs and system leakage is returned to within limits within 7 days.

C. If the containment temperature and pressure cannot be maintained within the limits of TS Fig 3.8.2-1, the reactor shall be placed in the hot shutdown condition.

Basis

The Spray Systems in each reactor unit consist of two separate parallel Containment Spray Subsystems, each of 100 percent capacity, and four separate parallel Recirculation Spray Subsystems, each of 50 percent capacity.

Each Containment Spray Subsystem draws water independently from the 398,000 gal. capacity refueling water storage tank. The water in the tank is cooled to 45°F or below by circulating the tank water through one of the two refueling water storage tank coolers through the use of one of the two refueling water recirculating pumps. The water temperature is maintained by two mechanical refrigerating units required. In each Containment Spray Subsystem, the water flows from the tank through an electric motor driven containment spray pump and is sprayed into the containment atmosphere through two separate sets of spray nozzles. The capacity of the Spray Systems to depressurize the containment in the event of a Design Basis Accident is a function of the pressure and temperature of the containment atmosphere, the service water temperature, and the temperature in the refueling water storage tanks as discussed in Specification 3.8.2-B.

Each Recirculation Spray Subsystem draws water from the common containment pump. In each subsystem the water flows through a recirculation spray pump and recirculation spray cooler, and is sprayed into the containment atmosphere through a separate set of spray nozzles. Two of the recirculation spray pumps are located inside the containment and two outside the containment in the containment auxiliary structure.

With one Containment Spray Subsystem and two Recirculation Spray Subsystems operating together, the Spray Systems are capable of cooling and depressurizing the containment to subatmospheric pressure in less than 60 minutes following the Design Basis Accident. The Recirculation Spray Subsystems are capable of maintaining subatmospheric pressure in the containment indefinitely following the Design Basis Accident when used in conjunction with the Containment Vacuum System to remove any long term air in leakage.

In addition to supplying water to the Containment Spray System, the refueling water storage tank is also a source of water for safety injection following an accident. This water is borated to a concentration which assures reactor shutdown by approximately 10 percent $\Delta k/k$ when all control rod assemblies are inserted and when the reactor is cooled down for refueling.

References

FSAR Section 4	Reactor Coolant System
FSAR Section 6.3.1	Containment Spray Subsystem
FSAR Section 6.3.1	Recirculation Spray Pumps and Coolers
FSAR Section 6.3.1	Refueling Water Chemical Addition Tank
FSAR Section 6.3.1	Refueling Water Storage Tank
FSAR Section 14.5.2	Design Basis Accident
FSAR Section 14.5.5	Containment Transient Analysis

450 psig, respectively, residual heat removal requirements are normally satisfied by steam bypass to the condenser. If the condenser is unavailable, steam can be released to the atmosphere through the safety valves, power operated relief valves, or the 4 inch decay heat release line.

The capability to supply feedwater to the generators is normally provided by the operation of the Condensate and Feedwater Systems. In the event of complete loss of electrical power to the station, residual heat removal would continue to be assured by the availability of either the steam driven auxiliary feedwater pump or one of the motor driven auxiliary feedwater pumps and the 110,00 gallon condensate storage tank.

A minimum of 92,000 gallons of water in the 110,000 gallon condensate tank is sufficient for 8 hours of residual heat removal following a reactor trip and loss of all off-site electrical power. If the protected condensate storage tank level is reduced to 60,000 gallons, the immediately available replenishment water in the 300,000 gallon condensate tank can be gravity-feed to the protected tank if required for residual heat removal. An alternate supply of feedwater to the auxiliary feedwater pump suction is also available from the Fire Protection System Main in the auxiliary feedwater pump cubicle.

The five main steam code safety valves associated with each steam generator have a total combined capacity of 3,725,575 pounds per hour at their individual set pressure; the total combined capacity of all fifteen main steam code safety valves is 11,176,725 pounds per hour. The ultimate power rating steam flow is 11,167,923 pounds per hour. The combined capacity of the safety valves required by Specification 3.6 always exceeds the total steam flow corresponding to the maximum steady-state power than can be obtained during one, two or three reactor

3.8.2 CONTAINMENT (UNIT 2)

Applicability

Applies to the integrity and operating pressure of the reactor containment.

Objective

To define the limiting operating status of the reactor containment for unit operation.

Specification

A. Containment Integrity and Operating Pressure

1. The containment integrity, as defined in TS Section 1.0, shall not be violated, except as specified in A2, below, unless the reactor is in the cold shutdown condition.
2. The reactor containment shall not be purged while the reactor is operating, except as stated in Specification A.3.
3. During the plant startup, the remote manual valve on the steam jet air ejector suction line may be open, if under administrative control, while containment vacuum is being established. The Reactor Coolant System temperature and pressure must not exceed 350°F and 450 psig, respectively, until the air partial pressure in the containment has been reduced to a value equal to, or below, that specified in TS Figure 3.8.2-1.
4. The containment integrity shall not be violated when the reactor vessel head is unbolted unless a shutdown margin greater than 10 percent $\Delta k/k$ is maintained.
5. Positive reactivity changes shall not be made by rod drive motion or boron dilution unless the containment integrity is intact.

B. Internal Pressure

1. If the internal air partial pressure rises to a point 0.25 psi above the maximum allowable set point value of the air partial pressure (TS Figure 3.8.2-1), the reactor shall be brought to the hot shutdown condition.
2. If the leakage condition cannot be corrected without violating the containment integrity or if the internal partial pressure continues to rise, the reactor shall be brought to the cold shutdown condition utilizing normal operating procedures.
3. If the internal pressure falls below 8.25 psia the reactor shall be placed in the cold shutdown condition.
4. The minimum allowable set point for the air partial pressure is 9.1 psia. If the air partial pressure cannot be maintained greater than or equal to 9.0 psia, the reactor shall be brought to the hot shutdown condition.

Basis

The Reactor Coolant System temperature and pressure being below 350°F and 450 psig, respectively, ensures that no significant amount of flashing steam will be formed and hence that there would be no significant pressure build-up in the containment if there is a loss-of-coolant accident.

The shutdown margins are selected based on the type of activities that are being carried out. The 10 percent $\Delta k/k$ shutdown margin during refueling precludes criticality under any circumstance, even though fuel and control rod assemblies are being moved.

The maximum allowable set point for the containment air partial pressure is presented in Figure 3.8.2-1 for service water temperature from 25 to 90°F. The allowable set point varies as shown in Figure 3.8.2-1 for a given containment average temperature. The RWST water shall have a maximum temperature of 45°F.

The horizontal limit lines in Figure 3.8.2-1 are based on LOCA peak calculated pressure criteria, and the sloped line is based on LOCA subatmospheric peak pressure criteria.

The curve shall be interpreted as follows:

> The horizontal limit line designates the maximum air partial pressure set point for the given average containment temperature. The horizontal limit line applies for service water temperatures from 25°F to the sloped line intersection value (maximum service water temperature).

From Figure 3.8.2-1, if the containment average temperature is 112°F and the service water temperature is less than or equal to 83°F, the air partial pressure set point value shall be less than or equal to 9.65 psia. If the average containment temperature is 116°F and the service water temperature is less than or equal to 88°F, the air partial pressure set point value shall be less than or equal to 9.35 psia. These horizontal limit lines are a result of the higher allowable initial containment average temperatures and the analysis of the pump suction break.

If the containment air partial pressure rises to a point 0.25 psi above the maximum set point value, the reactor shall be brought to the hot shutdown condition. If a LOCA occurs at the time the containment air partial pressure is 0.25 psi above the set point value, the maximum containment pressure will be less than 45 psig, the containment will depressurize in less than 1 hour, and the maximum subatmospheric peak pressure will be less than 0.0 psig.

The minimum allowable set point for the containment air partial pressure is 9.1 psia. If the containment air partial pressure cannot be maintained greater than or equal to 9.0 psia, the reactor shall be brought to the hot shutdown condition. The shell and dome plate liner o the containment are capable of withstanding an internal pressure as low as 3 psia, and the bottom mat liner is capable of withstanding an internal pressure as low as 8 psia.

<u>References</u>

FSAR Section 4.3.2	Reactor Coolant Pump
FSAR Section 5.2	Containment Isolation
FSAR Section 5.2.1	Design Bases
FSAR Section 5.5.2	Isolation Design

MAXIMUM ALLOWABLE AIR PARTIAL PRESSURE

SURRY POWER STATION - UNIT NO. 2

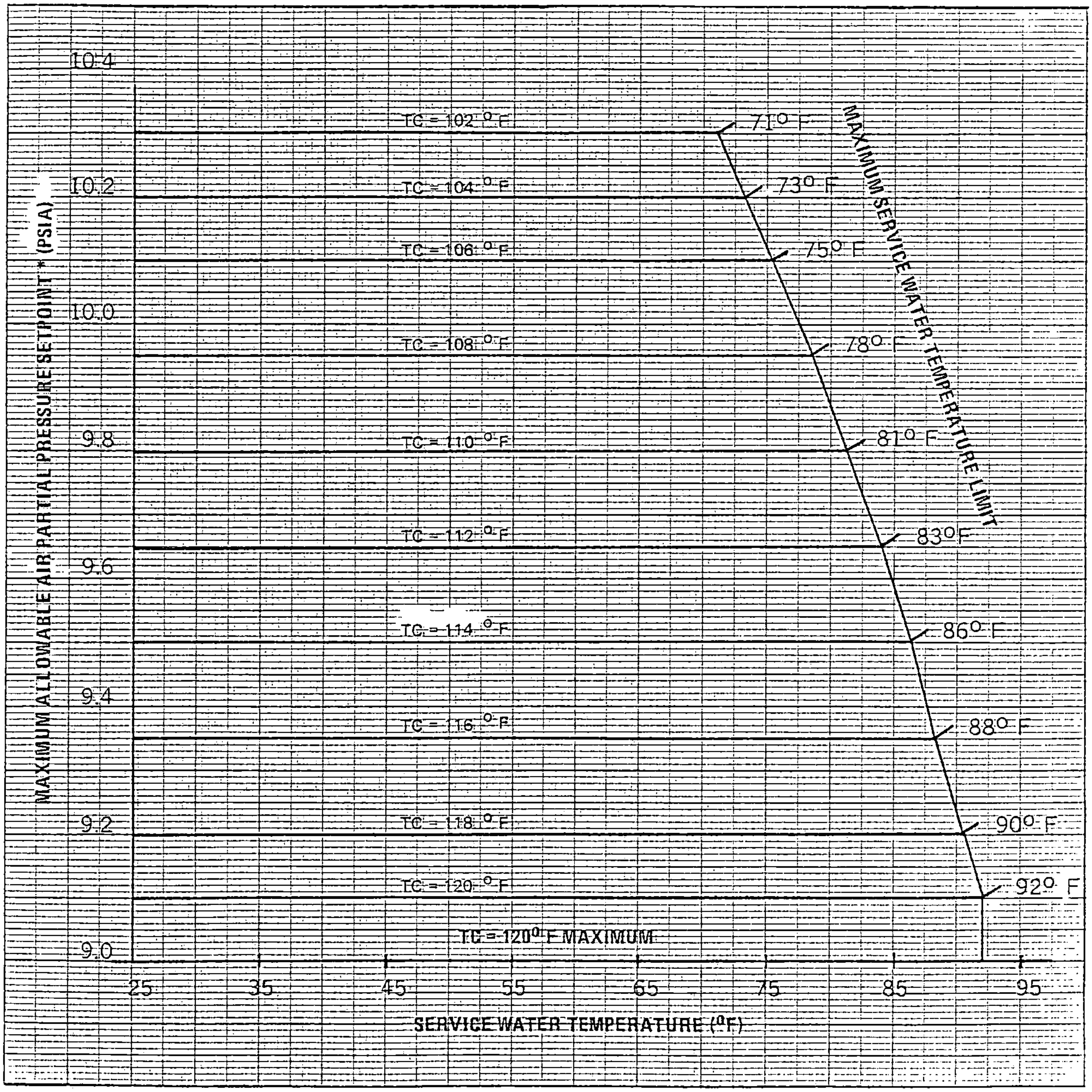

FIGURE 3.8.1-1 (Continued)

FIGURE NOTATION

* - Setpoint value in containment vacuum system instrumentation.

TC - Containment average temperature.

FIGURE NOTES

1. Maximum allowable operating air partial pressure in the containment as a function of service water temperature.

2. Refueling Water Storage Tank temperature $\leq 45^{\circ}F$.

3. Horizontal lines designate maximum air partial pressure setpoint per given containment average temperature.

4. Each containment temperature line is a maximum for the given air partial pressure.

5. Hot shutdown is required for containment air partial pressure setpoint increase greater than 0.25 psi or less than 9.0 psia.

6. Cold shutdown is required for containment air partial pressure less than 8.25 psia.

TABLE 4.1-1 (Continued)

	Channel Description	Check	Calibrate	Test	Remarks
10.	Rod Position Bank Counters	S (1,2)	N.A.	N.A.	1) Each six inches of rod motion when data logger is our of service 2) With analog rod position
11.	Steam Generator Level	S	R	M	
12.	Charging Flow	N.A.	R	N.A.	
13.	Residual Heat Removal Pump Flow	N.A.	R	N.A.	
14.	Boric Acid Tank Level	*D	R	N.A.	
15A.	Unit 1 Refueling Water Storage Tank Level	W	R	N.A.	
15B.	Unit 2 Refueling Water Storage Tank Level	S	R	M	
16.	Boron Injection Tank Level	W	N.A.	N.A.	
17.	Volume Control Tank Level	N.A.	R	N.A.	
18.	Reactor Containment Pressure-CLS	*D	R	M (1)	1) Isolation Valve signal and spray signal
19.	Process and Area Radiation Monitoring Systems	*D	R	M	
20.	Boric Acid Control	N.A.	R	N.A.	
21.	Containment Pump Level	N.A.	R	N.A.	
22.	Accumulator Level and Pressure	S	R	N.A.	
23.	Containment Pressure-Vacuum Pump System	S	R	N.A.	
24.	Steam Line Pressure	S	R	M	

TABLE 4.5-1
RECIRCULATION SUBSYSTEM LEAKAGE*

Item	No. of Units	Type of Leakage Control and Unit Leakage Rate	Design Uncollected Leakage, cc per hr**	Leakage to Vent and Drain System, cc per hr
Recirculation spray pumps	2	No leak of spray water due to tandem seal arrangement	0	0
Flanges:		40 drops per min per flange		
a. pump	4		480	0
b. Valves - bonnet to body (larger than 2 in.)	4		460	0
Valves - Stem leakoffs	4	Backseated, double packing with leakoff - 4 cc per hr per in. stem diameter	0	16
Miscellaneous small valves	2	Flanges body, packed stem - 4 drop per min	24	0
		Total	964	16

*Based on two subsystems in operation under DBA conditions.

Total Allowed System Uncollected Leakage is 964.cc/hr.

**Individual component uncollected leakage may exceed the design value provided that the total allowable system uncollected leakage is not exceeded.

TABLE 4.11-1

EXTERNAL RECIRCULATION LOOP LEAKAGE (Safety Injection System Only)

Items	No. of Units	Type of Leakage Control and Unit Leakage Rate	Design Leakage to Atmosphere cc per hr**	Design Leakage to Waste Disposal Tank, cc per hr
Low Head Safety Injection Pumps	2	Mechanical Seal with leakoff - 4 drop per min	0	24
Safety Injection Charging	3	Mechanical Seal with leakoff - 4 drop per min.	0	36
Flanges:				
a. Pump	10	Gasket - adjusted to zero leakage following any test - 40 drops per min, per flange	1,200	0
b. Valves Bonnet to Body (larger than 2 in.)	54		2,240	0
Valves - Stem Leakoffs	27	Backseated, double packing with leakoff - 4 cc per hr per in stem diameter	0	108
Misc. Valves	33	Flanges body packed stems - 4 drop per min	396	0
		Totals	3,836	168

Total Allowed System Uncollected Leakage is 3,836 cc/hr

**Individual component uncollected leakage may exceed the design value provided that the total allowable system uncollected leakage is not exceeded.