Public Service
Electric and Gas
Company

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JUN 11 1993

NLR-N93077
LCR 93-17

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

REQUEST FOR AMENDMENT
BORON CONCENTRATION REDUCTION
SALEM GENERATING STATION
UNIT NOS. 1 AND 2
FACILITY OPERATING LICENSES NOS. DPR-70 AND DPR-75
DOCKET NOS. 50-272 AND 50-311

In accordance with the requirements of 10CFR50.90, Public Service Electric and Gas Company (PSE&G) hereby transmits a request for amendment of Facility Operating Licenses DPR-70 and DPR-75 for Salem Generating Station, Units Nos., 1 and 2, respectively. In accordance with 10CFR50.91 (b) (1) requirements, a copy of this request for amendment has been sent to the State of New Jersey.

The proposed amendment reduces the boron concentration in the boric acid tank from 12 percent by weight to between 3.75 and 4.0 percent by weight. The reduced boron concentration results in eliminating the need for heat tracing. With the lower temperature and lower boron concentration, reliability and availability of the boric acid system will be significantly improved.

A description of the requested amendment, supporting information and analyses for the change, and the basis for a no significant hazards consideration determination are provided in Attachment 1. The Technical Specification pages affected by the proposed change are marked-up in Attachment 2. A detail technical bases and operational analysis CEN-606 is in Attachment 3.

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Upon NRC approval of this proposed change, PSE&G requests that the amendment be made effective on the date of issuance, but implemented prior to mode 4 following the eleventh refueling outage for Unit 1, and following the eighth refueling cycle for Unit 2. Please note that the proposed TS change is similar to that approved for Turkey Point Nuclear Plant on July 16, 1991 and posted for Sequoyah Nuclear Plant on May 12, 1993.

Should you have any questions regarding this request, we will be pleased to discuss them with you.

Sincerely,

JJ Hagan

Attachments (3)

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REF: NLR-N93077

STATE OF NEW JERSEY)
) SS.
COUNTY OF SALEM)

J. J. Hagan, being duly sworn according to law deposes and says:

I am Vice President - Nuclear Operations of Public Service Electric and Gas Company, and as such, I find the matters set forth in the above referenced letter, concerning the Salem Generating Station, Unit Nos. 1 and 2, are true to the best of my knowledge, information and belief.

J J Hagan

Subscribed and Sworn to before me
this 11th day of June, 1993

Kimberly Jo Brown
Notary Public of New Jersey

KIMBERLY JO BROWN
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 21, 1998

My Commission expires on ______________

ATTACHMENT 1
PROPOSED CHANGES TO TECHNICAL SPECIFICATIONS

LICENSE AMENDMENT APPLICATION
BORON CONCENTRATION REDUCTION
FACILITY OPERATING LICENSES DPR-70 AND DPR-75
DOCKET NOS. 50-272 AND 50-311

I. Description of Change

Technical Specification (TS) 3.1.1.1 action statement will be revised to increase the flow rate from 10 gallons per minute (gpm) to 33 gpm and to decrease the boron concentration from 20,000 parts per million (ppm) to ≥6,560 ppm.

TS 3.1.1.2 action statement will be revised to increase the flow rate from 10 gpm to 33 gpm and decrease the boron concentration from 20,000-ppm boron to ≥6,560-ppm boron.

TS 3.1.2.1 Surveillance Requirements (SR) 4.1.2.1.a will be revised to include the required temperature monitoring for the boric acid flow path components and delete the heat trace requirement. The monitoring temperature will be lowered from ≥145°F to ≥63°F for boric acid tank and ≥50°F for the pipe from recirculation line to the charging pump suction line.

TS 3.1.2.2 SR 4.1.2.2.a will be revised to include the required temperature monitoring for the boric acid flow path components and delete the heat trace requirements. The monitoring temperature will be lowered from ≥145°F to ≥63°F for boric acid tank and ≥50°F for the pipe from recirculation line to the charging pump suction line.

TS 3.1.2.2 SR 4.1.2.2.d will be added for unit-1 only, to verify the operability of the flow path required by specification 3.1.2.2.a delivers at least 33 gpm to the Reactor Coolant System. TS 3.1.2.2 SR 4.1.2.2.d (unit-2) will be revised to increase the flow rate from 10 gpm to 33 gpm.

TS 3.1.2.7.a (3.1.2.5.a Unit-2) will be revised to delete the heat trace requirement. Part 1 will have the required boric acid solution volume increased to 2,600 gallons. The concentration in Part 2 has been reduced to between 6,560 ppm and 6,990 ppm of boron, which correlates to approximately 3.75 to 4.0 percent by weight. Part 3 will now require the 63°F instead of 145°F.

TS 3.1.2.7.b (3.1.2.5.b Unit-2) will be revised to increase the required borated water volume in the refueling water storage tank (RWST) from 12,500 gallons to 37,000 gallons.

TS 3.1.2.7 SR 4.1.2.7 (TS 3.1.2.5 SR 4.1.2.5. Unit-2) The format of the surveillance statement will be revised to separate the boric acid storage system (labeled a) and the RWST (labeled b) requirements.

TS 3.1.2.7 SR 4.1.2.7b (TS 3.1.2.5 SR 3.1.2.5.b Unit-2) will be revised to add the Surveillance for the boron concentration and borated water volume for RWST.

TS 3.1.2.8 wording for unit-1 will be revised to be similar to TS 3.1.2.6 (Unit-2). Typographical correction will be made to TS 3.1.2.6 (Unit-2) to correct the referenced TS from 3.1.1.2 to 3.1.2.2.

TS 3.1.2.8.a (3.1.2.6.a Unit-2) will be revised to delete the heat trace requirement and indicate the required volume and concentration of boric acid in the boric acid storage system. Figure 3.1-2 has been added to provide the variable relation between concentration and volume. The solution temperature of 145°F has been reduced to 63°F.

TS 3.1.2.8. SR 4.1.2.8 (3.1.2.6 SR 4.1.2.6 Unit-2) will be revised similar to SR 4.1.2.7 (4.1.2.5 Unit-2).

TS 3.9.1 action statement will be revised to increase the flow rate from 10 gpm to 33 gpm and to decrease the boron concentration from 20,000-ppm boron to ≥6,560-ppm boron. The footnote will be revised for unit 1 to be same as the unit 2 footnote.

TS 3.10.1 Action Statements a and b will be revised to increase the flow rate from 10 gpm to 33 gpm and to decrease the boron concentration from 20,000-ppm boron to ≥6,560-ppm boron.

The bases for the boration system will be revised to delete the reference to the heat trace system. Additionally, the volumes and concentrations of borated water have been changed to reflect the calculated values shown in Attachment 3. New statements have been added to describe (1) how the temperatures on the boric acid tank water source is being monitored and maintained and (2) how the RWST shutdown margin volume requirements are determined.

II. REASON FOR THE PROPOSED CHANGES

The original design of Salem required, the boron concentration in the BATs to be approximately 12 percent by weight. This concentration presently creates two major operational problems. First, the high temperature and high concentration create a reliability/availability issue with a boric acid system components including BAT pump seals, boric acid evaporator and small instrument lines. Second, the heat tracing requirements for the CVCS are extensive and require significant maintenance to maintain them operable. If a heat trace failure is undetected, the pipe blockage because of boric acid solidification may render one of the flow paths inoperable, impacting safety system availability. By reducing the concentration to between 3.75 and 4.0 percent by weight and maintaining the appropriate temperature to at least 63°F, the previously listed problems are eliminated. Based upon the changes in the required volumes, concentration and solution temperature, the associated SRs were changed to include the new parameters to be monitored. For additional clarification, the format was revised.

The borated water volume required in the RWST for Modes 5 and 6 has been increased to 37,000 gallons to provide for the new boration requirements to maintain shutdown margins and additional instrument inaccuracies.

III JUSTIFICATION FOR THE CHANGE

The boric acid storage system borated water volume and boron concentration minimum values presently specified in the Salem TS are based upon the ability to borate the reactor coolant system (RCS) to the required cold shutdown boron concentration. The present method used to achieve cold shutdown is to borate the RCS to the required concentration to obtain the TS shutdown margin of 1.6 percent delta k/k at 200°F before starting the plant cooldown. The CVCS is then required to provide adequate makeup of sufficiently borated water to compensate for shrinkage as the RCS temperature is lowered to cold shutdown.

The proposed boric acid concentration reduction in the BATs will be accomplished by making a change to the plant boration and cooldown procedures. Attachment 3 reevaluates the original requirements for the BAT boric acid concentration to show the acceptability of the new methodology of boration-to-cold shutdown with the reduced boron concentration. The new method of boration-to-cold shutdown allows for boration during the cooldown process.

When cooldown is started, makeup from the BAT is provided until such time as the required BAT volume is discharged into the RCS. At this time, additional volume from the second BAT, or from batching operations, or from the RWST is provided. The above combination or the RWST alone provides an adequate supply of borated water to ensure the required shutdown margin is maintained.

To operate at the proposed lower boric acid concentrations, the minimum required delivery rate will be increased to 33 gpm to ensure that the same net boration rate will be supplied as required by the current TS. Salem will be modifying the flow path from the boric acid tank to the boric acid blender to allow for the higher-required flow rate and the recalibration of the BAT level transmitter to allow for the maximum utilization of the BAT volume. Additionally, the heat trace system will be disconnected. As a precaution the heaters on the boric acid tank, the batching tank and the concentrates holding tank will be maintained. The settings for the heaters will be lowered to automatically maintain an approximate range of 65 to 75°F. This will ensure that no significant amount of boric acid precipitates out in case there is an abnormal low Auxiliary Building temperature.

The volume of borated water required to provide adequate shutdown margin for Modes 5 and 6 (i.e., RCS less than 350°F) is 7,100 gallons from the RWST. Attachment 3 provides calculations to support this new volume requirement. The proposed TS requires 37,000 gallons. This quantity was derived from a combination of: (1) the location of the lower tap for the level transmitters on the RWST, (2) additional instrument inaccuracies, (3) conservatism to provide for gage legibility in the control room, (4) 7,100 gallons provided for shutdown margin, and (5) additional 140 gallons due to rounding up.

When performing batching operations, the boric acid batching tank is heated well above 63°F to ensure the boric acid will enter into solution easily. This will ensure that when the boric acid solution is transferred to the BAT, it is at an elevated temperature relative to the area ambient temperature.

The 63°F temperature was selected to provide sufficient margin to ensure the boric acid will remain in solution. For the "worst-case" condition when there is a 4.0 percent solution, the boron still will not precipitate out until the temperature falls below 58°F. The margin established of at least 5° is considered sufficient since the BAT and CVCS piping are housed in areas that are normally above the 63°F minimum.

UFSAR Section 9.4.2.1 describes the capabilities of the auxiliary building ventilation system. Based upon an expected range of external temperatures the system is capable of maintaining the building temperature from 60°F to 105°F. There is the possibility that air temperature in the auxiliary building may drop to approximately 60°F. As part of the modification, continuous temperature monitoring of the boration flow paths and components will be provided with an alarm in the control room to annunciate whenever temperature drops below 63°F. This alarm will be used to initiate additional monitoring to ensure that the solution temperature remains at or above the 63°F requirement. Should ambient temperature decrease below 63°F, the boric acid tank heaters, in conjunction with boric acid pump recirculation, are capable of maintaining the boric acid in the tank and the pump at or above 63°F. A small amount of boric acid in the flowpath between the boric acid recirculation line and the suction line to the charging pump will precipitate out, but it will not cause flow blockage even with temperature below 50°F. At 50°F, 3.5% by weight will remain in solution. The small amount which precipitates out will not cause flow blockage. As soon as the temperature is retained to normal, the precipitated boric acid will go back into solution.

By revising the format of SRs 4.1.2.7 (Salem-2 SRs 4.1.2.5) and 4.1.2.8 (4.1.2.6 Salem-2), the actual SRs were not changed (except for those proposed by this submittal), but were aligned with the TS requirements and action statements. This change will eliminate any confusion that was introduced in the original format.

In summary, the proposed revision to reduce the required BAT boron concentration will maintain shutdown margin requirements, and will eliminate the operational problem associated with maintaining high boron concentrations.

Footnote for section 3.9.1 for unit 1 will be revised to be compatible with the definitions operational modes stated in TS table 1.1.

IV. Significant Hazards Consideration

In accordance with 10CFR50.92,PSE&G has reviewed the proposed technical specification (TS) changes and concluded the proposed changes do not involve a significant hazards consideration because the proposed changes would not:

1. Involve a significant increase in the probability or consequences of an accident previously evaluated.

   The reduction of the boric acid concentration in the boric acid tanks (BAT) and elimination of requirements for the associated heat trace circuits will not significantly increase the probability or consequence of an accident previously evaluated. Only minor modifications are planned, and while operating procedures will revised to reflect the new boration method, the capability to safely shut down has not been changed or modified. TS controls have been placed on the boric acid tank to ensure that the lack of heat tracing does not result in the boron precipitating out of solution. Originally, Salem had the ability to borate at 10 gallons per minute (gpm) with boron solution of 20,000 parts per million (ppm). With the proposed change, Salem will provide the ability to borate at 33 gpm with a solution of between 6,560-ppm to 6,990-ppm boron. This will ensure that the boron addition rate remains essentially the same. In addition, boron addition from the BAT is not taken credit for in any accident analysis.

   Two independent and redundant boration flow paths with appropriate borated water are provided to compensate for reactivity changes and all expected transients throughout core life. The sources of borated water are the BATs and the Refueling Water Storage Tank (RWST) . The RWST is necessary for ECCS requirements. The current Technical Specification Bases covers using feed and bleed from the RWST alone. The design bases used to establish the required volume and boron concentration in the BAT have been examined, and the results are presented in attachment 3.

   The existing boric acid tank heaters, with the BAT pumps on recirculation, will ensure that there is no precipitation of boric acid in the majority of the safety related portion of the boric acid injection system. This includes the boric acid tanks, the BAT pumps, and most of the process lines.

The exception is on the injection paths between the BAT pump recirculation line and the suction line to the charging pumps. A 4% boric acid solution will not cause line blockage even with temperatures well below 50°F. At 50°F, 0.125 or less, of the boric acid will precipitate out creating a small film at the bottom of the piping. Since this portion of the flowpath does not contain a significant amount of 4% boric acid solution, there is no significant amount of boron precipitating out. Also, this film will not adhere to the piping and will not cause the blockage of the flow path. When ambient temperature is restored, the film will go back very quickly into solution. Based upon this analysis, this change does not involve a significant increase in the probability or consequences of any accident previously evaluated.

2. Create the possibility of a new or different kind of accident from any previously analyzed.

The original Salem design required heat trace circuits to ensure the boron, which was at 12% by weight, would remain in solution and be available for reactor coolant system reactivity control throughout core life. By lowering the boron concentration to 3.75 to 4.0 percent by weight, there is no possibility of boron precipitating out of solution as long as the boric acid solution remains above 58°F. The auxiliary building, where this equipment is located normally, remains well above 58°F. Continuous monitoring of the required area temperatures, in conjunction with an alarm in the main control room, will allow for operator actions to ensure the solution temperature remains above the TS-required temperature of greater than or equal to 63°F. By eliminating the need for the heat trace, there is an increase in the availability of the boric acid storage system. This stored volume remains adequate to bring the unit to a safe, cold shutdown. Therefore, the removal of requirements for heat trace circuits and the reduction of the boron concentration in the BATs do not create the possibility of a new or different kind of accident from any previously analyzed.

3. Involve a significant reduction in a margin of safety.

The margin of safety requirements is not affected by the removal of the heat trace circuits and reduction of the boric acid concentration in the BATs. The required flow paths and borated water sources are still available as before. The required quantity of borated water is still available based upon the new evaluation, and the ability to deliver this borated water remains the same. As stated previously, the reduction of the boric acid concentration in the BATs will ensure that the boric acid remains in solution at the normal room temperature in the auxiliary building. To ensure this, temperature will be continuously monitored at the control room. With the above changes, there will be a net improvement in system reliability and, accordingly. Therefore, the proposed changes do not involve a significant reduction in any margin of safety.

V. <u>Conclusions</u>

Based on the information presented above, PSE&G has concluded there is no significant hazards consideration.