SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 90 TO

FACILITY OPERATING LICENSE NPF-5

GEORGIA POWER COMPANY
OGLETHORPE POWER CORPORATION
MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA
CITY OF DALTON, GEORGIA

EDWIN I. HATCH NUCLEAR PLANT, UNIT 2

DOCKET NO. 50-366

INTRODUCTION

By letter dated September 22, 1987 (Reference 1), Georgia Power Company (the licensee) proposed changes to the Hatch Plant Unit 2 Technical Specifications (TSs) that would: (1) reduce the limits on the volume of the sodium pentaborate solution in the Standby Liquid Control System (SLCS) and on the amount of sodium pentaborate in the solution to reflect the use of sodium pentaborate that has been enriched in the isotope Boron-10; (2) change the form of the TS limits regarding the sodium pentaborate solution; and (3) add a surveillance requirement to require periodic verification of the Boron-10 isotopic enrichment in the sodium pentaborate solution. The proposed changes would result from the use of sodium pentaborate enriched in the Boron-10 isotope which has been proposed by the licensee to meet the requirements of the Anticipated Transients Without Scram (ATWS) Rule, 10 CFR 50.62(c)(4). The current Technical Specifications are based upon the use of sodium pentaborate unenriched in the Boron-10 isotope. The proposed changes would replace TS Figure 3.1.5-1 with two new figures, 3.1.5-1 and 3.1.5-2; would modify TS 3/4.1.5 to refer to the new figures; add a new surveillance requirement to TS 4.1.5; and change the Bases for 3/4.1.5 to describe the revised SLCS.

EVALUATION

The proposed TS changes are intended to meet the requirements of 10 CFR 50.62(c)(4). The resulting TS would then be comparable to the TS for Hatch Unit 1, which were approved by the NRC as documented in Amendments 138 and 142 to the Hatch Unit 1 Facility Operating License DPR-57 (References 2 and 3). The ATWS Rule requires that the SLCS be equivalent in control capacity to a system with an 86 gpm injection rate, using 13 weight percent unenriched sodium pentaborate solution. While not stated explicitly in the rule, the selection of the 86 GPM injection rate and the 13 w/o solution of sodium pentaborate was based on discharge of the solution into a reactor vessel with a 251-inch inside diameter, as used in the newer BWR/5 and BWR/6 designs. A lesser rate of boron addition would be acceptable into a smaller reactor vessel, such as the 218-inch reactor vessel of Hatch Unit 2. However, consideration of vessel size in calculations of equivalent control capacity requires an exemption from the requirements of the ATWS Rule which does not provide for variations in vessel size.

By letter dated January 6, 1988 (Reference 4) the licensee requested an exemption from 10 CFR 50.62(c)(4) to allow consideration of the smaller size of the Hatch Unit 2 reactor vessel. Pursuant to 10 CFR 50.12(a)(2)(ii), the Commission has granted an Exemption to 10 CFR 50.62(c)(4) in a separate document issued on the same date as this evaluation.

The staff has reviewed the changes proposed against the requirements of the ATWS Rule and the guidance in Generic Letter 85-03, "Clarification of Equivalent Control Capacity for Standby Liquid Control Systems," dated January 28, 1985.

Of the several proposed approaches for meeting the ATWS Rule presented in the General Electric report (Reference 5), and approved in the NRC evaluation (Reference 6), the licensee has chosen to use boron enriched in the Boron-10 isotope. Calculations using the methods of Reference 5, the smaller (218-inch) diameter Hatch Unit 2 reactor vessel, sodium pentaborate that has been enriched to 60 atomic percent in the Boron-10 isotope, and an injection rate of 41.2 GPM (Hatch Unit 2 TS minimum injection rate) result in a minimum sodium pentaborate solution concentration of 6.2 w/o. The calculational approach taken by the licensee and the resulting parameter values will provide negative reactivity in an ATWS event which is equivalent to the minimum flow capacity and boron content set forth in 10 CFR 50.62(c)(4) and are acceptable.

The existing TS 4.1.5 sets limits on the minimum volume of sodium pentaborate solution and the minimum weight of sodium pentaborate in the solution. TS Figure 3.1.5-1 sets minimum solution temperature limits as a function of solution concentration. The licensee proposes to replace TS Figure 3.1.5-1 with a new Figure 3.1.5-1 which establishes an operating range of acceptable solution volumes as a function of the concentration of sodium pentaborate in the solution, and a new Figure 3.1.5-2 which sets an operating range of minimum solution temperatures as a function of sodium pentaborate concentration. The text of TS 3/4.1.5 would be revised to reference the limits shown on these two new figures. The revised minimum solution volume is set at 2,883 gallons when using a 6.2 weight percent solution of sodium pentaborate enriched to 60 percent in the Boron-10 isotope. This volume and concentration maintains the same margin of safety as in the existing TS. For higher concentrations of sodium pentaborate, smaller volumes of solution are required, as displayed on TS Figure 3.1.5-1. The minimum solution temperature required by the graph on TS Figure 3.1.5-2 maintains a constant 10°F margin above the saturation temperature for the solution concentration. The two new figures are identical to those previously approved for the Unit 1 TS (Reference 2). In conjunction with the revisions to the text of TS 3/4.1.5, this approach establishes appropriate limits on the sodium pentaborate solution and is acceptable.

To provide assurance that the concentration of Boron-10 in the sodium pentaborate is maintained at a minimum of 60 atomic percent, a new surveillance requirement 4.1.5.c.5 would be added to require that the enrichment of the sodium pentaborate be verified by analysis at least once per 18 months prior to startup from plant shutdown. This is identical to the surveillance requirement added to the Unit 1 TS (Reference 3) and is acceptable.

The TS Bases 3/4.1.5 would be revised to reflect operation of the SLCS with enriched sodium pentaborate. The content of 3/4.1.5 is the same as previously approved for Unit 1 (Reference 2) and is acceptable.

In summary, the licensee has requested TS changes for Hatch Unit 2 which would provide for the use of boron enriched in the B-10 isotope in the SLCS to meet the requirements of 10 CFR 50.62. The use of the enriched boron in the SLCS would allow the TS changes requested by tne licensee without any loss of reactivity control. Because the approach selected by the licensee is consistent with the purpose of 10 CFR 50.62, an Exemption has been granted separately pursuant to 10 CFR 50.12(a)(2)(ii) and the associated TS changes are acceptable.

ENVIRONMENTAL CONSIDERATIONS

The amendment involves a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes in surveillance requirements. The staff has determined that tne amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

CONCLUSION

The Commission made a proposed determination that the amendment involves no significant hazards consideration which was published in the Federal Register (52 FR 44244) on November 18, 1987, and consulted with the state of Georgia. No public comments were received, and the state of Georgia did not have any comments.

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

REFERENCES

1. Letter from J. P. O'Reilly, Georgia Power Company, to U.S. Nuclear Regulatory Commission, dated September 22, 1987.

2. Letter from L. P. Crocker, NRC, to J. P. O'Reilly, Georgia Power Company, dated May 28, 1987, subject; Issuance of Amendment No. 138 to Facility Operating License DPR-57 - Edwin I. Hatch Nuclear Plant, Unit 1.

3. Letter from L. P. Crocker, NRC, to J. P. O'Reilly, Georgia Power Company, dated July 7, 1987, subject: Issuance of Amendment No. 142 to Facility Operating License DPR-57 - Edwin I. Hatch Nuclear Plant, Unit 1.

4. Letter from L. T. Gucwa, Georgia Power Company, to U. S. Nuclear Regulatory Commission, dated Janaury 6, 1988.

5. "Anticipated Transients Without Scram: Response to the NRC ATWS Rule, 10 CFR 50.62," NEDE-31096-P, December 1985.

6. "Safety Evaluation of Topical Report (NEDE-31096-P) 'Anticipated Transients Without Scram: Response to ATWS Rule, 10 CFR 50.62'," October 21, 1986.

Principal Contributor: L. Crocker

Dated: February 3, 1988

ATTACHMENT TO LICENSE AMENDMENT NO. 90

FACILITY OPERATING LICENSE NO. NPF-5

DOCKET NO. 50-366

Replace the following pages of the Appendix A Technical Specifications.

Remove Page	Insert Page
3/4 1-18	3/4 1-18
3/4 1-19	3/4 1-19
3/4 1-20	3/4 1-20
---	3/4 1-20a
B 3/4 1-4	B 3/4 1-4
B 3/4 1-4a	B 3/4 1-4a
---	B 3/4 1-4b

3/4.1.5 STANDBY LIQUID CONTROL SYSTEM

LIMITING CONDITION FOR OPERATION

3.1.5 The standby liquid control system shall be OPERABLE with:

a. An OPERABLE flow path from the storage tank to the reactor core containing two pumps and two inline explosive injection valves, and

b. The contained solution volume, concentration and temperature are within the Operating Ranges of Figure 3.1.5-1 and Figure 3.1.5-2.

APPLICABILITY: CONDITIONS 1, 2, and 5*.

ACTION:

a. In CONDITION 1 or 2:

1. With one pump and/or one explosive valve inoperable, restore the inoperable pump and/or explosive valve to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within the next 12 hours.

2. With the standby liquid control system inoperable, restore the system to OPERABLE status within 8 hours or be in at least HOT SHUTDOWN within the next 12 hours.

b. In CONDITION 5*:

1. With one pump and/or one explosive valve inoperable, restore the inoperable pump and/or explosive valve to OPERABLE status within 30 days or fully insert all insertable control rods within the next hour.

2. With the standby liquid control system inoperable, fully insert all insertable control rods within one hour.

3. The provisions of Specification 3.0.3 and 3.0.4 are not applicable.

*With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.11.1 or 3.9.11.2.

SURVEILLANCE REQUIREMENTS

4.1.5 The standby liquid control system shall be demonstrated OPERABLE:

a. At least once per 24 hours by verifying that:

1. The temperature of the sodium pentaborate solution is within the limits of Figure 3.1.5-2, and

2. The volume of sodium pentaborate solution is within the limits of Figure 3.1.5-1, and

3. The heat tracing circuit is OPERABLE by determining that the temperature of the pump suction piping is within the limits of Figure 3.1.5-2.

b. At least once per 31 days by:

1. Starting each pump and recirculating demineralized water to the test tank,

2. Verifying the continuity of the explosive charge, and

3. Determining that the concentration of boron in solution is within the limits of Figure 3.1.5-1 by chemical analysis.*

c. At least once per 18 months during shutdown by;

1. Initiating one of the standby liquid control system loops, including an explosive valve, and verifying that a flow path from the pumps to the reactor pressure vessel is available by pumping demineralized water into the reactor vessel. The replacement charge for the explosive valve shall be from the same manufactured batch as the one fired or from another batch which has been certified by having one of that batch successfully fired. Both injection test loops shall be tested in 36 months.

2. Demonstrating that the minimum flow requirement of 41.2 gpm at a pressure of 1190 psig is met.

3. Demonstrating that the pump relief valve setpoint ≤ 1400 psig and verifying that the relief valve does not actuate during recirculation to the test tank.

4. **Demonstrating that all heat traced piping is unblocked by pumping from the storage tank to the test tank.

5. Prior to startup, verify (by analysis) that the sodium pentaborate enrichment is within prescribed limits.

*This test shall also be performed anytime water or boron is added to the solution or when the solution temperature drops below the lower limit established in Figure 3.1.5-2.

**This test shall also be performed whenever both heat tracing circuits have been found to be inoperable.

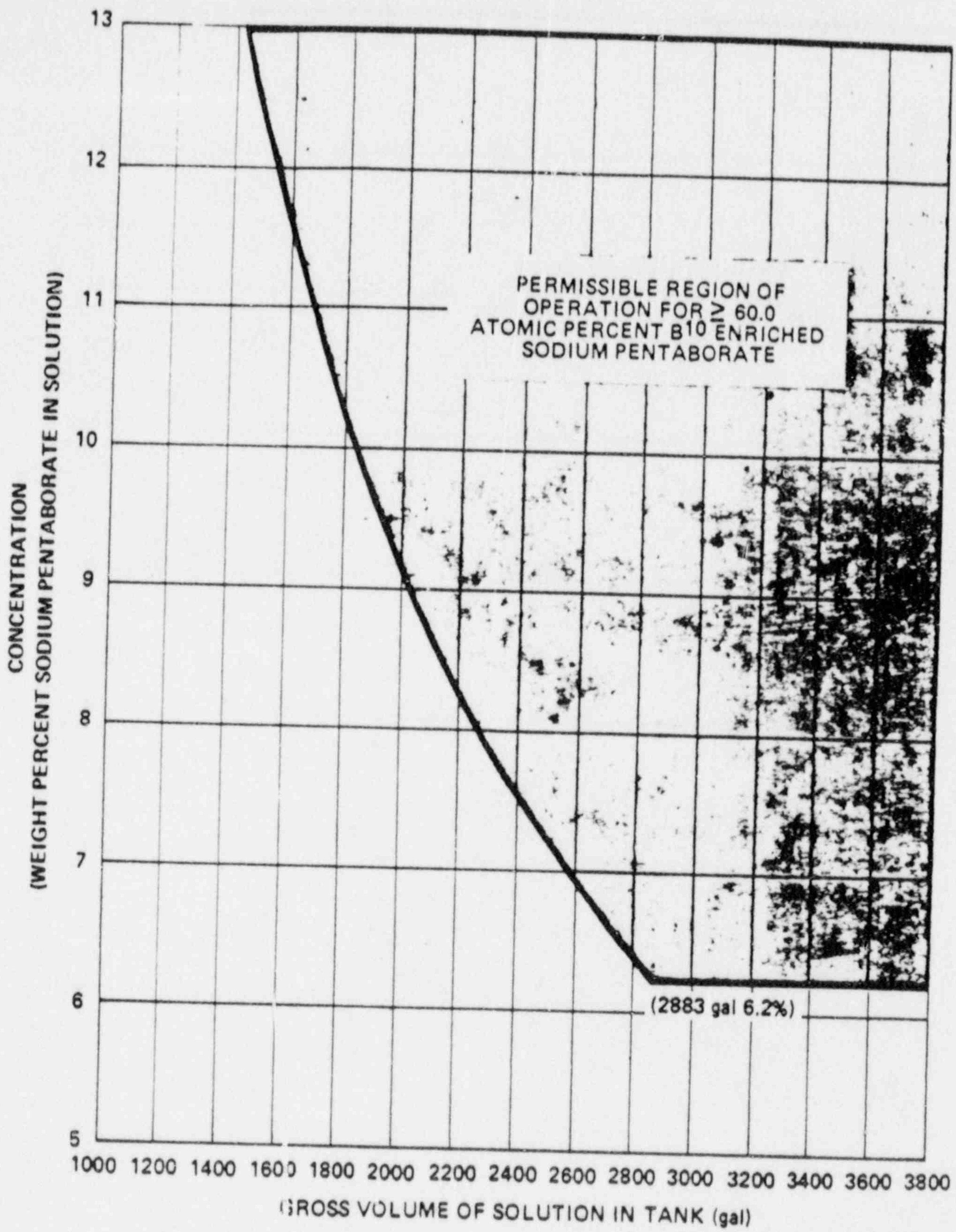

FIGURE 3.1.5-1 SODIUM PENTABORATE SOLUTION VOLUME VERSUS CONCENTRATION REQUIREMENTS

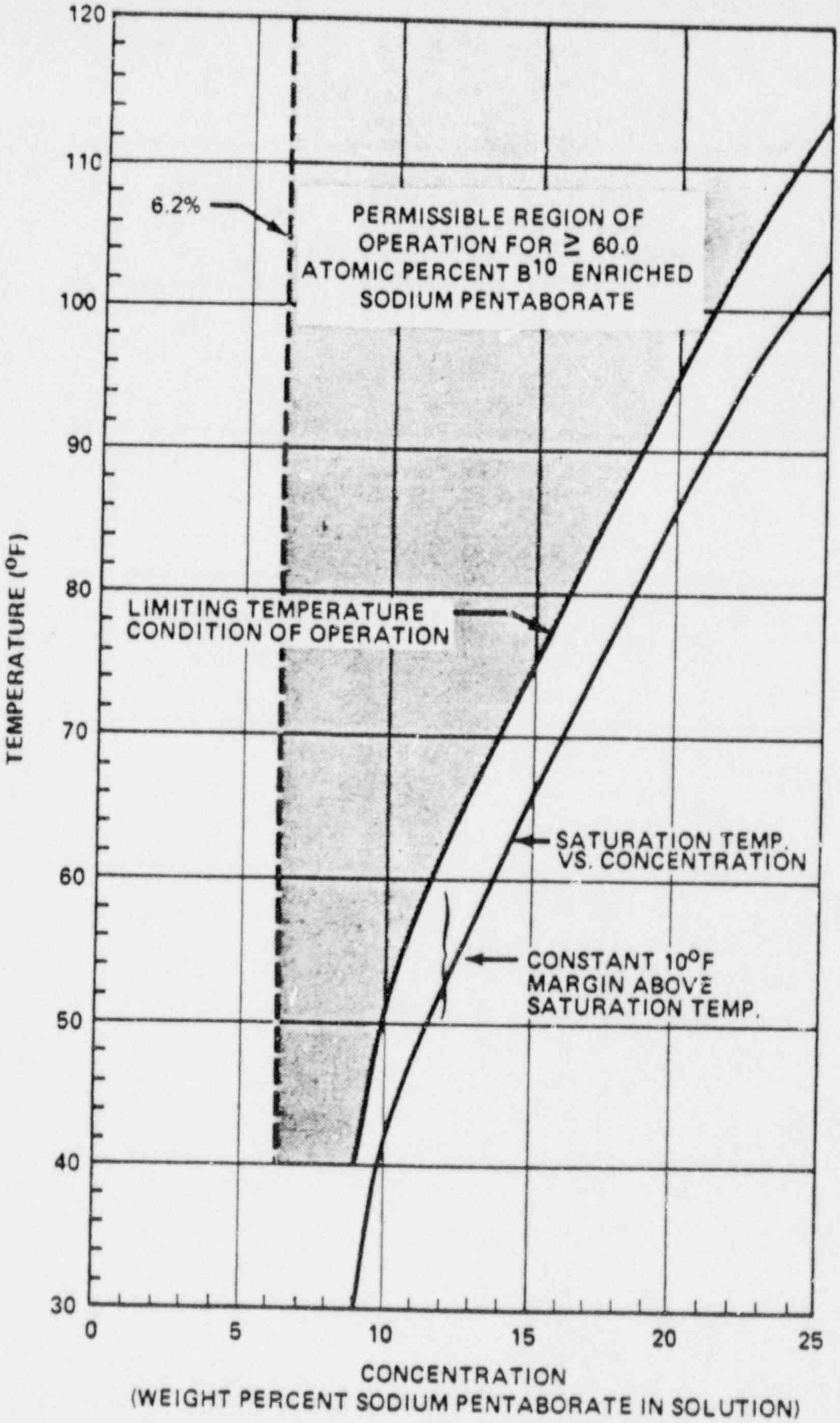

FIGURE 3.1.5-2 SODIUM PENTABORATE SOLUTION TEMPERATURE VERSUS CONCENTRATION REQUIREMENTS

CONTROL RODS PROGRAM CONTROLS (Continued)

The RSCS and RWM provide automatic supervision to assure that out-of-sequence rods will not be withdrawn or inserted.

The analysis of the rod drop accident is presented in Section 15.1.38 of the FSAR and the techniques of the analysis are presented in a topical report, Reference 1, and two supplements, References 2 and 3.

The RBM is designed to automatically prevent fuel damage in the event of erroneous rod withdrawal from locations of high power density during high power operation. The RBM is only required to be operable when the Limiting Condition defined in Specification 3.1.4.3 exists. Two channels are provided. Tripping one of the channels will block erroneous rod withdrawal soon enough to prevent fuel damage. This system backs up the written sequence used by the operator for withdrawal of control rods. Further discussion of the RBM system and power dependent setpoints may be found in NEDC-30474-P (Ref. 4).

3/4.1.5 STANDBY LIQUID CONTROL SYSTEM

The standby liquid control (SLC) system provides a backup reactivity control capability to the control rod scram system. The original design basis for the standby liquid control system is to provide a soluble boron concentration to the reactor vessel sufficient to bring the reactor to a cold shutdown. In addition to meeting its original design basis, the system must also satisfy the requirements of the ATWS Rule 10 CFR 50.62 paragraph (c) (4), which requires that the system have a control capacity equivalent to that for a system with an injection rate of 86 gpm of 13 weight percent unenriched sodium pentaborate, normalized to a 251 inch diameter reactor vessel.

To meet its original design basis, the SLC system was designed with a sodium pentaborate solution tank, redundant pumps, and redundant explosive injection valves. The tank contains a sodium pentaborate solution of sufficient volume, concentration and B^{10} enrichment to bring the reactor to a cold shutdown. The solution is injected into the reactor vessel using one of the redundant pumps.

The volume limits in Figure 3.1.5-1 are calculated such that for a given concentration of sodium pentaborate, the tank contains a volume of solution adequate to bring the reactor to a cold shutdown, with margin. These volume limits are based on gross volume and account for the unusable volume of solution in the tank and suction lines.

To meet 10 CFR 50.62 Paragraph (c) (4), the system must have a reactivity control capacity equivalent to that of a system with an 86 gpm injection flow rate of 13 weight percent unenriched sodium pentaborate into a 251 inch diameter reactor vessel. The term "equivalent reactivity control capacity" refers to the rate at which the boron isotope B^{10} is injected into the reactor core. The standby liquid control system meets this requirement

STANDBY LIQUID CONTROL SYSTEM (Continued)

by using a sodium pentaborate solution enriched with a higher concentration of the B^{10} isotope. The minimum concentration limit of 6.2 percent sodium pentaborate solution is based on 60 atomic percent B^{10} enriched boron in sodium pentaborate and a flow rate of 41.2 gpm. The method used to show equivalence with 10 CFR 50.62 is set forth in NEDE-31096-P (Ref. 5).

Limiting Conditions for Operation are established based on the redundancy within the system and the reliability of the control rod scram system. With the standby liquid control system inoperable, reactor operation for short periods of time is justified because of the reliability of the control rod scram system. With one redundant component inoperable, reactor operation for longer periods of time is justified because the system could still fulfill its function.

Surveillance requirements are established on a frequency that assures a high system reliability. Thorough testing of the system each operating cycle assures that the system can be actuated from the control room and will develop the flow rate required. Replacement of the explosive charges in the valves at regular intervals assures that these valves will not fail due to deterioration of the charges. Functional testing of the pumps is performed once per month to assure pump operability.

The sodium pentaborate solution is carefully monitored to assure its reactivity control capability is maintained. The enriched sodium pentaborate solution is made by mixing granular, enriched sodium pentaborate with water. Isotopic tests on the granular sodium pentaborate are performed to verify the actual B^{10} enrichment, prior to mixing with water. Once the enrichment is established, only the solution concentration, volume and temperature must be monitored to insure that an adequate amount of reactivity control is available. Determining the solution concentration once per 31 days verifies that the solution has not been diluted with water. Checking the volume once each day will guard against noticeable fluid losses or dilutions, and daily temperature checks will prevent sodium pentaborate precipitation.

1. C. J. Paone, R. C. Stirn and J. A. Woodley, "Rod Drop Accident Analysis for Large BWRs," GE Topical Report NEDO-10527, March 1972.

2. C. J. Paone, R. C. Stirn and R. M. Yound, Supplement 1 to NEDO-10527, July 1972.

3. J. A. Haum, C. J. Paone and R. C. Stirn, Addendum 2, "Exposed Cores," Supplement 2 to NEDO-10527, January 1973.

STANDBY LIQUID CONTROL SYSTEM (Continued)

4. "Average Power Range Monitor, Rod Block Monitor and Technical Specification Improvement (ARTS) Program for Edwin I. Hatch Nuclear Plant, Units 1 and 2," NEDC-30474-P, December 1983.

5. "Anticipated Transients without Scram, Response to NRC ATWS Rule, 10 CFR 50.62", NEDE-31096-P, December 1985.