LIMITING CONDITION FOR OPERATION

c. The liquid poison tank shall contain a minimum of 1185 gallons of boron bearing solution. The solution shall have a sufficient concentration of sodium pentaborate enriched with Boron-10 isotope to satisfy the equivalency equation.

$$\frac{C}{13\%\ wt} \times \frac{628300}{M} \times \frac{Q}{86\ GPM} \times \frac{E}{19.8\%\ Atom} \geq 1$$

Where: C = Sodium Pentaborate Solution Concentration (Wt %)
M = Mass of Water in Reactor Vessel and Recirculation piping at Hot Rated Conditions (501500 lb)
Q = Liquid Poison Pump Flow Rate (30 GPM nominal)
E = Boron-10 Enrichment (Atom %)

d. The liquid poison solution temperature shall not be less than the temperature presented in Figure 3.1.2.b.

e. If Specifications "a" through "d" are not met, initiate normal orderly shutdown within one hour.

SURVEILLANCE REQUIREMENT

Remove the squibs from the valves and verify that no deterioration has occurred by actual field firing of the removed squibs. In addition, field fire one squib from the batch of replacements.

Disassemble and inspect the squib-operated valves to verify that valve deterioration has not occurred.

(2) <u>At least once per month -</u>

Demineralized water shall be recycled to the test tank. Pump discharge pressure and minimum flow rate shall be verified.

b. <u>Boron Solution Checks</u>:

(1) <u>At least once per month -</u>

Boron concentration shall be determined.

(2) <u>At least once per day -</u>

Solution volume shall be checked. In addition, the sodium pentaborate concentration shall be determined and conformance with the requirements of the equivalency equation shall be checked any time water or boron are added or if the solution temperature drops below the limits specified by Figure 3.1.2.b.

LIMITING CONDITION FOR OPERATION

SURVEILLANCE REQUIREMENT

(3) At least once per day-

The solution temperature shall be checked.

(4) At least once per operating cycle

Verify enrichment by analysis.

c. Surveillance with Inoperable Components

When a component becomes inoperable its redundant component shall be demonstrated to be operable immediately and daily thereafter.

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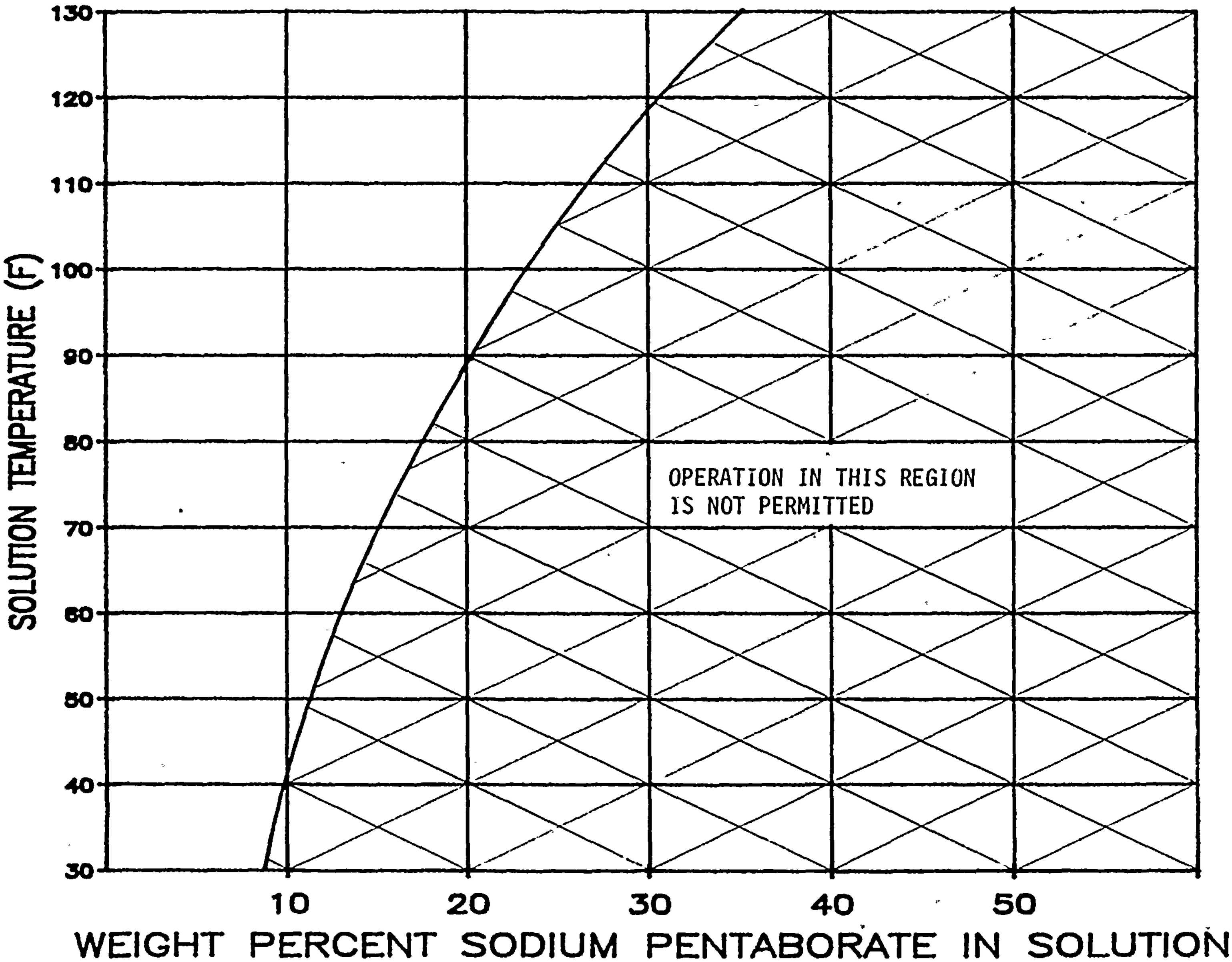
Figure 3.1.2b
MINIMUM ALLOWABLE SOLUTION TEMPERATURE



The liquid poison system (Section VII-C*) acting alone does not prevent fuel clad damage for any conceivable type of Station transient. This system provides a backup to permit reactor shutdown in the event of a massive failure of the control rods to insert.

The liquid poison system is designed to provide the capability to bring the reactor from full design rating (1850 thermal megawatts) to a cold, xenon free shutdown condition assuming none of the control rods can be inserted. A concentration of 120 ppm of boron-10 (the boron isotope with a high neutron cross section) in the reactor coolant will bring the reactor from full design rating (1850 thermal megawatts) to greater than 3 percent delta k subcritical (0.97 k_{eff}) considering the combined effects of the control rods, coolant voids, temperature change, fuel doppler, xenon, and samarium.

In order to provide good mixing, the injection time has to be greater than 17 minutes(2). The rate of boron-10 injection must also be sufficient to achieve hot shutdown during ATWS events.

The liquid poison storage tank minimum volume assures that the above requirements for boron solution insertion are met with one 30 gpm liquid poison pump. The quantity of Boron-10 isotope required to be stored in solution includes an additional 25 percent margin beyond the amount needed to shutdown the reactor to allow for any unexpected non-uniform mixing. The relationship between sodium pentaborate concentration and sodium pentaborate Boron-10 enrichment must satisfy the equivalency equation: (1)

$$\frac{C}{13\%\ \text{wt}} \times \frac{628300}{M} \times \frac{Q}{86\ \text{GPM}} \times \frac{E}{19.8\%\ \text{Atom}} \geq 1$$

Where: C = Sodium Pentaborate Solution Concentration (Wt %)
M = Mass of Water in Reactor Vessel and Recirculation piping at Hot Rated Conditions (501500 lb)
Q = Liquid Poison Pump Flow Rate (30 GPM nominal)
E = Boron-10 Enrichment (Atom %)

The tank volume requirements include consideration for 197 gallons of solution which is contained below the point where the pump takes suction from the tank and therefore cannot be inserted into the reactor.

The solution saturation temperature varies with the concentration of sodium pentaborate. Figure 3.1.2.b. includes a 5F margin above the saturation temperature to guard against precipitation. Temperature and liquid level alarms for the system are annunciated in the Control Room.

*FSAR

(1) GE Topical Report NEDE-31096-P-A, "Anticipated Transients Without Scram. Response to ATWS Rule 10CFR50.62."
(2) GE Report NEDC-30921, "Assessment of ATWS Compliance Alternatives."

ATTACHMENT B

NIAGARA MOHAWK POWER CORPORATION

LICENSE NO DPR-63

DOCKET NO. 50-220

Supporting Information and No Significant Hazards Consideration Analysis

The proposed Amendment to Sections 3.1.2 and 4.1.2 of the Technical Specifications incorporates the changes required to satisfy the liquid poison system control capacity equivalency requirements as required by 10 CFR 50.62. These requirements are in accordance with the staff's Safety Evaluation of Topical Report [NEDE 31096-P], "Anticipated Transients Without Scram; Response to ATWS Rule 10 CFR 50.62," which indicates that the equivalency requirement is demonstrated when the following relationship is satisfied:

$$\frac{Q}{86} \times \frac{M251}{M} \times \frac{C}{13} \times \frac{E}{19.8} \geq 1$$

Where: Q = expected Liquid Poison System Flow Rate (30 gpm)

M = mass of water in the reactor vessel and recirculation system at hot rated conditions (501,500 lbs.)

C = sodium pentaborate solution concentration, weight percent

E = Boron-10 isotope enrichment (19.8% for natural boron), atom percent

M251 = mass of water for 251 inch reference plant (628,300 lbs.)

$$\frac{30}{86} \times \frac{628300}{501500} \times \frac{13}{13} \times \frac{50.34}{19.8} \geq 1$$

$$1.111 \geq 1$$

The proposed amendment increases the rate of boron-10 isotope injection into the reactor vessel. The increased injection rate is achieved by using combinations of solution concentration and boron-10 enrichment that satisfy the equivalency equation. A specific combination of concentration and enrichment is not identified in the Technical Specifications. This provides flexibility in procurement of enriched sodium pentaborate. Inclusion of the equivalency equation in the Technical Specifications is sufficient to assure compliance with the ATWS rule.

The Liquid Poison System is a backup to the highly reliable Control Rod Drive System. When a scram signal occurs, the control rods are automatically inserted to bring the reactor to a subcritical condition. In the unlikely event the control rods fail to insert, the Liquid Poison System is designed to inject a sufficient quantity of soluble boron to bring the reactor to a hot subcritical condition. For Nine Mile Point Unit 1, a concentration of 600 ppm natural boron in the core coolant is required (ref. FSAR Section VII-C). An additional 25% is provided to compensate for any unexpected non-uniform mixing. This resulting concentration of 750 ppm natural boron is equivalent to a concentration of 150 ppm boron-10. This quantity of boron-10 is provided by injecting a minimum volume of 985 gallons of sodium pentaborate solution that satisfies the equivalency equation. Consequently, Figure 3.1.2a has been deleted. The tank level instrumentation and alarms will be modified to monitor the new minimum volume. The surveillance requirement for the daily checks of solution volume will remain unchanged so that the possibility of dilution through inadvertent water addition is minimized. In addition, surveillance requirements are imposed to monitor the boron-10 isotope enrichment in the sodium pentaborate solution.

The requirement for a minimum injection time of 60 minutes has been eliminated by the performance of mixing tests. General Electric has demonstrated (Report NEDC-30921 March 85 "Assessment of ATWS Compliance Alternatives") that the liquid poison system would be able to achieve 95 percent mixing efficiency within 17 minutes following start of boron injection. The test modeled the Nine Mile Point type standpipe sparger under the core plate using jet pump type water circulation. Circulation with external loops is expected to provide equivalent mixing efficiency. At Nine Mile Point 1, 985 gallons of sodium pentaborate solution would be injected in approximately 33 minutes, well exceeding the test value of 17 minutes. Consequently, the one-hour minimum injection time has been removed from the basis.

The 2-hour maximum injection time has also been eliminated since the rate of boron-10 injection is determined by the equivalency equation. The rate of boron-10 injection must be sufficient to achieve hot shutdown during ATWS events.

Figure 3.1.2.b has been redrawn to include lower temperatures and lower concentrations of sodium pentaborate.

10 CFR 50.91 requires that at the time a licensee requests an amendment, it must provide to the Commission its analysis using the standards in Section 50.92 about the issue of no significant hazards consideration. Therefore, in accordance with 10 CFR 50.91 and 10 CFR 50.92, the following analysis has been performed.

<u>The operation of Nine Mile Point Unit 1, in accordance with the proposed amendment, will not involve a significant increase in the probability or consequences of an accident previously evaluated</u>.

The Liquid Poison System, as modified, satisfies the new requirement to bring the reactor to hot shutdown with an ATWS type event and meets the original design basis requirement to bring the reactor to cold shutdown, 3 percent delta k subcritical (0.97 k_{eff}) from 1850 megawatts thermal.

Therefore, there is no significant increase in the probability or consequences of an accident previously evaluated.

The operation of Niagara Mohawk Power Corporation, in accordance with the proposed amendment, will not involve a significant reduction in the margin of safety.

The Liquid Poison System must be able to inject sufficient neutron absorbing boron-10 isotope to bring the reactor from the full design rating of 1850 megawatts thermal to greater than the 3 percent delta k subcritical (0.97 k_{eff}) considering the combined effects of control rods, coolant voids, temperature change, fuel doppler, xenon, and samarium.

Injecting a minimum volume of 985 gallons of sodium pentaborate enriched with sufficient boron-10 isotope meets the requirements of the ATWS equivalency formula and satisfies the original design requirement to bring the reactor subcritical. Consequently, the margin of safety is not reduced by this change.

The operation of Nine Mile Point Unit 1, in accordance with the proposed amendment, will not create the possibility of a new or different kind of accident from any accident previously analyzed.

Injection of liquid poison solution into the reactor has been considered in the system design. Changing the enrichment level of boron-10 isotope does not change any chemical or other physical characteristics of the solution. Consequently, this change does not create the possibility of a new or different kind of accident.