Docket No. 50-245
B14626

Attachment 1

Millstone Nuclear Power Station, Unit No. 1

Proposed Revision to Technical Specifications
Standby Liquid Control System

Marked Up Pages

January 1994

LIMITING CONDITION FOR OPERATION

3.4 STANDBY LIQUID CONTROL SYSTEM

C. Boron Requirements

The liquid poison tank shall contain a boron-bearing solution that satisfies the following requirements at all times when the liquid poison system is required to be OPERABLE:

- Boron enrichment (atom % B-10) ≥50%, and
- Solution concentration ≥11 wt%, and
- Solution volume ≥1,850 gallons, and
- The temperature of the solution, including that in the piping, shall not be less than the temperature presented in Figure 3.4.1.

D. Shutdown Requirement

3.4.A, 3.4.B, and 3.4.C

If Specifications 3.3.A through C are not met, an orderly shutdown shall be initiated.

SURVEILLANCE REQUIREMENT

4.4 STANDBY LIQUID CONTROL SYSTEM

C. The availability of the proper boron-bearing solution shall be verified by performance of the following tests.

1. At least once per month

Boron concentration shall be determined. In addition, the boron concentration shall be determined any time water or boron is added or if the solution temperature drops below the limits specified by Figure 3.4.1.

2. At least once per day

Solution volume shall be checked.

3. At least once per day

The solution temperature, including that in the piping, shall be checked.

4. At least once per refueling cycle

Boron-10 enrichment shall be determined. In addition, the boron-10 enrichment shall be determined within 60 days of adding sodium pentaborate to the tank.

($Na_2B_{10}O_{16} \cdot 10H_2O$)

3.4 STANDBY LIQUID CONTROL SYSTEM

BASES

A. Normal Operation

The design objective of the liquid control system is two fold. One objective is to provide the capability of bringing the reactor from full power to a cold, xenon-free shutdown assuming that none of the withdrawn control rods can be inserted. To meet this objective, the liquid control system is designed to inject a sufficient quantity of Boron-10 (the boron isotope with the higher neutron absorption cross-section) in less than 125 minutes to bring the reactor from full power to a minimum of 2.6% delta K subcritical condition considering the hot to cold reactivity swing, xenon poisoning, analytical biases and uncertainties, etc. This quantity is equivalent to the quantity of naturally occurring boron which produces a concentration of 660 ppm.

An additional 25% of boron solution is provided for possible imperfect mixing of the chemical solution in the reactor coolant. A minimum quantity of 1,610 net gallons of 50% B-10 enriched sodium pentaborate in a solution having a concentration of no less than 10 wt% (the higher minimum solution concentration in the LCO accounts for the measurement uncertainty) is required to meet this shutdown requirement. Actual minimum system volume for this quantity is 1,850 gallons. (240 gallons are contained below the pump suction and, therefore, cannot be inserted.)

of 11 wt %

The time requirement (125 minutes) for insertion of the boron solution was selected to override the rate of reactivity insertion due to cooldown of the reactor following the xenon poison peak.

The second objective of the liquid control system is to meet the requirement of the ATWS rule (10CFR50.62) which states that, in part:

REPLACE WITH INSERT A

> "Each boiling water reactor must have a standby liquid control system (SLCS) with a minimum flow capacity and boron content equivalent in control capacity to 86 gallons per minute of 13-weight percent sodium pentaborate solution."

The equivalency requirement is met by satisfying the following equations:

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

Where:

Q = Flowrate from one SLCS pump, 38 gpm. (The higher value specified in the LCO accounts for the measurement uncertainty).

INSERT A

"Each boiling water reactor must have a standby liquid control system (SLCS) with the capability of injecting into the reactor pressure vessel a borated water solution at such a flow rate, level of boron concentration and boron-10 isotope enrichment, and accounting for reactor pressure vessel volume, that the resulting reactivity control is at least equivalent to that resulting from injection of 86 gallons per minute of 13 weight percent sodium pentaborate decahydrate solution at the natural boron-10 isotope abundance into a 251-inch inside diameter reactor pressure vessel for a given core design."

$\frac{M251}{M}$ = The ratio of mass of water in the reactor vessel and recirculation system at hot rated conditions for a plant with a vessel diameter of 251 inches to that of Millstone Unit 1. (This ratio is greater than 1.25).

C = Sodium pentaborate solution concentration, 10 wt% (the higher value specified in the LCO accounts for the measurement uncertainty).

E = B-10 isotope enrichment, 50 atom percent.

Boron concentration, solution temperature (within the tank and connecting piping including check of tank heater and pipe heat tracing system), and volume are checked on a frequency to assure a high reliability of operation of the system should it ever be required. Experience with pump operability indicates that monthly testing is adequate to detect if failures have occurred. Testing of B-10 enrichment once per refueling cycle or whenever sodium pentaborate is added to the tank provides sufficient assurance that the minimum B-10 enrichment will be maintained.

Components of the system are checked periodically, as described above, and make a functional test of the entire system on a frequency of less than once during each operating cycle unnecessary. A test of one installed explosive charge is made at least once during each operating cycle to assure that the charges are satisfactory. The replacement charge will be selected from the same batch as the tested charge. A continual check of the firing circuit continuity is provided by pilot lights in the control room.

The relief valves in the standby liquid control system protect the system piping and positive displacement pumps, which are nominally designed for 1500 psi, from overpressure. The pressure relief valves discharge back to the standby liquid control solution tank.

INCLUDED FOR INFORMATION ONLY

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Attachment 2

Millstone Nuclear Power Station, Unit No. 1

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Retyped Pages

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D. Shutdown Requirement

If Specifications 3.4.A, 3.4.B, and 3.4.C are not met, an orderly shutdown shall be initiated.

SURVEILLANCE REQUIREMENT

4.4 STANDBY LIQUID CONTROL SYSTEM

C. The availability of the proper boron-bearing solution shall be verified by performance of the following tests.

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