Docket No. 50-423
B15077

Attachment 2

Millstone Nuclear Power Station, Unit No. 3

Proposed Revision to Technical Specifications
TSP Baskets
Radiological Dose Calculation Assumptions and Results

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I. Offsite Doses

Figure 1 shows the assumed release pathways for the loss of coolant accident (LOCA) dose calculation. There are three release pathways analyzed: (1) containment leakage into the secondary containment which is filtered and released via the ventilation vent, (2) containment leakage that bypasses the secondary containment and is released unfiltered at the ground level, and (3) ESF leak which is filtered and released from the ventilation vent. The radiological doses are calculated separately and then added. The assumption for each pathway are provided in Tables 1, 2, and 3, respectively. Table 4 presents the assumptions associated with the iodine removal from containment atmosphere by the containment spray systems. Table 8 provides the results of the dose calculations.

II. Millstone Unit No. 3 Control Room Dose

Table 5 presents the assumptions associated with the Millstone Unit No. 3 control room dose calculations. The CRADLE code was used to calculate the doses and the Millstone Unit No. 3 control room doses are presented in Table 8. The resulting doses are within the guidelines of General Design Criterion (GDC) 19.

III. Millstone Unit No. 2 Control Room Doses

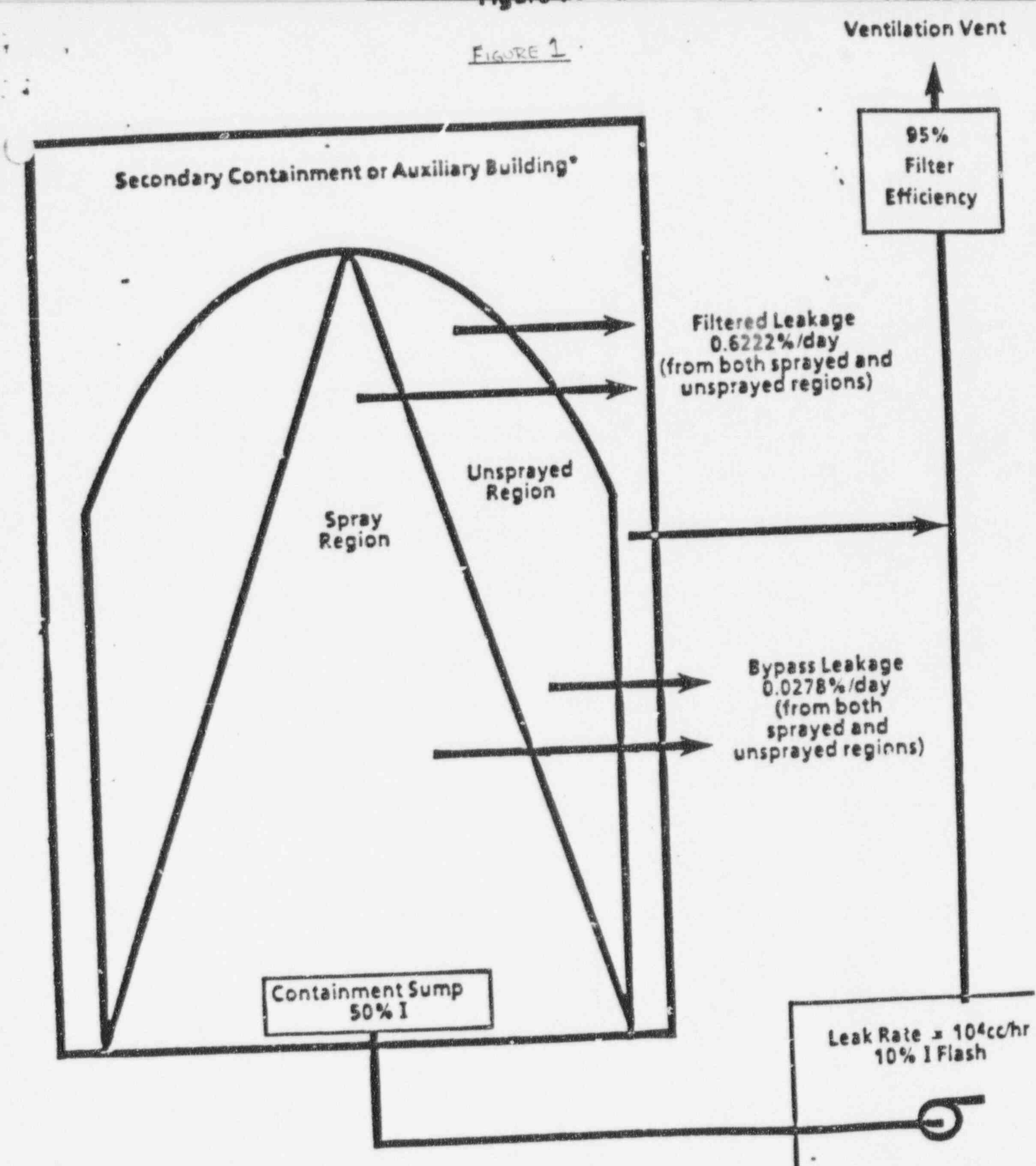
Table 6 presents the assumptions associated with the Millstone Unit No. 2 control room dose calculations from a Millstone Unit No. 3 LOCA. Using these assumptions and the CRADLE code resulted in the doses presented in Table 8. The resulting doses are within the guidelines of GDC 19.

IV. Millstone Technical Support Center

The effect of a Millstone Unit No. 3 LOCA on the dose to personnel in the Millstone Technical Support Center were also evaluated. The assumptions used for the dose calculations are presented in Table 7. Using these assumptions and the CRADLE

code resulted in the doses presented in Table 8. The resulting doses are within the guidelines of GDC 19.

FIGURE 1



* For conservatism, all leakage that is filtered is assumed to originate in the Auxiliary Building and is thus discharged via the ventilation vent. Leakage into the secondary containment would go to SLCRS and to Unit 1 stack. MP1 stack releases would result in lower doses.

TABLE 1

CONTAINMENT FILTERED LEAKAGE ASSUMPTIONS FOR DOSE DUE TO THE MILLSTONE UNIT NO. 3 LOCA

	November 4, 1993 Submittal	Current Calculations
Power Level (Mwt)	3636	3636
Core inventory	TACT code output	FSAR Table 15.0-7 S&W code output
Iodine Chemical Form Elemental Particulate Organic	 95.5% 2.5% 2.0% (SRP 6.5.2 Rev. 1)	 91% 5% 4% (SRP 6.5.2 Rev. 2)
Offsite Breathing Rate (0-8) hrs (8-24) hrs (24-720) hrs	 3.47 E-4 m^3/sec 1.75 E-4 m^3/sec 2.32 E-4 m^3/sec	 3.47 E-4 m^3/sec 1.75 E-4 m^3/sec 2.32 E-4 m^3/sec
Release Rate	0.287% Containment Volume/Day	0.6222% Containment Volume/Day
Filter Efficiency All Form of Iodine	95%	95%
Release Rate After 24 hours	0.144% Containment Volume/Day	0.311% Containment Volume/Day
Release Point	Ventilation Vent	Ventilation Vent
Containment Free Air Volume	2.32 E+6 ft^3	2.32 E+6 ft^3
Site Boundary (EAB) x/Q's (sec/m^3)	4.3 E-4	4.3 E-4
Low Population Zone (LPZ) x/Q's (sec/m^3) (0-8) hrs (8-24) hrs (24-96) hrs (96-720) hrs	 2.91 E-5 1.99 E-5 8.66 E-5 2.63 E-6	 2.91 E-5 1.99 E-5 8.66 E-6 2.63 E-6
Time for the Secondary Containment to Achieve a Negative Pressure	2 minutes (2 minutes of total unfiltered leakage assumed)	<1 min. for -0.1 in water gauge <3 min. for -0.4 in water gauge (no unfiltered leakage assumed)
Thyroid Dose Conversion Factors	R.G. 1.109	ICRP30

TABLE 2
CONTAINMENT BYPASS LEAKAGE ASSUMPTIONS FOR DOSE DUE TO THE MILLSTONE UNIT NO. 3 LOCA

	November 4, 1993 Submittal	Current Calculations
Power Level (Mwt)	3636	3636
Core Inventory	TACT Code Output	FSAR Table 15.0-7 S&W Code Output
Iodine Chemical Form Elemental Particulate Organic	 95.5% 2.5% 2% (SRP 6.5.2 Rev. 1)	 91% 5% 4% (SRP 6.5.2 Rev. 2)
Offsite Breathing Rate (0-8) hrs (8-24) hrs (24-720) hrs	 3.47 E-4 m^3/sec 1.75 E-4 m^3/sec 2.32 E-4 m^3/sec	 3.47 E-4 m^3/sec 1.75 E-4 m^3/sec 2.32 E-4 m^3/sec
Contain Leakage Rate L_a % Volume/Day	0.3%	0.65%
Bypass Leakage Rate % Volume/Day 0-24 hrs 24 hrs - 30 days	 0.01283% 0.006416%	 0.0278% 0.0139%
Release Point	Containment (Ground)	Containment (Ground)
Containment Free Volume (ft^3)	2.32 E6	2.32 E6
EAB X/Q's (sec/m^3)	5.42 E-4	5.42 E-4
LPZ X/Q's (sec/m^3) (0-8) hrs (8-24) hrs (24-96) hrs (96-720) hrs	 2.91 E-5 1.99 E-5 8.66 E-6 2.63 E-6	 2.91 E-5 1.99 E-5 8.66 E-6 2.63 E-6
Thyroid Dose Conversion Factor	R.G. 1.109	ICRP 30

TABLE 3
ESF LEAKAGE ASSUMPTIONS FOR DOSE DUE TO THE MILLSTONE UNIT NO. 3 LOCA

	November 4, 1993 Submittal	Current Calculations
Power Level (Mwt)	3636	3636
Core Inventory	TACT Code Output	FSAR Table 15.0-7 S&W Code Output
Iodine Chemical Form Elemental Particulate Organic	 95.5% 2.5% 2.0% (SRP 6.5.2 Rev. 1)	 91% 5% 4% (SRP 6.5.1 Rev. 2)
Offsite Breathing Rate (0-8) hrs (8-24) hrs (24-720)	 3.47 E-4 1.75 E-4 2.32 E-4	 3.47 E-4 1.75 E-4 2.32 E-4
Containment Sump Volume (gallons) 220 sec - 1 hr 1 hr - 2 hrs >2 hrs	 80,000 700,000 1,000,000	 80,000 700,000 1,000,000
Iodine Released from Sump Water	10%	10%
Release Point	Ventilation Vent	Ventilation Vent
OESF Leakage - Twice the Maximum Operational Leakage	10,000 cc/hr	10,000 cc/hr
ESF Leakage Begins	220 seconds	220 seconds
EAB X/Q's (sec/m^3)	4.3 E-4	4.3 E-4
LPZ X/Q's (sec/m^3) (0-8) hr (8-24) hr (24-96) hr (96-720) hr	 2.91 E-5 1.99 E-5 8.66 E-6 2.63 E-6	 2.91 E-5 1.99 E-5 8.66 E-5 2.63 E-6
Thyroid Dose Conversion Factor	R.G. 1.109	ICRP 30

Table 4
Containment Spray Assumptions FOR DOSE DUE TO THE MILLSTONE UNIT NO. 3 LOCA

	November 4, 1993 Submittal	Current Calculations
Assumed Quench Spray Initiation	0 Seconds	64 seconds
Recirculation Spray Initiation	750 Seconds	750 Seconds
Maximum Allowed DF from Spray Operation	12 Elemental	200 Elemental
Time to Achieve MAX Elemental Iodine DF	1.0 hrs	2.61 hrs
Containment Free Volume	2.32 E6 ft^3	2.32 E6 ft^3
Node 1 Sprayed Region Volume	1.206 E+06 ft^3	1.166 E+06 ft^3
Node 2 Unsprayed Region Volume	1.114 E+06 ft^3	1.154 E+06 ft^3
Mixing Rate = 2 turnovers/hr Unsprayed Region	2.227 E+06 ft^3/hr	2.308 E+06 ft^3/hr
Elemental Iodine Removal Coefficient λ spray λ plate out	28.1/hr 0.176/hr	20.0/hr 3.1/hr
Particulate Iodine Removal Coefficient λ DF <50 λ DF >50	2.16/hr 2.16/hr	12.5/hr 1.3/hr
Time to Achieve Particulate Iodine Depletion by a Factor of 50	N/A	2.07 hrs

Table 5
Millstone Unit No.3 (MP3) Control Room Parameters/Assumptions
FOR DOSE DUE TO THE MILLSTONE UNIT NO. 3 LOCA

ASSUMPTIONS FOR CURRENT CALCULATIONS*	
(1)	Control room (CR) damper closure time = 3 sec.
(2)	Control room is pressurized from bottled air instantaneously 1 minute following control building isolation signal and bottle lasts 1 hour.
(3)	Control room intake prior to pressurization (<1 min) = 125 cfm
(4)	Minimum distance between CR intake and containment = 72 meters
(5)	Minimum distance between CR intake and ventilation vent = 38 meters
(6)	Wind velocity used in MP3 containment X/Q analysis = 1.9 m/sec
(7)	Wind velocity used in MP3 ventilation vent X/Q analysis = 1.7 m/sec
(8)	Time for plume radiation to reach intake from containment = 1.053E-2 hr
(9)	Time for plume radiation to reach intake from ventilation vent = 6.194E-3 hr
(10)	Unfiltered inleakage after 1.01667 hr when bottled air is exhausted and filtered intake begins = 10 cfm
(11)	Control room emergency ventilation rate after 1 hr: Filtered intake = 250 cfm Filtered recir = 750 cfm
(12)	Control room iodine cleanup rate = 0.1796/hr
(13)	Control room filter efficiency = 95% for all forms of iodine
(14)	Elemental iodine removal rate in containment (.01778 - 2.61) hr = 2.038/hr
(15)	Control Room Volume = 2.38E5 ft^3
(16)	Control Room X/Q's (sec / m^3)":

	Containment	Vent
(0-8) hr	8.08E-4	2.24E-3
(8-24) hr	5.49E-4	1.40E-3
(24-96) hr	1.95E-4	5.08E-4
(96-720) hr	2.75E-5	9.68E-5

Table 5
Millstone Unit No. 3 (MP3) Control Room Parameters/Assumptions
FOR DOSE DUE TO THE MILLSTONE UNIT NO. 3 LOCA

ASSUMPTIONS FOR CURRENT CALCULATIONS*
(17) Particulate iodine removal rate in containment (.0118-2.07) hr = 1.90/hr (2.08 - 8) hr = 0.534/hr
(18) Bypass release rate = 1.158E-5/hr
(19) Filtered release rate = 2.593E-4/hr
(20) Bypass release rate after 1 hr is one half = 5.792E-6/hr
(21) Filtered release rate after 1 hr is one half = 1.296E-4/hr
(22) Core Inventory from FSAR 15.0-7
(23) Thyroid Dose Conversion Factors from ICRP 30

*The Control Rooms and Technical Support Center dose calculations were not performed in 1993 since the EAB/LPZ doses proved that the releases were less than the February 26, 1990 submittal.

Table 6

Millstone Unit No. 2 (MP2) Control Room Parameters/Assumptions
FOR DOSE DUE TO THE MILLSTONE UNIT NO. 3 LOCA

ASSUMPTIONS FOR CURRENT CALCULATIONS*	
(1)	Control Room Volume = 6.6E4 ft^3
(2)	Maximum outside supply fan flow rate prior to isolation = 800 cfm
(3)	Recirculation flow rate through charcoal filters = 2500 cfm
(4)	Time at which recirculation starts through filters = 10 min
(5)	Unfiltered inleakage rate = 130 cfm
(6)	Filter efficiency = 90% (all forms of iodine)
(7)	Time for Control Room to isolate = 23.1 sec (18.1 sec for monitor response and signal plus 5 seconds for damper to close)

*The Control Rooms and Technical Specification Support Center dose calculations were not performed in 1993 since the EAB/LPZ doses proved that the releases were less than the February 26, 1990 submittal.

Table 7
Millstone Technical Support Center (TSC) Parameters/Assumptions
FOR DOSE DUE TO THE MILLSTONE UNIT NO. 3 LOCA

ASSUMPTIONS FOR CURRENT CALCULATION*
(1) TSC damper closure time/isolation = 3.7 sec
(2) TSC is isolated for the first 30 minutes
(3) Wind velocity used in MP3 containment X/Q analysis = 1.9 m/sec
(4) Wind velocity used in MP3 ventilation vent X/Q analysis = 1.9 m/sec
(5) Time for plume radiation to reach intake from containment = 1.05E-2 hr
(6) Time for plume radiation to reach intake from ventilation vent = 5.555E-3 hr
(7) TSC unfiltered intake prior to isolation = 100 cfm
(8) TSC unfiltered inleakage during the first 30 minutes = 50 cfm
(9) No inleakage after pressurized at 30 minutes
(10) TSC emergency ventilation rate: (0-30) minutes: Filtered intake = 0 cfm Filtered recir = 2000 cfm (> 30) minutes: Filtered intake = 100 cfm Filtered recir = 1900 cfm
(11) TSC iodine cleanup rate: (0-30) minutes: = 3.434/hr (> 30) minutes: = 3.262/hr
(12) TSC filter efficiency = 95% for all forms of iodine
(13) Elemental iodine removal rate in containment (.01788 - 2.61) hr = 2.038 hr
(14) TSC Volume = 3.32E4 ft^3
(15) Occupancy Factors: (0-8) hr = 1.0 (8-24) hr = 0.5 (24-96) hr = 0.6 (96-720) hr = 0.4

Table 7
Millstone Technical Support Center (TSC) Parameters/Assumptions
FOR DOSE DUE TO THE MILLSTONE UNIT NO. 3 LOCA

ASSUMPTIONS FOR CURRENT CALCULATION*
(16) TSC X/Qs (sec / m^3): Time period / Containment / Vent (0-8) hr / 8.08E-4 / 2.00E-3 (8-24) hr / 2.69E-4 / 6.65E-4 (24-96) hr / 1.92E-4 / 4.75E-4 (96-720) hr / 3.01E-5 / 7.45E-5
(17) Particulate iodine removal rate in containment (.01778-2.07) hr = 1.90/hr (2.07 - 8) hr = 0.534/hr
(18) Bypass release rate = 1.158E-5/hr
(19) Filter release rate = 2.593E-4/hr
(20) Bypass release rate after 1 hr is one half = 5.792E-6/hr
(21) Filtered release rate after 1 hr is one half = 1.296E-4/hr
(22) Core Inventory from FSAR 15.0-7
(23) Thyroid Dose Conversion Factors from ICRP 30

*The Control Rooms and Technical Specification Support Center dose calculations were not performed in 1993 since the EAB/LPZ doses proved that the releases were less than the February 26, 1990 submittal.

Table 8
Dose Calculation Results

TYPE OF DOSE	LIMIT	FEB. 26,1990 SUBMITTAL	NOV. 4, 1993* SUBMITTAL	CURRENT
EAB - Thyroid EB - Whole Body	300 REM 25 REM	150 REM 19.5 REM	141 REM 9.4 REM	61 REM 16.7 REM
LPZ - Thyroid LPZ - Whole Body	300 REM 25 REM	31.6 REM 3.5 REM	29.8 REM 1.7 REM	10.9 REM 2.8 REM
MP3 Control Room - Thyroid MP3 Control Room - Whole Body MP3 Control Room - Skin	30 REM 5 REM 30 REM	26 REM 3.05 REM 24.5 REM	- - -	7.9 REM 4.1 REM 25.5 REM
MP2 Control Room - Thyroid MP2 Control Room - Whole Body MP2 Control Room - Skin	30 REM 5 REM 30 REM	18.4 REM 0.5 REM 8.3 REM	- - -	10.3 REM 2.4** REM 8.2 REM
Tech Support Center - Thyroid Tech Support Center - Whole Body Tech Support Center - Skin	30 REM 5 REM 30 REM	7.4 REM 1.4 REM 24.9 REM	- - -	3.3 REM 2.3 REM 29.90 REM

*The Control Room and Technical Support Center dose calculations were not performed in 1993 since the EAB/LPZ doses proved that the releases were less than the February 26, 1990 submittal.

**The previous calculations did not include shine dose from sources outside control room. For comparison purposes, the dose from airborne activity inside the control room is 0.5 REM, which is the same as the 1990 submittal.

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Attachment 3

Millstone Nuclear Power Station, Unit No. 3

Proposed Revision to Technical Specifications
Trisodium Phosphate Baskets in Containment

Marked Up Pages

January 1995

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

BASES

SECTION PAGE

NEW

3/4.5.5 pH TRISODIUM PHOSPHATE STORAGE BASKETS

LIMITING CONDITION FOR OPERATION

3.5.5 The trisodium phosphate (TSP) dodecahydrate Storage Baskets shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4

ACTION:

With the TSP Storage Baskets inoperable, restore the system TSP Storage Baskets to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN the following 6 hours.

SURVEILLANCE REQUIREMENTS

4.5.5 The TSP Storage Baskets shall be demonstrated OPERABLE at least once each REFUELING INTERVAL by verifying that a minimum total of 974 cubic feet of TSP is contained in the TSP Storage Baskets.

CONTAINMENT SYSTEMS

SPRAY ADDITIVE SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.2.3 The Spray Additive System shall be OPERABLE with:

a. A chemical addition tank containing a volume of between 17,760 and 18,760 gallons of between 3.4 and 4.1% by weight NaOH solution, and

b. Two gravity feed paths each capable of adding NaOH solution from the chemical addition tank to each Containment Quench Spray subsystem pump suction.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With the Spray Additive System inoperable, restore the system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore the Spray Additive System to OPERABLE status within the next 48 hours or be in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.2.3 The Spray Additive System shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position;

b. At least once per 6 months by:

1) Verifying the contained solution volume in the tank, and

2) Verifying the concentration of the NaOH solution by chemical analysis is within the above limits.

c. At least once per 18 months, during shutdown, by verifying that each automatic valve in the flow path actuates to its correct position on a CDA test signal.

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BACKGROUND

Trisodium phosphate (TSP) dodecahydrate is stored in porous wire mesh baskets on the floor or in the sump of the containment building to ensure that iodine, which may be dissolved in the recirculated reactor cooling water following a loss of coolant accident (LOCA), remains in solution. TSP also helps inhibit stress corrosion cracking (SCC) of austenitic stainless steel components in containment during the recirculation phase following an accident.

Fuel that is damaged during a LOCA will release iodine in several chemical forms to the reactor coolant and to the containment atmosphere. A portion of the iodine in the containment atmosphere is washed to the sump by containment sprays (i.e., Quench Spray and/or Containment Recirculation Spray). The emergency core cooling water is borated for reactivity control. This borated water causes the sump solution to be acidic. In a low pH (acidic) solution, dissolved iodine will be converted to a volatile form. The volatile iodine will evolve out of solution into the containment atmosphere, significantly increasing the levels of airborne iodine. The increased levels of airborne iodine in containment contribute to the radiological releases and increase the consequences from the accident due to containment atmosphere leakage.

After a LOCA, the components of the core cooling and containment spray systems will be exposed to high temperature borated water. Prolonged exposure to the core cooling water combined with stresses imposed on the components can cause SCC. The SCC is a function of stress, oxygen and chloride concentrations, pH, temperature, and alloy composition of the components. High temperatures and low pH, which would be present after a LOCA, tend to promote SCC. This can lead to the failure of necessary safety systems or components.

Adjusting the pH of the recirculation solution to levels above 7.0 prevents a significant fraction of the dissolved iodine from converting to a volatile form. The higher pH thus decreases the level of airborne iodine in containment and reduces the radiological consequences from containment atmosphere leakage following a LOCA. Maintaining the solution pH $\geq$ 7.0 also reduces the occurrence of SCC of austenitic stainless steel components in containment. Reducing SCC reduces the probability of failure of components.

Granular TSP dodecahydrate is employed as a passive form of pH control for post LOCA containment spray and core cooling water. Baskets of TSP are placed on the floor or in the sump of the containment building to dissolve

NEW

BACKGROUND (continued)

from released reactor coolant water and containment sprays after a LOCA. Recirculation of the water for core cooling and containment sprays then provides mixing to achieve a uniform solution pH. The dodecahydrate form of TSP is used because of the high humidity in the containment building during normal operation. Since the TSP is hydrated, it is less likely to absorb large amounts of water from the humid atmosphere and will undergo less physical and chemical change than the anhydrous form of TSP.

APPLICABLE SAFETY ANALYSES

The LOCA radiological consequences analysis takes credit for iodine retention in the sump solution based on the recirculation water pH being ≥ 7.0. The radionuclide releases from the containment atmosphere and the consequences of a LOCA would be increased if the pH of the recirculation water were not adjusted to 7.0 or above.

LIMITING CONDITION FOR OPERATION

The TSP is required to adjust the pH of the recirculation water to ≥ 7.0 after a LOCA. A pH ≥ 7.0 after a LOCA is necessary to prevent significant amounts of iodine released from fuel failures and dissolved in the recirculation water from converting to a volatile form and evolving into the containment atmosphere. Higher levels of airborne iodine in containment may increase the release of radionuclides and the consequences of the accident. A pH ≥ 7.0 is also necessary to prevent SCC of austenitic stainless steel components in containment. SCC increases the probability of failure of components.

The required amount of TSP is based upon the extreme cases of water volume and pH possible in the containment sump after a large break LOCA. The minimum required volume is the volume of TSP that will achieve a sump solution pH of ≥ 7.0 when taking into consideration the maximum possible sump water volume and the minimum possible pH. The amount of TSP needed in the containment building is based on the mass of TSP required to achieve the desired pH. However, a required volume is specified, rather than mass, since it is not feasible to weigh the entire amount of TSP in containment. The minimum required volume is based on the manufactured density of TSP dodecahydrate. Since TSP can have a tendency to agglomerate from high humidity in the containment building, the density may increase and the volume decrease during normal plant operation. Due to possible agglomeration and increase in density, estimating the minimum volume of TSP in containment is conservative with respect to achieving a minimum required pH.

NEW

APPLICABILITY

In MODES 1, 2, 3, and 4, a design basis accident (DBA) could lead to a fission product release to containment that leaks to the secondary containment boundary. The large break LOCA, on which this system's design is based, is a full-power event. Less severe LOCAs and leakage still require the system to be OPERABLE throughout these MODES. The probability and severity of a LOCA decrease as core power and reactor coolant system pressure decrease. With the reactor shut down, the probability of release of radioactivity resulting from such an accident is low.

In MODES 5 and 6, the probability and consequence of a DBA are low due to the pressure and temperature limitations in these MODES. Under these conditions, the SLCRS is not required to be OPERABLE.

ACTIONS

If it is discovered that the TSP in the containment building sump is not within limits, action must be taken to restore the TSP to within limits. During plant operation, the containment sump is not accessible and corrections may not be possible.

The 7-day Completion Time is based on the low probability of a DBA occurring during this period. The Completion Time is adequate to restore the volume of TSP to within the technical specification limits.

If the TSP cannot be restored within limits within the 7-day Completion Time, the plant must be brought to a MODE in which the LCO does not apply. The specified Completion Times for reaching MODES 3 and 4 are those used throughout the technical specifications; they were chosen to allow reaching the specified conditions from full power in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

Surveillance Requirement 4.5.5

Periodic determination of the volume of TSP in containment must be performed due to the possibility of leaking valves and components in the containment building that could cause dissolution of the TSP during normal operation. A Frequency of once each REFUELING INTERVAL is required to determine visually that a minimum of 974cubic feet is contained in the TSP Storage Baskets. This requirement ensures that there is an adequate volume of TSP to adjust the pH of the post LOCA sump solution to a value ≥ 7.0.

The periodic verification is required every refueling outage, since access to the TSP baskets is only feasible during outages. Operating experience has shown this Surveillance Frequency acceptable due to the margin in the volume of TSP placed in the containment building.

3/4.6.1.6 CONTAINMENT STRUCTURAL INTEGRITY

This limitation ensures that the structural integrity of the containment will be maintained comparable to the original design standards for the life of the facility. Structural integrity is required to ensure that the containment will withstand the maximum pressure of 60 psia in the event of a LOCA. A visual inspection in conjunction with the Type A leakage tests is sufficient to demonstrate this capability.

3/4.6.1.7 CONTAINMENT VENTILATION SYSTEM

The 42-inch containment purge supply and exhaust isolation valves are required to be locked closed during plant operation since these valves have not been demonstrated capable of closing during a LOCA or steam line break accident. Maintaining these valves closed during plant operations ensures that excessive quantities of radioactive materials will not be released via the Containment Purge System. To provide assurance that these containment valves cannot be inadvertently opened, the valves are locked closed in accordance with Standard Review Plan 6.2.4 which includes mechanical devices to seal or lock the valve closed, or prevents power from being supplied to the valve operator.

The Type C testing frequency required by 4.6.1.2d is acceptable, provided that the resilient seats of these valves are replaced every other refueling outage.

3/4.6.2 DEPRESSURIZATION AND COOLING SYSTEMS

3/4.6.2.1 and 3/4.6.2.2 CONTAINMENT QUENCH SPRAY SYSTEM and RECIRCULATION SPRAY SYSTEM

The OPERABILITY of the Containment Spray Systems ensures that containment depressurization and iodine removal will occur in the event of a LOCA. The pressure reduction, iodine removal capabilities and resultant containment leakage are consistent with the assumptions used in the safety analyses.

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3/4.6.2.3 SPRAY ADDITIVE SYSTEM

The OPERABILITY of the Spray Additive System ensures that sufficient NaOH is added to the containment spray in the event of a LOCA. The limits on NaOH volume and concentration ensure a pH value of between 7.0 and 7.35 for the solution recirculated within containment after a LOCA. This pH band minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components. The contained water volume limit includes an allowance for water not usable because of tank discharge line location or other physical characteristics.

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Attachment 4

Millstone Nuclear Power Station, Unit No. 3

Proposed Revision to Technical Specifications
Trisodium Phosphate Baskets in Containment

Retyped Pages

January 1995

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

BASES

3/4.5.5 pH TRISODIUM PHOSPHATE STORAGE BASKETS

LIMITING CONDITION FOR OPERATION

3.5.5 The trisodium phosphate (TSP) dodecahydrate Storage Baskets shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4

ACTION:

With the TSP Storage Baskets inoperable, restore the system TSP Storage Baskets to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN the following 6 hours.

SURVEILLANCE REQUIREMENTS

4.5.5 The TSP Storage Baskets shall be demonstrated OPERABLE at least once each REFUELING INTERVAL by verifying that a minimum total of 974 cubic feet of TSP is contained in the TSP Storage Baskets.

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3/4.5.5 TRISODIUM PHOSPHATE STORAGE BASKETS

BASES

BACKGROUND

Trisodium phosphate (TSP) dodecahydrate is stored in porous wire mesh baskets on the floor or in the sump of the containment building to ensure that iodine, which may be dissolved in the recirculated reactor cooling water following a loss of coolant accident (LOCA), remains in solution. TSP also helps inhibit stress corrosion cracking (SCC) of austenitic stainless steel components in containment during the recirculation phase following an accident.

Fuel that is damaged during a LOCA will release iodine in several chemical forms to the reactor coolant and to the containment atmosphere. A portion of the iodine in the containment atmosphere is washed to the sump by containment sprays (i.e., Quench Spray and/or Containment Recirculation Spray). The emergency core cooling water is borated for reactivity control. This borated water causes the sump solution to be acidic. In a low pH (acidic) solution, dissolved iodine will be converted to a volatile form. The volatile iodine will evolve out of solution into the containment atmosphere, significantly increasing the levels of airborne iodine. The increased levels of airborne iodine in containment contribute to the radiological releases and increase the consequences from the accident due to containment atmosphere leakage.

After a LOCA, the components of the core cooling and containment spray systems will be exposed to high temperature borated water. Prolonged exposure to the core cooling water combined with stresses imposed on the components can cause SCC. The SCC is a function of stress, oxygen and chloride concentrations, pH, temperature, and alloy composition of the components. High temperatures and low pH, which would be present after a LOCA, tend to promote SCC. This can lead to the failure of necessary safety systems or components.

Adjusting the pH of the recirculation solution to levels above 7.0 prevents a significant fraction of the dissolved iodine from converting to a volatile form. The higher pH thus decreases the level of airborne iodine in containment and reduces the radiological consequences from containment atmosphere leakage following a LOCA. Maintaining the solution pH ≥ 7.0 also reduces the occurrence of SCC of austenitic stainless steel components in containment. Reducing SCC reduces the probability of failure of components.

Granular TSP dodecahydrate is employed as a passive form of pH control for post LOCA containment spray and core cooling water. Baskets of TSP are placed on the floor or in the sump of the containment building to dissolve

BACKGROUND (continued)

from released reactor coolant water and containment sprays after a LOCA. Recirculation of the water for core cooling and containment sprays then provides mixing to achieve a uniform solution pH. The dodecahydrate form of TSP is used because of the high humidity in the containment building during normal operation. Since the TSP is hydrated, it is less likely to absorb large amounts of water from the humid atmosphere and will undergo less physical and chemical change than the anhydrous form of TSP.

APPLICABLE SAFETY ANALYSES

The LOCA radiological consequences analysis takes credit for iodine retention in the sump solution based on the recirculation water pH being ≥ 7.0. The radionuclide releases from the containment atmosphere and the consequences of a LOCA would be increased if the pH of the recirculation water were not adjusted to 7.0 or above.

LIMITING CONDITION FOR OPERATION

The TSP is required to adjust the pH of the recirculation water to ≥ 7.0 after a LOCA. A pH ≥ 7.0 after a LOCA is necessary to prevent significant amounts of iodine released from fuel failures and dissolved in the recirculation water from converting to a volatile form and evolving into the containment atmosphere. Higher levels of airborne iodine in containment may increase the release of radionuclides and the consequences of the accident. A pH ≥ 7.0 is also necessary to prevent SCC of austenitic stainless steel components in containment. SCC increases the probability of failure of components.

The required amount of TSP is based upon the extreme cases of water volume and pH possible in the containment sump after a large break LOCA. The minimum required volume is the volume of TSP that will achieve a sump solution pH of ≥ 7.0 when taking into consideration the maximum possible sump water volume and the minimum possible pH. The amount of TSP needed in the containment building is based on the mass of TSP required to achieve the desired pH. However, a required volume is specified, rather than mass, since it is not feasible to weigh the entire amount of TSP in containment. The minimum required volume is based on the manufactured density of TSP dodecahydrate. Since TSP can have a tendency to agglomerate from high humidity in the containment building, the density may increase and the volume decrease during normal plant operation. Due to possible agglomeration and increase in density, estimating the minimum volume of TSP in containment is conservative with respect to achieving a minimum required pH.

APPLICABILITY

In MODES 1, 2, 3, and 4, a design basis accident (DBA) could lead to a fission product release to containment that leaks to the secondary containment boundary. The large break LOCA, on which this system's design is based, is a full-power event. Less severe LOCAs and leakage still require the system to be OPERABLE throughout these MODES. The probability and severity of a LOCA decrease as core power and reactor coolant system pressure decrease. With the reactor shut down, the probability of release of radioactivity resulting from such an accident is low.

In MODES 5 and 6, the probability and consequence of a DBA are low d to the pressure and temperature limitations in these MODES. Under these conditions, the SLCRS is not required to be OPERABLE.

ACTIONS

If it is discovered that the TSP in the containment building sump is not within limits, action must be taken to restore the TSP to within limits. During plant operation, the containment sump is not accessible and corrections may not be possible.

The 7-day Completion Time is based on the low probability of a DBA occurring during this period. The Completion Time is adequate to restore the volume of TSP to within the technical specification limits.

If the TSP cannot be restored within limits within the 7-day Completion Time, the plant must be brought to a MODE in which the LCO does not apply. The specified Completion Times for reaching MODES 3 and 4 are those used throughout the technical specifications; they were chosen to allow reaching the specified conditions from full power in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

Surveillance Requirement 4.5.5

Periodic determination of the volume of TSP in containment must be performed due to the possibility of leaking valves and components in the containment building that could cause dissolution of the TSP during normal operation. A Frequency of once each REFUELING INTERVAL is required to determine visually that a minimum of 974cubic feet is contained in the TSP Storage Baskets. This requirement ensures that there is an adequate volume of TSP to adjust the pH of the post LOCA sump solution to a value ≥ 7.0.

The periodic verification is required every refueling outage, since access to the TSP baskets is only feasible during outages. Operating experience has shown this Surveillance Frequency acceptable due to the margin in the volume of TSP placed in the containment building.

3/4.6.1.6 CONTAINMENT STRUCTURAL INTEGRITY

This limitation ensures that the structural integrity of the containment will be maintained comparable to the original design standards for the life of the facility. Structural integrity is required to ensure that the containment will withstand the maximum pressure of 60 psia in the event of a LOCA. A visual inspection in conjunction with the Type A leakage tests is sufficient to demonstrate this capability.

3/4.6.1.7 CONTAINMENT VENTILATION SYSTEM

The 42-inch containment purge supply and exhaust isolation valves are required to be locked closed during plant operation since these valves have not been demonstrated capable of closing during a LOCA or steam line break accident. Maintaining these valves closed during plant operations ensures that excessive quantities of radioactive materials will not be released via the Containment Purge System. To provide assurance that these containment valves cannot be inadvertently opened, the valves are locked closed in accordance with Standard Review Plan 6.2.4 which includes mechanical devices to seal or lock the valve closed, or prevents power from being supplied to the valve operator.

The Type C testing frequency required by 4.6.1.2d is acceptable, provided that the resilient seats of these valves are replaced every other refueling outage.

3/4.6.2 DEPRESSURIZATION AND COOLING SYSTEMS

3/4.6.2.1 and 3/4.6.2.2 CONTAINMENT QUENCH SPRAY SYSTEM and RECIRCULATION SPRAY SYSTEM

The OPERABILITY of the Containment Spray Systems ensures that containment depressurization and iodine removal will occur in the event of a LOCA. The pressure reduction, iodine removal capabilities and resultant containment leakage are consistent with the assumptions used in the safety analyses.

Docket No. 50-423
B15077

Attachment 1

Millstone Nuclear Power Station, Unit No. 3

Description of the Proposed Technical Specifications
Safety Assessment and Significant Hazards
Consideration Discussion

January 1995

Millstone Nuclear Power Station, Unit No. 3
Description of the Proposed Technical Specifications
Safety Assessment and Significant Hazards
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I. Description of the Proposed Technical Specification Changes

Millstone Unit No. 3 over the past operating cycles has experienced operational problems with the chemical addition tank (CAT). Due to leaking isolation valves, the solution in the CAT can be diluted by inleakage from the refueling water storage tank (RWST) or the RWST can become contaminated with NaOH. This results in costly neutralization and treatment of contaminated water. Additionally, the original recirculation pump lacks sufficient head and has been temporarily supplemented by an in-line booster pump. The proposed design will eliminate the existing system and will install trisodium phosphate (TSP) baskets in the containment which will maintain water pH in the containment sump above 7.0 post-LOCA conditions. As such, a new technical specification is required and is being proposed for the TSP baskets. Northeast Nuclear Energy Company (NNECO) proposes to revise the Millstone Unit No. 3 Technical Specifications as follows:

1. New Section 3/4.5.5, Trisodium Phosphate Storage Baskets

   The proposed (new) specification for the TSP storage baskets provides a limiting condition for operation (LCO) and action statements and surveillance requirements. This proposed specification is based on the new improved standard technical specifications (STS) for the Combustion Engineering (CE) plants (NUREG-1432). Generally, CE plants have the TSP baskets for the long-term pH control of the containment sump water (i.e., post-DBA). This specification is similar to the Haddam Neck Plant and Millstone Unit No. 2 technical specifications. The Bases for the specifications is prepared based on the new improved STS for the CE plants (NUREG-1432).

2. Section 3.6.2.3, Spray Additive System

   Since the spray additive system will not be utilized once the TSP baskets become operational, the Technical Specification Section 3.6.2.3 and corresponding Bases section are being deleted.

3. Index Pages viii, ix, and xiv are revised to reflect the above changes.

II. Safety Assessment

The following changes to the technical specifications are being proposed:

Technical Specification Sections 3/4.5.5 are being added to provide a limiting condition for operation (LCO), an action statement, and surveillance requirements for the TSP baskets which will be installed inside containment during the fifth refueling outage. Also, a Bases section is being added for the TSP baskets. The 12 TSP baskets being installed on the containment floor will provide a passive method of neutralizing sump pH following a DBA LOCA and allow for the abandonment CAT.

Sections 3/4.6.2.3 and Bases 3/4.6.2.3 relating to the spray additive system are being deleted. These sections will not be applicable since the CAT is being abandoned.

Index Pages viii, ix, and xiv are being revised to reflect the above changes.

The installation of 12 TSP baskets on the containment floor will provide a passive method to assure that the containment sump water pH will be $\geq$ 7.1 following a LOCA while still assuring adequate retainment of fission product (iodine) in the containment sump. The design pH value of 7.1 was selected to provide margin, compensating for uncertainties, to assure that a final sump pH $\geq$ 7.0 is achieved (as required by SRP 6.5.2, Rev. 2). Westinghouse has also recommended the use of TSP baskets as a method to adjust the sump pH within acceptable limits following a LOCA.

The current system mixes the boric acid solution (from the RWST) with sodium hydroxide solution (from the CAT) to produce a neutralized solution for the containment quench spray system

(QSS). This system has experienced some operational problems in the past including: migration of RWST water into the CAT, contamination of RWST water by sodium hydroxide (from the CAT), and packing leaks in associated valves and pumps due to the harshness of the sodium hydroxide solution.

The installation of the TSP baskets and the abandonment of the CAT provides a passive means of attaining an ultimate sump pH of about 7.1 following a LOCA. A result of this change is that the pH of QSS flow will be acidic (pH = 4.4). This limit for acidity is based on an assumed maximum boric acid concentration of 2900 ppm. Immediately following the initiation of recirculation spray system (RSS), the RSS flow will reach a maximum pH of about 11.0. This will decrease while QSS flow progresses until about 3 hours after the initiation of the LOCA when the final pH of RSS flow will reach the design pH value of $\geq$ 7.1.

NNECO has evaluated potential malfunctions of the TSP powder and the baskets which hold the TSP powder. It is expected that the TSP will perform its safety function for the following reasons:

- The TSP powder was determined to be chemically stable and its neutralization capabilities will not change over time.

- A sufficient volume of TSP powder is assured through periodic surveillance.

- The TSP was determined to be sufficiently soluble even if it is caked or hardened. For this same reason, clogging of the wire mesh in the baskets is not a concern.

- Deformation and movement of the baskets due to a seismic event will not prevent the TSP from dissolving and performing its function.

- The potential movement of the basket due to a seismic event will not adversely affect other plant equipment such as the containment sump protective screen assembly.

It has also been determined that the transient pH behavior does not adversely affect metals, coatings, and elastomers in the containment, and the performance of associated safety

functions is not affected. There is no impact on the environmental qualification of electrical equipment inside containment.

Additionally, the change in the chemical composition of the QSS solution will not affect the operability of this system or its ability for containment heat removal and pressure mitigation. Spray droplet size nd temperature are not affected by the design changes and, therefore, the effectiveness of the QSS is not impacted.

In summary, it is concluded that the installation of TSP baskets in the containment sump and the abandonment of the CAT is safe. The changes do not adversely affect any equipment credited in the safety analysis. Also, the changes do not increase the calculated peak clad temperature (PCT) or the offsite doses due to the design basis LOCA. Therefore, there is no impact on the margin of safety as specified in the technical specifications.

III. Significant Hazards Consideration Determination

In accordance with 10CFR50.92, NNECO has reviewed the proposed changes and has concluded that they do not involve a significant hazards consideration (SHC). The basis for this conclusion is that the three criteria of 10CFR50.92 are not compromised. The proposed changes do not involve an SHC because the changes would not:

1. Involve a Significant Increase in the Probability or Consequences of an Accident Previously Evaluated.

   The plant change affects the chemical composition of the QSS flow and the method of sump pH control, which are important for containment heat removal/pressure mitigation (MSLB and LOCA) and fission product removal (LOCA). However, this change does not affect the probability of occurrence of these accidents. Since the TSP baskets are passive devices located inside the containment, they cannot initiate a transient or affect the probability of occurrence of any previously evaluated accident.

   The design change will not adversely affect the radiological doses for the DBA LOCA at the Exclusion Area Boundary, Low Population Zone, Millstone Unit No.3

Control Room, Millstone Unit No 2 Control Room, and the Millstone Technical Support Center. Also, the change will not adversely affect the calculated peak clad temperature (PCT) for the DBA LOCA.

2. Create the Possibility of a New or Different Kind of Accident from any Previously Analyzed.

   The change does not create a malfunction that is different from those previously evaluated. The TSP baskets are passive devices that have minimal impact on any other systems except through water chemistry. The change in water chemistry does not adversely affect any safety systems. The installation of the TSP baskets and the abandonment of the CAT will not change the probability of a malfunction of safety-related equipment.

   Potential malfunctions relating to the TSP powder, the 12 baskets which hold the TSP powder, the QSS and other systems, and equipment credited in the safety analysis were evaluated and determined not to be adversely affected by the change. Additionally, the transient pH behavior of the spray flow will not adversely affect metals, coatings and elastomers in the containment, and the performance of associated safety functions is not affected.

   Finally, the change in the chemical composition of the QSS solution will not affect the operability of this system or its ability for containment heat removal and pressure mitigation.

3. Involve a Significant Reduction in the Margin of Safety.

   The design changes do not adversely affect the ability of the QSS to perform the function of containment heat removal, pressure mitigation and fission product (iodine) retention. The design changes do not adversely affect any equipment credited in the safety analysis. Also, the design changes to not increase the calculated peak clad temperature (PCT) or the offsite doses due to the design basis LOCA. Therefore, there is no impact on the margin of safety as specified in the technical specifications.