Docket No. 50-423
B16727

Attachment 2

Millstone Nuclear Power Station Unit No. 3
Proposed Revision to Technical Specification
Reactivity Control for Spent Fuel Pool and Refueling Operations
(PTSCR 3-33-97)
Marked Up Pages

November 1997

MARKUP OF PROPOSED REVISION

Refer to the attached markup of the proposed revision to the Technical Specifications. The attached markup reflects the currently issued version of the Technical Specifications listed below. Pending Technical Specification revisions or Technical Specification revisions issued subsequent to this submittal are not reflected in the enclosed markup.

The following Technical Specification changes are included in the attached markup.

- Revision of the Technical Specification to require Spent Fuel Pool (SFP) boron concentration be maintained at greater than or equal to 1750 ppm:

  3.9.1.2 LCO

- Revision of the Technical Specification to reflect that it is applicable whenever fuel assemblies are in the SFP:

  3.9.1.2 Applicability

- Incorporation of action requirements to restore boron concentration to greater than or equal to 1750 ppm within 72 hours and to suspend movement of all fuel assemblies within the SFP and loads over the spent fuel racks

  3.9.1.2 Action

- Revise the Surveillance requirement to verify every 72 hours that the boron concentration is greater than or equal to 1750 ppm in the SFP

  4.9.1.2 Surveillance Requirements

- Add Surveillance requirements to verify the reactivity condition within the SFP following the occurrence of an Operating Basis Earthquake (OBE) or greater, or drop of a load on the Spent Fuel racks, with fuel in the fuel rack location.

  4.9.13 Surveillance Requirements

- Added steps within the Action Statement to:

  1. Require that action be initiated to correct the cause of a misplaced or dropped fuel assembly; and;

  2. Identify additional actions required following drop of a load on the racks and;

  3. Identify additional actions required following the occurrence of a seismic event of OBE magnitude or greater

  3.9.13 Action

- Format changes to pages for consistency.

- Corresponding Bases changes to Sections:

  3/4.9.1.2

  3/4 9.13

3-33-97

REFUELING OPERATIONS

BORON CONCENTRATION

Limiting Condition for Operation

3.9.1.2 The boron concentration of the Spent Fuel Pool shall be maintained uniform and sufficient to ensure that the boron concentration is greater than or equal to ~~800~~ 1750 ppm.

Applicability

~~During all fuel assembly movements within~~ Whenever fuel assemblies are in the spent fuel pool.

Action

~~With the boron concentration less than 800 ppm, suspend the movement of all fuel assemblies within the spent fuel pool.~~ INSERT A

Surveillance Requirements

4.9.1.2 ~~Verify that the boron concentration is greater than or equal to 800 ppm prior to any movement of a fuel assembly into or within the spent fuel pool, and every 72 hours thereafter during fuel movement.~~ INSERT B

INSERT A

a With the boron concentration less than 1750 ppm initiate action to bring the boron concentration in the fuel pool to at least 1750 ppm within 72 hours, and

b With the boron concentration less than 1750 ppm, suspend the movement of all fuel assemblies within the spent fuel pool and loads over the spent fuel racks

INSERT B

4.9.1.2.1 Verify that the boron concentration in the fuel pool is greater than or equal to 1750 ppm every 72 hours.

REFUELING OPERATIONS

SPENT FUEL POOL - REACTIVITY

3.9.13 The Reactivity Condition of the Spent Fuel Pool shall be such that k_{eff} is less than or equal to 0.95 at all times.

INSERT C

APPLICABILITY: Whenever fuel assemblies are in the spent fuel pool.

ACTION: ~~With the requirements of the above specification not satisfied:~~

~~a. Borate until $k_{eff} \leq .95$ is reached, and~~

~~b. Perform surveillance 4.9.1.2 until the misplaced/dropped fuel assembly causing $k_{eff} > .95$ is corrected.~~

SURVEILLANCE REQUIREMENTS

~~4.9.13~~ 4.9.13.1 Ensure that all fuel assemblies to be placed in Region II of the spent fuel pool are within the enrichment and burn-up limits of Figure 3.9-1 by checking the fuel assembly's design and burn-up documentation.

INSERT D

INSERT C

With k eff greater than 0.95:

a. Borate the Spent Fuel Pool until k eff is less than or equal to 0.95,and

b. Initiate action to correct the cause of the misplaced / dropped fuel assembly, if required, and

c. Following the drop of a load on the fuel racks, with fuel in the fuel rack location, close and administratively control the opening of dilution pathways to the Spent Fuel Pool until Boraflex in the Spent Fuel Pool is determined to be within design, and

d. Following a seismic event of Operating Basis Earthquake (OBE) magnitude or greater:

   1) Close and administratively control the opening of dilution pathways to the Spent Fuel Pool until Boraflex in the Spent Fuel Pool is determined to be within design.

   2) Notify the Commission of the action taken for Spent Fuel Reactivity control as part of the report required by specification 4.3.3.3.2.

INSERT D

4.9.13.2 Following a seismic event of Operating Basis Earthquake (OBE) magnitude or greater, perform an engineering evaluation to determine that K_{eff} is less than or equal to 0.95 and that soluble boron is not required for control of K_{eff} in the Spent Fuel Pool. Pending completion of engineering evaluation, take action as required for K_{eff} being greater than 0.95.

4.9.13.3 Following the drop of a load on the Spent Fuel Racks, with fuel in the fuel rack location, perform an engineering evaluation to determine that K_{eff} is less than or equal to 0.95 and that soluble boron is not required for control of K_{eff} in the Spent Fuel Pool. Pending completion of engineering evaluation, take action as required for K_{eff} being greater than 0.95.

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: (1) the reactor will remain subcritical during CORE ALTERATIONS, and (2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. The value of 0.95 or less for K_{eff} includes a 1% Δk/k conservative allowance for uncertainties. Similarly, the boron concentration value of 2600 ppm or greater includes a conservative uncertainty allowance of 50 ppm boron. The 2600 ppm provides for boron concentration measurement uncertainty between the spent fuel pool and the RWST. The locking closed of the required valves during refueling operations precludes the possibility of uncontrolled boron dilution of the filled portion of the RCS. This action prevents flow to the RCS of unborated water by closing flow paths from sources of unborated water.

3/4.9.1.2 Boron Concentration in Spent Fuel Pool

INSERT E

The limitations of this specification ensure that in the event of a fuel assembly handling accident involving either a misplaced or dropped fuel assembly, the K_{eff} of the spent fuel storage racks will remain less than or equal to .95.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the Source Range Neutron Flux Monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short-lived fission products. This decay time is consistent with the assumptions used in the safety analyses.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment building penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity conditions during CORE ALTERATIONS.

INSERT E TO PAGE B 3/4 9-1

During normal Spent Fuel Pool operation, the spent fuel racks are capable of maintaining K_{eff} at less than or equal to 0.95 in an unborated water environment due to the geometry of the rack spacing and the presence of Boraflex neutron absorber in the spent fuel racks. Seismic analysis has shown that there is a possibility that the Boraflex absorber could degrade following a seismic event greater in magnitude than an Operating Basis Earthquake (OBE). At least 1500 ppm boron in Spent Fuel Pool is required in anticipation that a seismic event could cause a loss of Boraflex integrity. If, in addition to a loss of Boraflex, a single misplaced fuel assembly is postulated, then a minimum of 1750 ppm boron is required. The 1750 ppm boron concentration requirement bounds conditions for a loss of all Boraflex in the fuel racks.

The boron requirement in the spent fuel pool also ensures that in the event of a fuel assembly handling accident involving either a dropped or misplaced fuel assembly, the K_{eff} of the spent fuel storage rack will remain less than or equal to 0.95.

3/4.9.10 and 3/4.9.11 WATER LEVEL - REACTOR VESSEL and STORAGE POOL

The restrictions on minimum water level ensure that sufficient water depth is available to remove 99% of the assumed 10% iodine gap activity released from the rupture of an irradiated fuel assembly. The minimum water depth is consistent with the assumptions of the safety analysis.

3/4.9.12 FUEL BUILDING EXHAUST FILTER SYSTEM

The limitations on the Fuel Building Exhaust Filter System ensure that all radioactive iodine released from an irradiated fuel assembly and storage pool water will be filtered through the HEPA filters and charcoal adsorber prior to discharge to the atmosphere. Operation of the system with the heaters operating for at least 10 continuous hours in a 31-day period is sufficient to reduce the buildup of moisture on the adsorbers and HEPA filters. The OPERABILITY of this system and the resulting iodine removal capacity are consistent with the assumptions of the safety analyses. ANSI N510-1980 will be used as a procedural guide for surveillance testing. The filtration system removes radioiodine following a fuel handing or heavy load drop accident. Noble gases would not be removed by the system. Other radionuclides would be scrubbed by the storage pool water. Iodine-131 has the longest half-life: ~8 days. After 60 days decay time, there is essentially negligible iodine and filtration is unnecessary.

3/4.9.13 SPENT FUEL POOL - REACTIVITY

The limitations described by Figure 3.9-1 ensure that the reactivity of fuel assemblies introduced into Region II are conservatively within the assumptions of the safety analysis.

Administrative controls have been developed and instituted to verify that the enrichment and burn-up limits of Figure 3.9-1 have been maintained for the fuel assembly.

INSERT F

3/4.9.14 SPENT FUEL POOL - STORAGE PATTERN

The limitations of this specification ensure that the reactivity conditions of the Region I storage racks and spent fuel pool k_{eff} will remain less than or equal to 0.95.

The Cell Blocking Devices in the 4th location of the Region I storage racks are designed to prevent inadvertent placement and/or storage of fuel assemblies in the blocked locations. The blocked location remains empty to provide the flux trap to maintain reactivity control for fuel assemblies in adjacent and diagonal locations of the STORAGE PATTERN.

STORAGE PATTERN for the Region I storage racks will be established and expanded from the walls of the spent fuel pool per Figure 3.9-2 to ensure definition and control of the Region I/Region II boundary and minimize the number of boundaries where a fuel misplacement incident can occur.

INSERT F TO PAGE B 3/4 9-8

During normal Spent Fuel Pool operation, the spent fuel racks are capable of maintaining k_{eff} at less than 0.95 in an unborated water environment due to the geometry of the rack spacing and the presence of Boraflex neutron absorber in the spent fuel racks. Due to radiation induced embrittlement, there is a possibility that the Boraflex absorber could degrade following a seismic event. At least 1500 ppm boron in the Spent Fuel Pool is required in anticipation that a seismic event could cause a complete loss of all Boraflex. If, in addition to a loss of Boraflex, a single misplaced fuel assembly is postulated, then a minimum of 1750 ppm boron is required. The 1750 ppm boron concentration requirement bounds conditions for a loss of all Boraflex in the fuel racks.

The action requirements of this specification recognize the possibility of a seismic event which could degrade the Boraflex neutron absorber in the spent fuel racks. Seismic analysis has shown that there is a possibility that the Boraflex absorber could degrade following a seismic event greater in magnitude than an Operating Basis Earthquake (OBE). The action statement specifies that following a seismic event at the OBE level or greater, which is approximately one-half the Safe Shutdown Earthquake (SSE) level, action will be taken to determine the condition of the Boraflex. Once a seismic event of greater than or equal to an OBE has occurred, then the boron in the Spent Fuel Pool will be credited to maintain k_{eff} less than or equal to 0.95. The specification requires that dilution paths to the Spent Fuel Pool be closed and administratively controlled until the racks can be inspected and the condition of the Boraflex can be determined. The specification also assumes that piping systems external to the Spent Fuel Pool are mounted such that they remain leak tight following an earthquake up to the level of an SSE, or will not direct water into the Spent Fuel Pool should they leak, or have been isolated from flow to prevent leakage into the Spent Fuel Pool.

Docket No. 50-423
B16727

Attachment 3

Millstone Nuclear Power Station Unit No. 3
Proposed Revision to Technical Specification
Reactivity Control for Spent Fuel Pool and Refueling Operations
(PTSCR 3-33-97)
Retyped Pages

November 1997

RETYPE OF PROPOSED REVISION

Refer to the attached retype of the proposed revision to the Technical Specifications. The attached retype reflects the currently issued version of the Technical Specifications. Pending Technical Specification revisions or Technical Specification revisions issued subsequent to this submittal are not reflected in the enclosed retype. The enclosed retype should be checked for continuity with Technical Specifications prior to issuance.

BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1.2 The boron concentration of the Spent Fuel Pool shall be maintained uniform and sufficient to ensure that the boron concentration is greater than or equal to 1750 ppm.

Applicability

Whenever fuel assemblies are in the spent fuel pool.

Action

a. With the boron concentration less than 1750 ppm, initiate action to bring the boron concentration in the fuel pool to at least 1750 ppm within 72 hours, and

b. With the boron concentration less than 1750 ppm, suspend the movement of all fuel assemblies within the spent fuel pool and loads over the spent fuel racks.

SURVEILLANCE REQUIREMENTS

4.9.1.2 Verify that the boron concentration in the fuel pool is greater than or equal to 1750 ppm every 72 hours.

3/4.9.13 SPENT FUEL POOL - REACTIVITY

LIMITING CONDITION FOR OPERATION

3.9.13 The Reactivity Condition of the Spent Fuel Pool shall be such that k_{eff} is less than or equal to 0.95 at all times.

APPLICABILITY: Whenever fuel assemblies are in the spent fuel pool.

ACTION: With k_{eff} greater than 0.95:

a. Borate the Spent Fuel Pool until k_{eff} is less than or equal to 0.95, and

b. Initiate action to correct the cause of the misplaced/dropped fuel assembly, if required, and

c. Following the drop of a load on the spent fuel racks, with fuel in the fuel rack location, close and administratively control the opening of dilution pathways to the Spent Fuel Pool until Boraflex in the Spent Fuel Pool is determined to be within design, and

d. Following a seismic event of Operating Basis Earthquake (OBE) magnitude or greater:

1) Close and administratively control the opening of dilution pathways to the Spent Fuel Pool until Boraflex in the Spent Fuel Pool is determined to be within design.

2) Notify the Commission of the action taken for Spent Fuel Reactivity control as part of the report required by Specification 4.3.3.3.2.

SURVEILLANCE REQUIREMENTS

4.9.13.1 Ensure that all fuel assemblies to be placed in Region II of the spent fuel pool are within the enrichment and burn-up limits of Figure 3.9-1 by checking the fuel assembly's design and burn-up documentation.

4.9.13.2 Following a seismic event of Operating Basis Earthquake (OBE) magnitude or greater, perform an engineering evaluation to determine that k_{eff} is less than or equal to 0.95 and that soluble boron is not required for control of k_{eff} in the Spent Fuel Pool. Pending completion of engineering evaluation, take action as required for k_{eff} being greater than 0.95.

4.9.13.3 Following the drop of a load on the Spent Fuel Racks, with fuel in the fuel rack location, perform an engineering evaluation to determine that k_{eff} is less than or equal to 0.95 and that soluble boron is not required for control of k_{eff} in the Spent Fuel Pool. Pending completion of engineering evaluation, take action as required for k_{eff} being greater than 0.95.

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: (1) the reactor will remain subcritical during CORE ALTERATIONS, and (2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. The value of 0.95 or less for K_{eff} includes a 1% Δk/k conservative allowance for uncertainties. Similarly, the boron concentration value of 2600 ppm or greater includes a conservative uncertainty allowance of 50 ppm boron. The 2600 ppm provides for boron concentration measurement uncertainty between the spent fuel pool and the RWST. The locking closed of the required valves during refueling operations precludes the possibility of uncontrolled boron dilution of the filled portion of the RCS. This action prevents flow to the RCS of unborated water by closing flow paths from sources of unborated water.

3/4.9.1.2 Boron Concentration in Spent Fuel Pool

During normal Spent Fuel Pool operation, the spent fuel racks are capable of maintaining K_{eff} at less than or equal to 0.95 in an unborated water environment due to the geometry of the rack spacing and the presence of Boraflex neutron absorber in the spent fuel racks. Seismic analysis has shown that there is a possibility that the Boraflex absorber could degrade following a seismic event greater in magnitude than an Operating Basis Earthquake (OBE). At least 1500 ppm boron in Spent Fuel Pool is required in anticipation that a seismic event could cause a loss of Boraflex integrity. If, in addition to a loss of Boraflex, a single misplaced fuel assembly is postulated, then a minimum of 1750 ppm boron is required. The 1750 ppm boron concentration requirement bounds conditions for a loss of all Boraflex in the fuel racks.

The boron requirement in the spent fuel pool also ensures that in the event of a fuel assembly handling accident involving either a dropped or misplaced fuel assembly, the K_{eff} of the spent fuel storage rack will remain less than or equal to 0.95.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the Source Range Neutron Flux Monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short-lived fission products. This decay time is consistent with the assumptions used in the safety analyses.

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: (1) the reactor will remain subcritical during CORE ALTERATIONS, and (2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. The value of 0.95 or less for K_{eff} includes a 1% Δk/k conservative allowance for uncertainties. Similarly, the boron concentration value of 2600 ppm or greater includes a conservative uncertainty allowance of 50 ppm boron. The 2600 ppm provides for boron concentration measurement uncertainty between the spent fuel pool and the RWST. The locking closed of the required valves during refueling operations precludes the possibility of uncontrolled boron dilution of the filled portion of the RCS. This action prevents flow to the RCS of unborated water by closing flow paths from sources of unborated water.

3/4.9.1.2 Boron Concentration in Spent Fuel Pool

During normal Spent Fuel Pool operation, the spent fuel racks are capable of maintaining K_{eff} at less than or equal to 0.95 in an unborated water environment due to the geometry of the rack spacing and the presence of Boraflex neutron absorber in the spent fuel racks. Seismic analysis has shown that there is a possibility that the Boraflex absorber could degrade following a seismic event greater in magnitude than an Operating Basis Earthquake (OBE). At least 1500 ppm boron in Spent Fuel Pool is required in anticipation that a seismic event could cause a loss of Boraflex integrity. If, in addition to a loss of Boraflex, a single misplaced fuel assembly is postulated, then a minimum of 1750 ppm boron is required. The 1750 ppm boron concentration requirement bounds conditions for a loss of all Boraflex in the fuel racks.

The boron requirement in the spent fuel pool also ensures that in the event of a fuel assembly handling accident involving either a dropped or misplaced fuel assembly, the K_{eff} of the spent fuel storage rack will remain less than or equal to 0.95.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the Source Range Neutron Flux Monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short-lived fission products. This decay time is consistent with the assumptions used in the safety analyses.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment building penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity conditions during CORE ALTERATIONS.

3/4.9.10 and 3/4.9.11 WATER LEVEL - REACTOR VESSEL and STORAGE POOL

The restrictions on minimum water level ensure that sufficient water depth is available to remove 99% of the assumed 10% iodine gap activity released from the rupture of an irradiated fuel assembly. The minimum water depth is consistent with the assumptions of the safety analysis.

3/4.9.12 FUEL BUILDING EXHAUST FILTER SYSTEM

The limitations on the Fuel Building Exhaust Filter System ensure that all radioactive iodine released from an irradiated fuel assembly and storage pool water will be filtered through the HEPA filters and charcoal adsorber prior to discharge to the atmosphere. Operation of the system with the heaters operating for at least 10 continuous hours in a 31-day period is sufficient to reduce the buildup of moisture on the adsorbers and HEPA filters. The OPERABILITY of this system and the resulting iodine removal capacity are consistent with the assumptions of the safety analyses. ANSI N510-1980 will be used as a procedural guide for surveillance testing. The filtration system removes radioiodine following a fuel handing or heavy load drop accident. Noble gases would not be removed by the system. Other radionuclides would be scrubbed by the storage pool water. Iodine-131 has the longest half-life: ~8 days. After 60 days decay time, there is essentially negligible iodine and filtration is unnecessary.

3/4.9.13 SPENT FUEL POOL - REACTIVITY

The limitations described by Figure 3.9-1 ensure that the reactivity of fuel assemblies introduced into Region II are conservatively within the assumptions of the safety analysis.

Administrative controls have been developed and instituted to verify that the enrichment and burn-up limits of Figure 3.9-1 have been maintained for the fuel assembly.

During normal Spent Fuel Pool operation, the spent fuel racks are capable of maintaining k_{eff} at less than 0.95 in an unborated water environment due to the geometry of the rack spacing and the presence of Boraflex neutron absorber in the spent fuel racks. Due to radiation induced embrittlement, there is a possibility that the Boraflex absorber could degrade following a seismic event. At least 1500 ppm boron in the Spent Fuel Pool is required in anticipation that a seismic event could cause a complete loss of all Boraflex. If, in addition to a loss of Boraflex, a single misplaced fuel assembly is postulated, then a minimum of 1750 ppm boron is required. The 1750 ppm boron concentration requirement bounds conditions for a loss of all Boraflex in the fuel racks.

The action requirements of this specification recognize the possibility of a seismic event which could degrade the Boraflex neutron absorber in the spent fuel racks. Seismic analysis has shown that there is a possibility that the Boraflex absorber could degrade following a seismic event greater in magnitude than an Operating Basis Earthquake (OBE). The action statement specifies that following a seismic event at the OBE level or greater, which is approximately one-half the Safe Shutdown Earthquake (SSE) level, action will be taken to determine the condition of the Boraflex. Once a seismic event of greater than or equal to an OBE

3/4.9.13 SPENT FUEL POOL - REACTIVITY (continued)

has occurred, then the boron in the Spent Fuel Pool will be credited to maintain k_{eff} less than or equal to 0.95. The specification requires that dilution paths to the Spent Fuel Pool be closed and administratively controlled until the racks can be inspected and the condition of the Boraflex can be determined. The specification also assumes that piping systems external to the Spent Fuel Pool are mounted such that they remain leak tight following an earthquake up to the level of an SSE, or will not direct water into the Spent Fuel Pool should they leak, or have been isolated from flow to prevent leakage into the Spent Fuel Pool.

3/4.9.14 SPENT FUEL POOL - STORAGE PATTERN

The limitations of this specification ensure that the reactivity conditions of the Region I storage racks and spent fuel pool k_{eff} will remain less than or equal to 0.95.

The Cell Blocking Devices in the 4th location of the Region I storage racks are designed to prevent inadvertent placement and/or storage of fuel assemblies in the blocked locations. The blocked location remains empty to provide the flux trap to maintain reactivity control for fuel assemblies in adjacent and diagonal locations of the STORAGE PATTERN.

STORAGE PATTERN for the Region I storage racks will be established and expanded from the walls of the spent fuel pool per Figure 3.9-2 to ensure definition and control of the Region I/Region II boundary and minimize the number of boundaries where a fuel misplacement incident can occur.

Docket No. 50-423
B16727

Attachment 4

Millstone Nuclear Power Station Unit No. 3
Proposed Revision to Technical Specification
Reactivity Control for Spent Fuel Pool and Refueling Operations
(PTSCR 3-33-97)
Background and Safety Assessment

November 1997

Background

MP3 Technical Specifications require K-effective to be maintained in the SFP at ≤ 0.95 at all times. Credit for soluble boron in the spent fuel pool is not allowed under normal conditions to maintain K-effective in the SFP. Credit for soluble boron is allowed in the SFP under malfunction conditions to meet the K-effective Technical Specification (TS) limit. The current MP3 Technical Specifications identify that credit for 800 ppm soluble boron in the SFP during analyzed malfunctions, specifically a misplaced or dropped fuel assembly, is acceptable. It was postulated and subsequently confirmed by analysis that a seismic event of greater than an Operating Basis Earthquake (OBE) could cause wide spread cracking and settling of the Boraflex in the MP3 spent fuel racks. Cracking and settling of Boraflex may create gaps of no Boraflex in excess of those evaluated in the criticality analysis for the racks. Because of the difficulty in predicting the final configuration of the Boraflex, it is conservatively assumed that there is no Boraflex in the fuel racks following a seismic event of greater than an OBE. The proposed Technical Specification change will increase the soluble boron credited in the MP3 spent fuel pool from 800 ppm to 1750 ppm. The limiting malfunction for the Millstone 3 spent fuel pool as a result of this change now becomes a seismic event of greater than or equal to an OBE that causes Boraflex failure. The 1750 ppm boron requirement also bounds any criticality concerns for a fuel handling or dropped load event due to the no Boraflex assumption. Crediting soluble boron in the SFP following a seismic event to holdown rack reactivity to less than 0.95 k-effective, assuming all the Boraflex in the racks has cracked and formed large gaps in the existing fuel rack matrix, will maintain the plant in a safe condition. As k-effective of the spent fuel racks remains less than or equal to 0.95 following a seismic event up to the level of a Safe Shutdown Earthquake (SSE) with credit for soluble boron the change is safe and does not create a significant hazard.

The postulated loss of Boraflex in the spent fuel racks following a seismic event, and the crediting of soluble boron in the spent fuel pool to control fuel rack k-effective to less than or equal to 0.95 is evaluated. The change will allow crediting soluble boron in the spent fuel pool following a seismic event of OBE magnitude or greater to maintain spent fuel rack k-effective less than or equal to 0.95. The no Boraflex assumption in the 1750 ppm boron concentration requirement also bounds other events, such as a fuel or load drop which could damage Boraflex.

Safety Assessment

Although a new malfunction is created as the result of the Boraflex failing to provide its reactivity holdown function following a seismic event of greater than an OBE, the change is safe due to the presence of soluble boron in the SFP.

The design basis of the existing spent fuel racks assumes that following a seismic event the k-eff of the fuel pool remains less than 0.95. Previous SFP criticality analysis assumed that the Boraflex absorber remains intact for all occasions. The embrittlement of the Boraflex due to gamma radiation and potential cracking/gap formation of the Boraflex results in the need to credit soluble boron in the SFP following a greater than OBE seismic event.

The use of soluble boron credit in the spent fuel pool is safe following a seismic event because the soluble boron concentration will not be reduced below 1750 ppm. The normally filled piping systems in the vicinity of the spent fuel pool are fire protection, hot water heating, hot water preheating, domestic water, and component cooling. In addition, the roof drain system piping runs through the building. An engineering review of these systems has determined that the majority of the lines are leak tight and meet NU's commitment to seismic II/I criteria at earthquakes up to and including an SSE. The analysis was performed consistent with the original design criteria for seismic II/I piping as documented in Section 3.9.2 of the Millstone 3 Safety Evaluation Report (SER) Number 4.

Portions of fuel building piping systems that may not be leak tight following an SSE, and that would not leak into the spent fuel pool based on location of the potential leak, are not possible sources of dilution.

Two lines in the Hot Water Preheating system will be modified to meet the leak tight seismic II/I criteria and will not be possible sources of dilution.

A new pipe support will be added to the roof drain piping to meet the seismic II/I criteria. With the new support installed, one portion of the drain piping will still not meet leak tight requirements. The inlet opening on the roof feeding this portion of the piping will therefore be capped. Since the location of the potential cracking in the drain piping lies above the connection to the balance of the drain piping, and the system is not under pressure, water flowing from other portions of the drain system will not flow up to and out of the potentially cracked portion. This precludes a possible source of dilution. Therefore there is no possibility of a SFP boron dilution accident coincident with or following a seismic event, and credit for soluble boron is acceptable to meet the K-effective limit of 0.95 for the SFP.

The proposed Technical Specification change will increase the soluble boron credited in the MP3 spent fuel pool from 800 ppm to 1750 ppm. This soluble boron value of 1750 ppm will be required to be present in the SFP at all times. This boron value was calculated by Westinghouse. The 1750 ppm boron concentration contains very conservative assumptions. By maintaining 1750 ppm soluble boron concentration in the SFP at all times, K-effective would remain less than or equal to 0.95 following a seismic event of greater than a OBE even if all of the following occurred: no credit for any Boraflex, and a simultaneous worst case single misplaced/dropped fuel assembly, and a loss of spent fuel pool cooling resulting in boiling conditions in the SFP. A seismic event resulting only in the loss of all Boraflex would have resulted in the need for 1500 ppm of soluble boron credit. However, it was thought prudent to conservatively postulate the additional malfunctions of a single misplaced/dropped fuel assembly, and a loss of spent fuel pool cooling resulting in boiling conditions in the SFP, which caused the value of 1750 ppm of soluble boron to be determined. The criticality analysis for the spent fuel pool also selects conservative parameters for analytical inputs when compared to the present condition of the spent fuel pool. The analysis assumes that all fuel assemblies in the fuel pool are at the maximum possible reactivity. In reality, all fuel assemblies in the spent fuel pool are at a lower reactivity than assumed in the analysis.

The surveillance interval for the proposed TS is to verify the SFP soluble boron concentration at least every 72 hours. Normal fuel pool makeup from primary grade water for evaporative losses can be made with reliance on the 72 hour boron sampling surveillance requirement. The 72 hour sampling frequency for fuel pool boron is selected based on existing Technical Specification sampling requirements. The 72 hour surveillance interval is considered acceptable based on the fact that the interval is satisfactory for maintaining fuel pool boron concentration at a safe level during fuel handling. The surveillance interval is also consistent with the required surveillance interval on boron concentration for fuel movement as specified in NUREG 1431. Makeup to the spent fuel pool from non borated water sources for non evaporative reasons can be allowed provided that prior to the makeup the volume of water to be added is determined to not cause a dilution below the required boron concentration, and the fuel pool is sampled for boron following the makeup.

The discussion so far has addressed ensuring that the necessary soluble boron concentration is present in the SFP prior to a seismic event, so that K-effective will be maintained $\leq$ 0.95 during and immediately after the seismic event. Following a seismic event when Boraflex is postulated to fail, it will be necessary to prohibit dilution of the fuel pool by administratively controlling the normal makeup path to the fuel pool that could dilute the fuel pool. Currently the FSAR (section 9.1.3.2) allows fuel pool normal makeup from either the primary grade water system or the Refueling Water Storage Tank (RWST). The requirement to administratively control makeup from the primary grade water system following a seismic event is acceptable. The RWST remains available as a seismic storage tank for the fuel pool, although the lines from the RWST to the fuel pool are non seismic piping. Makeup to the fuel pool from primary grade water can be allowed provided that prior to the makeup, the volume of water to be added is determined to not cause a dilution below the required boron concentration, and the fuel pool is sampled for boron following the makeup.

The service water system is described in FSAR section 9.1.3.3 as a seismic makeup system to the spent fuel pool in the unlikely event of a failure of both fuel pool cooling trains and the RWST makeup source. Non-borated water additions will be allowed provided the water volume is determined in advance, and the fuel pool is sampled following the water addition to ensure that the boron concentration is not diluted below an acceptable level. This is acceptable as the FSAR description of the system is for a loss of spent fuel pool cooling event, where the service water system could be used to makeup for evaporative losses in the pool.

In order to implement this change the following Technical Specification changes will be necessary

1 The SFP soluble boron concentration will need to be maintained at greater than or equal to 1750 ppm at all times.
2 The SFP will need to be sampled at least once per 72 hours, to ensure that adequate SFP boron concentration is being maintained.
3 Following a seismic event of greater than or equal to an OBE level, an inspection of the spent fuel racks to determine Boraflex integrity will be necessary.
4 Following a seismic event of greater than or equal an OBE level, it will be necessary to initiate action to close off dilution paths and administratively control the opening of potential dilution paths of systems connected to the SFP to prevent a dilution accident.

In order to implement this change the following procedure changes have been made.

> The MP3 loss of fuel pool cooling procedures have been modified to require for non-borated water additions, that the volume of water to be added is determined to not cause a dilution below the required boron concentration, and the fuel pool is sampled for boron following the makeup for non evaporative losses.

Additionally, the condition proposed is a temporary condition not expected to go beyond the year 2001. Re-racking of the Millstone 3 spent fuel pool is expected prior to the start of the eighth operating cycle. When the pool is re-racked new spent fuel storage racks using a different neutron absorber material will be installed, and any remaining existing spent fuel racks will not credit Boraflex. Millstone 3 is also located in a seismically stable region. The level of earthquake chosen for the OBE level is approximately double the largest recorded earthquake noted in the region as described in section 2.5.2 of the Millstone 3 FSAR. The conservative value selected for an OBE, the low seismic activity for the Millstone region and the limited period of time for which the need to credit soluble boron in the spent fuel pool will be required further reduces the possibility of the need to actually utilize soluble boron for control of K-effective.

Based on the above, the SFP can be maintained in a safe condition by requiring the presence of soluble boron in the fuel pool following a seismic event to compensate for the potential loss of Boraflex. By requiring soluble boron in the fuel pool, k-effective will be maintained at less than or equal to 0.95 following a seismic event so there is no reduction in the margin of safety.

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B16727

Attachment 5

Millstone Nuclear Power Station Unit No. 3
Proposed Revision to Technical Specification
Reactivity Control for Spent Fuel Pool and Refueling Operations
(PTSCR 3-33-97)
Significant Hazards Consideration and Environmental Considerations

November 1997

Significant Hazards Consideration

NNECO has reviewed the proposed revision in accordance with 10CFR50.92 and has concluded that the revision does not involve a significant hazards consideration (SHC). The basis for this conclusion is that the three criteria of 10CFR50.92(c) are not satisfied. The proposed revision does not involve a SHC because the revision would not:

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

   There is one spent fuel pool accident condition discussed in Chapter 15 of the FSAR. The FSAR discusses a fuel handling accident which drops a fuel assembly onto the fuel racks during fuel movement. Degradation of the Boraflex panels in a post-seismic condition will have no effect on the probability of a fuel assembly drop onto the stored fuel, or the fuel racks. Changing the way Boraflex responds to a seismic event will have no impact on the probability of a seismic event. A misplaced fuel assembly can be postulated in the MP3 fuel pool as a result of either equipment malfunction or operator error. Degradation of the Boraflex panels will have no effect on the probability of a fuel misplacement event. Therefore, the degradation of Boraflex in a post-seismic condition does not involve an increase in the probability of an accident previously evaluated.

   A fuel handling accident could cause a radioactive release of fission gases, resulting in dose consequences. This radioactive release of fission gases is due to the failure of a certain number of fuel pins which are postulated to fail during the fuel handling accident. The number of fuel pins which are postulated to fail in this event is not changed by the degradation of the Boraflex panels in a post-seismic condition. There are no criticality issues with this fuel handling accident for the reasons described next. Although conservative, should a fuel handling accident occur during or after a seismic event, even with no Boraflex credit, the proposed 1750 ppm of soluble boron is sufficient to ensure that K-effective of the SFP is maintained at less than or equal to 0.95. The 1750 ppm boron requirement also bounds any criticality concerns for a fuel handling or dropped load event due to the no Boraflex assumption. Therefore, this proposed change does not involve an increase in the probability or consequences of an accident previously evaluated.

   Therefore, the proposed revision does not involve a significant increase in the probability or consequence of an accident previously evaluated.

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

   The change in the way Boraflex responds to a seismic event with the presence of 1750 ppm boron does not create a new accident. The use of soluble boron in the spent fuel pool is safe. There is no possibility of a dilution event during or following a seismic event up to the magnitude of an SSE. The normally filled piping systems in the vicinity of the spent fuel pool are fire protection, hot water heating, hot water preheating, domestic water, and component cooling. In addition, the roof drain system piping runs through the building. An engineering review of these systems has determined that the majority of the systems are leak tight and meet NU's commitment to seismic II/I criteria for a seismic event up to and including an SSE. The analysis was performed consistent with the original design criteria for seismic II/I piping as documented in section 3.9.2 of the Millstone 3 Safety Evaluation Report (SER) Number 4.

Portions of fuel building piping systems that may not be leak tight following an SSE, and that would not leak into the spent fuel pool based on location of the potential leak, are not possible sources of dilution.

Two lines in the Hot Water Preheating system will be modified to meet the leak tight seismic II/I criteria and will not be possible sources of dilution.

A new pipe support will be added to the roof drain piping to meet the seismic II/I criteria. With the new support installed, one portion of the drain piping will still not meet leak tight requirements. The inlet opening on the roof feeding this portion of the piping will therefore be capped. Since the location of the potential cracking in the drain piping lies above the connection to the balance of the drain piping, and the system is not under pressure, water flowing from other portions of the drain system will not flow up to and out of the potentially cracked portion. This precludes a possible source of dilution.

Non borated water sources that are connected to the SFP will be isolated following a seismic event of greater than or equal to an OBE to prevent dilution. Therefore there is no possibility of a SFP boron dilution accident coincident with or following a seismic event up to an SSE, and credit for soluble boron is acceptable to meet the K-effective limit of 0.95 for the SFP. The crediting of soluble boron in the spent fuel pool to control K-effective following a seismic event does not create a new accident as boron dilution of the pool can be prevented by closing and administratively controlling the opening of dilution paths to the pool and initiating routine sampling requirements on SFP boron. At present the crediting of soluble boron following a fuel misplacement event is allowed for the Millstone 3 spent fuel pool. Analysis has shown that a seismic event of greater than an OBE level earthquake can cause Boraflex damage which can be more limiting than a fuel misplacement event. As such, the minimum boron requirement in the fuel pool will be increased from 800 ppm to 1750 ppm. As such, no new accident has been created because the crediting of boron following a malfunction/accident has always been allowed.

Therefore, the proposed revision does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

The margin of safety, as defined by MP3 Technical Specifications, is to ensure that the K-effective of the MP3 SFP is maintained less than or equal to 0.95 at all times. The proposed change does not credit soluble boron during normal operations, but allows crediting soluble boron at a new higher concentration for control of K-effective during malfunction conditions. There is no reduction in the margin of safety as the result of the degradation of Boraflex following a greater than OBE seismic event, because soluble boron will compensate for the loss of Boraflex A value of 1750 ppm of soluble boron in the SFP at all times ensures that K-effective of the MP3 SFP is maintained less than or equal to 0.95 at all times, including this new malfunction of degraded Boraflex following a greater than OBE seismic event.

Eliminating the credit for the reactivity holdown effect of Boraflex panels in conjunction with 1750 ppm boron will have no effect on the probability of a seismic event. As the probability of a seismic event has not changed there is no increase in the probability of an accident or malfunction due to a seismic event. Following a seismic event, operators are presently required to make inspections of the plant to determine post seismic event plant conditions. As a result of this change, inspections will be required to review the status of the spent fuel pool and isolate potential dilution paths following a seismic event of greater than or equal to a OBE. These actions are consistent with present guidance in the seismic response procedure and do not create an undue burden on the operator. To compensate for the potential loss of Boraflex after a seismic event, the SFP is now required to be to borated at all times to at least 1750 ppm to maintain the proper post seismic k-effective condition. As such, there is no mitigation equipment that has to operate in the spent fuel pool following a seismic event.

Although the Boraflex in the fuel racks is assumed to fail in a seismic event greater than an OBE, the presence of soluble boron in the fuel pool water will compensate for the loss of Boraflex. Surveillance requirements on SFP boron will ensure that there will be boron present in the SFP and ensure that the SFP is not diluted below the minimum required boron concentration during normal operation.

As the presence of SFP soluble boron during and after a seismic event maintains k-effective less than 0.95 there is no effect on the consequences of any accidents evaluated. As there are no new accidents created, there are no changes in the consequences of previously analyzed accidents, and there is no effect on the consequences of any accident. There is no reduction in the margin of safety as the result of the degradation of Boraflex following a greater than OBE seismic event, because during normal operations k-effective remains less than 0.95 without reliance on soluble boron, and during malfunction and accident conditions soluble boron can be used to compensate for the loss of Boraflex to maintain K-effective less than 0.95.

Therefore, the proposed revision does not involve a significant reduction in a margin of safety.

In conclusion, based on the information provided, it is determined that the proposed revision does not involve an SHC.

Environmental Considerations

NNECO has reviewed the proposed license amendment against the criteria of 10CFR51.22 for environmental considerations. The proposed revision does not involve a SHC, does not significantly increase the type and amounts of effluents that may be released offsite, nor significantly increase individual or cumulative occupational radiation exposures. Based on the foregoing, NNECO concludes that the proposed revision meets the criteria delineated in 10CFR51.22(c)(9) for categorical exclusion from the requirements for environmental review.

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B16727

Attachment 6

Millstone Nuclear Power Station Unit No. 3
Proposed Revision to Technical Specification
Reactivity Control for Spent Fuel Pool and Refueling Operations
(PTSCR 3-33-97)
Response to Request for Additional Information for May 5, 1997 Submittal

November 1997

**Reactivity Control for Spent Fuel
Pool and Refueling Operations
Request for Additional Information**

Question 1 Explain the meaning of the statement in Insert C to SR 4.9.13.1: "Boraflex in the spent fuel racks is determined to be within design...

Response 1 The proposed LCO 3.9.13 Action statement 3(a) states: "Close and administratively control the opening of potential dilution pathways to the Spent Fuel Pool until Boraflex in the Spent Fuel Racks is determined to be within design, .." This action is meant to ensure that potential dilution pathways are closed until it is determined that the Boraflex condition is consistent with the assumptions of the current criticality analysis. Hence the words "within design" refers to the Boraflex condition being consistent with the Boraflex assumptions of the current criticality analysis. This ensures that K-effective is $\leq$0.95 under non-accident conditions without soluble boron credit. Proposed Surveillance 4.9.13.2 is consistent with this approach. The response for Millstone Unit No. 3 to Generic Letter 96-04 describe the Boraflex related assumptions of the current criticality analysis.

Question 2 Describe the type of action which will be taken to determine the condition of the Boraflex, following a seismic event of the OBE level or greater (Insert F to B 3/4.9.13).

Response 2 Blackness testing will be performed to determine whether there has been any redistribution of the Boraflex material in the axial direction following an OBE level or greater event..

Question 3 What would be the effect of increased concentration of boric acid (from 800 to 1750 ppm B) on the corrosion of metallic components exposed to the Spent Fuel Pool (SFP) water (especially at the surface)?

Response 3 The SFP (and fuel) metallic components at Millstone Unit No. 3 are fabricated from Type 300 series stainless steels, high nickel alloys such as Inconels, and Zirconium alloys such as Zircaloy-4 and ZIRLO. It is well recognized throughout the Pressurizer Water Reactor (PWR) industry, and throughout other industries, that all of these materials are highly resistant to acid corrosion attack.

Millstone Unit No. 3 typically has a SFP boron concentration of about 2700 ppm. Therefore, the increase in the minimum Technical Specification required soluble boron concentration from 800 ppm to the proposed value of 1750 ppm will still be far below the 2700 ppm of soluble boron typically present in the SFP. With about 2700 ppm of soluble boron in the SFP, the typical pH is about 4.3. Any surface effect, such as the potential for a small increase in boron concentration, at the water/air interface, is expected to be negligible with regard to the long term integrity of the SFP lining.

Question 4 Increased concentration of boric acid will cause a lowering of pH. Describe the effect that this lower pH will have on retention in the SFP water of the iodine which may accidentally be released from the damaged rods.

Response 4 In 1971 Westinghouse Corporation performed a study (Radiological Consequences of a Fuel Handling Accident, WCAP-7828) on the Decontamination Factors (DF) associated with a fuel handling accident in the SFP. The study was split into two parts: small scale and large scale. The small scale study was set up to closely monitor the quantitative aspects of iodine absorption from gas bubbles to the surrounding liquid. The small scale tests closely monitored the pH levels in the liquid. These tests were performed at about 2000 ppm of soluble boron with a pH ranging between 4.3 and 5.0. The large scale tests were mainly performed to identify bubble patterns from a full assembly. The results of the Westinghouse study concluded that a minimum DF of 760 was obtained. Westinghouse conservatively concluded that a DF of 500 should be used to account for deviations in the factors which control iodine absorption by the pool water. This report is the basis for the NRC DF value of 100 as reported in Safety Guide 25. A DF of 100 is used in the Millstone Unit No. 3 SFP fuel handling accident calculations.

Millstone Unit No. 3 typically has a SFP boron concentration of about 2700 ppm. Therefore the increase in the minimum Technical Specification required soluble boron concentration from 800 ppm to the proposed value of 1750 ppm will still be far below the 2700 ppm of soluble boron typically present in the SFP. With about 2700 ppm of soluble boron in the SFP, the typical SFP pH is about 4.3. Given the typical SFP pH value of about 4.3, it is concluded that the Millstone Unit No. 3 SFP operation is consistent with the parameters under which the Westinghouse Report conducted its study and therefore a DF factor for a Fuel Handling Accident of 100 is justified.

Question 5 Based on the design and dimensional tolerances of the Boraflex panels and the stainless steel cover plate, explain how and where the embrittled Boraflex could settle during a seismic event.

Response 5 There is a nominal 0.09" space between the cell wall and the stainless steel cover plate which support the Boraflex sheet that is a nominal 0.075" thick. This leaves a nominal 0.015" gap, under static load conditions. The analysis demonstrates that an SSE seismic event may cause fragmentation of Boraflex panels over significant regions leading to their breakup into small segments. Some plastic deformation of the cell wall is also predicted. An evaluation of these factors led us to conclude that we could not reliably predict the extent of Boraflex gapping that may result from the seismic event. Nor could we estimate the amount of settling of the Boraflex into the space between the cell wall and the cover plate in the event that the Boraflex was reduced to fragmented sections or individual particles. We therefore conservatively assumed total loss of Boraflex as a poison material after the seismic event.

Question 6 Why can the stainless steel cover plate be assumed to remain in place during a seismic event?

Response 6 NNECO performed a preliminary evaluation of the cover plate integrity which demonstrated that the cover plate remains intact during and after a design basis seismic event. This evaluation compared the increase stresses due to the seismically induced rattle loads with the stresses calculated in the original design of the fuel racks. The applied seismic shear and tension loads on the cover plate and spot welds produce stresses on these components that are within allowable limits. This conclusion was corroborated by a detailed computer analysis performed by Holtec International.

Question 7 Why is this not a generic type of event and applicable to Units 1 and 2 also?

Response 7 The response of Boraflex to a Safe Shutdown Earthquake (SSE) event was calculated for Millstone Unit Nos. 1 and 2 in a similar manner as was performed for Millstone Unit No. 3. For Millstone Unit No. 1, the Boraflex response to the SSE event did not result in Boraflex cracking. For Millstone Unit No. 2, the Boraflex response to the SSE event did result in some limited amount of Boraflex cracking, but not to the degree that would cause the Boraflex to break into small pieces, therefore there was no reactivity effect.

Generally, this calculation involves determining the response of the Boraflex and fuel storage rack to the loads imparted from fuel assemblies which "rattle" inside the storage cell due to the seismic event. These calculations are influenced by the magnitude of the seismic event, the amount of gap between the fuel assembly and rack wall, the geometry and weight of the fuel assembly, the thickness of the cell wall and sheathing that contains the Boraflex and the width and properties of the

Boraflex panel. For Millstone Unit No. 1, a Boiling Water Reactor (BWR), the calculation was influenced favorably by the relatively light weight of a BWR fuel assembly and the relatively small width of BWR Boraflex panels. The Millstone Unit No. 3 Boraflex seismic response was the least desirable of the three Millstone Units principally because of the relatively large fuel assembly weights and the relatively thin rack cell wall design of the Westinghouse racks. The weight of a Millstone Unit No. 2 fuel assembly is less than the weight of a Millstone Unit No. 3 fuel assembly. This difference in the fuel assembly weights and the thicker MP2 storage rack cell wall are significant factors in the difference between the Millstone Unit Nos. 2 and 3 results. In summary, calculations for Millstone Unit No's. 1, 2, and 3, each with significantly different rack/fuel designs, showed only Millstone Unit No. 3 to be susceptible to this issue.

Question 8 Your Safety Assessment states that the balance of equipment in the fuel building which could cause a dilution is seismically qualified or mounted in a fashion as not to direct unborated water into the SFP should a line rupture. Provide a list of the systems with non-seismic piping that passes in the vicinity of the SFP. Include the volume of the associated systems. Explain the statement that the piping is "mounted in a fashion as not to direct unborated water into the pool."

Response 8 The safety assessment for PTSCR 3-1-97 stated that the balance of equipment in the fuel handling building which could cause a dilution is seismically qualified or mounted in a fashion as not to direct unborated water into the SFP should a line rupture. While preparing our responses to the request for additional information, it was determined that portions of piping in the vicinity of the SFP could potentially fail during a seismic event and direct unborated water into the SFP. Normally filled systems with nonborated water that pass in the vicinity of the SFP are domestic water, fire protection water, component cooling, hot water preheating and hot water heating. In addition, portions of the fuel building roof drain system run in the vicinity of the SFP. Due to subsequent withdrawal of PTSCR 3-1-97, the statement, "mounted in a fashion as not to direct unborated water into the pool", is no longer applicable and, as such, will not be addressed.

Analysis has concluded that, with exceptions as noted below, piping systems in the SFP area will remain leak tight following a seismic event up to the level of the SSE. This analysis was performed consistent with the original design criteria for seismic II/I piping documented in section 3.9.2 of the Millstone Unit 3 Safety Evaluation Report Number 4.

Piping systems in the Fuel Handling Building that may not remain leak tight following a seismic event have been divided into two categories:

Category 1 - Involves piping that may leak, but leak flow will not enter the SFP as the potential leak paths are sufficiently distant from the SFP and a path exists for the leak to drain away from the SFP. The affected piping in this category involves a run of hot water system line on the north wall of the SFP building. Leakage from this line is expected to flow through floor grating and away from the SFP. In addition, the elevated curb that defines the edge of the SFP will protect incidental leakage from this source from entering the SFP. As such, no additional action is planned regarding this line.

Category 2 - Involves piping that may leak and provide a source of SFP dilution. Affected piping in this category involves two lines in the hot water preheating (glycol) system. To eliminate these lines as a possible source of SFP dilution, they will be modified in order to meet leak tight seismic II/I criteria.

This category also includes a portion of a drain line of the roof drain system that run through the Fuel Handling Building in the vicinity of the SFP. The roof drain is not normally filled or pressurized. A new pipe support will be added to the roof drain piping to meet the seismic II/I criteria. With the new support installed, one portion of the drain piping will still not meet leak tight requirements. The inlet opening on the roof feeding this portion of the piping will therefore be capped. Since the location of the potential cracking in the drain piping lies above the connection to the balance of the drain piping, and the system is not under pressure, water flowing from other portions of the drain system will not flow up to and out of the potentially cracked portion. This precludes a possible source of dilution.

Question 9 It is stated in Insert E that "seismic analysis has shown that there is a possibility that the Boraflex absorber could degrade following a seismic event greater in magnitude than an OBE." Was the analysis performed a deterministic one? If yes, then the answer should have been failure or no failure, not "a possibility...could degrade." If not, perform a deterministic analysis and discuss results.

Response 9 A calculation to determine the response of Boraflex to a Safe Shutdown Earthquake (SSE) event for Millstone Unit No. 3 showed the Boraflex would crack and allow settling of the Boraflex. This established the need for soluble boron credit for this accident condition. As such, credit for soluble boron in this manner is consistent with ANSI/ANS-57.2-1983, section 6.4.2.2.9.

NNECO also performed an initial simplified deterministic evaluation of the Operating Basis Earthquake (OBE) case. This evaluation demonstrated that the Boraflex would not experience wide spread cracking at the OBE seismic level. This evaluation is based on ratioing the previous SSE analysis performed by Holtec International to obtain OBE Boraflex integrity results. This approach is considered acceptable due to the fact that the damping values utilized for the SSE analysis are conservative and are essentially applicable for OBE input loading. This evaluation was later corroborated by a detailed computer analysis (deterministic) by Holtec International.

Based on these deterministic calculations, it was concluded that failure of the Boraflex would occur for a seismic event at the SSE level, but would not occur for a seismic event at the OBE level. The technical specifications were therefore written to use the OBE seismic event as a threshold level at which an engineering evaluation is needed to determine if the boraflex has been damaged, and credit soluble boron during this post seismic condition. The word "possibility" in the sentence "... possibility that the Boraflex absorber could degrade following a seismic event greater in magnitude than an OBE." refers to the following: While boraflex damage is deterministically predicted for an SSE event, actual boraflex damage may not occur, because the seismic event may be at or above the OBE seismic level, but still be far enough away from an SSE level event. Hence the word "possibility" is used to recognize that depending on the severity of the seismic event (SSE level or OBE level), significant boraflex damage, may or may not occur.