REFUELING OPERATIONS

DECAY TIME

LIMITING CONDITION FOR OPERATION

3.9.3.1 The reactor shall be subcritical for a minimum of 72 hours prior to movement of irradiated fuel in the reactor pressure vessel.

APPLICABILITY: MODE 6.

ACTION:

With the reactor subcritical for less than 72 hours, suspend all operations involving movement of irradiated fuel in the reactor pressure vessel.

SURVEILLANCE REQUIREMENTS

4.9.3.1 The reactor shall be determined to have been subcritical for at least 72 hours by verification of the date and time of subcriticality prior to movement of irradiated fuel in the reactor pressure vessel.

REFUELING OPERATIONS

DECAY TIME

LIMITING CONDITION FOR OPERATION

3.9.3.2 At least two trains of the spent fuel pool cooling system shall be OPERABLE.

APPLICABILITY: MODE 5 and 6 with the most recent 1/3 core offload* decayed less than 504 hours from subcriticality. This specification is not applicable if Shutdown Cooling is being used to cool the spent fuel pool.

ACTION:

With the above conditions not satisfied;

a. Immediately initiate actions to restore both trains of spent fuel pool cooling, and

b. Within one hour, suspend all fuel movement in the spent fuel pool, and

c. With one hour, isolate the spent fuel pool cleanup demineralizers.

SURVEILLANCE REQUIREMENTS

4.9.3.2 Within 24 hours prior to fuel movement into the spent fuel pool, and every 72 hours thereafter while this specification is applicable, verify that two trains of the spent fuel cooling system are OPERABLE.

* For the purposes of this specification, the most recent 1/3 core offload is defined as the fuel bundles discharged at the end of the most recent fuel cycle. This specification does not apply to partial mid-cycle discharges resulting from defective or damaged fuel if the total decay heat load on the spent fuel pool cooling system resulting from such a discharge is less than the total decay heat load of the spent fuel pool at 504 hours after subcriticality of the most recent 1/3 core offload.

DECAY TIME

LIMITING CONDITION FOR OPERATION

3.9.3.3 The reactor shall be maintained in MODE 5 or 6 until the most recent 1/3 core offload* in the spent fuel pool has decayed for greater than 504 hours from subcriticality.

APPLICABILITY: MODE 5 and 6 with the most recent 1/3 core offload* decayed less than 504 hours from subcriticality.

ACTION:

With the above conditions not satisfied, immediately initiate actions to restore the reactor to MODE 5 or 6.

SURVEILLANCE REQUIREMENTS

4.9.3.3 Within 24 hours prior to entry into MODE 4, verify that the most recent 1/3 core offload* has decayed for greater than 504 hours from subcriticality.

* For the purposes of this specification, the most recent 1/3 core offload is defined as the fuel bundles discharged at the end of the most recent fuel cycle. This specification does not apply to partial mid-cycle discharges resulting from defective or damaged fuel if the total decay heat load on the spent fuel pool cooling system resulting from such a discharge is less than the total decay heat load of the spent fuel pool at 504 hours after subcriticality of the most recent 1/3 core offload.

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. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the accident analyses.

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 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 accident analyses.

The requirement for two trains of spent fuel pool cooling to be OPERABLE for 504 hours after subcriticality for the most recently discharged 1/3 core ensures that high water temperature will not degrade resin in the spent fuel pool demineralizers and that the temperature and humidity above the pool are compatible with personnel comfort and safety requirements. The shutdown cooling (SDC) system is a high capacity system. One train of the SDC is sufficient to cool both the core and the spent fuel pool should a failure occur in the spent fuel pool cooling system.

The requirement for the reactor to remain in MODE 5 or 6 until the most recent 1/3 core offload has decayed 504 hours ensures that alternate cooling is available during this time to cool the spent fuel pool should a failure occur in one train of the spent fuel pool cooling system.

3/4.9.4 CONTAINMENT PENETRATIONS

The requirements on containment 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 condition during fuel or CEA movement within the reactor pressure vessel.

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B12267

ATTACHMENT 2

Millstone Nuclear Power Station, Unit No. 2

Safety Evaluation and No Significant

Hazards Consideration Determination

I. Spent Fuel Pool Cooling System Safety Evaluation

Proposed Technical Specification 3.9.3.2 requires that when in Mode 5 or 6 and the most recent 1/3 core offload having decayed less than 504 hours, both spent fuel pool cooling trains shall be OPERABLE. This proposed specification is required because the spent fuel pool cooling system does not possess the cooling capacity required by the NRC for a single active failure. During the first 504 hours after subcriticality with all available storage locations occupied with spent fuel and with a fresh 1/3 core offload, both trains of spent fuel pool cooling are required to maintain the spent fuel pool water at a temperature which is compatible with the spent fuel pool cleanup system demineralizer resins and to ensure personnel exposure to elevated temperatures and humidity over the pool resulting from elevated water temperature does not pose a personnel safety hazard. Should one train become inoperable, the proposed specification action statement requires suspension of all fuel movement in the spent fuel pool and isolation of the demineralizers within one hour if both trains have not been restored. Also, Operating Procedure 2305 requires isolation of the demineralizers if inlet temperature exceeds 140°F.

This proposed specification is not applicable when the spent fuel pool is being cooled by the Shutdown Cooling System. The Shutdown Cooling System is a high-capacity cooling system which is designed to maintain a full core at 130°F at 27½ hours after shutdown. Because of this large capacity, it can easily maintain the spent fuel pool at a stable, acceptable temperature (less than 140°F) at several days following subcriticality and 1/3 core offload.

The worst case single failure that could occur within 504 hours after subcriticality while in two train operation would be the failure of the cooling water supply to a spent fuel pool heat exchanger. With half the fluid in the spent fuel pool cooling system flowing through an idle heat exchanger, the temperature of the pool would peak out in excess of 170°F. However, this is not a realistic failure since operator action can be taken within several hours to isolate the idle heat exchanger. With two spent fuel pool cooling pumps delivering flow to one spent fuel pool heat exchanger, the peak pool temperature will be approximately 157°F.

The other single failure evaluated was the mechanical failure of a single spent fuel pool cooling pump. This failure is less limiting because with one pump delivering flow through two heat exchangers, the spent fuel pool temperature will peak at approximately 145°F.

After the most recent 1/3 core offload has decayed greater than 504 hours, the spent fuel pool cooling system can tolerate a single failure and still maintain acceptable temperatures. According to CE calculations, 490 hours are required to reach this point. Preliminary independent calculations by the NRC Staff concluded that 504 hours would be required before one train of spent fuel pool cooling could maintain acceptable temperatures. Since both calculated times are close, the more conservative 504 hours was chosen as the basis for this specification.

Proposed Technical Specification 3/4.9.3.3 prevents the reactor from entering Mode 4 until 504 hours of decay time have elapsed on the most recent 1/3 core offload. This ensures that alternate cooling is available to cool the spent fuel pool if required due to a failure in the spent fuel pool cooling system. Although shutdown cooling is not required by technical specifications in Mode 5, it is operationally required to maintain the unit in Mode 5.

The footnote in the proposed Technical Specifications permits a partial mid-cycle fuel discharge. This is valid as long as the partial discharge would result in a lower decay heat load than would exist following a normal 1/3 core refueling offload with 504 hours of decay.

The proposed change to Technical Specification 3.9.3 to be renumbered 3.9.3.1 is required for consistency with the proposed new Technical Specifications 3.9.3.2 and 3.9.3.3. The proposed change to Technical Specification Bases 3/4.9.3 requires the addition of a new page numbered B 3/4 9-1a to provide sufficient space for the expanded Bases.

II. Spent Fuel Pool Mechanical Safety Evaluation

The proposed technical specifications would establish an operability requirement for both trains of spent fuel pool cooling together with a decay time limit of 504 hours to restrict startup after a refueling 1/3 core offload. This will ensure that the spent fuel pool and spent fuel storage racks are maintained within the design criteria for Millstone Unit No. 2 in the event of a single active failure of the spent fuel pool cooling system; that is, the spent fuel rack structures are maintained below 235°F and the peak pool temperature is maintained below 212°F.

The following tables delineate the heat loads, operating temperatures and thermal hydraulic criteria of the spent fuel pool for which the racks have been analyzed, qualified and licensed.

Table I

SPENT FUEL POOL COOLING SYSTEM
HEAT LOADS AND OPERATING TEMPERATURES

Normal Maximum Heat Load: 15.2×10^6 BTU/hr(1)

Abnormal Maximum Heat Load: 37.8×10^6 BTU/hr(2)

OPERATING CONDITION	POOL TEMPERATURES	
Design Basis	Design	Calculated
Normal Maximum	120°F	131°F(3)*
Abnormal Maximum	150°F	120°F(4)
Single Active Failure of a SFP Cooling Train		
Normal Maximum	212°F	178°F**
Abnormal Maximum	212°F	185°F
Total Loss of Forced Pool Cooling		
Normal Maximum	212°F	9 3/4 hrs. to boiling
Abnormal Maximum	212°F	4 hrs. to boiling

(1) This heat load is predicted for normal refueling with the most recently unloaded one-third core having decayed for 150 hours. After 12 more days, the decay heat load will be less than 11.3×10^6 BTU/hr.

(2) This heat load is predicted for spent fuel in the pool with the entire core offloaded.

(3) This temperature is a function of using only the Spent Fuel Pool cooling heat exchangers.

(4) This temperature value is a function of using one train of the Shutdown Cooling Heat Exchangers in addition to Spent Fuel Pool Heat Exchangers.

* The consequences of exceeding the design value were previously addressed and found to be acceptable in a letter dated July 24, 1985, J.F. Opeka to E.J. Butcher, "Millstone Nuclear Power Station, Unit No. 2 Proposed Change toTechnical Specifications Modifications to Spent Fuel Storage Pool," Docket No. 50-336, Section 5.2.1 and a letter dated May 21, 1986, J.F. Opeka to A.C. Thadani, "Millstone Nuclear Power Station, Unit No. 2 Proposed Change to Technical Specifications Storage of Consolidated Spent Fuel," Docket No. 50-336, Sections 5.2.1 and 5.2.2.

** The 178°F value is representative of the failure of Valve 2-RB-8.1A (or 1B) controlling RBCCW flow to the heat exchanger. The resulting temperature assumes no corrective action to realign flow and isolate the subject heat exchanger.

TABLE II

THERMAL HYDRAULIC DESIGN PARAMETERS

Number Assemblies Normal Reload	1/3 core
Minimum Decay Time One Assembly	3 days
Minimum Decay Time Full Core	6 days
Minimum Cooling Time of a Fuel Assembly before the Rods are Consolidated	5 years
Water Height Above Fuel	23 feet
Minimum Water Height Above Rack (Accident)*	10 feet/1.4 feet**
Maximum Bulk Water Temperature (Normal)	150°F
Maximum Water Temperature in the Rack Region (Accident)*	235°F/230°F**

* First value is for loss of external cooling accident.

** Although it is not considered a design basis accident, the review of this submittal has considered the consequences of a reactor cavity seal failure accident. These values represent the water height and maximum temperature for such an accident.

The following spent fuel pool time/temperature profiles were generated to confirm the criteria of 504 hours and to establish the responses of the spent fuel pool for the worst cases of single active failures that occur within 504 hours after shutdown. The results show that the spent fuel pool temperature drops to less than or equal to 140°F at or before 504 hours in the event of a single active failure.

Specifically, the accident scenarios consist of:

1. Mechanical Failure of One Spent Fuel Cooling Pump (resulting in one pump and two heat exchangers remaining operable)

   - Time for the discharged batch to be placed in spent fuel pool — 150 hours
   - Time for pool temperature to increase from 120°F to maximum of 145°F — 27 hours
   - Time for pool temperature to decrease from 145°F to 140°F — 72.5 hours
   - Total cycle time — 249.5 hours

2. Failure of One Spent Fuel Pool Cooling Heat Exchanger (resulting in isolation of the heat exchanger with the flow from two pumps directed to the one remaining heat exchanger)

o	Time for the discharged batch to be placed in the spent fuel pool	150 hours
o	Time for the pool temperature to increase from 120°F to a maximum 157°F	27 hours
o	Time for the pool temperature to decrease from 157°F to 140°F	313 hours
o	Total cycle time	490 hours

III. Conclusion

Based on the analysis provided in Sections I and II, this proposed change to the Technical Specifications does not constitute an unreviewed safety question or a significant hazards consideration per 10 CFR 50.59 and 10 CFR 50.92 since it does not:

1. Increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report. The only design basis accident considered for the spent fuel pool is the fuel handling accident, which is not impacted by the proposed technical specification change. Since no new failure mode is identified, the proposed change does not result in an initiating event. The probability of failure of safety systems is not applicable since no safety systems are affected by the change.

   The operability requirements of the proposed technical specification change are designed to satisfy the design basis of the Millstone Unit No. 2 spent fuel pool 504 hours after shutdown. Since at present there is no Limiting Condition of Operation for the Spent Fuel Pool Cooling System, addition of any operability requirements is an improvement. Therefore, the proposed change does not increase the probability of exceeding the design basis of the spent fuel pool.

2. Create the possibility of an accident or malfunction of a different type than previously analyzed in the safety analysis report. The proposed change does not impact the design basis accident and creates no new failure modes and does not create a new accident by modifying the plant response. Since there are no failure modes associated with the change, the proposed change does not create an unanalyzed accident.

3. Reduce the margin of safety as defined in the Technical Specifications. The proposed Technical Specification change has no impact on the protective boundaries, therefore, the change does not reduce the margin of safety provided for the protective boundaries.

The Federal Register, Volume 51, No. 44, page 7751 dated March 6, 1986, lists examples of proposed amendments the Commission considers not likely to involve significant hazards considerations. In accordance with example (ii), a proposed amendment to an operating license will likely be found to involve no significant hazards considerations if operation of the facility in accordance with the proposed amendent involves a change that constitutes an additional limitation, restriction, or control not presently included in the technical specifications.

The proposed changes to the Technical Specifications conform to example (ii) of the Federal Register, Volume 51, No. 44, page 7751 dated March 6, 1986 by providing a Limiting Condition for Operation for the Spent Fuel Pool Cooling System where none was specified previously, restricting reactor startup until the most recently discharged refueling offload has decayed 504 hours, and mitigating the consequences of a single active failure by controlling the temperature in the Spent Fuel Pool. The applicability of this example, as well as the fact that this proposal is responsive to a previous NRC request, supports the conclusion that this amendment involves no significant hazards considerations.