NORTHEAST UTILITIES
THE CONNECTICUT LIGHT AND POWER COMPANY
THE HARTFORD ELECTRIC LIGHT COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

P.O. BOX 270
HARTFORD, CONNECTICUT 06101
(203) 666-6911

July 17, 1978

Docket No. 50-336

Director of Nuclear Reactor Regulation
Attn: Mr. R. Reid, Chief
Operating Reactors Branch #4
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Reference: (1) V. Stello, Jr., letter to W. G. Counsil dated May 17, 1978.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
Control of Heavy Loads Near Spent Fuel

In Reference (1), Northeast Nuclear Energy Company (NNECO) was requested to provide information concerning the control of heavy loads near spent fuel. Accordingly, Attachment 1 is provided which addresses each of the requested items.

We trust this information is responsive to your request.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil

W. G. Counsil
Vice President

Attachment

8008220487

DOCKET NO. 50-336

ATTACHMENT 1

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2

CONTROL OF HEAVY LOADS NEAR SPENT FUEL

JULY, 1978

Response 4

The following analyses have been provided to the NRC Staff:

Millstone Unit No. 2 Environmental Report

Section 6.6 - Fuel Assembly Drop in Refueling Pool
- Heavy Object Drop onto Fuel in Core

Section 6.7 - Fuel Assembly Drop into Spent Fuel Pool
- Heavy Object Drop onto the Spent Fuel Racks
- Spent Fuel Shipping Cask Drop

Millstone Unit No. 2 FSAR

Section 5.4.3.3.3 - Cask Drop Analysis

Section 14.5 - Fuel Handling Incident

D. C. Switzer letter to G. Lear dated March 21, 1977

Fuel Handling Accident in Containment

Item 5

Identify any heavy loads that are carried over equipment required for the safe shutdown of a plant that is operating at the time the load is moved. Identify what equipment could be affected in the event of a heavy load handling accident (piping, cabling, pumps, etc.) and discuss the feasibility of such an accident affecting this equipment. Describe the basis for your conclusions.

Response 5

Due to physical arrangements, heavy loads are not carried over operating vital equipment.

Item 6

If heavy loads are required to be carried over the spent fuel storage pool or fuel transfer canal at your facility, discuss the feasibility of a handling accident which could result in water leakage severe enough to uncover the spent fuel. Describe the basis for your conclusions.

Response 6

A cask drop in the spent fuel pool represents the most limiting incident which could result in water leakage. This incident has been analyzed in FSAR, Section 5.4.3.3.3 and the results indicate that although some local damage to the liner plate and/or concrete may occur, the extent of the damage is small and will not result in any significant damage to the floor.

Item 7

Describe any design features of your facility which affect the potential for a heavy load handling accident involving spent fuel, e.g., utilization of a single failure-proof crane.

Response 7

These design features are described in FSAR, Section 9.8, "Fuel and Reactor Component Handling Equipment".

Item 8

Provide copies of all procedures currently in effect at your facility for the movement of heavy loads over the reactor core during refueling, the spent fuel storage pool, or equipment required for the safe shutdown of a plant that is operating at the time the move occurs.

Response 8

The only procedure which contains controls on movement of heavy loads is the attached operating procedure 2209A, Refueling Operations. Operating procedure 2211B, Spent Fuel Shipment has not been written pending the purchase of the shipment casks.

9. Comparison of the Millstone Unit No. 2 Spent Fuel Storage Facility to Regulatory Guide 1.13

The Millstone Unit No. 2 spent fuel storage facility has been compared with the guidelines set forth in Regulatory Guide 1.13 and has been found to be in complete compliance with this document. Brief descriptions of how the Millstone Unit No. 2 facility is in compliance with the eight regulatory positions in this guide are given below.

1. The spent fuel storage facility (including its structures and equipment except as noted in paragraph 6 below) should be designed to Category I seismic requirements.

   ***

   The spent fuel pool is an integral part of the auxiliary building. The entire auxiliary building is a seismic Category I structure. The structural properties of the spent fuel pool are described in Millstone Unit No. 2 FSAR Sections 5.4.1.1.2. Seismic analyses were performed on the auxiliary building and hence on the spent fuel pool in accordance with FSAR Section 5.8.

2. The facility should be designed (a) to keep tornadic winds and missiles generated by these winds from causing significant loss of watertight integrity of the fuel storage pool and (b) to keep missiles generated by tornadic winds from contacting fuel within the pool.

   ***

   The spent fuel pool, as part of the auxiliary building, is designed to withstand tornadic winds and missiles without loss of watertight integrity. The tornado design of the auxiliary building and spent fuel pool are described in the Millstone Unit No. 2 FSAR Sections 5.4.3.1.6 and 5.4.3.3.2.

3. Interlocks should be provided to prevent cranes from passing over stored fuel (or near stored fuel in a manner such that if a crane failed, the load could tip over on stored fuel) when fuel handling is not in progress. During fuel handling operations, the interlocks may be bypassed and administrative control used to prevent the crane from carrying loads that are not necessary for fuel handling over the stored fuel or other prohibited areas. The facility should be designed to minimize the need for bypassing such interlocks.

   ***

   Interlocks/physical stops are installed on the auxiliary building crane to prevent crane travel over irradiated fuel with loads in excess of 1800 pounds. The prohibition of lifting heavy loads over irradiated fuel is a requirement of Technical Specification 3.9.7. Surveillance requirements to assure that the required interlocks/stops are operable prior to handling irradiated fuel are given in Technical Specification 4.9.7.

4. A controlled leakage building should enclose the fuel pool. The building should be equipped with an appropriate ventilation and filtration system to limit the potential release of radioactive iodine and other radioactive materials. The building need not be designed to withstand extremely high winds, but leakage should be suitably controlled during refueling operations. The design of the ventilation and filtration system should be based on the assumption that the cladding of all of the fuel rods in one fuel bundle might be breached. The inventory of radioactive materials available for leakage from the building should be based on the assumptions given in Regulatory Guide 1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors" (Safety Guide 25).

***

The potentially radioactive areas of the auxiliary building, such as the spent fuel pool area, are maintained at a negative pressure relative to clean areas of the plant and the out of doors. This feature ensures that there will be no leakage from radioactive areas.

During handling of spent fuel which was decayed for less than sixty (60) days, the spent fuel pool area is ventilated by the enclosure building filtration system (EBFS). The exhaust air processed through the EBFS passes through pre-filters, charcoal and HEPA filters before being exhausted to the atmosphere via the Unit No. 1 stack. Inleakage is controlled by the administrative closure of all access doors to the spent fuel pool area as specified in Technical Specification 3.9.14. Ventilation requirements for handling of spent fuel which has decayed less than sixty (60) days are described in the Millstone Unit No. 2 Technical Specification 3.9.14.

During normal operation including handling of spent fuel decayed more than sixty (60) days, the exhaust air from the spent fuel pool area is passed through a particulate and a HEPA filter and exhausted up the Unit No. 2 stack. Outside makeup air is supplied at a lower flow rate than exhaust air thereby maintaining a negative pressure in the pool area.

In the event of a fuel handling accident in the spent fuel pool area, high radiation signal automatically diverts flow to be exhausted through the EBFS. The same higher radiation signal would isolate the normal air supply and exhaust. The exhaust path for the EBFS is described above.

The breaching of cladding integrity of a complete spent fuel assembly (176 rods) has been analyzed and the radiological consequences have been found to be well within the limits of 10 CFR Part 100. Structural analyses of the fuel has shown that only the first row (14 rods) could be breached during a fuel drop accident.

The normal ventilation system for the spent fuel pool area is described in FSAR Sections 9.9.8 and 9.9.9. The EBFS is described in FSAR Section 6.7. The fuel handling incident is described in FSAR Section 14.5.

5. The spent fuel storage facility should have at least one of the following provisions with respect to the handling of heavy loads, including the refueling cask:

(a) Cranes capable of carrying heavy loads should be prevented, preferably by design rather than by interlocks, from moving into the vicinity of the pool; or,

(b) Cranes should be designed to provide single-failure-proof handling of heavy loads, so that a single failure will not result in loss of capability of the crane-handling system to perform its safety function; or,

(c) The fuel pool should be designed to withstand, without leakage that could uncover the fuel, the impact of the heaviest load to be carried by the crane from the maximum height to which it can be lifted. If this approach is used, design provisions should be made to prevent the crane, when carrying heavy loads, from moving in the vicinity of stored fuel.

***

The spent fuel pool has been analyzed for a cask drop accident. It has been concluded that although some minor local damage to the 1/4 inch type 304 stainless steel liner plate would occur, no significant structural damage would result. The results of the cask drop analysis are given in the Millstone Unit No. 2 FSAR Section 5.4.3.3.3.

In addition, the crane is interlocked so that it cannot pass over the spent fuel pool or cask loading pit. During installation or removal of a cask into the cask loading pit, the interlock is partially disengaged to allow travel over the pit but still prevents travel over the remainder of the spent fuel pool. Technical Specification 4.9.7 ensures that the interlocks/stops which preclude crane travel with heavy laods over the spent fuel pool are operable/installed.

6. Drains, permanently connected mechanical or hydraulic systems, and other features that by maloperation or failure could cause loss of coolant that would uncover fuel should not be installed or included in the design. Systems for maintaining water quality and quantity should be designed so that any maloperation or failure of such systems (including failures resulting from the Safe Shutdown Earthquake) will not cause fuel to be uncovered. These systems need not otherwise meet Category I seismic requirements.

***

The spent fuel pool for Millstone Unit No. 2 does not have any low point drains. The suction to the spent fuel cooling system is taken just below normal water level. The return line which enters near the top of the pool and extends to near the bottom is equipped with a siphon breaker. Draining of the pool due to a break in the spent fuel pool cooling system is therefore not possible.

The only other connection which is near the bottom of the pool is the fuel transfer tube. This tube is seismic Category I and except during refueling, is isolated on the spent fuel side by a gate valve and on the containment side by a blind flange.

The pool is equipped with a leak chase system so that small leaks in the pool liner can be detected and corrective action can be taken.

The spent fuel pool is described in FSAR Section 9.5

7. Reliable and frequently tested monitoring equipment should be provided to alarm both locally and in a continuously manned location if the water level in the fuel storage pool falls below a predetermined level or if high local-radiation levels are experienced. The high radiation level instrumentation should also actuate the filtration system.

***

The spent fuel pool is equipped with both high and low level alarms. These alarms sound in the main control room. It is not necessary for this alarm to sound locally since personnel in the area would either visually notice an abnormal pool level or be notified of the abnormal pool level by control room personnel. These alarms are tested at routine intervals under approved maintenance procedures. In addition, proper water level is verified once per seven (7) days in accordance with Technical Specification 4.9.12.

The spent fuel pool area is equipped with high radiation monitors which sound both locally and in the main control room. As described in the answer to Regulatory Postion #4, a high radiation signal will automatically cause the EBFS to take suction from the spent fuel pool area. The radiation monitoring system is tested in accordance with Technical Specification 4.3.3.1. A description of this system can be found in FSAR Section 7.3.2.1.

8. A seismic Category I makeup system should be provided to add coolant to the pool. Appropriate redundancy or a backup system for filling the pool from a reliable source, such as a lake, river or onsite seismic Category I water-storage facility, should be provided. If a backup system is used, it need not be a permanently installed system. The capacity of the makeup systems should be such that water can be supplied at a rate determined by consideration of the leakage rate that would be expected as the result of damage to the fuel storage pool from the dropping of loads, from earthquake or from missiles originating in high winds.

***

Normally, makeup water is provided from the primary makeup water (PMW) tank through non-seismic lines. In an emergency makeup water can be supplied through seismic piping from either the refueling water storage tank or the condensate storage tank. Also, the fire protection system can be used for emergency makeup through temporary hose connections. For a detailed description, see FSAR Section 9.5.2.1.

DOCKET NO. 50-336

ATTACHMENT 2

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2

OPERATING PROCEDURE 2209A, REFUELING OPERATIONS

JULY, 1978

APPROVAL: _____ DATE: 7-1-77 W. Strong

Plant Superintendent

STATION PROCEDURE COVER SHEET

A. IDENTIFICATION

Number OP 2209A Rev. 2

Title REFUELING OPERATIONS

Prepared By William E. Strong

B. REVIEW

I have reviewed the above procedure and have found it to be satisfactory.

TITLE	SIGNATURE	DATE
DEPARTMENT HEAD		11/25/77

C. UNREVIEWED SAFETY QUESTION EVALUATION DOCUMENTATION REQUIRED:

(Significant change in procedure method or scope as described in FSAR) YES [ ] NO [XX]
(If yes, document in PORC/SORC meeting minutes)

ENVIRONMENTAL IMPACT

(Adverse environmental impact) YES [ ] NO [XX]
(If yes, document in PORC/SORC meeting minutes)

D. PORC/SORC APPROVAL

PORC/~~SORC~~ Meeting Number 77-133

E. APPROVAL AND IMPLEMENTATION

The attached procedure is hereby approved, and effective on the dates below:

Plant Superintendent/Unit Superintendent	Approved Date	Effective Date
	11/28/77	11/28/77

SF-301
Rev. 2

REFUELING OPERATIONS

Page No.	Effective Revision	Date
1	2	11/28/77
2	2	11/28/77
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13	2	11/28/77
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1. OBJECTIVE

1.1 To specify the plant requirements and steps necessary to place the plant in a refueling condition.

1.2 To delineate the necessary plant requirements and personnel responsibilities to ensure a safe and orderly refueling operation.

1.3 To specify the steps necessary to return the Reactor Coolant System to a cold shutdown condition.

2. PREREQUISITES

NOTE: Refer to Form 2209A-1, Prerequisite sign off sheet.

2.1 The reactor has been placed in a refueling shutdown condition in accordance with OP 2207 (Plant Cooldown).

2.2 Fuel assemblies required for refueling are verified to be stored in the spent fuel pool and/or the new fuel vault and all new fuel assemblies have been inspected in accordance with OP 2210A, New Fuel Assembly and Control Element Assembly Receipt and Inspection.

2.3 The following systems are capable of supporting refueling operations.

2.3.1	Reactor Coolant System	OP 2301
2.3.2	Shutdown Cooling System	OP 2310
2.3.3	Low Pressure Safety Injection	OP 2307
2.3.4	High Pressure Safety Injection	OP 2308
2.3.5	Refueling Water Storage Tank	OP 2350
2.3.6	Containment	OP 2312
2.3.7	Fuel Handling	OP 2303
2.3.8	Chemical Volume Control	OP 2304
2.3.9	Reactor Building Closed Cooling Water	OP 2330A
2.3.10	Service Water	OP 2326
2.3.11	Instrument Air	OP 2332B
2.3.12	Station Air	OP 2332A
2.3.13	Clean Liquid Radwaste	OP 2335
2.3.14	Aerated Liquid Radwaste	OP 2336
2.3.15	Makeup Water	OP 2340
2.3.16	Fire Protection	OP 2341

2.3.17	Spent Fuel Pool Cooling	OP 2305
2.3.18	Sampling System	OP 2311
2.3.19	Plant Communications	OP 2348
2.3.20	Station Electrical 4.16KV Bus 24C or D	OP 2343
2.3.21	Station Electrical 480V Bus 22E or F	OP 2344
2.3.22	120V Regulated Instrument AC	OP 2345A
2.3.23	120V Vital Instrument AC	OP 2345B
2.3.24	125 VDC	OP 2345C
2.3.25	Emergency Diesel Generator A or B	OP 2346
2.3.26	Nuclear Instrumentation Wide Range Log Channels	OP 2401
2.3.27	Process & Area Radiation Monitoring	OP 2404A & B
2.3.28	Engineered Safeguards Actuation	OP 2405
2.3.29	Containment Recirculation, Cooling & Ventilation Systems	OP 2313
2.3.30	Main Exhaust	OP 2314A
2.3.31	Containment & Enclosure Building Purge	OP 2314B
2.3.32	Radwaste (Aux. Bldg.)	OP 2314C
2.3.33	Fuel Handling Area	OP 2314F
2.3.34	Enclosure Bldg. Filtration	OP 2314G
2.3.35	Control Room Air Conditioning	OP 2315

2.4 The containment area radiation and airborne radiation monitors shall be operable during the refueling operation. (Tech. Spec. 3.9.9)

2.5 The containment purge valve isolation system shall be operable during refueling operations. (Tech. Spec. 3.9.10)

2.6 Containment penetrations shall be in the following status:

2.6.1 Equipment door in place and bolted.

2.6.2 At least one door in the personnel airlock secured.

2.6.3 Each penetration providing direct access from the containment atmosphere shall be:

1. Closed by an isolation valve, blind flange or a manual valve; or
2. Be capable of being closed by an operable containment purge valve.

2.7 The containment evacuation alarm shall be satisfactorily tested from panel C04 within one day prior to refueling.

2.8 Prior to initiating fuel movement ensure proper operation and interlock operability of the following refueling equipment is verified:

2.8.1 Refueling Machine (Preoperational Check List OPS Form 2303-1)

2.8.2 Transfer System (Preoperational Check List OPS Form 2303-2)

2.8.3 CEA Change Machine (Preoperational Check List OPS Form 2303-3)

2.8.4 Spent Fuel Pool Platform Crane (Preoperational Check List OPS Form 2303-4)

2.8.5 New Fuel Elevator (Preoperational Check List OPS Form 2303-5)

2.8.6 Communications Circuit

2.8.7 Alignment of T.V. Camera (OPS Form 2303-7)

2.8.8 Alignment of Refueling Machine (OPS Form 2303-8)

2.8.9 Spent Fuel Cask Crane (Preoperational Check List OPS Form 2303-9)

2.8.10 Spent Fuel Inspection Equipment (Preoperational Check List OPS Form 2303-10)

2.9 All personnel who will participate in the refueling operation have been briefed and are thoroughly familiar with this procedure, and the Fuel Handling Procedure, OP 2303.

2.10 Refueling work list has been properly initiated.

CHA CH5 2.11 A complete checkout, including a load test (Surv. Proc. 2637A), shall be conducted on the refueling machine crane with 3 days prior to the start of moving fuel assemblies. (Tech. Spec. 3.9.6)

2.12 Auxiliary building doors specified in Tech. Spec. Table 3.9-1 shall be closed and the spent fuel area shall be exhausted through the EBFAS in the auxiliary exhaust mode. (Tech. Spec. 3.9.14 and 3.9.15)

2.13 One off-site power supply and one emergency diesel shall be operational during refueling operations. (Tech. Spec. 3.8.1.2)

2.14 The minimum AC and DC electrical distribution (inplant) specified in Tech. Specs. 3.8.2.2 and 3.8.2.4 shall be maintained during the refueling operation.

2.15 At least one charging pump or one HPSI pump shall be operational during the refueling operation. (Tech. Spec. 3.1.2.3)

2.16 A minimum of one shutdown cooling loop shall be operable during refueling operations. (Tech. Spec. 3.9.8)

2.17 At least one flow path to the core for boric acid injection and its associated heat tracing shall be maintained during the refueling operation. (Tech. Spec. 3.1.2.1)

2.18 At least two spent fuel storage pool area radiation monitors and both the gaseous and particulate spent fuel storage pool ventilation monitors shall be operable. (Tech. Spec. 3.9.13)

3. INITIAL CONDITIONS

3.1 Reactor coolant boron concentration is being maintained uniform and of sufficient concentration to ensure keff is less than 0.90 with all rods inserted.

3.2 Reactor coolant system temperature is maintained greater than 82°F by the shutdown cooling system.

3.3 The chemical volume control system is lined up for normal operation in accordance with OP 2304 (CVCS) with the following exceptions:

3.3.1 Charging pumps secured. Handswitches in the off position on CO-2 and green stripe caution tagged.

3.3.2 System filled with borated water at a concentration equal to or greater than the concentration of the reactor coolant system.

3.3.3 Volume control tank at normal operating level.

3.3.4 Let down flow secured. 2-CH-515 and 2-CH-516 shut and red tagged.

3.3.5 Reactor coolant pump controlled bleed off isolated. 2-CH-505 and 2-CH-506 shut and red tagged.

3.3.6 VCT is pressurized to 5 PSIG with nitrogen.

3.4 To prevent the addition of unborated water to the reactor coolant system, the following valves are shut and red tagged.

1) 2-CS-10A PMW to RWST
2) 2-CH-195 PMW TO RCS Makeup
3) 2-CH-422 PMW to CVCS Demin.
4) 2-CH-080 PMW to CVCS Flush
5) 2-PMW-167 PMW to Spent Fuel Pool
6) 2-RW-77 PMW to SEP Demin.

3.5 Reactor coolant pump breakers are racked out and red tagged.

3.6 Pressurizer heater breakers are racked out and red tagged.

3.7 RCS hot leg drain valves 2-RC-215 and 040 are shut and caution tagged. Inaccurate refueling level will result if opened.

3.8 Spent fuel pool and transfer canal filled with borated water with a concentration equal to or greater than reactor coolant system concentration and spent fuel pool cooling system in operation.

3.9 Minimum shift complement during refueling is four (4) persons. A licensed Unit 2 SRO shall be in direct charge of refueling operations in the reactor fueling area. In addition, there shall be at least one licensed RO in the control room and one licensed Unit 2 SRO in the station not directly involved in supervising fuel loading.

4. PRECAUTIONS

4.1 Whenever core geometry is being changed, neutron flux shall be continuously monitored by at least two source range neutron monitors, with each monitor providing continuous visual indication in the control room, and one with audible indication in containment. (Tech. Spec. 3.9.2)

4.2 During reactor vessel head removal and while refueling operations are being performed in the reactor, the reactor coolant system

boron concentration must be maintained uniform and of a sufficient concentration to ensure keff is less than 0.90 with all rods inserted. (Tech. Spec. 3.9.1)

4.3 Direct communication between personnel in the control room and at the refueling machine shall be maintained during fuel movement within the reactor pressure vessel. (Tech. Spec. 3.9.5)

4.4 A minimum of 23 feet of water shall be maintained above the top of the fuel in the core whenever irradiated fuel is being handled in the core area. A minimum of 23 feet of water shall be maintained above the top of the fuel in the spent fuel storage racks whenever irradiated fuel is being handled in the spent fuel pool.

4.5 To ensure proper fuel positioning, the refueling machine must be realigned prior to loading fuel if the core support barrel had been moved.

4.6 Loads greater than that of a fuel assembly and CEA shall be prohibited from travel over irradiated fuel in the spent fuel pool. (Tech. Spec. 3.9.7)

4.7 Movement of irradiated fuel in the core shall not be initiated before the reactor core has decayed for a minimum of 72 hours. (Tech. Spec. 3.9.3)

4.8 If an excessive or unanticipated count rate multiplication, i.e., doubling, is indicated at any time, fuel handling will cease until the situation has been evaluated by the shift supervisor and reactor engineering personnel.

4.9 Movement of fuel assemblies, control element assemblies or sources is not allowed without knowledge and approval of the control room licensed operator.

4.10 If a fuel assembly, CEA or source is believed to be damaged, the fuel handling will cease. The reactor engineer will be notified and an inspection and evaluation is to be made on the component.

4.11 Throughout fueling operations the refueling machine operator must be extremely careful to prevent an inadvertent driving of the TV camera or hoist box into the core support barrel. To minimize the possibility of such an occurrence, the refueling work list indicates allowable refueling mast positions.

4.12 Health Physics procedures must be strictly adhered to at all times.

4.13 Loads greater than that of a fuel assembly and CEA shall be prohibited from travel over irradiated fuel in the vessel with the head removed, without approval of higher management.

5. PROCEDURE

5.1 Preparing the reactor vessel and cavity for refueling.

5.1.1 Purge the containment in accordance with OP 2314B (Containment and Enclosure Building Purge).

5.1.2 Enter the containment in accordance with HPP 2920 (Containment Entrance).

NOTE: Steps 5.1.3 through 5.1.5 may be done concurrently with only restrictions as per MP 2704.

5.1.3 Drain the reactor vessel to 12" below the vessel flange in accordance with OP 2301E (Draining the RCS).

5.1.4 Prepare the reactor vessel head for removal in accordance with MP 2704A (Preparation for Reactor Vessel Head Removal).

5.1.5 Install refueling pool seal in accordance with MP 2704B (Installation of Refueling Pool Seal).

5.1.6 Remove reactor vessel head in accordance with MP 2704C (Reactor Vessel Head Removal).

5.1.7 Remove blind flange from transfer tube.

5.1.8 Fill the reactor cavity to 31'6" level in accordance with OP 2307 (Low Pressure Safety Injection).

5.1.9 Uncouple the CEA extension shafts in accordance with MP 2704D (Uncoupling CEA Extension Shafts).

5.1.10 Prepare to remove the upper guide structure in accordance with MP 2704F, Steps 5.1 through 5.11 (Removal of Upper Guide Structure).

5.1.11 Remove incore instrument assembly in accordance with MP 2704E (Removal of ICI Assembly).

5.1.12 Fill reactor cavity to 36'6" level in accordance with OP 2307 (Low Pressure Safety Injection).

5.1.13 Complete removal of upper guide structure in accordance with MP 2704F (Removal of Upper Guide Structure).

5.1.14 Place the refueling pool skimmer system in operation in accordance with OP 2305 Section 7.7 (Spent Fuel Pool Cooling and Purification System).

NOTE: The following step is optional, depending on water clarity.

5.1.15 Place the spent fuel pool purification system in service on the refueling pool in accordance with OP 2305 Section 7.8 (Spent Fuel Pool Cooling and Purification).

5.1.16 Verify spent fuel pool level and refueling pool level are at the same level and greater than 35'6", then open the transfer tube isolation valve.

5.1.17 If not already operating, place the spent fuel pool skimmer system in operation in accordance with OP 2305 (Spent Fuel Pool Cooling and Purification).

5.1.18 Handle all core components in accordance with OP 2303 (Fuel Handling) and the refueling worklist.

5.2 Refueling operation - control room operating personnel.

5.2.1 Direct and approve all core component movement during the refueling operation.

NOTE: The refueling worklist contains a step by step refueling sequence (material transfer forms).

5.2.2 Receive notification of core component movement and acknowledge such notification by step No., component serial numbers, originating location, present location and orientation of the refueling machine mast, if applicable.

5.2.3 Maintain an up to date status of material transfer forms. Initial and note date and time (as executor) after each completed step. (Refueling Worklist)

5.2.4 Maintain the count rate data log (OPS Form 2209A-2). Log counts hourly, even during periods when refueling operations have been interrupted.

5.2.5 Stop any fuel handling movement immediately if any discrepancy is noted or for reasons of safety and immediately notify shift supervisor.

5.2.6 Maintain direct communications with refueling area and fuel storage area at all times while handling fuel.

5.2.7 Ensure Chemistry Dept. samples the reactor coolant system boron concentration at least daily.

5.3 Refueling operation - refueling area operating personnel.

5.3.1 Move all components under the direction of the control room and in accordance with material transfer forms. (Refueling Worklist)

5.3.2 Operate all fuel handling equipment in accordance with OP 2303 (Fuel Handling System).

5.3.3 Notify control room of completion of each applicable step, including step No., component serial number, originating location, present location and orientation of refueling machine mast, if applicable.

5.3.4 Notify control room of the following:

5.3.4.1 Receipt of a fuel bundle from spent fuel storage area via transfer carriage.

5.3.4.2 Holding a fuel bundle over a core location prior to insertion into the core.

5.3.4.3 Full insertion of the fuel bundle into the core.

5.3.4.4 Unlatching the fuel bundle.

5.3.4.5 Initiating transfer of fuel bundle to spent fuel area.

5.3.5 Obtain permission from control room prior to transporting fuel from containment to spent fuel area via transfer carriage.

5.3.6 Initial and note date and time after completion of each applicable step on the material transfer form (refueling machine operator will sign as Executor, SRO or RE as SNM checker).

5.3.7 Immediately notify control room if any discrepancies are discovered.

5.4 Refueling operation - fuel storage area operating personnel.

5.4.1 Move all components under the direction of the control room and in accordance with the material transfer forms. (Refueling Worklist)

5.4.2 Operate all fuel handling equipment in accordance with OP 2303 (Fuel Handling System).

5.4.3 Notify control room of the following:

5.4.3.1 When over a fuel assembly in the spent fuel storage/new fuel storage racks, prior to latching, stating step number, component serial number and fuel storage rack location.

5.4.3.2 After the completion of each applicable step (Refueling Worklist) by step number, component serial number, originating location and present location.

5.4.3.3 Receipt of a fuel bundle from refueling cavity area via transfer carriage.

5.4.4 Obtain permission from control room to transfer a core component to the refueling cavity via transfer carriage. Notify control room when transfer is complete and receive acknowledgement.

5.4.5 Immediately notify control room if any discrepancy is discovered.

5.4.6 Initial and note date and time after completion of each applicable step on the material transfer form (spent fuel machine operator will sign as Executor, RE as SNM checker).

5.5 Refueling operation - reactor engineering personnel.

5.5.1 Monitor count rate activity.

5.5.2 Maintain current entries in reactor engineers log.

5.5.3 Monitor entire refueling operation to include spot checks of each area and review of all data.

5.5.4 Resolve any questions of discrepancies concerning refueling.

5.5.5 Keep the unit reactor engineer apprised of the status of refueling.

5.5.6 Stop refueling operations at any time for reasons of safety.

5.5.7 Maintain the tag board to reflect status of all fuel assemblies, control element assemblies and sources.

5.6 Returning the reactor coolant system to a cold shutdown condition.

5.6.1 Verify the post refueling verification check has been completed. (Refueling Worklist)

5.6.2 Transfer the transfer carriage to the spent fuel pool transfer canal for storage.

CAUTION: If the spent fuel purification system is to remain in operation on refueling pool, ensure it is lined up for operation with the transfer tube isolation valve shut. Ensure spent fuel pool cooling system is lined up for operation with transfer tube isolation valve shut. (Refer to OP 2305, Spent Fuel Cooling and Purification.)

5.6.3 Install spent fuel pool gate.

5.6.4 Shut fuel transfer tube isolation valve.

5.6.5 Install the upper guide structure in accordance with MP 2704I (Installation of UGS) Steps 5.1 through 5.5.

5.6.6 Secure the refuel pool skimmer system OP 2305 (Spent Fuel Pool Cooling and Purification).

5.6.7 Drain the refuel pool to the 31'6" level (to clear the operating platform of the UGS lift assembly) in

accordance with OP 2305 Section 7.9 (Spent Fuel Pool Cooling and Purification). For an alternate method of draining refer to OP 2307 Section 7.3 (Low Pressure Safety Injection).

5.6.8 Install the incore instrument assembly in accordance with MP 2704J (Installation of I.C.I. Assembly).

5.6.9 Complete installation of upper guide structure in accordance with MP 2704I (Installation of UGS).

5.6.10 Couple the CEA extension shafts in accordance with MP 2704K (Coupling the CEA Extension Shafts).

5.6.11 Drain the refuel pool in accordance with OP 2305 Section 7.9 (Spent Fuel Pool Cooling and Purification). For alternate method of draining, refer to OP 2307 Section 7.3 (Low Pressure Safety Injection).

5.6.12 Install blind flange on transfer tube. Perform leak detection test on fuel transfer tube in accordance with Surveillance Procedure 2609B (Local Leak Detection Test).

5.6.13 Drain the reactor vessel to 12 inches below the reactor vessel flange in accordance with OP 2301E (Draining the RCS).

5.6.14 Install the reactor vessel head in accordance with MP 2704L (Reactor Vessel Head Installation).

5.6.15 Remove the refueling pool seal in accordance with MP 2704M (Removal of Refueling Pool Seal).

5.6.16 Complete the reactor vessel head installation in accordance with MP 2704N (Completion of Reactor Vessel Head Installation).

5.6.17 Fill and vent the reactor coolant system in accordance with OP 2301D (Reactor Coolant System Fill and Vent).

5.6.18 Perform the reactor coolant system leak rate test in accordance with OP 2301B (Reactor Coolant System Leak Rate Test).

6. CHECK OFF LISTS

6.1 None

NORTHEAST UTILITIES
THE CONNECTICUT LIGHT AND POWER COMPANY
THE HARTFORD ELECTRIC LIGHT COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

P.O. BOX 270
HARTFORD, CONNECTICUT 06101
(203) 666-6911

July 31, 1978

Docket No. 50-336

Director of Nuclear Reactor Regulation
Attn: Mr. R. Reid, Chief
Operating Reactors Branch #4
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

References: (1) W. G. Counsil letter to R. Reid dated July 17, 1978.
(2) W. G. Counsil letter to R. Reid dated June 6, 1978.
(3) E. J. Brunner letter to D. C. Switzer dated September 13, 1976.
(4) D. C. Switzer letter to R. Reid dated March 14, 1978.
(5) E. C. McCabe letter to D. C. Switzer dated April 6, 1978.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
Loads Near Spent Fuel, Neutron Shielding, and Containment Leak Rate Testing

In Reference (1), Northeast Nuclear Energy Company (NNECO) p ovided the requested information concerning the control of heavy loads near spent fuel. However, due to a collating error, it appears that page one of the attachment, responding to items one through three, was not included. Please find the responses to those items on the attached page.

In Reference (2), NNECO provided preliminary information regarding the proposed neutron shield design. In that letter, NNECO inadvertently neglected to address 10CFR170 considerations. NNECO had previously reviewed the proposal pursuant to the requirements of 10CFR170, and had determined that no fee was required. This basis for this determination is that the Reference (2) material is merely the continuation of an issue initiated prior to the effective date of 10CFR170.

In Reference (3), Inspection Item 76-14-1 discusses a discrepancy between the Millstone Unit No. 2 Technical Specifications and the literal requirements of 10CFR50, Appendix J, concerning Type B and C containment leak rate testing. To resolve this item, NNECO proposed a change to the Technical Specifications in Reference (4). Following inspector review of the change request, unresolved item 76-14-1 was reported as closed in Reference (5). Since that time, however, the Staff has verbally indicated that the proposed Technical Specification is

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overly restrictive and that the leak rate testing requirements as they are currently written adequately address the intent of Appendix J. Therefore, NNECO hereby withdraws this change request, with the understanding that this withdrawal will not result in any further action in this matter by the Office of Inspection and Enforcement.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil
Vice President

Attachment

Item 1

Provide a diagram which illustrates the physical relation between the reactor core, the fuel transfer canal, the spent fuel storage pool and the set down, receiving or storage areas for any heavy loads moved on the refueling floor.

Response 1

This information is provided in FSAR Figures 1.2-6, 9.8-2, and 9.8-3.

Item 2

Provide a list of all objects that are required to be moved over the reactor core (during refueling), or the spent fuel storage pool. For each object listed, provide its approximate weight and size, a diagram of the movement path utilized (including carrying height) and the frequency of movement.

Response 2

During refueling operation, administrative controls prevent movement of equipment which weighs more than a fuel bundle and CEA (approximately 1400 pounds) over either the spent fuel pool or reactor vessel. These precautions are noted in steps 4.6 and 4.13 of attached operating procedure 2209A, Refuel Operations (see Attachment 2). During the refuel operations, the only loads suspended over the irradiated fuel in either locations were the fuel and CEA's moved in the fuel shuffle and special tools used for CEA guide tube sleeving. The list of objects includes:

Fuel Assembly: 8" x 8" x 157", 1280 pounds
CEA: 161" long, 195/299 pounds (single/dual)
Fuel Handling Tool: 31' long, 365 pounds
Guide Tube Sleeving Tools: <100 pounds

Item 3

What are the dimensions and weights of the spent fuel casks that are or will be used at your facility?

Response 3

The purchase specifications have not been formulated for the spent fuel casks which will be used at this facility. Cask drop analyses have assumed a cask 19 feet long, 8 feet in diameter, and weighing 200,000 pounds (see FSAR, Section 5.4.3.1.9).

Item 4

Identify any heavy load or cask drop analyses performed to date for your facility. Provide a copy of all such analyses not previously submitted to the NRC Staff.

A 07/25/78

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UBJECT:
ESPONSE TO NRC REQUEST OF 05/17/78..FORWARDING INFO CONCERNING THE CONTROL
F HEAVY LOADS NEAR SPENT FUEL OF SUBJECT FACILITY.

LANT NAME: MILLSTONE #2

REVIEWER INITIAL: XJM
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WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
SOUTHEAST NUCLEAR ENERGY COMPANY

P.O. BOX 270
HARTFORD, CONNECTICUT 06101
(203) 666-6911

July 17, 1978

Docket No. 50-336

Director of Nuclear Reactor Regulation
Attn: Mr. R. Reid, Chief
Operating Reactors Branch #4
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Reference: (1) V. Stello, Jr., letter to W. G. Counsil dated May 17, 1978.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
Control of Heavy Loads Near Spent Fuel

In Reference (1), Northeast Nuclear Energy Company (NNECO) was requested to provide information concerning the control of heavy loads near spent fuel. Accordingly, Attachment 1 is provided which addresses each of the requested items.

We trust this information is responsive to your request.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil

W. G. Counsil
Vice President

Attachment

DOCKET NO. 50-336

ATTACHMENT 1

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2

CONTROL OF HEAVY LOADS NEAR SPENT FUEL

JULY, 1978

Response 4

The following analyses have been provided to the NRC Staff:

Millstone Unit No. 2 Environmental Report

Section 6.6 - Fuel Assembly Drop in Refueling Pool
- Heavy Object Drop onto Fuel in Core

Section 6.7 - Fuel Assembly Drop into Spent Fuel Pool
- Heavy Object Drop onto the Spent Fuel Racks
- Spent Fuel Shipping Cask Drop

Millstone Unit No. 2 FSAR

Section 5.4.3.3.3 - Cask Drop Analysis

Section 14.5 - Fuel Handling Incident

D. C. Switzer letter to G. Lear dated March 21, 1977

Fuel Handling Accident in Containment

Item 5

Identify any heavy loads that are carried over equipment required for the safe shutdown of a plant that is operating at the time the load is moved. Identify what equipment could be affected in the event of a heavy load handling accident (piping, cabling, pumps, etc.) and discuss the feasibility of such an accident affecting this equipment. Describe the basis for your conclusions.

Response 5

Due to physical arrangements, heavy loads are not carried over operating vital equipment.

Item 6

If heavy loads are required to be carried over the spent fuel storage pool or fuel transfer canal at your facility, discuss the feasibility of a handling accident which could result in water leakage severe enough to uncover the spent fuel. Describe the basis for your conclusions.

Response 6

A cask drop in the spent fuel pool represents the most limiting incident which could result in water leakage. This incident has been analyzed in FSAR, Section 5.4.3.3.3 and the results indicate that although some local damage to the liner plate and/or concrete may occur, the extent of the damage is small and will not result in any significant damage to the floor.

Item 7

Describe any design features of your facility which affect the potential for a heavy load handling accident involving spent fuel, e.g., utilization of a single failure-proof crane.

Response 7

These design features are described in FSAR, Section 9.8, "Fuel and Reactor Component Handling Equipment".

Item 8

Provide copies of all procedures currently in effect at your facility for the movement of heavy loads over the reactor core during refueling, the spent fuel storage pool, or equipment required for the safe shutdown of a plant that is operating at the time the move occurs.

Response 8

The only procedure which contains controls on movement of heavy loads is the attached operating procedure 2209A, Refueling Operations. Operating procedure 2211B, Spent Fuel Shipment has not been written pending the purchase of the shipment casks.

9. Comparison of the Millstone Unit No. 2 Spent Fuel Storage Facility to Regulatory Guide 1.13

The Millstone Unit No. 2 spent fuel storage facility has been compared with the guidelines set forth in Regulatory Guide 1.13 and has been found to be in complete compliance with this document. Brief descriptions of how the Millstone Unit No. 2 facility is in compliance with the eight regulatory positions in this guide are given below.

1. The spent fuel storage facility (including its structures and equipment except as noted in paragraph 6 below) should be designed to Category I seismic requirements.

   ***

   The spent fuel pool is an integral part of the auxiliary building. The entire auxiliary building is a seismic Category I structure. The structural properties of the spent fuel pool are described in Millstone Unit No. 2 FSAR Sections 5.4.1.1.2. Seismic analyses were performed on the auxiliary building and hence on the spent fuel pool in accordance with FSAR Section 5.8.

2. The facility should be designed (a) to keep tornadic winds and missiles generated by these winds from causing significant loss of watertight integrity of the fuel storage pool and (b) to keep missiles generated by tornadic winds from contacting fuel within the pool.

   ***

   The spent fuel pool, as part of the auxiliary building, is designed to withstand tornadic winds and missiles without loss of watertight integrity. The tornado design of the auxiliary building and spent fuel pool are described in the Millstone Unit No. 2 FSAR Sections 5.4.3.1.6 and 5.4.3.3.2.

3. Interlocks should be provided to prevent cranes from passing over stored fuel (or near stored fuel in a manner such that if a crane failed, the load could tip over on stored fuel) when fuel handling is not in progress. During fuel handling operations, the interlocks may be bypassed and administrative control used to prevent the crane from carrying loads that are not necessary for fuel handling over the stored fuel or other prohibited areas. The facility should be designed to minimize the need for bypassing such interlocks.

   ***

   Interlocks/physical stops are installed on the auxiliary building crane to prevent crane travel over irradiated fuel with loads in excess of 1800 pounds. The prohibition of lifting heavy loads over irradiated fuel is a requirement of Technical Specification 3.9.7. Surveillance requirements to assure that the required interlocks/stops are operable prior to handling irradiated fuel are given in Technical Specification 4.9.7.

4. A controlled leakage building should enclose the fuel pool. The building should be equipped with an appropriate ventilation and filtration system to limit the potential release of radioactive iodine and other radioactive materials. The building need not be designed to withstand extremely high winds, but leakage should be suitably controlled during refueling operations. The design of the ventilation and filtration system should be based on the assumption that the cladding of all of the fuel rods in one fuel bundle might be breached. The inventory of radioactive materials available for leakage from the building should be based on the assumptions given in Regulatory Guide 1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors" (Safety Guide 25).

***

The potentially radioactive areas of the auxiliary building, such as the spent fuel pool area, are maintained at a negative pressure relative to clean areas of the plant and the out of doors. This feature ensures that there will be no leakage from radioactive areas.

During handling of spent fuel which was decayed for less than sixty (60) days, the spent fuel pool area is ventilated by the enclosure building filtration system (EBFS). The exhaust air processed through the EBFS passes through pre-filters, charcoal and HEPA filters before being exhausted to the atmosphere via the Unit No. 1 stack. Inleakage is controlled by the administrative closure of all access doors to the spent fuel pool area as specified in Technical Specification 3.9.14. Ventilation requirements for handling of spent fuel which has decayed less than sixty (60) days are described in the Millstone Unit No. 2 Technical Specification 3.9.14.

During normal operation including handling of spent fuel decayed more than sixty (60) days, the exhaust air from the spent fuel pool area is passed through a particulate and a HEPA filter and exhausted up the Unit No. 2 stack. Outside makeup air is supplied at a lower flow rate than exhaust air thereby maintaining a negative pressure in the pool area.

In the event of a fuel handling accident in the spent fuel pool area, high radiation signal automatically diverts flow to be exhausted through the EBFS. The same higher radiation signal would isolate the normal air supply and exhaust. The exhaust path for the EBFS is described above.

The breaching of cladding integrity of a complete spent fuel assembly (176 rods) has been analyzed and the radiological consequences have been found to be well within the limits of 10 CFR Part 100. Structural analyses of the fuel has shown that only the first row (14 rods) could be breached during a fuel drop accident.

The normal ventilation system for the spent fuel pool area is described in FSAR Sections 9.9.8 and 9.9.9. The EBFS is described in FSAR Section 6.7. The fuel handling incident is described in FSAR Section 14.5.

5. The spent fuel storage facility should have at least one of the following provisions with respect to the handling of heavy loads, including the refueling cask:

(a) Cranes capable of carrying heavy loads should be prevented, preferably by design rather than by interlocks, from moving into the vicinity of the pool; or,

(b) Cranes should be designed to provide single-failure-proof handling of heavy loads, so that a single failure will not result in loss of capability of the crane-handling system to perform its safety function; or,

(c) The fuel pool should be designed to withstand, without leakage that could uncover the fuel, the impact of the heaviest load to be carried by the crane from the maximum height to which it can be lifted. If this approach is used, design provisions should be made to prevent the crane, when carrying heavy loads, from moving in the vicinity of stored fuel.

***

The spent fuel pool has been analyzed for a cask drop accident. It has been concluded that although some minor local damage to the 1/4 inch type 304 stainless steel liner plate would occur, no significant structural damage would result. The results of the cask drop analysis are given in the Millstone Unit No. 2 FSAR Section 5.4.3.3.3.

In addition, the crane is interlocked so that it cannot pass over the spent fuel pool or cask loading pit. During installation or removal of a cask into the cask loading pit, the interlock is partially disengaged to allow travel over the pit but still prevents travel over the remainder of the spent fuel pool. Technical Specification 4.9.7 ensures that the interlocks/stops which preclude crane travel with heavy laods over the spent fuel pool are operable/installed.

6. Drains, permanently connected mechanical or hydraulic systems, and other features that by maloperation or failure could cause loss of coolant that would uncover fuel should not be installed or included in the design. Systems for maintaining water quality and quantity should be designed so that any maloperation or failure of such systems (including failures resulting from the Safe Shutdown Earthquake) will not cause fuel to be uncovered. These systems need not otherwise meet Category I seismic requirements.

***

The spent fuel pool for Millstone Unit No. 2 does not have any low point drains. The suction to the spent fuel cooling system is taken just below normal water level. The return line which enters near the top of the pool and extends to near the bottom is equipped with a siphon breaker. Draining of the pool due to a break in the spent fuel pool cooling system is therefore not possible.

The only other connection which is near the bottom of the pool is the fuel transfer tube. This tube is seismic Category I and except during refueling, is isolated on the spent fuel side by a gate valve and on the containment side by a blind flange.

The pool is equipped with a leak chase system so that small leaks in the pool liner can be detected and corrective action can be taken.

The spent fuel pool is described in FSAR Section 9.5

7. Reliable and frequently tested monitoring equipment should be provided to alarm both locally and in a continuously manned location if the water level in the fuel storage pool falls below a predetermined level or if high local-radiation levels are experienced. The high radiation level instrumentation should also actuate the filtration system.

***

The spent fuel pool is equipped with both high and low level alarms. These alarms sound in the main control room. It is not necessary for this alarm to sound locally since personnel in the area would either visually notice an abnormal pool level or be notified of the abnormal pool level by control room personnel. These alarms are tested at routine intervals under approved maintenance procedures. In addition, proper water level is verified once per seven (7) days in accordance with Technical Specification 4.9.12.

The spent fuel pool area is equipped with high radiation monitors which sound both locally and in the main control room. As described in the answer to Regulatory Postion #4, a high radiation signal will automatically cause the EBFS to take suction from the spent fuel pool area. The radiation monitoring system is tested in accordance with Technical Specification 4.3.3.1. A description of this system can be found in FSAR Section 7.3.2.1.

8. A seismic Category I makeup system should be provided to add coolant to the pool. Appropriate redundancy or a backup system for filling the pool from a reliable source, such as a lake, river or onsite seismic Category I water-storage facility, should be provided. If a backup system is used, it need not be a permanently installed system. The capacity of the makeup systems should be such that water can be supplied at a rate determined by consideration of the leakage rate that would be expected as the result of damage to the fuel storage pool from the dropping of loads, from earthquake or from missiles originating in high winds.

***

Normally, makeup water is provided from the primary makeup water (PMW) tank through non-seismic lines. In an emergency makeup water can be supplied through seismic piping from either the refueling water storage tank or the condensate storage tank. Also, the fire protection system can be used for emergency makeup through temporary hose connections. For a detailed description, see FSAR Section 9.5.2.1.

DOCKET NO. 50-336

ATTACHMENT 2

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2

OPERATING PROCEDURE 2209A, REFUELING OPERATIONS

JULY, 1978

APPROVAL: _____ DATE: 7-1-77 W. Strong

Plant Superintendent

STATION PROCEDURE COVER SHEET

A. IDENTIFICATION

Number OP 2209A Rev. 2

Title REFUELING OPERATIONS

Prepared By William E. Strong

B. REVIEW

I have reviewed the above procedure and have found it to be satisfactory.

TITLE	SIGNATURE	DATE
DEPARTMENT HEAD	Jas J Kelley Jr	11/28/77

C. UNREVIEWED SAFETY QUESTION EVALUATION DOCUMENTATION REQUIRED:

(Significant change in procedure method or scope as described in FSAR) YES [ ] NO [XX]
(If yes, document in PORC/SORC meeting minutes)

ENVIRONMENTAL IMPACT

(Adverse environmental impact) YES [ ] NO [XX]
(If yes, document in PORC/SORC meeting minutes)

D. PORC/SORC APPROVAL

PORC/~~SORC~~ Meeting Number 77-133

E. APPROVAL AND IMPLEMENTATION

The attached procedure is hereby approved, and effective on the dates below:

Plant Superintendent/Unit Superintendent	Approved Date	Effective Date
	11/28/77	11/28/77

SF-301
Rev. 2

REFUELING OPERATIONS

Page No.	Effective Revision	Date
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3	2	11/28/77
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12	2	11/28/77
13	2	11/28/77
14	2	11/28/77

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1. OBJECTIVE

1.1 To specify the plant requirements and steps necessary to place the plant in a refueling condition.

1.2 To delineate the necessary plant requirements and personnel responsibilities to ensure a safe and orderly refueling operation.

1.3 To specify the steps necessary to return the Reactor Coolant System to a cold shutdown condition.

2. PREREQUISITES

NOTE: Refer to Form 2209A-1, Prerequisite sign off sheet.

2.1 The reactor has been placed in a refueling shutdown condition in accordance with OP 2207 (Plant Cooldown).

2.2 Fuel assemblies required for refueling are verified to be stored in the spent fuel pool and/or the new fuel vault and all new fuel assemblies have been inspected in accordance with OP 2210A, New Fuel Assembly and Control Element Assembly Receipt and Inspection.

2.3 The following systems are capable of supporting refueling operations.

2.3.1	Reactor Coolant System	OP 2301
2.3.2	Shutdown Cooling System	OP 2310
2.3.3	Low Pressure Safety Injection	OP 2307
2.3.4	High Pressure Safety Injection	OP 2308
2.3.5	Refueling Water Storage Tank	OP 2350
2.3.6	Containment	OP 2312
2.3.7	Fuel Handling	OP 2303
2.3.8	Chemical Volume Control	OP 2304
2.3.9	Reactor Building Closed Cooling Water	OP 2330A
2.3.10	Service Water	OP 2326
2.3.11	Instrument Air	OP 2332B
2.3.12	Station Air	OP 2332A
2.3.13	Clean Liquid Radwaste	OP 2335
2.3.14	Aerated Liquid Radwaste	OP 2336
2.3.15	Makeup Water	OP 2340
2.3.16	Fire Protection	OP 2341

2.3.17	Spent Fuel Pool Cooling	OP 2305
2.3.18	Sampling System	OP 2311
2.3.19	Plant Communications	OP 2348
2.3.20	Station Electrical 4.16KV Bus 24C or D	OP 2343
2.3.21	Station Electrical 480V Bus 22E or F	OP 2344
2.3.22	120V Regulated Instrument AC	OP 2345A
2.3.23	120V Vital Instrument AC	OP 2345B
2.3.24	125 VDC	OP 2345C
2.3.25	Emergency Diesel Generator A or B	OP 2346
2.3.26	Nuclear Instrumentation Wide Range Log Channels	OP 2401
2.3.27	Process & Area Radiation Monitoring	OP 2404A & B
2.3.28	Engineered Safeguards Actuation	OP 2405
2.3.29	Containment Recirculation, Cooling & Ventilation Systems	OP 2313
2.3.30	Main Exhaust	OP 2314A
2.3.31	Containment & Enclosure Building Purge	OP 2314B
2.3.32	Radwaste (Aux. Bldg.)	OP 2314C
2.3.33	Fuel Handling Area	OP 2314F
2.3.34	Enclosure Bldg. Filtration	OP 2314G
2.3.35	Control Room Air Conditioning	OP 2315

2.4 The containment area radiation and airborne radiation monitors shall be operable during the refueling operation. (Tech. Spec. 3.9.9)

2.5 The containment purge valve isolation system shall be operable during refueling operations. (Tech. Spec. 3.9.10)

2.6 Containment penetrations shall be in the following status:

2.6.1 Equipment door in place and bolted.

2.6.2 At least one door in the personnel airlock secured.

2.6.3 Each penetration providing direct access from the containment atmosphere shall be:

1. Closed by an isolation valve, blind flange or a manual valve; or
2. Be capable of being closed by an operable containment purge valve.

2.7 The containment evacuation alarm shall be satisfactorily tested from panel C04 within one day prior to refueling.

2.8 Prior to initiating fuel movement ensure proper operation and interlock operability of the following refueling equipment is verified:

2.8.1 Refueling Machine (Preoperational Check List OPS Form 2303-1)

2.8.2 Transfer System (Preoperational Check List OPS Form 2303-2)

2.8.3 CEA Change Machine (Preoperational Check List OPS Form 2303-3)

2.8.4 Spent Fuel Pool Platform Crane (Preoperational Check List OPS Form 2303-4)

2.8.5 New Fuel Elevator (Preoperational Check List OPS Form 2303-5)

2.8.6 Communications Circuit

2.8.7 Alignment of T.V. Camera (OPS Form 2303-7)

2.8.8 Alignment of Refueling Machine (OPS Form 2303-8)

2.8.9 Spent Fuel Cask Crane (Preoperational Check List OPS Form 2303-9)

2.8.10 Spent Fuel Inspection Equipment (Preoperational Check List OPS Form 2303-10)

2.9 All personnel who will participate in the refueling operation have been briefed and are thoroughly familiar with this procedure, and the Fuel Handling Procedure, OP 2303.

2.10 Refueling work list has been properly initiated.

2.11 A complete checkout, including a load test (Surv. Proc. 2637A), shall be conducted on the refueling machine crane with 3 days prior to the start of moving fuel assemblies. (Tech. Spec. 3.9.6)

2.12 Auxiliary building doors specified in Tech. Spec. Table 3.9-1 shall be closed and the spent fuel area shall be exhausted through the EBFAS in the auxiliary exhaust mode. (Tech. Spec. 3.9.14 and 3.9.15)

2.13 One off-site power supply and one emergency diesel shall be operational during refueling operations. (Tech. Spec. 3.8.1.2)

2.14 The minimum AC and DC electrical distribution (inplant) specified in Tech. Specs. 3.8.2.2 and 3.8.2.4 shall be maintained during the refueling operation.

2.15 At least one charging pump or one HPSI pump shall be operational during the refueling operation. (Tech. Spec. 3.1.2.3)

2.16 A minimum of one shutdown cooling loop shall be operable during refueling operations. (Tech. Spec. 3.9.8)

2.17 At least one flow path to the core for boric acid injection and its associated heat tracing shall be maintained during the refueling operation. (Tech. Spec. 3.1.2.1)

2.18 At least two spent fuel storage pool area radiation monitors and both the gaseous and particulate spent fuel storage pool ventilation monitors shall be operable. (Tech. Spec. 3.9.13)

3. INITIAL CONDITIONS

3.1 Reactor coolant boron concentration is being maintained uniform and of sufficient concentration to ensure keff is less than 0.90 with all rods inserted.

3.2 Reactor coolant system temperature is maintained greater than 82°F by the shutdown cooling system.

3.3 The chemical volume control system is lined up for normal operation in accordance with OP 2304 (CVCS) with the following exceptions:

3.3.1 Charging pumps secured. Handswitches in the off position on CO-2 and green stripe caution tagged.

3.3.2 System filled with borated water at a concentration equal to or greater than the concentration of the reactor coolant system.

3.3.3 Volume control tank at normal operating level.

3.3.4 Let down flow secured. 2-CH-515 and 2-CH-516 shut and red tagged.

3.3.5 Reactor coolant pump controlled bleed off isolated. 2-CH-505 and 2-CH-506 shut and red tagged.

3.3.6 VCT is pressurized to 5 PSIG with nitrogen.

3.4 To prevent the addition of unborated water to the reactor coolant system, the following valves are shut and red tagged.

1) 2-CS-10A PMW to RWST
2) 2-CH-195 PMW TO RCS Makeup
3) 2-CH-422 PMW to CVCS Demin.
4) 2-CH-080 PMW to CVCS Flush
5) 2-PMW-167 PMW to Spent Fuel Pool
6) 2-RW-77 PMW to SEP Demin.

3.5 Reactor coolant pump breakers are racked out and red tagged.

3.6 Pressurizer heater breakers are racked out and red tagged.

3.7 RCS hot leg drain valves 2-RC-215 and 040 are shut and caution tagged. Inaccurate refueling level will result if opened.

3.8 Spent fuel pool and transfer canal filled with borated water with a concentration equal to or greater than reactor coolant system concentration and spent fuel pool cooling system in operation.

3.9 Minimum shift complement during refueling is four (4) persons. A licensed Unit 2 SRO shall be in direct charge of refueling operations in the reactor fueling area. In addition, there shall be at least one licensed RO in the control room and one licensed Unit 2 SRO in the station not directly involved in supervising fuel loading.

4. PRECAUTIONS

4.1 Whenever core geometry is being changed, neutron flux shall be continuously monitored by at least two source range neutron monitors, with each monitor providing continuous visual indication in the control room, and one with audible indication in containment. (Tech. Spec. 3.9.2)

4.2 During reactor vessel head removal and while refueling operations are being performed in the reactor, the reactor coolant system

boron concentration must be maintained uniform and of a sufficient concentration to ensure keff is less than 0.90 with all rods inserted. (Tech. Spec. 3.9.1)

4.3 Direct communication between personnel in the control room and at the refueling machine shall be maintained during fuel movement within the reactor pressure vessel. (Tech. Spec. 3.9.5)

4.4 A minimum of 23 feet of water shall be maintained above the top of the fuel in the core whenever irradiated fuel is being handled in the core area. A minimum of 23 feet of water shall be maintained above the top of the fuel in the spent fuel storage racks whenever irradiated fuel is being handled in the spent fuel pool.

4.5 To ensure proper fuel positioning, the refueling machine must be realigned prior to loading fuel if the core support barrel had been moved.

4.6 Loads greater than that of a fuel assembly and CEA shall be prohibited from travel over irradiated fuel in the spent fuel pool. (Tech. Spec. 3.9.7)

4.7 Movement of irradiated fuel in the core shall not be initiated before the reactor core has decayed for a minimum of 72 hours. (Tech. Spec. 3.9.3)

4.8 If an excessive or unanticipated count rate multiplication, i.e., doubling, is indicated at any time, fuel handling will cease until the situation has been evaluated by the shift supervisor and reactor engineering personnel.

4.9 Movement of fuel assemblies, control element assemblies or sources is not allowed without knowledge and approval of the control room licensed operator.

4.10 If a fuel assembly, CEA or source is believed to be damaged, the fuel handling will cease. The reactor engineer will be notified and an inspection and evaluation is to be made on the component.

4.11 Throughout fueling operations the refueling machine operator must be extremely careful to prevent an inadvertent driving of the TV camera or hoist box into the core support barrel. To minimize the possibility of such an occurrence, the refueling work list indicates allowable refueling mast positions.

4.12 Health Physics procedures must be strictly adhered to at all times.

4.13 Loads greater than that of a fuel assembly and CEA shall be prohibited from travel over irradiated fuel in the vessel with the head removed, without approval of higher management.

5. PROCEDURE

5.1 Preparing the reactor vessel and cavity for refueling.

5.1.1 Purge the containment in accordance with OP 2314B (Containment and Enclosure Building Purge).

5.1.2 Enter the containment in accordance with HPP 2920 (Containment Entrance).

NOTE: Steps 5.1.3 through 5.1.5 may be done concurrently with only restrictions as per MP 2704.

5.1.3 Drain the reactor vessel to 12" below the vessel flange in accordance with OP 2301E (Draining the RCS).

5.1.4 Prepare the reactor vessel head for removal in accordance with MP 2704A (Preparation for Reactor Vessel Head Removal).

5.1.5 Install refueling pool seal in accordance with MP 2704B (Installation of Refueling Pool Seal).

5.1.6 Remove reactor vessel head in accordance with MP 2704C (Reactor Vessel Head Removal).

5.1.7 Remove blind flange from transfer tube.

5.1.8 Fill the reactor cavity to 31'6" level in accordance with OP 2307 (Low Pressure Safety Injection).

5.1.9 Uncouple the CEA extension shafts in accordance with MP 2704D (Uncoupling CEA Extension Shafts).

5.1.10 Prepare to remove the upper guide structure in accordance with MP 2704F, Steps 5.1 through 5.11 (Removal of Upper Guide Structure).

5.1.11 Remove incore instrument assembly in accordance with MP 2704E (Removal of ICI Assembly).

5.1.12 Fill reactor cavity to 36'6" level in accordance with OP 2307 (Low Pressure Safety Injection).

5.1.13 Complete removal of upper guide structure in accordance with MP 2704F (Removal of Upper Guide Structure).

5.1.14 Place the refueling pool skimmer system in operation in accordance with OP 2305 Section 7.7 (Spent Fuel Pool Cooling and Purification System).

NOTE: The following step is optional, depending on water clarity.

5.1.15 Place the spent fuel pool purification system in service on the refueling pool in accordance with OP 2305 Section 7.8 (Spent Fuel Pool Cooling and Purification).

5.1.16 Verify spent fuel pool level and refueling pool level are at the same level and greater than 35'6", then open the transfer tube isolation valve.

5.1.17 If not already operating, place the spent fuel pool skimmer system in operation in accordance with OP 2305 (Spent Fuel Pool Cooling and Purification).

5.1.18 Handle all core components in accordance with OP 2303 (Fuel Handling) and the refueling worklist.

5.2 Refueling operation - control room operating personnel.

5.2.1 Direct and approve all core component movement during the refueling operation.

NOTE: The refueling worklist contains a step by step refueling sequence (material transfer forms).

5.2.2 Receive notification of core component movement and acknowledge such notification by step No., component serial numbers, originating location, present location and orientation of the refueling machine mast, if applicable.

5.2.3 Maintain an up to date status of material transfer forms. Initial and note date and time (as executor) after each completed step. (Refueling Worklist)

5.2.4 Maintain the count rate data log (OPS Form 2209A-2). Log counts hourly, even during periods when refueling operations have been interrupted.

5.2.5 Stop any fuel handling movement immediately if any discrepancy is noted or for reasons of safety and immediately notify shift supervisor.

5.2.6 Maintain direct communications with refueling area and fuel storage area at all times while handling fuel.

5.2.7 Ensure Chemistry Dept. samples the reactor coolant system boron concentration at least daily.

5.3 Refueling operation - refueling area operating personnel.

5.3.1 Move all components under the direction of the control room and in accordance with material transfer forms. (Refueling Worklist)

5.3.2 Operate all fuel handling equipment in accordance with OP 2303 (Fuel Handling System).

5.3.3 Notify control room of completion of each applicable step, including step No., component serial number, originating location, present location and orientation of refueling machine mast, if applicable.

5.3.4 Notify control room of the following:

5.3.4.1 Receipt of a fuel bundle from spent fuel storage area via transfer carriage.

5.3.4.2 Holding a fuel bundle over a core location prior to insertion into the core.

5.3.4.3 Full insertion of the fuel bundle into the core.

5.3.4.4 Unlatching the fuel bundle.

5.3.4.5 Initiating transfer of fuel bundle to spent fuel area.

5.3.5 Obtain permission from control room prior to transporting fuel from containment to spent fuel area via transfer carriage.

5.3.6 Initial and note date and time after completion of each applicable step on the material transfer form (refueling machine operator will sign as Executor, SRO or RE as SNM checker).

5.3.7 Immediately notify control room if any discrepancies are discovered.

5.4 Refueling operation - fuel storage area operating personnel.

5.4.1 Move all components under the direction of the control room and in accordance with the material transfer forms. (Refueling Worklist)

5.4.2 Operate all fuel handling equipment in accordance with OP 2303 (Fuel Handling System).

5.4.3 Notify control room of the following:

5.4.3.1 When over a fuel assembly in the spent fuel storage/new fuel storage racks, prior to latching, stating step number, component serial number and fuel storage rack location.

5.4.3.2 After the completion of each applicable step (Refueling Worklist) by step number, component serial number, originating location and present location.

5.4.3.3 Receipt of a fuel bundle from refueling cavity area via transfer carriage.

5.4.4 Obtain permission from control room to transfer a core component to the refueling cavity via transfer carriage. Notify control room when transfer is complete and receive acknowledgement.

5.4.5 Immediately notify control room if any discrepancy is discovered.

5.4.6 Initial and note date and time after completion of each applicable step on the material transfer form (spent fuel machine operator will sign as Executor, RE as SNM checker).

5.5 Refueling operation - reactor engineering personnel.

5.5.1 Monitor count rate activity.

5.5.2 Maintain current entries in reactor engineers log.

5.5.3 Monitor entire refueling operation to include spot checks of each area and review of all data.

5.5.4 Resolve any questions of discrepancies concerning refueling.

5.5.5 Keep the unit reactor engineer apprised of the status of refueling.

5.5.6 Stop refueling operations at any time for reasons of safety.

5.5.7 Maintain the tag board to reflect status of all fuel assemblies, control element assemblies and sources.

5.6 Returning the reactor coolant system to a cold shutdown condition.

5.6.1 Verify the post refueling verification check has been completed. (Refueling Worklist)

5.6.2 Transfer the transfer carriage to the spent fuel pool transfer canal for storage.

CAUTION: If the spent fuel purification system is to remain in operation on refueling pool, ensure it is lined up for operation with the transfer tube isolation valve shut. Ensure spent fuel pool cooling system is lined up for operation with transfer tube isolation valve shut. (Refer to OP 2305, Spent Fuel Cooling and Purification.)

5.6.3 Install spent fuel pool gate.

5.6.4 Shut fuel transfer tube isolation valve.

5.6.5 Install the upper guide structure in accordance with MP 2704I (Installation of UGS) Steps 5.1 through 5.5.

5.6.6 Secure the refuel pool skimmer system OP 2305 (Spent Fuel Pool Cooling and Purification).

5.6.7 Drain the refuel pool to the 31'6" level (to clear the operating platform of the UGS lift assembly) in

accordance with OP 2305 Section 7.9 (Spent Fuel Pool Cooling and Purification). For an alternate method of draining refer to OP 2307 Section 7.3 (Low Pressure Safety Injection).

5.6.8 Install the incore instrument assembly in accordance with MP 2704J (Installation of I.C.I. Assembly).

5.6.9 Complete installation of upper guide structure in accordance with MP 2704I (Installation of UGS).

5.6.10 Couple the CEA extension shafts in accordance with MP 2704K (Coupling the CEA Extension Shafts).

5.6.11 Drain the refuel pool in accordance with OP 2305 Section 7.9 (Spent Fuel Pool Cooling and Purification). For alternate method of draining, refer to OP 2307 Section 7.3 (Low Pressure Safety Injection).

5.6.12 Install blind flange on transfer tube. Perform leak detection test on fuel transfer tube in accordance with Surveillance Procedure 2609B (Local Leak Detection Test).

5.6.13 Drain the reactor vessel to 12 inches below the reactor vessel flange in accordance with OP 2301E (Draining the RCS).

5.6.14 Install the reactor vessel head in accordance with MP 2704L (Reactor Vessel Head Installation).

5.6.15 Remove the refueling pool seal in accordance with MP 2704M (Removal of Refueling Pool Seal).

5.6.16 Complete the reactor vessel head installation in accordance with MP 2704N (Completion of Reactor Vessel Head Installation).

5.6.17 Fill and vent the reactor coolant system in accordance with OP 2301D (Reactor Coolant System Fill and Vent).

5.6.18 Perform the reactor coolant system leak rate test in accordance with OP 2301B (Reactor Coolant System Leak Rate Test).

6. CHECK OFF LISTS

6.1 None