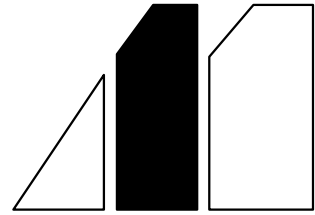


**MILLSTONE POWER STATION
GENERAL OPERATING PROCEDURE**



Reactor Shutdown

**OP 2206
Rev. 011-00**



Approval Date: 10/04/05

Effective Date: 10/13/05

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**Millstone Unit 2
General Operating Procedure**

Reactor Shutdown

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1. PURPOSE

1.1 **Objective**

This procedure provides instructions for plant operations from OPERATIONAL MODE 2 (STARTUP) to OPERATIONAL MODE 3 (HOT STANDBY).

1.2 **Discussion**

The SM or US must initial and date those steps that apply and “N/A” those steps that do *not* apply, as well as document reasons in Section 5.

Steps in this procedure may be performed in parallel, provided the SM or US reviews the applicable steps and determines that *no* plant conditions or system alignments established by any preceding steps are required, prior to commencing these steps.

Items specified on Attachment 1, “Reactor Shutdown Conditional Actions,” apply to this procedure and should be referred to as necessary during reactor shutdown.

The new wide range monitors extend range input to the source range monitors is an automatic function. The only operator action, is to ensure the “EXT RANGE” LED lights at less than 1,000 cps.

2. PREREQUISITES

2.1 **General**

____/____

2.1.1 Two licensed operators are in the Control Room.

2.1.2 Plant is in OPERATIONAL MODE 2, as specified in OP 2205, “Plant Shutdown,” with the following:

____/____

- Reactor critical with power less than 5% THERMAL POWER, as indicated by wide range power instruments

____/____

- RCS temperature being maintained at approximately 532°F

____/____

2.1.3 SG level is being maintained between 60 and 75% by manual control of FRV bypass valves or Auxiliary Feedwater System.

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2.1.4 SG pressure is being maintained automatically at approximately 900 psia by one of the following:

- Atmospheric dump valves
- Condenser Steam Dump and Bypass System

2.1.5 Shutdown group CEAs are fully withdrawn and regulating group CEAs are above the PPDIL.

2.2 Documents

2.2.1 OP 2205, “Plant Shutdown”

2.2.2 OP 2207, “Plant Cooldown”

2.2.3 OP 2208, “Reactivity Calculations”

2.2.4 OP 2302A, “Control Element Drive System”

2.2.5 SP 2610E, “MSIV Closure and Main Steam Valve Operational Readiness Testing”

2.2.6 SP 2619A–001, “Control Room Daily Surveillance, MODES 1 and 2”

2.2.7 Millstone 2 Technical Requirements Manual, Appendix 8.1, “Core Operating Limits Report (COLR)”

3. PRECAUTIONS

3.1 When decreasing power with the reactor critical, the PDIL, as specified in Millstone 2 Technical Requirements Manual, Appendix 8.1, “Core Operating Limits Report (COLR),” must *not* be exceeded.

3.2 This procedure contains steps to shutdown the reactor by simultaneous insertion of all CEAs. For the purpose of this procedure, this action is *not* classified as a Reactor Trip. If during the performance of this procedure a Reactor Trip is required, EOP 2525 actions shall be implemented. {Ref. 6.2}

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4. INSTRUCTIONS

4.1 **Reactor Shutdown Initial Actions**

Shift Manager →

4.1.1 CONDUCT shift briefing of all personnel involved in evolution to ensure items specified in the following are understood:

- Precautions, Section 3
- Attachment 1, “Reactor Shutdown Conditional Actions”

SM Initials/Date

_____/_____
_____/_____
_____/_____

4.1.2 Refer To OP 2208, “Reactivity Calculations,” and PERFORM SHUTDOWN MARGIN determination for HOT STANDBY.

4.1.3 IF required, PERFORM SP 2619A–001, “Control Room Daily Surveillance, MODES 1 and 2,” to verify CEA position (4.1.3.1.1).

4.1.4 WHEN inserting CEAs, MONITOR the following (RPS, C–04):

- SUR, for negative indication

NOTE

Wide range power instrument channels shift from “percent power” to “CPS” at approximately $10^{-4}\%$ power, as indicated by the meters and lights on C–04 and “EXT RANGE” LED lit on RPS panels.

- Wide range power instruments for decreasing power
- Applicable group CEA movement on the following:
 - “CEAPDS MONITOR”
 - Backup scanner
 - PPC CEA positions display, “CEA”
 - Core mimic

– End of Section 4.1 –

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4.2 Regulating Groups Insertion

4.2.1 PERFORM applicable action:

____/____

- **IF** normal shutdown method is to be used (manual insertion of regulating groups), Go To step 4.2.2.

____/____

- **IF** alternate shutdown method is to be used (simultaneous insertion of all CEAs), Go To step 4.2.3.

4.2.2 **IF** normal shutdown method is to be used (manual insertion of regulating groups), PERFORM the following:

____/____

- a. **IF** PPC is OPERABLE, Refer To OP 2302A, “Control Element Drive System,” and INSERT regulating group CEAs in “Manual Sequential” mode.

____/____

- b. **IF** PPC is *not* OPERABLE, Refer To OP 2302A, “Control Element Drive System,” and INSERT regulating group CEAs in “Manual Group” mode.

____/____

- c. **WHEN** Group 4 is at 72 steps, RECORD entry to OPERATIONAL MODE 3 in SM Log Book.

- d. **WHEN** Lower Electrical Limit is reached (green light lit on core mimic) **OR** lower stop alarm (PPC), is received, for *any* CEA in regulating group being inserted, PERFORM the following (ensures CEA alignment during insertion):

____/____

- 1) STOP CEA group insertion.

____/____

- 2) Refer To OP 2302A, “Control Element Drive System,” and INSERT each CEA in associated group to Lower Electrical Limit (green light lit on core mimic), in “Manual Individual” mode.

____/____

- 3) CHECK CEA group fully inserted.

4) PERFORM applicable action:

____/____

- IF PPC is OPERABLE, Go To step 4.2.2.a. for next regulating group.

____/____

- IF PPC is *not* OPERABLE, Go To step 4.2.2.b. for next regulating group.

____/____

- IF all regulating groups CEAs are inserted, Go To Section 4.3.

4.2.3 IF alternate shutdown method is to be used (simultaneous insertion of all CEAs), PERFORM the following:

____/____

- a. VERIFY main turbine is tripped.

____/____

- b. OPEN all eight TCBs by simultaneously pressing *all* 4 “RX TRIP TCBS” buttons (C-04).

____/____

- c. CHECK the following:

____/____

- 1) TCB 1 through 8 indicate open (green lights lit) (RPS, C-04).

____/____

- 2) *All* amber CEA bottom lights lit on core mimic.

____/____

- 3) “CEAPDS MONITOR” and PPC CEA positions display, “CEA,” indicate *all* CEAs on the bottom.

____/____

- 4) Reactor power is dropping (C-04, RPS).

____/____

- 5) Startup Rate is negative (C-04, RPS).

____/____



- d. RECORD entry to OPERATIONAL MODE 3 in SM Log Book.

- e. Go To Section 4.4.

– End of Section 4.2 –

4.3 Shutdown CEA Groups Insertion

4.3.1 PERFORM the following to insert Shutdown CEA groups:

 CAUTION  Shutdown group CEAs shall <i>not</i> be inserted below 176 steps until <i>all</i> regulating group CEAs are inserted, except in the case of a reactor trip.
--

a. CHECK “CEA S/D GPS INS PER” alarm light lit (C-04, window BA-13)

b. CHECK “CEA S/D GPS INS PER BK/UP” alarm light lit (C-04, window BA-14)

c. Refer To OP 2302A, “Control Element Drive System,” and INSERT shutdown group CEAs in “Manual Group” mode.

d. WHEN Lower Electrical Limit is reached (green light lit on core mimic) OR lower stop alarm (PPC), is received, for *any* CEA in shutdown group being inserted, PERFORM the following (ensures CEA alignment during insertion):

1) STOP CEA group insertion.

2) Refer To OP 2302A, “Control Element Drive System,” and INSERT each CEA in associated group to Lower Electrical Limit (green light lit on core mimic), in “Manual Individual” mode.

3) CHECK CEA group fully inserted.

4) IF applicable, Go To step 4.3.1 a. and INSERT remaining shutdown group.

e. WHEN *all* CEAs are fully inserted (at Lower Electrical Limit), PERFORM the following:

- VERIFY main turbine is tripped

- OPEN all 8 TCBs by simultaneously pressing *all* 4 “RX TRIP TCBS” buttons (C-04).

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f. CHECK the following:

____/____

____/____

____/____

- TCB 1 through 8 indicate open (green lights lit) (RPS, C-04)
- *All* amber CEA bottom lights lit on core mimic
- “CEAPDS MONITOR” and PPC CEA positions display, “CEA,” indicate *all* CEAs on the bottom

– End of Section 4.3 –



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4.4 Reactor Shutdown Follow-up Actions

- ____/____ 4.4.1 MONITOR wide range power instruments for any unusual increase or decrease in count rate.
- ____/____ 4.4.2 ENERGIZE “AUDIBLE COUNTRATE” monitor and ALIGN to OPERABLE wide range monitor, “A”, “B”, “C” or “D” channel (RC05E).
- ____/____ 4.4.3 LISTEN for audible count rate signal present.
- 4.4.4 IF count rate for any channel decreases to less than 1,000cps, OBSERVE the following:
- Applicable channel’s meter white “CPS” light lit (C-04)
 - Applicable channel’s annunciator lit (C-04):
 - “CH ‘A’ Wide Range Extended Range C.P.S.” (CA-12)
 - “CH ‘B’ Wide Range Extended Range C.P.S.” (CB-12)
 - “CH ‘C’ Wide Range Extended Range C.P.S.” (DA-12)
 - “CH ‘D’ Wide Range Extended Range C.P.S.” (DB-12)
 - Applicable channel’s “EXT RANGE” LED lit (new wide range monitors)

	CAUTION	
<p>If reactor has been shutdown for greater than 26 hours, with a concurrent loss of charging and letdown, <u>AND</u> shutdown boron concentration has <i>not</i> been established, in order to assure sufficient RCS volume for boric acid addition to attain SHUTDOWN MARGIN, a plant cooldown must be initiated.</p>		

- ____/____ 4.4.5 Refer To Section 5, “Review and Signoff,” and COMPLETE.
- ____/____ 4.4.6 Go To OP 2205, “Plant Shutdown.”

– End of Section 4.4 –

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5. REVIEW AND SIGNOFF

The following sections of this procedure were used:

All Specific Sections: _____

Entire specified sections were completed: Yes No

If procedure was terminated prior to completion, specify cause. Also include any additional comments for items designated "N/A": _____

Performed By: _____ / _____ / _____ Date: _____
Name (printed) Signature Initials

_____ / _____ / _____ Date: _____
Name (printed) Signature Initials

_____ / _____ / _____ Date: _____
Name (printed) Signature Initials

_____ / _____ / _____ Date: _____
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Name (printed) Signature Initials

_____ / _____ / _____ Date: _____
Name (printed) Signature Initials

_____ / _____ / _____ Date: _____
Name (printed) Signature Initials

Approved By: _____ Date: _____
Signature (Shift Manager)

Reviewed By: _____ Date: _____
Signature (Department Head
or designee)

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6. REFERENCES

6.1 Technical Specifications:

- LCO, 3.1.1.1
- LCO, 3.1.1.5
- LCO, 3.1.3.7
- Surveillance Requirement, 4.7.1.5
- Administrative Control, 6.2.2c.

6.2 NUREG–1022, Rev. 2 issued October 2000

7. SUMMARY OF CHANGES

Summary of Changes – Revision 011–00

7.1 Upgraded in accordance with the U–2 PGIP guidelines (revision bars *not* used).

7.2 Deleted the (following) steps 4.3.3 and 4.3.4:

7.2.1 IF alternate shutdown method is to be used (simultaneous insertion of all CEAs), PERFORM the following:

- a. VERIFY main turbine is tripped.
- b. OPEN all eight TCBs by simultaneously pressing *all* four “RX TRIP TCBS” buttons (C–04).

7.2.2 CHECK the following:

- TCB 1 through 8 indicate open (green lights lit) (RPS, C–04)
- *All* amber CEA bottom lights lit on core mimic
- “CEAPDS MONITOR” and PPC CEA positions display, “CEA,” indicate *all* CEAs on the bottom

Attachment 1

Reactor Shutdown Conditional Actions

(Sheet 1 of 1)

1. IF at any time, the following conditions occur, **PERFORM** the specified action:
 - IF T_{avg} decreases to between 515 and 525°F AND the reactor is critical, Refer To SP 2619A–001, “Control Room Daily Surveillance, MODES 1 and 2,” and RECORD RCS temperature once every hour.
 - IF T_{avg} decreases to below 515°F AND the reactor is critical, **PERFORM** the following:
 - 1.1.1 INCREASE T_{avg} to greater than 515°F within 15 minutes.
 - 1.1.2 IF T_{avg} is *not* greater than 515°F within 15 minutes, PLACE plant in HOT STANDBY condition within the next 15 minutes.
 - IF an uncontrolled cooldown occurs, Refer To AOP 2558, “Emergency Boration” and INITIATE emergency boration to COLD SHUTDOWN boron concentration.

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