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## THREE MILE ISLAND NUCLEAR STATION UNIT #2 ABNORMAL PROCEDURE 2203-1.3 CRD MALFUNCTION ACTIONS ASYMMETRIC ROD FAULT (6.5%)

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Unit 1 Staff Recommends Approval

Approval N/A Date —  
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Unit 2 Staff Recommends Approval

Approval N/A Date —  
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Unit 1 PORC Recommends Approval

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THREE MILE ISLAND NUCLEAR STATION  
UNIT #2 ABNORMAL PROCEDURE 2203-1.3  
CRD MALFUNCTION ACTIONS  
ASYMMETRIC ROD FAULT (6.5%)

1.0 SYMPTOMS

- A. Asymmetric rod fault light on the CRD operators console.  
(Panel 4).
- B. One or more fault lamps lit on the Position Indication Panel.  
(Panel 14).
- C. CRD pattern asymmetrical alarm above PI Panel on Panel 14.
- D. Possible ICS runback alarm. (ICS Trouble Alarms - Panel 4).
- E. Rod mis-alignment indicated by the Position Indication meters  
(Panel 14) and computer.
- F. Possible Group 6/7 fault on CRD operators console. (Panel 4).

2.0 IMMEDIATE ACTION

A. Automatic Action.

- 1. If rod control is in automatic, the ICS runs the unit back to 55% power on any of the following conditions:
  - (1) Loss of any Safety group out-limit.
  - (2) Asymmetric rod with a Group 5 in-limit.
  - (3) Asymmetric rod with Group 5  $\geq$  25% and Group 6 or 7 in-limit.

B. Manual Action.

- 1. Manually reduce power to less than 60%. If runback has occurred, verify that MWe, neutron power and feed flow are decreasing and that neutron power and feed flow level off at the values corresponding to 55% power (527 MWe).
- 2. If any ICS stations are in manual, run the station in manual back to correspond to 60% of the power allowed for the RC Pump combination.

NOTE: Compatible values of neutron power, MWe and feedwater flow are found on the nomogram located on Panel 4.

### 3.0 Follow Up Action.

- A. Following runback, verify rod group overlap between rod groups 5 and 6/7 is  $25 \pm 5\%$ , if applicable.
- B. If Group 6/7 fault light is lit and the runback has concluded, select manual, sequence bypass and adjust Group 6/7 to obtain the correct overlap, after the group asymmetric condition has been corrected.
- C. If quadrant power tilt exceeds limits of T.S. 3.2.4, insure the applicable action statements are followed.
- D. Confirm the position and operability of the asymmetric rod by a 2% exercise of the affected group. Check the indicated position with the zone reference lamps in System Logic Cabinet 7 and 8 by transferring the affected rod to the auxiliary supply and driving it in to the nearest zone reference position.
- E. If the rod and its position indication are functional, realign the rod with its group average position.
- F. If the rod cannot be exercised and is in a safety or regulating group or if both the absolute and relative positions are inoperable, perform the following per Tech. Spec. 3.1.3.1 and 3.1.3.3.
  - 1. Maintain power at 60% of the thermal power allowed for the RC Pump combination.



NOTE: If less than four RC pumps are running, power must be manually reduced from the runback setpoint of 55% to less than 60% of the thermal power allowed for the RC pump combination.

2. Initiate an immediate evaluation to verify existence of two percent  $\Delta K/K$  hot shutdown margin within one (1) hour. Continue to verify this 2%  $\Delta K/K$  SDM at least once per 12 hours per 2311-1 until the rod is again declared operable.
3. A shutdown margin of 2% must be present when the worth of an inoperable rod is combined with the highest worth operable rod or the reactor must be brought to hot standby within 6 hours.
4. During the shutdown margin evaluation, boration may be initiated to compensate for the worth of the inoperable rod or until the regulating rods are withdrawn to the limit of the rod index.
5. Reduce the Overpower Trip setpoint to  $\leq 70\%$  of the Thermal Power allowable for the reactor coolant pump combination within 4 hours.
6. If a shutdown margin greater than 2% is verified within one hour of the determination that a rod is inoperable and if the rod is in a regulating group, and if the control rod is not inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, trim the remaining rods in

the group to the position of the inoperable rod and continue normal operation. Maintain the inoperable rod within the limits of the group average position and maintain proper overlap between groups.

- G. Obtain a power distribution map from the incore detectors and verify that  $FQ$  and  $F\Delta^N H$  are within their limits within 72 hours.
- J. If more than one rod (other than in Group 8) is inoperable, shut down the reactor.
- I. With one or more control rods inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SDM is  $\geq 2\% \Delta K/K$  within one hour and be in at least Hot Standby within 6 hours.
- J. Perform a re-evaluation of each accident analysis of Table 3.1-1 of the Technical Specifications within 5 days. This re-evaluation shall confirm that the previously analyzed results of these accidents remain valid for the duration of operation under these conditions.

## DROPPED ROD

### 1.0 SYMPTOMS

- A. Unexpected in-limit indication. (Panel 14).
- B. CRD Pattern Asymmetrical Alarm. (Panel 4).
- C. Absolute Position Indication shows one or more rods at 0% on both the individual meters (Panel 14) and the computer.
- D. Flux tilt as indicated by incore and out-of-core detectors. (Panel 4 and 14).
- E. Reduction in reactor power level with accompanying fluctuations in reactor coolant temperature, reactor coolant pressure, and pressurizer level. (Panel 4).
- F. Possible Group 6/7 fault indication on CRD operator console. (Panel 4).

### 2.0 IMMEDIATE ACTION

- A. Automatic Action.
  - 1. If rod control is in automatic, the ICS runs the plant back to 55% power.
  - 2. Possible low reactor pressure trip.
- B. Manual Action
  - 1. Manually reduce power to less than 60%. If runback has occurred, verify that MWe, neutron power and feed flow are decreasing and that neutron power and feed flow level off at the values corresponding to 55% power (527 MWe).
  - 2. If any ICS station is in manual, run the station back to correspond to 60% of the power allowed for the RC Pump combination.



NOTE: Compatible values of neutron power, MWe and feedwater flow are found on the nomogram located on Panel 4.

### 3.0 FOLLOW UP ACTION

- A. For a Group 6 or Group 7 dropped rod condition, the Group 6/7 fault light will be energized.
- B. Do not re-adjust Group 6 or 7.
- C. If quadrant power tilt exceeds limits of T.S. 3.2.4, insure the applicable action statements are followed.
- D. Confirm the position and operability of the asymmetric rod by a 25 exercise of the affected group. Transfer the dropped rod to the Auxiliary supply. Reset the RPI associated with the dropped rod. Relatch the dropped rod. Check the indicated position with the zone reference lamps in System Logic Cabinet 7 and 8 by driving the rod out to the nearest zone reference position.
- E. If the rod and its position indication are functional, realign the rod with its group average position and transfer the rod to the Group Supply.
- F. If the rod cannot be exercised and is in a safety or regulating group or if both the absolute and relative positions are inoperable, perform the following per Tech. Spec. 3.1.3.1 and 3.1.3.3.
  - 1. Maintain power at 60% of the thermal power allowed for the RC Pump combination.

NOTE: If less than four RC pumps are running, power must be manually reduced from the runback setpoint of 60% to less than 60% of the thermal power allowed for the RC pump combination.

2. Initiate an immediate evaluation to verify existence of two percent  $\Delta K/K$  hot shutdown margin within one (1) hour. Continue to verify this 2%  $\Delta K/K$  SDM at least once per 12 hours per 2311-1 until the rod is again declared operable.
3. Reduce the Overpower Trip setpoint to  $\leq 70\%$  of the Thermal Power allowable for the reactor coolant pump combination within 4 hours.
4. If the rod cannot be re-latched, then have Electrical Maintenance check or replace the fuse in each of the 6 stator phases.
5. To verify that the problem is mechanical and not an electrical problem, have current reading taken of each stator coil. The phase current should be approximately 15 amperes.
6. If the rod cannot be re-latched, and the Tech Spec limitations for power operation cannot be met, then cooldown as required and repair the CRDM.
- G. Obtain a power distribution map from the incore detectors and verify that FQ and  $F\Delta^N H$  are within their limits within 72 hours.
- J. If more than one rod (other than in Group 8) is inoperable, shutdown the reactor.
- I. With one or more control rods inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SDM is  $\geq 2\%$   $\Delta K/K$  within one hour and be in at least Hot Standby within 6 hours.



- J. Perform a re-evaluation of each accident analysis of Table 3.1-1 of the Technical Specifications within 5 days. This re-evaluation shall confirm that the previously analyzed results of these accidents remain valid for the duration of operation under these conditions.

## ROD EJECTION

### 1.0 SYMPTOMS

- A. Asymmetric rod fault alarm as indicated on PI Panel (7") (Panel 14) or console (9") (Panel 4).
- B. Possible unexpected out-limit indication (Panel 14).
- C. Unexpected increase in reactor power (Panel 4).
- D. Possible increase in primary system temperature (Panel 4).
- E. Reactor Coolant Pressure will increase or decrease (Panel 4).
- F. LOCA symptoms e.g. increase in reactor building pressure (Panel 8 Annunciator A1).

### 2.0 IMMEDIATE ACTION

#### A. Automatic Action.

- 1. If a rod is ejected, the RPS will automatically trip the reactor, and the SFAS will be activated by:
  - a) Underpressure of reactor coolant.
  - b) Overpressure of reactor building.

NOTE: Reactivity excursions initiated by uncontrolled rod withdrawal at a fixed rate will be safely terminated by the RPS. In order for reactivity to be added to the core at a more rapid rate, physical failure of the pressure boundary component must occur. The power excursion due to a rapid increase in reactivity is limited by the doppler effect and terminated by reactor protection system trips.

#### B. Manual Action

- 1. Manually trip the reactor.

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2. Initiate Safety Injection.

3.0 FOLLOW UP ACTION

A. Proceed with the following:

1. Loss of RC/RC Press - Procedure No. 2202-1.3 as applicable.



## STUCK ROD

### 1.0 SYMPTOMS

- A. Failure of the rod to respond to group commands.
- B. CROM may be de-energized with no in-limit indication and no zero position indication (Panel 14).

### 2.0 IMMEDIATE ACTION

- A. Automatic Action.
  - 1. None.
- B. Manual Action.
  - 1. Transfer CROCS to manual mode.
  - 2. Transfer the stuck rod to the Auxiliary Power Supply per 2105-1.9.
  - 3. Attempt to move the rod by first inserting the rod, at jog speed, a short distance (about 20 seconds) and then withdrawing it in the out direction.
  - 4. If the rod can be moved, then align the rod with the group and transfer the rod from Auxiliary Supply to the Group Supply.
  - 5. If the rod cannot be moved reduce power to 50% of allowable power for RCP combination.

### 3.0 FOLLOW UP ACTION

- A. If quadrant power tilt exceeds limits of T.S. 3.2.4, insure the applicable action statements are followed.
- B. If the stuck rod cannot be moved with the Auxiliary Supply, then have Electrical Maintenance check or replace the fuse in each of the 6 stator phases. Fuse blocks are located in front of the CROCS Transfer Cabinets 1 through 8.

- C. To verify that the problem is mechanical and not an electrical problem, have current reading taken of each stator coil. The phase current should be approximately 15 amperes.
- D. If step B above shows that the problem is mechanical, then again try to exercise the rod.
- E. Investigate the possibility of an inoperable API channel. By inserting the affected rods RPI indication to the nearest zone reference lamp area. If it is confirmed that the rod has defective API indication, proceed with action statements of 3.1.3.3.
- F. With one or more control rods inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the shutdown margin requirements of Specification 3.1.1.1 is satisfied within one hour and be in at least hot standby within 6 hours per T.S. 3.1.3.1.