ATTACHMENT 3
TO P-85040

CONTROL ROD DRIVE AND ORIFICING ASSEMBLY PROPOSED PREVENTIVE/PREDICTIVE MAINTENANCE PROGRAM

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I. ABSTRACT

A review of source information to identify potential preventive maintenance activities has been completed, and aspects of that program are being proposed. The detailed implementation of some parts of the program will be dependent upon the results of currently underway Engineering studies. Evidence suggests that a preventive maintenance schedule based on the scheduled refueling cycle for normal service rods (i.e., replacement of rods in refueling regions with refurbished assemblies), and for the regulating rod, in conjunction with predictive maintenance, is appropriate. Of particular importance is the monitoring of shim motor performance, to identify and schedule maintenance other than normally scheduled maintenance.

II. DESCRIPTION OF TECHNICAL REVIEW

A review of a variety of source information on Control Rod Drive and Orificing Assemblies (CRDOAs) has been performed to identify aspects of maintenance for which preventive maintenance consideration would be appropriate. The following sources of information were used:

1. Operations and Maintenance Manual (GA-9806, May 1977)
2. Completed Plant Trouble Reports from the STAIRS database
3. Open Station Service Requests (Plant Trouble Reports)
4. Plant Maintenance Personnel
5. Plant Maintenance Engineering Personnel
6. Proposed Modifications
7. Operational Experience
8. D-1201 Drawings (Design Drawings)
9. Surveillance Requirements
10. Engineering Development Studies

From this variety of information, a set of potential preventive maintenance activities has been identified. Each of these is being subsequently considered individually with regard to component failure history, service life, predictive maintenance (PDM) test potential, and other possibilities, to identify a set of preventive maintenance (PM) activities that is appropriate.

III. PREVENTIVE MAINTENANCE (PM) PROGRAM - GENERAL OVERVIEW OF POTENTIAL PM ACTIVITIES

A. SHIM MOTOR/BRAKE ASSEMBLY

1. Visual Examination

a. Pinion gear
b. Motor bearings
c. Brake pads

2. Test - as left

a. Dynamometer
b. Torque to rotate - removed from CRDOA
c. Torque to rotate - installed on CRDOA
d. Back-EMF (scram generated braking voltage)

3. Shim Motor Bearings

a. Clean/replace as required

4. Electrical

a. Megger motor (insulation test)
b. Dynamometer (load capability)
c. Megger brake windings (insulation test)

B. DRIVE TRAIN

1. Visual Examination of exterior

2. Torque - delivered (rods on) measurement

a. Torque to rotate - motor installed on CRDOA - through shim motor rotor shaft
(This is the same as item A.2.c, above)
b. Back-EMF (scram generated braking voltage)

C. CABLE

1. Visual examination

2. Surface wipe analysis

3. Replace one cable every 3rd refueling cycle to allow:

a. Detailed visual examination
b. Metallographic examination
c. Pull test

D. RESERVE SHUTDOWN SYSTEM

1. Hopper

   a. Visual examination

2. Material

   a. Sample removal - visual examination
   b. Sample analysis - select CRDOAs

3. Pressure switch

   a. Functional test - Surveillance Requirement

4. Valves

   a. None

5. RSD System

   a. Functional test (blow rupture disk) - Surveillance Requirement

E. POSITION POTENTIOMETERS - ROD PAIR

1. Visual Inspection

2. Test

3. Replace based on service

   a. Number of shims
   b. Rod travel
   c. Anomalous indication
   d. Other service parameters

F. LIMIT SWITCHES (2 each - slack cable, in, out, retract)

1. Visual Inspection

2. Test

3. Replace based on service

   a. Time in reactor
   b. Moisture
   c. Anomalous behavior

G. ORIFICE DRIVE MOTOR ASSEMBLY

1. Visual
2. Bench Test
3. Clean and lube (dry)
4. Replace support nut

H. ORIFICE DRIVE LEAD SCREW

1. Visual - as found
2. Clean - physical
3. Dye Penetrant testing
4. Lubricate and exercise

I. LOWER SEAL

1. Visual
2. Clean - physical, wipe
3. Clean - body housing

J. PRIMARY SEAL - 600 ASSEMBLY

1. Visual - both surfaces
2. Clean - wipe
3. Clean - mating surface, penetration and 600 Assembly
4. Lifetime evaluation - possible replacement

K. PRIMARY SEAL - 200 ASSEMBLY

1. Visual
2. Clean - wipe
3. Clean - mating surface
4. Lifetime evaluation - possible replacement

L. CHECK VALVES - (RSD, CRDOA Purge)

1. Visual
2. Test

M. CABLE SEALS

1. As determined by observed elevated/abnormal housing temperatures

N. ORIFICE MOTOR PLATE SEALS

1. Visual

2. Clean - wipe

O. WINDOW SEALS

1. Visual

2. Clean - wipe

3. Gasket material - evaluate for lifetime

P. MCC CAPACITORS

1. Test

2. Shelf life/service life evaluation

Q. ELECTRICAL - POWER

1. Megger shim motor (test insulation deterioration)

2. Bench test shim motor (load capability)

3. Megger brake windings (test insulation deterioration)

4. Bench test brake solenoid (load capability)

5. Bench test stepping motor (load capability)

R. ELECTRICAL - INDICATION

1. In/Out Limit Switch Function - test redundancy when made up

2. Slack Cable - test redundancy when made up

3. Full retract - N/A - normally not both made up

S. BOLTS - EXPOSED TO PRIMARY COOLANT

1. Visual on selected bolts

T. ABSORBER STRINGS

1. Visual

2. Lifetime evaluation - possible replacement

3. Shock absorber only replacement

IV. PREDICTIVE MAINTENANCE (PDM) PROGRAM

A. SHIM MOTOR/BRAKE ASSEMBLY AND GEAR TRAIN

1. Wattage - outward shims - as found/as left
inward shims - as found/as left

2. Back-EMF voltages - during scram (and/or equivalent) - as found/as left

3. Delivered torque at motor - as found/as left

a. After CRD removed from PCRV during PM

b. Static - complete rotation, both directions

4. Scram times (SR 5.1.1a-A)

a. Gross performance parameter (really monitors motor variation if done with constant capacitances)

5. Rod drop <u>rate</u> (SR 5.1.1b-M)

a. More sensitive than Item 4., but less than Item 2.

6. Torque to rotate motor/brake assembly - as found/as left

a. Removed from CRDOA (hence reflects motor bearings only)

b. Static - complete rotation

FORT ST. VRAIN STATION

CONTROL ROD DRIVE AND ORIFICING ASSEMBLY

REFURBISHMENT PROGRAM

RADIOACTIVE WASTE HANDLING ANALYSIS

PUBLIC SERVICE COMPANY OF COLORADO
FORT ST. VRAIN NUCLEAR GENERATING STATION

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FORT ST. VRAIN STATION

CONTROL ROD DRIVE AND ORIFICING ASSEMBLY

REFURBISHMENT PROGRAM

RADIOACTIVE WASTE HANDLING ANALYSIS

Introduction

The radioactive waste generated as a result of the Fort St. Vrain Control Rod Drive Refurbishment Program will fall into two general types: relatively low activity, high volume waste such as anticontamination clothing, gloves, wipes, cleaning materials, reserve shutdown material, and the like; and relatively high activity, low volume waste including the control rod clevis bolts, cable and fittings, and control rod cables. The handling methods for each of the two waste types will differ and are described below.

Low Activity, High Volume Waste

For the most part, this waste will be handled in accordance with existing plant procedures relative to collection, transport to the on-site compacting building, compaction, and staging prior to shipment off-site for disposal. At the current time, Fort St. Vrain does not have an approved low level waste disposal program satisfying 10CFR61 requirements. This was identified in NRC Inspection 83-28 as Open Item 04 and is being tracked as Corrective Action Request (CAR) 84-005 by PSC. An approved program will be in place prior to shipment off-site for disposal. Currently the PSC Office of Executive Staff Assistant is evaluating via CAR 84-006 the Fort St. Vrain on-site waste staging facilities (NRC Inspection 83-28, Open Item 05) to determine an acceptable activity content for staging. At no time will the activity placed in the staging area exceed the acceptable quantity as determined in response to CAR 84-006.

Reserve shutdown material will be handled on a case-by-case basis to ensure proper handling and staging techniques are followed.

FORT ST. VRAIN STATION

CONTROL ROD DRIVE AND ORIFICING ASSEMBLY

INTERIM

SURVEILLANCE PROGRAM

PUBLIC SERVICE COMPANY OF COLORADO
FORT ST. VRAIN NUCLEAR GENERATING STATION

PREPARED BY: _____

Charles H. Fuller
Station Manager

Elements of Test for Partially Inserted Rods

1. Obtain analog and digital position.

2. Verify "Rod Out", "Rod In", and "Slack Cable" lights are not lit.

3. During the drop, obtain back EMF data.

4. Obtain analog and digital position.

5. Withdraw the rod to its previous position.

6. Obtain analog and digital position.

Elements of Test for Fully Inserted Control Rods

1. Obtain analog and digital position.

2. Verify "Rod In" light on; verify "Rod Out" and "Slack Cable" lights off.

Elements of the Test for all Control Rods

1. Obtain CRD motor temperatures.

2. Obtain purge flow if installation on individual rods can be achieved prior to startup.

3. Verify that no "Slack Cable" lights are lit.

Discussion

The obtaining and comparison of analog and digital position indication confirms the satisfactory operation of the associated potentiometers. The acceptable deviation between the indication will be 10" which is well within the deviation assumed in the FSAR for different control rods within a group (2 ± 1 foot per Page 3.6-19, Page 7.2-9, and Section 7.2.2.1). Deviations greater than 10" will be resolved by calibration if possible, or comparison with operable position switch indication. If this is not successful appropriate corrective action will be taken to ensure compliance with Technical Specifications.

A rod drop of approximately 10" is performed by deenergizing the control rod brake for a specified time. This portion of the test confirms that the brake assembly is operating properly, and that deenergization (such as during a scram) will in fact result in brake release.

Quarterly Surveillance

Objective - To supplement information obtained on the weekly surveillance; to verify redundancy of selected control rod position limit switches.

Methodology - Check redundancy.

Elements of Test for Fully Withdrawn Rods

1. Determine which of the two redundant "Rod Out" limit switches has actuated.

2. Bypass this switch to allow further rod withdrawal.

3. Withdraw the rod further until the second switch actuates.

4. Confirm operation of rod motor deenergization interlock with second switch actuation.

5. Return rod to original position and remove bypass.

Elements of Test for Partially Inserted Rods

Not Applicable - Partially inserted rods will not have "Rod In", "Rod Out", or "Slack Cable" lights lit. Weekly surveillance will compare analog and digital indication.

Elements of Test for Fully Inserted Rods

Not Applicable - Technical Specifications prohibit the withdrawal of these control rods out of sequence. Such withdrawal would be necessary to confirm limit switch redundancy. The weekly surveillance will compare analog and digital indication, and that the control rod "Rod In" light is lit. Fully inserted rods are already performing their design function.