HEALTH PHYSICS AND CHEMISTRY DEPARTMENT OUTAGE ACTIVITIES IMPLEMENTING PROCEDURE

1.0 PURPOSE

1.1 This procedure identifies the Chemistry outage activities to chemically treat and layup systems, identifies the Health Physics outage activities to reduce radio activity levels in Plant systems and reduce exposure to personnel during an outage, describes the support necessary to complete them, and defines the responsibilities for providing support.

NOTE

Outage Types are described in Procedure 01000-C, "Management Of Outages".

1.2 This procedure applies to Type IV - Extended forced Outages and Type V - Scheduled Outages, depending upon the duration and plant configuration. If Type II - System Outage, and Type III - Short Forced Outage turn into Type - IV outages, this procedure will be applicable.

1.3 During shutdowns and startups for outages, chemical specifications change. The cleanup or layup of plant systems may require holds where the plant equipment involved can not be secured. Where possible this, procedure names that plant equipment.

2.0 DEFINITIONS

2.1 ACTION PLANS - Written outline of actions to be taken and the department responsible for their completion.

2.2 STRUCTURED BRIEFINGS - Briefings or action plans conducted by Chemistry for departmental personnel and representatives of all other responsible departments.

2.3 CHEMISTRY OUTAGE PLAN - Outline of Chemistry Department Outage Activities developed and maintained by Chemistry Technical Support Group.

2.4 CHEMISTRY EXTENDED LIFE AND PLANT LAY-UP MANUAL - Manual for Lay-up and inspections of Balance of Plant systems.

3.0 RESPONSIBILITIES

3.1 MANAGER-HEALTH PHYSICS/CHEMISTRY

The Manager-Health Physics/Chemistry is responsible for the management of all aspects of the Chemistry Section, Health Physics Section and HP/Chemistry Support Section activities during an outage.

3.2 SUPERINTENDENT OF CHEMISTRY

3.2.1 Give direction to chemistry department personnel and the Chemistry Outage Coordinator during outages.

3.2.2 Direct the development of the Chemistry Operations section of the Chemistry Outage Plan.

3.2.3 Review Chemistry data and request corrective actions as necessary.

3.2.4 Maintain adequate supplies of layup and RCS cleanup chemicals.

3.3 SUPERINTENDENT OF HEALTH PHYSICS AND CHEMISTRY TECHNICAL SUPPORT

3.3.1 Give direction to the Technical Support Group Personnel and the Chemistry Outage Coordinator.

3.3.2 Direct the development of the Chemistry Technical Support's outage activities section of the Chemistry Outage Plan.

3.3.3 Provide Technical Support to Chemistry Outage activities.

3.3.4 Assign a Chemistry Outage Coordinator from the Technical Support Group.

3.4 CHEMISTRY TECHNICAL SUPPORT GROUP OUTAGE COORDINATOR

3.4.1 Develop the Outage Chemistry Plan.

3.4.2 Provide information to other departments as necessary about chemistry outage activities.

3.4.3 Track Maintenance Work Orders written to perform inspections and corrective maintenance written by the Technical Support Group Engineers.

3.4.4 Attend outage planning meetings and provide status of chemistry activities.

3.4.5 Attend Plan of the Day meetings with Work Planning.

3.5 CHEMISTRY TECHNICAL GROUP ENGINEERS

3.5.1 Identify inspections and corrective maintenance for outage on systems to which they are assigned.

3.5.2 Write Maintenance Work Orders to perform inspection and corrective maintenance.

3.5.3 Perform inspections as necessary.

3.6 CHEMISTRY SUPERVISOR-SHIFT OPERATIONS

3.6.1 Provide technical expertise and direction for personnel in the Chemistry Operations Section during outages.

3.6.2 Provide organization of activities, technical direction, and assignment of work tasks to implement the Chemistry Program during outages.

3.6.3 Schedule qualified personnel in Chemistry Operations Section to support outage activities.

3.6.4 Review, schedule and incorporate into analytical schedule requests for support during outages.

3.7 CHEMISTRY SUPERVISOR-SUPPORT

3.7.1 Provide technical expertise and direction for personnel in the Chemistry Section Support group during outages.

3.7.2 Provide organization of activities, technical direction, and assignment of work tasks to implement the Chemistry Support Program during outages.

3.7.3 Schedule qualified specialists as necessary to support outage activities.

3.7.4 Provide specialists for technical assistance when requested in support of outage activities.

3.8 CHEMISTRY FOREMAN

3.8.1 Direct the activities of the Nuclear Chemistry Technicians including activities in the laboratory during outages.

3.8.2 Review chemistry data of all analyses performed by Nuclear Chemistry Technicians during outages, conduct correlations for any abnormalities, and initiate corrective actions for out-of-limit conditions.

3.8.3 Ensure all shift activities during an outage are conducted in accordance with technical specifications and the latest revision of approved procedures and standing orders.

3.9 CHEMISTRY TECHNICAL SPECIALISTS

3.9.1 Provide technical assistance and support outage activities when directed to do so by Chemistry Supervisor-Support.

3.10 NUCLEAR CHEMISTRY TECHNICIANS

3.10.1 Perform sampling and analysis of plant systems and components during outages in accordance with technical specifications and the latest revisions of Chemistry procedures.

3.10.2 Perform chemical additions in accordance with Chemistry procedures.

3.10.3 Review data for accuracy and identify and report out-of-limit conditions to Chemistry Foreman on shift.

4.0 TYPE III - SHORT FORCED OUTAGE BY MODES

4.1 MODE 3 or 4

NOTE

When the Reactor Coolant System temperature is decreased below 330°F, the solubility of activated corrosion products (CRUD) increases which results in a "Crud Burst". The purification flow rate should be maximized and any draining from the Reactor Coolant System should be through the CVCS Mixed Bed Demineralizers.

4.1.1 Isolate PERMS monitor RE 48000 prior to cooling down below 330°F.

4.1.2 Degas the Reactor Coolant System to 15 cc/kg H_2 prior to reactor shutdown or after reactor trip. The pressurizer vapor space may also be degassed prior to shutdown.

4.2 MODE 5

4.2.1 If the Reactor Cooling System is to be opened for work:

NOTE

Proper cleanup requires the Reactor Coolant System remaining pressurized and at least one Reactor Coolant Pump operating.

a. Degas RCS to $\leq$ 5 cc/kg H_2 and $\leq$0.05 uCi/gm Xe-133.

b. Reduce RCS Gross Gamma Activity to $\leq$0.1 uCi/gm.

4.2.2 If the outage is to be more than 4 days the Steam Generators should be placed in wet layup. Clearance should not be hung on the following systems until the Steam Generator's wet layup parameters are within specification.

a. Condensate Storage Tanks.

b. Auxiliary Feedwater System.

c. Feedwater Layup Pump.

d. Demineralized Water Storage Tank.

e. Water Treatment Plant.

f. Steam Generator Recirculation Pump.

g. Steam Generator Blowdown System.

h. Condensate System (Blowdown System Cooling).

i. Steam Generator Layup Pump.

4.2.3 If the outage is to be more than 10 days the condensate and Feedwater system should be placed in wet layup. The condensate system should be long path recirculation with one condensate pump running, condenser vacuum maintained and the Auxiliary Boiler in service. Clearance should not be hung on the following system until the High Pressure Feedwater Heaters are 200°F and the Condensate and Feedwater System's wet layup parameters are in specification:

a. Condensate system

b. Feedwater Heaters

c. Feedwater System

d. Auxiliary Boiler

e. Condensate Storage Tank

f. Demineralized Water Storage Tank

g. Water Treatment Plant

h. Feedwater layup pump

5.0 TYPE IV - EXTENDED FORCED OUTAGE BY MODES

5.1 MODES 3 or 4

NOTE

When the Reactor Coolant System temperature is decreased below 350°F, the solubility of activated corrosion products (CRUD) increases which results in a "Crud Burst". The Purification flow rate should be maximized and any draining from the Reactor Coolant System should be through the CVCS Mixed Bed Demineralizers.

5.1.1 Isolate PERMS monitor RE 48000 prior to cooling down below 350°F.

5.1.2 Degas the Reactor Coolant System to 15 cc/kg H_2 prior to reactor shutdown or after reactor trip.

5.2 MODE 5

5.2.1 If the Reactor Cooling System is to be opened for work:

NOTE

Proper cleanup requires the Reactor Coolant System remaining pressurized and at least one Reactor Coolant Pump operating.

a. Degas RCS to ≤ 5 cc/kg H_2 and ≤ 0.05 uCi/gm Xe-133.

b. Reduce RCS Gross Gamma Activity to ≤ 0.1 uCi/gm.

5.2.2 If the outage is to be more than 4 days the Steam Generators should be placed in wet layup. Clearance should not be hung on the following systems until the Steam Generator's wet layup parameters are within specification.

a. Condensate Storage Tanks.

b. Auxiliary Feedwater System.

c. Feedwater Layup Pump.

d. Demineralized Water Storage Tank.

e. Water Treatment Plant.

f. Steam Generator Recirculation Pump.

g. Steam Generator Blowdown System.

h. Condensate System (Blowdown System Cooling).

i. Steam Generator Layup Pump.

5.2.3 If the outage is to be more than 10 days the condensate and Feedwater system should be placed in wet layup. The condensate system should be long path recirculation with one condensate pump running, condenser vacuum maintained and the Auxiliary Boiler in service. Clearance should not be hung on the following system until the High Pressure Feedwater Heaters are 200°F and the Condensate and Feedwater System's wet layup parameters are in specification:

a. Condensate system

b. Feedwater Heaters

c. Feedwater System

d. Auxiliary Boiler

e. Condensate Storage Tank

f. Demineralized Water Storage Tank

g. Water Treatment Plant

h. Feedwater layup pump

5.2.4 If the outage is to be longer than 60 days it will be necessary to place the High Pressure and Low Pressure Turbines under humidity controlled dry layup along guidelines in the Plant Extended Life Layup Manual.

5.3 MODE 6

5.3.1 If the Reactor Cavity is to be filled or the head is to be removed, then reduce the RCS Gross Gamma Activity to < 0.05 uCi/gm.

NOTE

If 2565 is one of the operable monitors in step 5.3.2, then either Channels 2565A and 2565B (considered one channel) or 2565C must be operable.

5.3.2 The 2 out of 3 of the following PERMS monitors shall be operable in Mode 6:

RE-0002

RE-0003

RE-2565

5.3.3 A complete set of analyses for all sample parameters listed in Section 3.6 of procedure 35180-C, "Chemistry Control During Refueling" shall be current (within 24 hours) prior to moving fuel elements in the Reactor Vessel.

6.0 TYPE V - SCHEDULED OUTAGES BY MODES AND REFUELING

6.1 MODES 3 or 4

NOTE

When the Reactor Coolant System temperature is decreased below 350°F, the solubility of activated corrosion products (CRUD) increases which results in a "Crud Burst". The Purification flow rate should be maximized and any draining from the Reactor Coolant System should be through the CVCS Mixed Bed Demineralizers.

6.1.1 Isolate PERMS monitor RE 48000 prior to cooling down below 350°F.

6.1.2 Degas the Reactor Coolant System to 15 cc/kg H_2 prior to reactor shutdown or after reactor trip.

6.2 MODE 5

6.2.1 If the Reactor Cooling System is to be opened for work:

NOTE

Proper cleanup requires the Reactor Coolant System remaining pressurized and at least one Reactor Coolant Pump operating.

a. Degas RCS to $\leq$ 5 cc/kg H_2 and $\leq$0.05 uCi/gm Xe-133.

b. Reduce RCS Gross Gamma Activity to $\leq$0.1 uCi/gm.

6.2.2 If the outage is to be more than 4 days the Steam Generators should be placed in wet layup. Clearance should not be hung on the following systems until the Steam Generator's wet layup parameters are within specification.

a. Condensate Storage Tanks.

b. Auxiliary Feedwater System.

c. Feedwater Layup Pump.

d. Demineralized Water Storage Tank.

e. Water Treatment Plant.

f. Steam Generator Recirculation Pump.

g. Steam Generator Blowdown System.

h. Condensate System (Blowdown System Cooling).

i. Steam Generator Layup Pump.

6.2.3 If the outage is to be more than 10 days the condensate and Feedwater system should be placed in wet layup. The condensate system should be long path recirculation with one condensate pump running, condenser vacuum maintained and the Auxiliary Boiler in service. Clearances should not be hung on the following system until the High Pressure Feedwater Heaters are 200°F and the Condensate and Feedwater System's wet layup chemical parameters are in specification:

a. Condensate system

b. Feedwater Heaters

c. Feedwater System

d. Auxiliary Boiler

e. Condensate Storage Tank

f. Demineralized Water Storage Tank

g. Water Treatment Plant

h. Feedwater layup pump

6.2.4 If the outage is to be longer than 60 days it will be necessary to place the High Pressure and Low Pressure Turbines under humidity controlled dry layup along guidelines in the Plant Extended Life Layup Manual.

6.3 MODE 6

6.3.1 If the Reactor Cavity is to be filled or the head is to be removed, then reduce the RCS Gross Gamma Activity to $\leq$ 0.05 uCi/gm prior to opening reactor vessel head.

NOTE

If 2565 is one of the operable monitors in step 6.3.2, then either Channels 2565A and 2565B (considered one channel) or 2565C must be operable.

6.3.2 The 2 out of 3 of the following PERMS monitors shall be operable in Mode 6:

RE-0002

RE-0003

RE-2565

6.3.3 A complete set of analyses for all sample parameters listed in Section 3.6 of procedure 35180-C, "Chemistry Control During Refueling" shall be current (within 24 hours) prior to moving fuel elements in the Reactor Vessel.

6.4 Refueling

6.4.1 RWST Cleanup

a. The RWST is normally recirculated through the Sludge Mixing Pump and Heater.

NOTE

Step 6.4.1.b is for water clarity purposes.

b. At least four weeks prior to beginning of outage, recirculate RWST with the Spent Fuel Pool Demineralizers and Filter using the Refueling Water Purification Pump until the specification for suspended solids is obtained.

SPEC: SUSPENDED SOLIDS $\leq$ 0.350 PPM

6.4.2 Spent Fuel Pool

a. The Spent Fuel Pool is normally lined up to the Spent Fuel Pool purification system. Just prior to the outage the RWST is lined up per Section 6.4.1.b.

b. Borate Fuel Pool to refueling Concentration ($\geq$ 2000 ppm) one month prior to outage.

c. When the RWST has been cleaned up, insure SFP Purification System is realigned to the SFP and recirculating.

6.4.3 Replacement of Letdown Resin Beds

a. Mixed Bed Resin

The in service CVCS Mixed Bed should have a DF of $\geq$ 50 for I-131 and or Co-58. The standby CVCS Mixed Bed should be new and unused.

b. Cation Bed Resin

The CVCS Cation Bed should demonstrate a DF $\geq$ 50 for Lithium removal.

c. Resin beds shall be replaced as necessary. At least one replacement Cation Bed and Two replacement Mixed Beds should be available.

6.4.4 Reactor Coolant System Cleanup with Hydrogen Peroxide (H_2O_2)

a. Laboratory Preparation

1. Prepare Hydrogen Peroxide (H_2O_2) analytical method for Photospectrometer.

2. Order Plastic cuvetts for spectrophotometer.

3. Prepare Nickel (Ni) analytical method for the Atomic Absorption Photospectrometer.

4. Develop Calibration Curves and standards necessary to support analytical methods.

NOTE

Cleanup may generate Gross Gamma activity levels in excess of 1.0 uCi/gm. The Purification flowrate should be maximized and any drainage from the RCS should be through the CVCS Mixed Bed Demineralizer.

5. Perform a Structured Briefing for Laboratory Technicians on Radiological safety in handling Reactor Coolant Samples from cleanup. Technicians need attend only one structured briefing on this topic.

b. At Shutdown:

1. Begin 4 hour Gamma Isotopic analyses and elemental analysis for Ni with the technical specification analysis for DEQ I-131 and obtain letdown flow rate.

2. Ensure Operations Department borates RCS to refueling concentration.

Borate as necessary to keep up with the removal by a new resin bed.

3. Begin degassing from 15 cc/kg to ≤ 5 cc/kg H_2 and ≤ 0.05 uCi/gm Xe-133.

4. Place a new CVCS Mixed Bed in service.

   a. Draw Gamma Isotopic and Boron DF samples every 4 hours.

   b. When Boron DF is < 10, analysis may be stopped. Continue Gamma Isotopic analyses until cleanup is complete.

c. Cooldown/Draindown

NOTE

Draining of the RCS shall be through the purification (CVCS) Mixed Bed demineralizer at approximately 75 gallons per minute. Flow depends on system pressure.

1. The plant should have been placed on RHR, cooled down to 110°F, and drained down to midloop via the purification (CVCS) mixed bed demineralizers prior to H_2O_2 addition.

d. Cleanup

1. When the draindown is complete, Hydrogen Peroxide should be added.

NOTE

This cleanup will require a minimum of 60 pints of uninhibited hydrogen peroxide (H_2O_2).

2. Add 10 pints of uninhibited H_2O_2

Maintain a 0.5 ppm O_2 concentration and 0.5 ppm H_2O_2 residual, with a maximum of 10 ppm by H_2O_2 addition.

3. Place Standby Mixed bed in service as necessary.

   Replace used Mixed Bed as Necessary.

4. Co-58 activity will peak. Continue cleanup using RHR pumps.

   NOTE

   Dose Equivalent Iodine should be below 0.1uci/gm and Xe-133 below 0.05 uci/gm prior to opening the Reactor Coolant System.

5. Continue cleanup while on RHR through the purification system until Co-58 activity is less than 0.05 uci/gm.

6. A new purification (CVCS) mixed bed should be placed in service prior to the Reactor Cavity being filled.

6.4.5 PERMS monitors required for first refueling and will normally be operational prior to MODE-6.

RE-2532A

RE-2532B

RE-2533A

RE-2533B

RE-12116

RE-12117

RE-2565A

RE-2565B

RE-2565C

RE-002

RE-003

7.0 PLANT SHUTDOWN/COOLDOWN

Urgent or Emergency Containment Entries are performed in accordance with Section 4.2 of Procedure 00303-C, "Containment Entry".

7.1 MODES 1 TO 3

7.1.1 Radiological Precautions

7.1.1.1 Containment Entries during modes 1, 2, 3, or 4 are performed in accordance with Section 4.1 of Procedure 00303-C, "Containment Entries".

7.1.2 Reactor Coolant System

7.1.2.1 If there is greater than a 15%/Hr reduction in reactor thermal power, or the reactor is started up or shutdown. Data Sheet 5 of 35110-C, "Chemistry Control Of The Reactor Coolant System", must be completed.

Operations Department will be borating the reactor coolant system to shutdown concentrations and requesting analyses.

7.1.3 Steam Generators

7.1.3.1 At less than 3% Reactor power, the Steam Generators are transferred to the Auxiliary Feedwater Pumps (AFW). Steam Generator Blowdown continues in operation.

7.1.3.2 If chemicals are not added to the CST or the reactor has been tripped, it may be necessary to align chemical feed up to AFW pump discharge using the Feedwater Layup pump.

7.1.3.3 Chemical additions to Steam Generators are made in accordance with Section 3.9 Condensate Chemical Injection When the Plant is In Heatup or Low Power Operation of Procedure 35333-C, "Operation Of The Condensate Chemical Injection System".

7.1.3.4 The Steam Generators are sampled once per shift in accordances with Section 4.7.1 Heatup/Hot Standby (Greater than 220°F Less Than or Equal to 5% Power of Procedure 35210-C, "Chemistry Control Of The Steam Generators".

7.1.4 Secondary System

7.1.4.1 Prior to a reaching 25% power or after trip, chemistry can make chemical additions of Ammonium and Hydrazine to the Condensate Storage Tank (CST) in accordance with Section 4.8 of Procedure 35250-C, "Chemistry Control Of The Condensate Storage Tank".

7.1.4.2 The Heater Drain pumps should be stopped when the Reactor power is below 25% Power.

7.1.4.3 One Main Feed Pump (MFP) is secured below 3% power.

7.1.4.4 CHemistry should request that the Condensate and Feedwater systems remain in long path recirculation. If the outage is to be 10 days, Section 4.6 Shutdown - Short Term Wet Layup, of Procedure 35220-C, "Chemistry Control Of The Condensate And Feedwater Systems", applies.

7.1.4.5 If the outage is to be 10 days, Chemistry should take preparations for wet layup of condensate and feedwater systems in accordance with Section 4.5.2.2 of Procedure 35220-C. The system should be operated with one condensate pump until the High Pressure Feedwater Heaters are 200°F and vacuum is broken in the condenser.

7.1.4.6 Chemistry Department should confirm no tube leaks in the condenser by Helium Leak detection method, checking all waterboxes of the Circulating Water System via the Ametsp System, prior to securing condenser vacuum.

7.1.5 Support Systems

7.1.5.1 The Auxiliary Boiler is started below 25% Reactor and the DM plant should be placed in operation. The Auxiliary Boiler will require about 150 gpm of makeup feedwater.

7.2 MODE 3 COOLDOWN

7.2.1 Reactor Coolant System

7.2.1 Transfer VCT to Nitrogen and Degas to $\leq$ 15 cc/kg Hydrogen. If the RCS is to be opened for maintenance then it should be degassed down to $\leq$ 5 cc/kg H_2 and 0.05 uCi/gm Xe-133.

7.2.1.2 Reactor Coolant System chemical parameters must be within specifications of Table 1 of Procedure 35110-C, "Chemistry Control Of The Reactor Coolant System".

7.2.2 Borated Water Sources

7.2.2.1 When RCS Pressure is below 1000 psig, the accumulators no longer require Technical specification surveillances.

7.2.3 Steam Generators

7.2.3.1 Sample once per shift in accordance with Section 4.7 of Procedure 35210-C, "Chemistry Control Of The Steam Generators". When steam generator pressure becomes too low, Operations Department will transfer from steam dumps to Atmospheric reliefs.

7.2.4 Secondary

When steam pressure becomes too low, the main feed pump will be secured.

7.3 MODE 4

7.3.1 RCS/Reactor Heat Removal System (RHR)

NOTE

When the Reactor Coolant System temperature is decreased below 350°F to 140°F, the solubility of activated corrosion products (CRUD) increases as temperature decreases, which results in a "Crud Burst". The Purification flow rate should be maximized and any draining from the Reactor Coolant system should be through the CVCS Mixed Bed Demineralizers.

7.3.1.1 At 340°F / 425 psig at least one train of RHR can be put in service. Chemistry must perform Boron analysis of RHR. RHR parameters must be within specifications of Table 1 and Table 2 of Procedure 35110-C.

7.3.1.2 If a MODE 6 entry is anticipated, commence prerequisites for MODE 6 entry, Section 4.6.3 of this procedure for Extended Outage and Section 4.6.4 for a Refueling Outage.

7.3.2 Borated Water Sources

7.3.2.1 The Refueling Water Storage Tanks and Boric Acid Storage Tanks should be sampled for Boron. The specifications are stated in Section 5.1 of Procedure 30090-C, "Chemistry Technical Surveillance Performance Coordination".

7.3.3 Steam Generators

7.3.3.1 At 250°F or when Steam Generator steam pressure drops below 25 psig, request operations initiate Nitrogen (N_2) to Steam Generator of 2 to 5 psig.

7.3.3.2 If the Steam Generators are to be in wet layup for more than 4 days, coordinate with operations department in adding chemicals and increasing water levels to 50 -100% Narrow Range indication in accordance with Section 4.6.3 of Procedure 35210-C, "Chemistry Control Of The Steam Generators".

7.3.3.3 If the Steam Generator parameters do not meet the specifications stated in Section 4.6 of Procedure 35210-C, then a series of fill and draining evolutions coordinated with Operations Department may be required.

7.3.3.4 Wet layup should be postponed until MODE 5, 140°F. When cooldown rate would not be affected. Clearances should not be hung on the Auxiliary Feedwater system until the Steam Generators are at layup levels are all chemical parameters are within specification.

7.3.3.5 Each draining and refilling evolution takes approximately 8 hours per Steam Generator.

7.4 MODE 5

7.4.1 Radiological Precautions

7.4.1.1 Outage Entries during modes 5 and 6 are performed in accordance with Section 4.3 of Procedure 00303-C, "Containment Entries".

7.4.2 RHR

7.4.2.1 Prior to entering MODE 6 Operations should be borating the RCS to > 2000 ppm and RCS degas to less than 5 cc/kg should be completed.

7.4.2.2 The RCS/RHR Crud Burst should be in progress and sample should be drawn every 4 hours on RHR, the outlets of the CVCS heat exchanger, and the CVCS Mixed Bed Demineralizer. Co-58 activity should be plotted and cleanup rate determined.

7.4.2.3 Purification flowrate should be set at 120 gpm. The RCS should remain pressurized with at least one main coolant pump running until the prerequisite specification for the outage is reached, see Section 4.6.2.1 of this procedure.

7.4.3 Steam Generators

7.4.3.1 At 140°F, if the Steam Generator chemical parameters do not meet specifications of Section 4.6 of Procedure 35210-C, then a series of draining and refilling evolutions will be necessary. Chemistry shall calculate the number of draining and refillings needed to bring the Steam Generator chemical parameters within specification, see Section 4.11 Useful Formulas of Procedure 35210-C.

7.4.3.2 When Steam Generator parameters are in specification, chemicals may be added for layup using the steam generator recirculation pump. The Steam Generators should be recirculated in accordance with Section 4.6.4.4 of Procedure 35210-C, and chemical adjustments made as necessary.

7.4.4 Secondary

7.4.4.1 If chemicals have not been added to the feedwater and condensate system, they should be in accordance with Section 4.5.2.2 for long term wet layup or Section 4.6.1 for short term wet layup of Procedure 35220-C, "Chemical Control Of The Condensate And Feedwater System".

7.4.4.2 The feedwater heaters should be layed up in accordance with Section 4.5.2.3 and sampled in accordance with Section 4.5.2.4 and Section 4.5.2.5 of Procedure 35520-C.

7.4.4.3 When layup of feedwater heaters is completed then the Condensate and Feedwater system should be placed in short path recirculation.

7.4.4.4 Guidelines for the layup and inspection of Feedwater Heaters and Main Steam Reheaters during extended outages and periods when internals are open to the Atmosphere are found in the Plant Extended Life and Plant Layup Manual.

7.4.5 Perms Monitors

7.4.5.1 Reset RE-0002 and RE-0003 to the low set point of 10 mrem/hr.

7.4.6 Turbine Plant Cooling System

The Turbine Plant Cooling Tower, Circulating Water system and Turbine Plant Cooling Water systems should be secured during refueling outages. Guidelines for the layup and inspection of these Plant components are described in the Plant Extended Life and Layup Manual.

7.4.7 Nuclear Service Cooling Water

The Nuclear Service Cooling Water System Cooling Towers and system heat exchangers should be isolated and inspected one train at a time. Guidelines for the layup and inspection of these Plant components are described in the Plant Extended Life and Layup Manual.

7.4.8 Radiological Precautions

NOTE

Containment cannot be occupied when the In-core Detectors are operated or less than fully inserted.

7.4.8.1 Prior to opening the containment for outage work, Operations Department shall complete Sections 3.2.1 and 3.2.2 of Procedure 00303-C, Containment Entries and a clearance shall be hung on the breaker for the In-core Detector Drive motors so they can not be operated.

7.4.8.2 Prior to opening the containment for outage work, outage entries, Health Physics will establish radiological and air quality status utilizing air sample and survey data, radiation barriers and stepoff pads per HP procedures in accordance with Section 4.3 of Procedure 00303-C, "Containment Entries".

7.5 MODE 6 (REFUELING)

7.5.1 A complete set of analyses for all samples and parameters listed in Section 3.6 of Procedure 35180-C, "Chemistry Control During Refueling", shall be current within 24 hours prior to moving fuel elements in the reactor vessel.

7.5.2 Refueling Pathway

7.5.2.1 When the Reactor Cavity is flooded, prior to and during fuel transfer, obtain daily Boron samples of:

RHR Train in service
Reactor Cavity
Refueling Canal
Transfer Canal
Spent Fuel Pool

7.5.2.2 When the refueling canal in the containment building is flooded, obtain tritium analyses on the Plant Vent once per 24 hours.

7.5.2.3 During a first refueling of a unit, when spent fuel is in the spent fuel pool, tritium analyses on plant vent once per 7 days is required.

7.5.2.4 If both of the minimum of 2 required source range neutron flux monitors inoperable, determine the boron concentration of the reactor coolant system once per 12 hours per Section 3.4 of Procedure 35180-C, "Chemistry Control During Refueling".

7.5.2.5 Place the standby mixed bed in service prior to filling the cavity for refueling.

7.5.2.6 Purification of the coolant via the RHR loop and low pressure purification loop must be maintained continuously while the reactor cavity is flooded.

7.5.2.7 The reactor cavity should also be filtered and demineralized continuously during refueling operation and again after return to the RWST.

7.5.3 Radiological Precautions

NOTE

Containment cannot be occupied when the In-core Detectors are operated or less than fully inserted.

Prior to flooding the reactor cavity, locked or posted access shall be established on the concrete plugs for the fuel transfer tube bellows in the Fuel Handling Building and Containment Building.

8.0 PLANT HEATUP/STARTUP

8.1 PREREQUISITES

8.1.1 DM plant should be placed in service when the Auxiliary Boiler is started up.

NOTE

During recovery from outage, the secondary system should be cleaned up for several days prior to plant startup.

8.1.2 The secondary plant should be in long path recirculation

8.1.2.1 The Auxiliary Boiler is in operation.

8.1.2.2 A condensate pump should be running and the condensate polishers are in operation.

8.1.2.3 Vacuum is drawn on the main condensers

NOTE

If the On-line analyzers are not available, then grab samples must be obtained, per Section 4.11.1 of Procedure 35220-C.

8.1.2.4 The following secondary on-line analyzers should be available:

a. Condenser System

1. Condenser Hotwells (6) - Cation Conductivity

2. Condenser Pump Discharge - Cation Conductivity
Specific Conductivity
pH
Dissolved Oxygen
Silica
Sodium

b. Feedwater System

1. Feedwater Chemical Control sample point

Hydrazine
Specific Conductivity

2. Feedwater Pump (A&B) inlet - Dissolved Oxygen

3. Feedwater Pump (A&B) Discharge - Dissolved Oxygen

4. Feedwater to Steam Generator

Specific Conductivity
Cation Conductivity
Hydrazine
pH
Turbidity
Sodium
Dissolved Oxygen

8.1.2.5 When the condenser vacuum is drawn, no condenser tube leakage should be verified by helium leak checking via the Amertap system to the circulating waterboxes.

8.1.3 PERMS Monitor

8.1.3.1 The following PERMS monitors should be available (All MODES).

RE-0018
RE-0021
RE-0020A
RE-0020B
RE-0848
RE-17646
RE-12116
RE-12117

RE-12442A or RE-12444A
RE-12442B or RE-12444B
RE-12442C or RE-12444C
FT-12442 or FT-12444
FI-12442 or FI-12444

When a release is in progress via this pathway:

RE-12839A
RE-12839B
RE-12839C
FT-12839

8.1.3.2 The following monitors should be available (MODES 1-4).

RE-005
RE-006

8.1.3.3 The following PERMS Monitors Must be available (MODES 1-4) to change modes during startup.

RE-002*
RE-003*
RE-2565* (A and B) or C

RE-2562A
RE-2562C

* 2 out of 3 of these monitors must be available, 2565 (A and B) or 2565C must be operable for 2565 to be considered operable.

8.1.3.4 The following Perms Monitors must be available (MODE 1-3) to Change modes.

RE-13119	RE-13120
RE-13121	RE-13121

8.2 MODE 6 TO MODE 5

8.2.1 Reactor Coolant System

8.2.1.1 Reactor Coolant System chemical parameters must be within specification of Table 1 of Procedure 35110-C, "Chemistry Control Of The Reactor Coolant System".

8.2.2 Borated Water Sources

8.2.2.1 When the water from the reactor cavity is pumped to the RWST, the activity in the RWST must be reduced, recommend to Operations Department that the RWST should be lined up to the spent fuel pool purification system.

8.2.2.2 The refueling water storage tank and the boric acid storage tanks should be sampled for Boron. The specifications are stated in Section 5.1 of Procedure 30090-C, "Chemistry Technical Surveillance Performance Coordination".

8.2.3 Radiological Controls

8.2.3.1 Decontamination of Reactor Cavity

8.2.3.2 When the Reactor Cavity has been drained, the locked and posted access on the concrete plugs for the Fuel Transfer tube bellows in the Fuel Handling Building and Containment should be released.

8.3 MODE 5 TO MODE 4

8.3.1 RCS/RHR

8.3.1.1 Operations may begin diluting boron to operating concentrations.

8.3.1.2 The Reactor Coolant System should be lithiated in compliance with the coordinated lithium and boron control program.

NOTE

While performing oxygen scavenging using Hydrazine additions, the CVCS letdown demineralizers should be bypassed and letdown flow diverted to the VCT.

8.3.1.3 Prior to exceeding 180°F:

Oxygen should be below 100 ppb or sufficient hydrazine added to scavenge the oxygen, per Table 1 of Procedure 35110-C.

Litium should be within limits of the Coordinated Lithium-Boron Control program per Table 1 of Procedure 35110-C.

8.3.1.4 PZR boron should not be different from RCS by more than 50 ppm.

8.3.2 Steam Generators

8.3.2.1 Steam Generator blowdown should be established. The following Steam Generator Blowdown monitors should be available:

Specific Conductivity
Cation Conductivity
pH
Sodium

If the on-line monitors are not available, then grab samples should be obtained.

8.3.2.2 If it is desired to route the Steam Generator blowdown to the environs, refer to Procedure 36001-C, "NPDES Implementation And Control" for non-radiological effluent requirements and Procedure 36010-C, "Offsite Dose Calculations Manual (ODCM) Implementation And Control" for radiological effluent requirements.

8.3.2.3 Steam Generators should be drained to operating levels. In accordance with Section 4.7.1 of Procedure 35210-C, "Chemistry Control Of Steam Generator Chemistry".

NOTE

If Steam Generators do not meet specifications for commencing heatup of Section 4.7.1, then drain and refill to attain those specification that will be required.

8.3.2.4 Prior to exceeding 200°F on heatup the chemical parameters of Section 4.7.1 of Procedure 35210-C, "Chemistry Control Of Steam Generators" should be within specification. If parameters exceed specification, request operations hold temperature and perform corrective action to return the parameter to within specification. If parameters are within specification notify operations that steam generator chemistry is satisfactory for operations above 200°F.

8.3.2.4 Steam Generator samples should be obtained once per shift while in Heatup/ Hot Standby.

8.3.3 Secondary

8.3.3.1 Steam Generator Blowdown Processing System

NOTE

The Steam Generator Blowdown Demineralizers can be bypassed during startups and shutdowns.

a. The Steam Generator Blowdown Demineralizer Chemical parameters are stated in Section 3.5 of Procedure 35225-C, "Chemical Control Of The Steam Generato: Blowdown Processing System".

b. Steam Generator Blowdown Processing system has an On-line analyzer at the outlet of each mixed bed Demineralizer and should be available. The following parameters are continuously analyzed.

1. Cation Conductivity

2. Specific Conductivity

If the monitors are not available, then grab samples should be obtained in accordance with Section 3.6.3 and 3.6.4 of Procedure 35225-C.

8.3.3.2 Secondary system cleanup is conducted in accordance with Section 4.7.3, Secondary /Cleanup of the secondary system of Procedure 35220-C, "Chemistry Control Of The Condensate And Feedwater Systems".

a. The secondary plant should be operating in long path recirc with one condensate pump running, with a condenser vacuum until Fe $<$ 100 ppb and $O_2 <$ 100 ppb.

b. The condensate polishers are placed in service with ecodex filter medium, when Iron (Fe^+) is within specification the ecodex is replaced with the Hydrogen form resin. Chemistry control of the condensate polishers are maintained in accordance with Section 4.6 Operating Chemistry Control of Procedure 35320-C, "Chemical Control Of The Condensate Polishing System". When operating the condensate polisher, the following On-line analyzers should be available:

NOTE

If On-line analyzer is not available, then grab samples should be analyzed per Section 4.7.3 and 4.7.4 of Procedure 35230-C.

1. Individual Polisher Bed Effluent:
   a. Cation Conductivity
   b. Sodium
2. Combined Polisher Effluent:
   a. Cation Conductivity
   b. Specific Conductivity
   c. pH
   d. Turbidity
   e. Sodium
   f. Silica

8.3.3.4 The feed and condensate system chemical parameter for greater than 200°F to 5% power are listed in Section 4.7.2 of Procedure 35220-C. At 200°F, Chemical Samples are analyzed on the Condensate and Feedwater system, operations is notified that the Chemical parameters are satisfactory for operation above 200°F.

8.3.4 Radiological Precautions

NOTE

Containment cannot be occupied when the In-core Detectors are operated or less than fully inserted.

8.3.4.1 Prior to Mode 4, operations may release the clearance on the breakers for the In-core Detector drive motors so they cannot be operated.

8.3.5 PERMS

8.3.5.1 The following monitors should be available prior to 250°F.

RE-12839A
RE-12839B
RE-12839C
FT-12839

8.4 MODE 4 TO MODE 3

8.4.1 RCS/RHR

8.4.1.1 Prior to exceeding 250°F, Chemistry shall sample the RCS and PZR for dissolved oxygen, which must be less than 100 ppb.

8.4.1.2 When PZR heatup begins and saturation temperature is reached, place the PZR steam space sample line in service.

8.4.1.3 Between 300°F and 330°F RHR is isolated and cooled down.

8.4.2 Steam Generators

8.4.2.1 When the steam generator pressure reaches 25 psig, isolate the nitrogen to the steam generators.

8.4.2.2 The following Main Steam monitors should be available:

Cation Conductivity
pH
Sodium Process Monitor

If the on-line monitors are not available, then grab samples should be obtained.

8.4.3 Secondary System

8.4.3.1 Place the CST in operation, Chemistry should sample for dissolved oxygen. The CST chemical parameters should be within specifications started in Section 4.5 of Procedure 35250-C, "Chemistry Control Of The Condensate Storage Tank".

8.4.3.2 Above 340°F the Auxiliary Feedwater pumps will be placed in automatic.

8.4.3.3 Heatup rate will be maintained using the atmospheric steam reliefs or steam dumps.

8.4.4 Borated Water Sources

8.4.4.1 At 435°F and 925 psig in the RCS, operations will fill accumulators and gas pressure is adjusted after fill. Chemistry must sample for Boron, specifications are started in Section 3.3 of Procedure 35160-C, "Chemical Control Of The Accumulators".

8.4.5 Radiological Controls

8.4.5.1 Re-establish flow through RE-48000 prior to exceeding 350°F.

8.4.6 PERMS

8.4.6.1 The following monitors must be available prior to MODE 3:

RE-13119
RE-13120
RE-13121
RE-13122

8.5 MODE 3 TO MODE 2

Chemistry Department reports that the following system chemical parameters are within specification and satisfactory for power ascent:

Steam Generators
Reactor Coolant System
Condensate and Feedwater System

8.5.1 Reactor Coolant System

8.5.1.1 Reactor Coolant System chemical parameters must be within specifications of Table 3 of Procedure 35110-C, "Chemical Control Of The Reactor Coolant System".

8.5.1.2 Corrective actions should be taken if any parameters listed in Table 4 of Procedure 35110-C are not within the recommended guidelines. Hydrogen cover gas should be place on the volume control tank. Chemistry superintendent shall make recommendations as necessary to obtain concentration within recommended guidelines.

8.5.2 Steam Generators

NOTE

On Startup, the power operation specifications should be met prior to exceeding 30% power, this allows action level 1 values in Unit Startup to 30% power.

8.5.2.1 Power operation chemical parameter specifications are listed in Section 4.8 of Procedure 35210-C.

8.5.3 Secondary System

8.5.3.1 Chemical parameters for the secondary systems, for greater than 5% power, are listed in Section 4.8, Power Ops - Condensate System and in Section 4.9, Power Ops-Feedwater System of Procedure 35220-C, "Chemical Control Of Condensate And Feedwater System".

8.6 MODE 2 TO MODE 1

8.6.1 Reactor Coolant System

If there is greater than a 15%/Hr reduction in reactor thermal power, the reactor is started up or shutdown. Data Sheet 5 of 35110-C, "Chemical Control Of The Reactor Coolant System", must be completed.

8.6.2 Steam Generators

8.6.2.1 The specifications of Sections 4.7.4 of Procedure 35210-C, should be met prior to exceeding 5% power. The power operating specifications Section 4.8 should be met prior to exceeding 30% power.

8.6.2.2 Obtain and analyse Steam Generator samples a minimum of once per shift while ramping up in power in accordance with Section 4.7.4.2 of Procedure 35210-C.

8.6.3 Secondary

8.6.3.1 At 4% power, a MFP is started, Steam generators re transferred form Auxiliary Feedwater to Main Feedwater one steam generator at a time.

8.6.3.2 At 20% power, a Heater Drain Pump is started. During plant power RAMP up to full power, heater drains are directed back to the condenser.

a. Prior to Operations department starting the heater drain pumps, samples to verify the chemical parameter of the system should be taken and Steam Generator Chemistry monitored closely. Chemical parameters from the Heater Drain System, for greater than 5%, are listed in Section 4.10, Heater Drain Pump Discharge - Power Operations, of Procedure 35220-C, "Chemical Control Of Condensate And Feedwater System"

b. Heater Drain system has no treatment to remove chemical contamination prior to introduction to the Steam Generators and must be monitored. Heater Drain Pump Discharge Cation Conductivity monitors are utilized for indication and must either be available or grab sampled must be taken.

c. The following On-Line analyzers should be in service:

Heater drain pump discharge (A and B)

Cation Conductivity
Sodium

8.6.3.3 Above 30% power, at steady state power, and when steam generator chemistry parameters are within specification; the condensate polisher resin can be placed in the ammonia form, at the discration of the on shift chemistry foreman.

9.0 REFERENCES

9.1 PROCEDURES

9.1.1 00303-1, "Containment Entries"

9.1.2 01000-1, "Management Of Outages"

9.1.3 12000-1, "Refueling Recovery (MODE 6 To MODE 5)"

9.1.4	12001-1,	"Unit Heating To Hot Shutdown (MODE 5 To MODE 4)"
9.1.5	12002-1,	"Unit Heatup To Normal Operating Temperature And Pressure (MODE 4 To MODE 5)"
9.1.6	12003-1,	"Reactor Startup (MODE 3 To MODE 2)"
9.1.7	12004-1,	"Power Operation (MODE 1)"
9.1.8	12005-1,	"Reactor Shutdown To Hot Standby (MODE 2 To MODE 3)"
9.1.9	12006-1,	"Unit Cooldown To Cold Shutdown (MODE 3 To MODE 4)"
9.1.10	12007-1,	"Refueling Entry (MODE 5 To MODE 6)"
9.1.11	30090-C,	"Chemistry Technical Surveillance Performance Coordination"
9.1.12	35110-C,	"Chemistry Control Of The Reactor Coolant"
9.1.13	35120-C,	"Chemistry Control Of The Spent Fuel Pool"
9.1.14	35130-C,	"Chemistry Control Of The Refueling Water Storage Tank"
9.1.15	35180-C,	"Chemistry Control During Refueling"
9.1.16	35210-C,	"Chemistry Control Of Steam Generators"
9.1.17	35220-C,	"Chemistry Control Of The Condensate And Feedwater Systems"
9.1.18	35535-C,	"Operation Of The Condensate Chemical Injection System"
9.1.19	01030-C,	"Health Physics And Chemistry Department Outage Activities"

END OF PROCEDURE TEXT