

## **13.5 Plant Procedures**

The information in this section of the reference ABWR DCD, including all subsections, as modified by the STP Nuclear Operating Company Application to Amend the Design Certification rule for the U.S. Advanced Boiling Water Reactor (ABWR), "ABWR STP Aircraft Impact Assessment (AIA) Amendment Revision 3," dated September 23, 2010 is incorporated by reference with the following supplements that address COL License Information Items 13.3 through 13.6. The procedures that are identified in or required by the COL License Information Items in ABWR DCD, Tier 2, Table 1.9-1, will be incorporated into the plant procedures according to the following supplements, as applicable.

### **13.5.3.1 Plant Operating Procedures Development Plan**

The following standard supplement addresses COL License Information Item 13.3.

- (1) Plant operating procedures will be developed based on inputs and requirements identified in plant design documents, Human Factors Engineering (HFE) Task Analysis, HFE Functional Requirement Analysis and Functional Allocation, Probability Risk Assessment, as well as existing operating ABWR plant experience.
- (2) The scope encompassed by the procedure development plan includes those Plant Operating Procedures addressed in Section 13.5.3.4.2 through 13.5.3.4.8. These procedures direct operator actions during normal, abnormal, and emergency operations, periods when plant systems and equipment are undergoing test, maintenance, and inspection.
- (3) The methods and criteria for the development, verification, and validation will be in accordance with TMI Items I.C.1, and I.C.9. The verification and validation process is described in the Human Factors Engineering Program Plan.
- (4) Implementation, maintenance and revision of procedures will be in accordance with the established site administrative procedures.
- (5) Plant operating procedures include the following sub-classifications:
  - General Plant Procedures (GPP)
  - System Operating Procedures (SOP)
  - Abnormal Operating Procedures (AOP)
  - Alarm Response Procedures (ARP)
  - Surveillance Test Procedures (STP)

- (6) A procedure writer's guide will be developed and implemented that defines the process for developing GPP, SOP, AOP, ARP, and STP. For multi-unit sites with existing operating units, the Writers Guide in use for the operating units will be used to ensure consistent site operation. The guide will contain sufficiently objective criteria so that procedures developed are complete, accurate, consistent in organization, style, and content, easy to understand. It will provide instructions for procedure content and format, including the writing of action steps and the specification of acceptable acronym lists and acceptable terms to be used.
- (7) The content of the GPPs, SOPs, and STPs will incorporate the following elements as applicable.
- Title
  - Discussion
  - References
  - Prerequisites
  - Precautions (including warnings, cautions, and notes)
  - Limitations and actions
  - Required operator actions
  - Acceptance criteria (Surveillance Test Procedures only)
  - References
  - Attachments
- (8) The format for the Abnormal Operating Procedures (AOPs) and procedures for other significant events will include the following, as appropriate:
- Symptoms
  - Automatic actions
  - Immediate operator actions
  - Subsequent operator actions
- (9) The format for the Alarm Response Procedures will include the following, as appropriate:
- Alarm message description
  - Automatic actions

- Operator actions
- Probable causes

### **13.5.3.2 Emergency Operating Procedures**

The following standard supplement addresses COL License Information Item 13.4.

- (1) STP will utilize the approved Emergency Procedure Guidelines (EPG) as found in Chapter 18 of the Design Control Documents Tier 2, based on the BWR Owners Group EPG Revision 4.
- (2) A plant specific Emergency Operating Procedure (EOP) writer's guide will be developed and implemented. The writer's guide will contain objective criteria that will require that the emergency procedures are consistent in organization, style, content, and usage of terms. Guidance for the development of EOP's will come from NUREG-0899, NUREG-1358 (including Supplement 1) and NUREG/CR-5228.
- (3) EOPs will be in a symptom-based format with clearly specified entry conditions that provide the operator guidance in response to upset plant conditions in which one or more key variables are out of limits, regardless the cause.
- (4) STP Plant Specific Technical Guidelines (PSTGs) will be generated based on analysis of transients and accidents that are specific to a site plant design and operating philosophy. The PSTGs will be derived from the ABWR EPGs.
- (5) As part of the emergency procedure development, a document will be generated identifying any significant deviations from the approved EPGs (including identification of additional equipment beyond that identified in the approved guidelines), along with all necessary engineering evaluations or analyses to support the adequacy of each deviation. As part of this evaluation a determination whether these deviations impact the analysis of controls and indications identified in Appendix 18 F of the Design Control Document Tier-2 will be performed.
- (6) Site-specific calculations will be performed to support generation of the curves and limits utilized in the EOPs.
- (7) EOPs will support the Plant Operations Training Program. They are verified and validated in the HFE program and evaluated in the STP Human Factors Engineering Program. The EOPs will also be completed in time to support the Plant Operations Training Program. The Procedure Generation Package (PGP) for EOPs will be submitted to the NRC 3 months prior to formal operator training on EOPs.
- (8) Implementation, maintenance, and revision of procedures will be in accordance with the established site administrative procedures.

### **13.5.3.3 Implementation of the Plan**

The following standard supplement addresses COL License Information Item 13.5.

#### **13.5.3.3.1 Administrative Procedures**

- (1) Administrative procedures are those procedures that (a) provide the administrative controls with respect to performing activities or evolutions, and (b) define and provide controls for operational activities of the plant staff. Examples of procedures that fall in this category are identified in section 13.5.3.4.1.
- (2) Regulatory Guide (RG) 1.33, Rev. 2, will be used as a guide for the preparation of plant administrative policies and procedures. The requirements of the STP FSAR 17.2 (Quality Assurance During the Operations Phase) will be met for those systems and components listed in section 13.5.3.4.1 to which 10 CFR 50 Appendix B requirements apply.
- (3) Administrative procedures will be developed based upon the experiences of other STP operating plants and will be consistent with STP guidelines.
- (4) The responsibility for preparing, maintaining and approving plant procedures will be assigned by an STP administrative procedure. Procedures will be assigned to an STP organization and manager based on content, intended user, and importance to plant operation. Safety-related procedures will be reviewed by the Plant Operations Review Committee (PORC) and approved by the Plant Manager.

#### **13.5.3.3.2 Maintenance and Other Procedures**

- (1) Procedures under this category address specific site-wide programs as they relate to maintenance and general operations. Procedures in this category are normally developed consistent with STP guidelines and based on the experiences of other operating plants.
- (2) A list of typical procedures included in the scope of the Maintenance and Other Operating Procedures is provided in Section 13.5.3.4.2 and 13.5.3.4.3. It is not necessary for all the procedures to contain titles exactly as listed, but all systems, evolutions, and events listed that are applicable to the ABWR certified design will be covered.
- (3) The existing procedures in use at STP 1 & 2 will be used to ensure consistent site operation. A review will be performed to ensure that the existing administrative procedures are consistent with the STP 3 & 4 FSAR. Should any changes be necessary to those procedures as a result of ABWR unique features, the procedures will be updated using the existing procedure change process.

- (4) STP procedures will be prepared following the STP guidelines listed above and be issued six months prior to the commencement of the Preoperational Test Program.

#### **13.5.3.4 Procedures Included In Scope Of Plan**

The following standard supplement addresses COL License Information Item 13.6.

The following is a list of typical procedures that will be included in the scope of the Plant Procedures Development Plan. It is not necessary for all the procedures to contain titles exactly as listed, but all systems, evolutions, and events listed that are applicable to the ABWR nuclear power station will be covered.

##### **13.5.3.4.1 Administrative Procedures**

Administrative Procedures are those procedures that (1) provide the administrative controls with respect to performing activities or evolutions and (2) define and provide controls for operational activities of the plant staff. These include:

- (1) Control ( i.e. control of activities or evolutions)
- Procedure review and approval
  - Equipment control procedures
  - Control of maintenance and modifications
  - Fire protection procedures
  - Crane operation procedures
  - Temporary changes to procedures
  - Temporary procedures
  - Special orders of a transient or self-cancelling character
  - Special Nuclear Material (SNM) Material Control and Accounting Program
- (2) Specific Procedures (i.e. operational activities for plant staff)
- Standing orders to shift personnel including the authority and responsibility of the shift supervisor, licensed senior reactor operator in the control room, control room operator, and shift technical advisor
  - A process for implementing the safety/security interface requirements of 10 CFR 73.58.

- A process is in effect between the time of issuance of the combined license and prior to Security Program implementation during the design and construction period to implement the safety/security interface requirements of 10 CFR 73.58 and the guidance of RG 5.74. This process is used to manage safety/security interface while the security procedures and emergency plan implementing procedures are being developed and implemented.
- Assignment of shift personnel to duty stations and definition of “surveillance area”
- Shift relief and turnover
- Fitness for duty
- Control room access
- Limitations on work hours
- Feedback of design construction and applicable important industry and operation experience
- Shift Supervisor administrative duties
- Verification of correct performance of operating activities

#### **13.5.3.4.2 Maintenance and Other Operating Procedures**

Procedures will be provided to guide operation during maintenance and modification procedures that require operator actions to be taken in the main control room or remote shutdown panel including the following:

- (1) Exercising of equipment that is normally idle but that must operate when required
- (2) Removal of reactor head
- (3) Plant radiation protection procedures
- (4) Emergency preparedness procedures
- (5) Instrument calibration and test procedures
- (6) Chemical-radiochemical control procedures
- (7) Radioactive waste management procedures
- (8) Maintenance and modification procedures
- (9) Material control procedures

- (10) Precautions for performing testing, maintenance and inspections of Main Control Room and Remote Shutdown control panels
- (11) Activation and implementation of the facility emergency plan

#### **13.5.3.4.3 Radiation Control Procedures**

The following procedures will be provided as discussed in Section A 7(d) of ANSI/ANS-3.2

- (1) Mechanical vacuum pump operation
- (2) Air ejector operation
- (3) Packing steam exhaust operation
- (4) Sampling
- (5) Air ejection, ventilation, and stack monitor
- (6) Area radiation monitoring system operation
- (7) Process radiation monitoring system operation
- (8) Meteorological monitoring
- (9) Discharge of effluents
- (10) Dose calculations

Equipment-specific requirements (items 1 through 7) will be addressed in the System Operating Procedures and elements that must be incorporated for the entire site (items 8 through 10) will be addressed in Administrative or Maintenance Procedures.

#### **13.5.3.4.4 General Plant Procedures**

Integrated operating procedures provide instruction for the integrated operation of the plant. As discussed in Section A5 of ANSI/ANS-3.2, typical integrated operating procedures will include evolutions listed below:

- (1) Cold Shutdown to Hot Standby
- (2) Hot Shutdown to Startup
- (3) Recovery from Reactor Trip
- (4) Operation at Hot Standby
- (5) Turbine Startup and Synchronization of Generator
- (6) Changing Load and Load Following

- (7) Power Operation and Process Monitoring
- (8) Power Operation with Less than Full Reactor Coolant Flow
- (9) Plant Shutdown to Hot Standby
- (10) Hot Standby to Cold Shutdown
- (11) Preparation for Refueling and Refueling Equipment Operation
- (12) Refueling and Core Alternations

#### **13.5.3.4.5 System Operating Procedures**

Instructions for energizing, filling, venting, draining, starting up, shutting down, changing modes of operation, returning to service following testing (if not contained in the applicable testing procedure), and other instructions appropriate for operation of systems and prevention of water hammer will be delineated in System Operating Procedures. As discussed in Section A3 of ANSI/ANS-3.2, typical System Operating Procedures are listed below:

- (1) Nuclear Steam Supply System (Vessel and Recirculating System)
- (2) Control Rod Drive System
- (3) Reactor Water Cleanup System
- (4) Standby Liquid Control System
- (5) Residual Heat Removal System
- (6) High Pressure Core Flooder System
- (7) Reactor Core Isolation Cooling
- (8) Automatic Depressurization System
- (9) Reactor Building Cooling Water System
- (10) Containment
  - Maintaining Integrity
  - Containment Ventilation System
  - Inerting and Deinerting
- (11) Fuel Pool Cooling and Cleanup System
- (12) Main Steam System



- (13) Turbine/Generator System
- (14) Condensate System
- (15) Feedwater System
- (16) Makeup Water System
- (17) Reactor Building Service Water System
- (18) Turbine Building Service Water
- (19) Reactor Building HVAC System
- (20) Control Building HVAC System
- (21) Radwaste HVAC System
- (22) Standby Gas Treatment System
- (23) Instrument Air System
- (24) Electrical System
  - Offsite: Circuits between offsite transmission network and the onsite Class 1E distribution system
  - Onsite: Emergency Power Sources (e.g., Diesel generator, batteries)
    - AC System
    - DC System
- (25) Neutron Monitoring System
  - Startup Range Neutron Monitoring System
  - Power Range Neutron Monitoring System
  - Traversing In-core Probe System
- (26) Reactor Protection System
- (27) Rod Worth Minimizer

#### **13.5.3.4.6 Alarm Response Procedures**

Procedures will be prepared for off-normal or alarm conditions that require operator action in the Main Control Room. An individual procedure will be written for each annunciator window containing instructions for each alarm associated with that window which is important to safety or the operation of the power plant. These instructions will

normally contain (1) the meaning of the alarm, (2) the source of the signal, (3) the immediate action that is to occur automatically, (4) the immediate operator action, and (5) the long-range actions. If more than one alarm applies to a given procedure, repetition of the procedure may not be required if the applicable annunciators are listed at the beginning of the procedure.

Included in this procedure group will be specific guidance specifying operator actions in response to prolonged low level reactor coolant system leakage below Technical Specifications limits.

#### **13.5.3.4.7 Abnormal Operating Procedures**

As discussed in Section A 10 of ANSI/ANS-3.2, procedures will be provided to guide operation for significant events. Examples of such events are listed below.

- (1) Loss of Coolant (inside and outside primary containment, response to large and small breaks, including leak-rate determination)
- (2) Loss of Instrument Air
- (3) Loss of Electrical Power (and/or degraded power sources and Extended Loss of AC Power)
- (4) Loss of Core Coolant Flow
- (5) Loss of Condenser Vacuum
- (6) Loss of Containment Integrity
- (7) Loss of Service Water
- (8) Loss of Shutdown Cooling
- (9) Loss of Component Cooling System or Cooling to Individual Components
- (10) Loss of Feedwater or Feedwater System Failure
- (11) Loss of Protective System Channel
- (12) Miss-positioned Control Rod or Rods or Rod Drops
- (13) Inability to Drive Control Rods
- (14) Conditions Requiring Use of Standby Liquid Control System
- (15) Fuel Cladding Failure or High Activity in Reactor Coolant or Offgas
- (16) Fire in Control Room or Forced Evacuation of Control Room
- (17) Turbine and Generator Trips

- (18) Malfunction of Automatic Reactivity Control System
- (19) Malfunction of Pressure Control System
- (20) Reactor Trip
- (21) Plant fires
- (22) Acts of Nature (e.g., Tornado, flood, dam failure, earthquake)
- (23) Irradiated Fuel Damage While Refueling
- (24) Abnormal Releases of Radioactivity
- (25) Intrusion of Demineralizer Resin into Primary System
- (26) Hydrogen Explosions
- (27) Containment Isolation (including reopening of individual isolation valve following reset of safety injection or containment isolation valves)
- (28) Loss of Annunciators
- (29) Safe shutdown and cool-down under degraded core conditions (may be included in EOP actions)
- (30) Other expected transients that may be applicable

#### **13.5.3.4.8 Calibration, Inspection, and Test Procedures**

Procedures will be prepared for each surveillance test, inspection, or calibration required by Technical Specifications. As discussed in Section A8 of ANSI/ANS-3.2, examples of topics covered by surveillance test procedures are listed below:

- (1) Containment Leak Rate and Penetration Leak Rate Tests\*
- (2) Containment Isolation Tests
- (3) Containment Vacuum Breaker Tests
- (4) Containment Spray System Tests
- (5) Standby Gas Treatment System Tests (including filter tests)
- (6) Emergency Service Water System Functional Tests
- (7) Main Steam Isolation Valve Tests
- (8) Fire Protection System Functional Tests

- (9) Containment Monitoring System Tests
- (10) Emergency Core Cooling System Tests
- (11) Control Rod Operability and Scram Time Tests
- (12) Reactor Protection System Tests and Calibrations
- (13) Rod Block Tests and Calibrations
- (14) Refueling System Circuit Test
- (15) Standby Liquid System Tests
- (16) Core Thermal Limit Checks and Core Flux Monitor Calibrations
- (17) Emergency Power Tests
- (18) Reactor Core Isolation Cooling Tests
- (19) NSSS Pressurization and Leak Detection
- (20) Inspection of Reactor Coolant System Pressure Boundary
- (21) Inspection of Pipe Hanger Settings
- (22) Control Rod Drive System Functional Tests
- (23) Core Physics Surveillance, Including Heat Balance
- (24) Leak Detection System Tests\*
- (25) Area, Portable, and Air borne Radiation Monitor Calibrations
- (26) Process Radiation Monitor Calibrations
- (27) Safety Relief Valve Tests
- (28) Turbine Overspeed Trip Tests
- (29) Water Storage Tanks Level Instrumentation Calibrations
- (30) Reactor Building In-leakage Tests
- (31) Nitrogen Inerting System Tests

\* Included in this procedure group will be guidance regarding conversion of various leakage measurements into a common leakage equivalent.

**13.5.3.4.9 Emergency Operating Procedures**

Procedures that are symptom-oriented will be prepared to provide the operator guidance for maintaining the reactor in a safe condition with any or all of the principal process variables for the reactor or containment initially outside of limits, regardless of cause. Such procedures do not require the operator to diagnose the cause of the upset. A list of events that procedures will cover are provided below:

- (1) RPV Control
- (2) Primary Containment Control
- (3) Secondary Containment Control
- (4) Radioactivity Release Control
- (5) Level Restoration (Alternate Level Control)
- (6) Emergency (RPV) Pressurization
- (7) Steam Cooling
- (8) RPV Flooding
- (9) Level/Power Control
- (10) (Primary) Containment Flooding

**13.5.3.5.1 Supporting Documents**

- (1) ABWR Tier 2 Rev. 04, Appendix 18A, Emergency Procedure Guidelines

**13.5.3.5.2 Regulation and Regulatory Requirements**

- (1) NUREG-0737, Supplement No. 1, Clarification of TMI Action Plan Requirements, 1982
- (2) NUREG-0899, Guidelines for the Preparation of Emergency Operating Procedures, 1982
- (3) NUREG-1358, Lessons Learned From the Special Inspection Program for Emergency Operating Procedures, 1989
- (4) NUREG-1358, Lessons Learned From the Special Inspection Program for Emergency Operating Procedures, Supplement 1, 1992
- (5) NUREG/CR-5228, Techniques for Preparing Flowchart Format Emergency Operating Procedures, Volumes 1 and 2, 1989

**13.5.3.5.3 Additional References**

In addition to the sources cited previously, accepted methods and criteria for development of plant procedures are embodied in the following documents.

- 13.5-1 NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures", USNRC, 1982
- 13.5-2 NUREG-1358, "Lessons Learned From the Special Inspection Program for Emergency Operating Procedures", USNRC, 1989
- 13.5-3 NUREG-1358, Supplement 1, "Lessons Learned From the Special Inspection Program for Emergency Operating Procedures", USNRC, 1992
- 13.5-4 NUREG/CR-5228, "Techniques for Preparing Flowchart Format Emergency Operating Procedures" (Vols. 1 & 2), USNRC, 1989