

13.5 Plant Procedures

13.5.1 Administrative Procedures

Out of ABWR Standard Plant scope.

13.5.2 Operating and Maintenance Procedures

Out of ABWR Standard Plant scope.

13.5.3 COL License Information

13.5.3.1 Plant Operating Procedures Development Plan

A Plant Operating Procedures Development Plan shall be generated which establishes:

- That the scope encompassed by the procedures development process includes those operating procedures defined in Subsection 13.5.3.4, which direct operator actions during normal, abnormal and emergency operations, including consideration of plant operations during periods when plant systems/equipment are undergoing test, maintenance or inspection.
- The methods and criteria for the development, verification and validation, implementation, maintenance and revision of procedures. The methods and criteria shall be in accordance with TMI Items I.C.1 and I.C.9.

13.5.3.2 Emergency Procedures Development

In addition to the above, for Emergency Procedures development, the plan shall establish:

- That a writer's guide shall be developed and implemented which defines the process for developing emergency procedures. The writer's guide shall contain objective criteria which will require that the emergency procedures developed are consistent in organization, style, content and usage of terms.
- The form and content of the documentation describing the emergency procedure development activity results which includes, but is not limited to: (1) the objectives of the emergency procedure development process, (2) the methods employed during emergency procedure development, (3) deviations from generic technical guidelines approved by the NRC and (4) discussion of any design change recommendations and/or negative implications that the current design may have on safe operation as a result of emergency procedures development plan implementation.

13.5.3.3 Implementation of the Plan

Implementation of the Plant Operating Procedures Development Plan shall establish:

- Procedures which are consistent with the requirements of 10 CFR Part 50 and the TMI requirements described in NUREG-0737 and Supplement 1 to NUREG-0737.
- Requirements that the procedures developed shall include, as necessary, the elements described in ANSI 18.7/ANS-3.2 or subsequent NRC-approved version of ANSI/ANS-3.2 elected by the COL applicant.
- That the operator actions identified in the vendors task analysis and PRA efforts in support of the Standardized Design certification, Standardized Plant Design Emergency Procedure Guidelines and consideration of plant-specific equipment selection and site-specific elements such as the service water intake structure and the ultimate heat sink shall be used as a basis for specifying plant operating procedures.
- The definition of the methods through which specific operator skills and training needs, as may be considered necessary for reliable execution of the procedures, will be identified and documented.
- That the procedures specified in a., above, shall be made available for the purposes of the Human Factors V&V Implementation Plan described in Article VII of Table 18E-1.
- Procedures for the incorporation of the results of operating experience and the feedback of pertinent information into plant procedures in accordance with the provisions of TMI I.C..5.

13.5.3.4 Procedures Included In Scope Of Plan

The following procedures shall be included in the scope of the Plant Operating Procedures Development Plan described above:

System Procedures

Procedures as delineated in Section A3 of ANSI/ANS-3.2 shall be prepared, as appropriate, for the following BWR systems:

- Nuclear Boiler
- Control Rod Drive
- Reactor Water Cleanup
- Standby Liquid Control
- Residual Heat Removal
- High Pressure Core Flooder
- Reactor Core Isolation Cooling

- Reactor Building Cooling Water
- Containment
 - Maintaining Integrity
 - Containment Ventilation
 - Inerting and Deinerting
- Fuel Pool Cooling & Cleanup
- Main Steam
- Turbine/Generator
- Condensate/Feedwater
- Makeup Water
- Reactor Service Water
- Turbine Service Water
- Reactor Building HVAC
- Control Room HVAC
- Radwaste Building HVAC
- Standby Gas Treatment
- Instrument Air
- Electrical
 - 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
- Neutron Monitoring
 - Source Range

- Intermediate Range
- Power Range
- TIP System
- Reactor Protection
- Rod Worth Minimizer
- Alternate Feedwater Injection

Procedures For Off-Normal Or Alarm Conditions.

Prepare all procedures for off-normal or alarm conditions that require operator action in the MCR and RSS. These correspond to the number of alarm annunciators. Each annunciator important to safety should have its own written procedure, which should normally contain (a) the meaning of the annunciator, (b) the source of the signal, (c) the immediate action that is to occur automatically, (d) the immediate operator action and (e) the long-range actions. If more than one annunciator 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.

General Plant Operating Procedures.

As discussed in Section A5 of ANSI/ANS-3.2, procedures shall be prepared for the integrated operations of the plant. Typical general plant procedures are listed below:

- Cold Shutdown to Hot Standby
- Hot Standby to Minimum Load (nuclear startup)
- Recovery from Reactor Trip
- Operation at Hot Standby
- Turbine Startup and Synchronization of Generator
- Changing Load and Load Follow (if applicable)
- Power Operation and Process Monitoring
- Power Operation with Less than Full Reactor Coolant Flow
- Plant Shutdown to Hot Standby
- Hot Standby to Cold Shutdown
- Preparation for Refueling and Refueling Equipment Operation

- Refueling and Core Alterations

Procedures for Combating Emergencies and Other Significant Events.

As discussed in Section A10 of ANSI/ANS-3.2, procedures shall be provided to guide operations in emergencies and other significant events. Examples of such events are listed below. If symptomatic procedures are used, a single procedure may cover multiple events.

- Loss of Coolant (inside and outside primary containment) (response to large and small breaks, including leak-rate determination),
- Loss of Instrument Air
- Loss of Electrical Power or Degraded Power Sources, or both.
- Loss of Core Coolant Flow
- Loss of Condenser Vacuum
- Loss of Containment Integrity
- Loss of Service Water
- Loss of Shutdown Cooling
- Loss of Component Cooling System and Cooling to Individual Components
- Loss of Feedwater or Feedwater System Failure (including verification of proper operation of the auxiliary feedwater system)
- Loss of Protective System Channel
- Mispositioned Control Rod or Rods (and rod drops)
- Inability to drive control rods
- Conditions Requiring Use of Standby Liquid Control System
- Fuel Cladding Failure or High Activity in Reactor Coolant or Offgas
- Fire in Control Room or Forced Evacuation of Control Room
- Turbine and Generator Trips
- Other Expected Transients That May Be Applicable
- Malfunction of Automatic Reactivity Control System

- Malfunction of Pressure Control System
- Reactor Trip
- Plant Fires
- Acts of Nature (e.g., tornado, flood, dam failure, earthquake)
- Irradiated Fuel Damage While Refueling
- Abnormal Releases of Radioactivity
- Intrusion of Demineralizer Resin into Primary System
- Hydrogen Explosions
- Containment Isolation (including reopening of individual isolation valves following reset of safety injection or containment isolation valves).
- Achievement and Maintenance of Natural Circulation.
- Safe Shutdown and Cooldown of the reactor core under a degraded core condition, including sampling of the reactor coolant and containment atmosphere.
- Loss of Annunciators
- In addition, procedures shall be prepared for activation and implementation of the facility emergency plan. For example, a procedure should be prepared which describes the emergency action level classification system.
- In addition, procedures shall be prepared for plant operations during plant systems/equipment and HSI (i.e., MCR and RSS) equipment testing, maintenance or inspection.

Procedures for Maintenance and Modification.

Prepare all maintenance and modification procedures that require operator actions to be taken in the MCR or RSS, including the following:

- Exercise of equipment that is normally idle but that must operate when required.
- Removal of Reactor Head.
- Reactor Coolant System operation with loops partially drained.

Procedures for radiation control.

As discussed in Section A7(d) of ANSI/ANS-3.2, the following procedures shall be prepared:

- Mechanical Vacuum Pump Operation
- Air Ejector Operation.
- Packing Steam Exhauster Operation
- Sampling
- Air Ejection, Ventilation and Stack Monitor.
- Area Radiation Monitoring System Operation
- Process Radiation Monitoring System Operation
- Meteorological Monitoring
- Discharge of Effluents
- Dose Calculations

Procedures for Calibration, Inspection and Testing.

Prepare all calibration, inspection and testing procedures that require operator actions to be taken in the MCR or RSS, including the following:

- Containment Isolation Tests
- Containment Vacuum Relief Valve Tests
- Containment Spray System Tests
- Standby Gas Treatment System Tests (including filter tests)
- Emergency Service Water System Functional Tests
- Main Steam Isolation Valve Tests
- Fire Protector System Functional Tests
- Nitrogen Inerting System Tests
- Emergency Core Cooling System Tests
- Control Rod Operability and Scram Time Tests
- Reactor Protection System Tests and Calibrations

- Rod Block-Tests and Calibrations
- Liquid Poison System Tests
- Minimum Critical Heat Flux Checks and In Core Flux Monitor Calibrations
- Emergency Power Tests
- Isolation Condenser or Reactor Core Isolation Cooling (RCIC) Tests
- NSSS Pressurization and Leak Detection
- Control Rod Drive System Functional Tests
- Core Physics Surveillance, Including Heat Balance
- Axial and Radial Flux Pattern Determination
- Safety Valve Tests
- Turbine Overspeed Trip Test

13.5.4 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 Gilmore, et al, "User-Computer Interface in Process Control: A Human Factors Engineering Handbook", Academic Press, San Diego, Ca, 1989
- 13.5-2 IEC 964, "Design for Control Rooms of Nuclear Power Plants", Bureau Central de la Commission Electrotechnique Internationale
- 13.5-3 MIL-H-46855B, "Human Engineering Requirements for Military Systems, Equipment and Facilities", Dept. of Defense
- 13.5-4 MIL-STD-1472D, "Human Engineering Design Criteria for Military Systems, Equipment and Facilities", Dept. of Defense
- 13.5-5 NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures", USNRC, 1982
- 13.5-6 NUREG-1358, "Lessons Learned From the Special Inspection Program for Emergency Operating Procedures", USNRC, 1989
- 13.5-7 NUREG-1358, Supplement 1, "Lessons Learned From the Special Inspection Program for Emergency Operating Procedures", USNRC, 1992

- 13.5-8 NUREG/CR-5228, "Techniques for Preparing Flowchart Format Emergency Operating Procedures" (Vols. 1 & 2), USNRC, 1989