



***GE Nuclear Energy***

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Rev. 4  
March 1997

**ABWR  
Design  
Control  
Document**

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## **13.0 Conduct of Operations**

### **13.1 Organizational Structure of Applicant**

Out of ABWR Standard Plant scope.

## **13.2 Training**

### **13.2.1 Reactor Operator Training**

Out of ABWR Standard Plant scope.

### **13.2.2 Training For Non-Licensed Plant Staff**

Out of ABWR Standard Plant scope.

### **13.2.3 COL License Information**

#### **13.2.3.1 Incorporation of Operating Experience**

The results of reviews of operating experience shall be incorporated into training and retraining programs in accordance with the provisions of TMI Action Item I.C.5, Appendix 1A. The organizational responsibilities for accomplishing this shall be clearly identified.

## **13.3 Emergency Planning**

Emergency planning is not within the scope of the ABWR design. However, there are design features, facilities, functions, and equipment necessary to support emergency planning. The design features in the ABWR Standard Plant scope include the technical support center (TSC) and the operational support center (OSC), which are described in Table 13.3-1. The emergency operations facility (EOF), also described in Table 13.3-1, is beyond the scope of the ABWR design and is addressed as COL license information in Subsection 19A.3.4 relative to the 50.34(f) (2) (XXV) requirement. Additional ABWR design considerations pertaining to emergency planning are contained in Table 13.3-1. The COL applicant shall provide emergency plans in accordance with 10CFR50.33(g) and 52.79(d). See Subsection 13.3.1.1 for COL license information.

### **13.3.1 COL License Information**

#### **13.3.1.1 Emergency Plans**

The COL applicant shall provide emergency plans in accordance with 10CFR50.33(g) and 52.79(d). (See Section 13.3)

**Table 13.3-1  
ABWR Design Considerations for Emergency Planning Requirements**

Facility	Primary Document/ Section	Emergency Planning Requirements	ABWR Design Consideration
Technical Support Center (TSC)	NUREG-0696/ 1.3.1	<p>The TSC is an onsite facility located close to the control room that shall provide plant management and technical support to the reactor operating personnel located in the control room during emergency conditions. It shall have technical data displays and plant records available to assist in the detailed analysis and diagnosis of abnormal plant conditions and any significant release of radioactivity to the environment. The TSC shall be the primary communications center for the plant during an emergency. A senior official, designated by the licensee, shall use the resources of the TSC to assist the control room operators by handling the administrative items, technical evaluations, and contact with offsite activities, relieving them of these functions. The TSC facilities may also be used for performing normal functions, such as shift technical supervisor and plant operations/ maintenance analysis functions, as well as for emergencies.</p>	<p>The ABWR Standard Plant will comply with all the TSC design requirements. Specifically, a TSC of sufficient size (at least 175 m<sup>2</sup> of floor space) to support 25 people is located in the service building adjacent to the control building. The TSC is non-safety-related and is not Seismic Category I. The necessary facilities and equipment are called for in Section 2 of NUREG-0696.</p> <p>The TSC has displays for the plant parameters which are included in the fixed position displays on the Main Control Room Panels.</p> <p>The TSC has voice communication equipment for communication with the Main Control Room, Emergency Operations Facility, Operational Support Center (OSC), and NRC Headquarters Operation Center.</p> <p>As shown on Figure 12.3-64, the TSC has an installed area radiation monitor.</p>



**Table 13.3-1  
ABWR Design Considerations for Emergency Planning Requirements (Continued)**

<b>Facility</b>	<b>Primary Document/ Section</b>	<b>Emergency Planning Requirements</b>	<b>ABWR Design Consideration</b>
Operational Support Center (OSC)	NUREG-0696/ 1.3.2	The OSC is an onsite assembly area separate from the control room and the TSC where licensee operations support personnel report in an emergency. There is direct communications between the OSC and the control room and between the OSC and the TSC so that the personnel reporting to the OSC can be assigned to duties in support of emergency operations.	The ABWR Standard Plant will comply with all the OSC design requirements. Specifically, the lunch room adjacent to the TSC in the service building which is adjacent to the control building will be identified as the OSC. The OSC is non-safety-related and is not seismic Category I. The OSC has voice communication equipment for communication with the main control room and the TSC. The COL applicant is responsible for identifying the communication interfaces for inclusion in the detailed design of the control room and TSC. The detailed requirements are provided in Section 3 of NUREG-0696.

**Table 13.3-1  
ABWR Design Considerations for Emergency Planning Requirements (Continued)**

<b>Facility</b>	<b>Primary Document/ Section</b>	<b>Emergency Planning Requirements</b>	<b>ABWR Design Consideration</b>
Emergency Operations Facility (EOF)	NUREG-0696/ 1.3.3	The EOF is an offsite support facility for the management of overall licensee emergency response, coordination of radiological and environmental assessments and determination of recommended public protective actions. The EOF has appropriate technical data displays and plant records to assist in the diagnosis of plant conditions to evaluate the potential or actual release of radioactive materials to the environment. A senior licensee official in the EOF organizes and manages licensee offsite resources to support the TSC and the control room operators. Assembly area separate from the control room and the TSC, shall be provided for operations support personnel to report in an emergency. There shall be direct communications between the OSC and control room and between the OSC and the TSC so that the personnel reporting to the OSC can be assigned to duties in emergency operations.	The EOF is not within the scope of the ABWR Standard Plant. It is the responsibility of the COL applicant to identify his EOF and the communication interfaces for inclusion in the detailed design of the TSC and control room. The detailed requirements are provided in Section 4 of NUREG-0696.
Emergency Operations Center (EOC)	NUREG-0654/ II.H.6	Each licensee shall make provision to acquire data from or for emergency access to offsite monitoring equipment including geophysical phenomena and radiological monitors.	Not within the scope of the ABWR Standard Plant. However, no impact on ABWR design.

**Table 13.3-1  
ABWR Design Considerations for Emergency Planning Requirements (Continued)**

<b>Facility</b>	<b>Primary Document/ Section</b>	<b>Emergency Planning Requirements</b>	<b>ABWR Design Consideration</b>
Laboratory Facilities, Fixed or Mobile	NUREG-0654/ II.H.6.c	Provisions to acquire data from or for emergency access to offsite monitoring and analysis equipment for laboratory facilities, fixed or mobile.	Responsibility of COL applicant. ABWR design allows applicant to meet this requirement.
Post-Accident Sampling System	NUREG-0737/ II.B.3	Post-accident sampling capability.	The counting room for analyzing post-accident samples is located in the Service Building. Post-accident sampling system of Subsection 9.3.2 meets requirements except as described in Section 1A.2.7 for the upper limit of activity in the samples at the time they are taken.
Onsite Decontamination Facility	10CFR50 Appendix E/ IV.E.3	Provisions shall be made and described for facilities and supplies at the site for decontamination of onsite individuals.	Decontamination of onsite individuals will be provided by the COL applicant in the service building adjacent to the main change rooms (See Figure 1.2-20).

## **13.4 Review and Audit**

### **13.4.1 COL License Information**

The COL applicant shall provide a plan for conducting reviews of operating phase activities that are important to safety. The provisions for the plant operations review of operational activities, for the independent review of plant operations and for the independent assessment of activities for safety enhancement should be provided in accordance with 10 CFR 50.40 (b), TMI Action Item I.B.1.2, and ANSI 18.7/ANS 3.2 or subsequent NRC-approved version of ANSI/ANS 3.2 elected by the COL applicant.

## **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
- Hydrogen Recombiners

**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

## **13.6 Physical Security**

### **13.6.1 Preliminary Planning**

Not Required.

### **13.6.2 Security Plan**

The portion of the physical security plan, which is in the ABWR Standard Plant scope, is not included in DCD (Refer to SSAR Subsections 13.6.3.1, 13.6.3.2 and 13.6.3.3, Amendment 33).

### **13.6.3 COL License Information**

Safeguards Information not included in DCD (Refer to SSAR Subsection 13.6.3, Amendment 33).