
EPRI/NEI Digital I&C and Control Room Licensing Issues Workshop

March 28, 2006

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- I&C Status and Activities
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Utility Status

- The Following Utilities have Announced Plans to Apply for Multiple Unit AP1000 COL's
 - Duke Energy
 - Southern Company
 - South Carolina Electric and Gas
 - Progress Energy
 - TVA - NuStart



AP1000 I&C Review Status

- AP1000 Certified Design did not include the detailed design of the Protection and Monitoring System
- Design Acceptance Criteria (ITAAC) will be used for NRC review of the detailed Protection System Design after Design Certification
- Westinghouse intends to provide significant portions of the Protection System Design for NRC Review during the COL licensing phase



AP1000 I&C Review Status

AP1000

“The NRC staff intends to perform inspections that will audit the satisfactory completion of ITAAC requirements, including the Design Acceptance Criteria

“The staff will use a two part approach...The first part will involve a detailed, functional review at the block diagram level, to ensure appropriate implementation of NRC requirements...”

“The second part ... will address the implementation...”



AP1000 I&C Review Status

AP1000

The safety system hardware and software is developed using a planned design process which provides for specific design documentation and reviews during the following life cycle stages:

- a) Design requirements phase, may be referred to as conceptual or project definition phase
- b) System definition phase
- c) Hardware and software development phase, consisting of hardware and software design and implementation
- d) System integration and test phase
- e) Installation phase



AP1000 I&C Status - Design Requirements Phase

- Life Cycle Activity Group: Planning Activities

- Documents:
 - Software Program Manual
 - Project Quality Plan
 - Project Document Index
 - Commercial Grade Dedication Plan
 - AP1000 V&V Plan
 - System Test Plan



AP1000 I&C Status - System Definition Phase

- Life Cycle Activity Group: Requirements Activities

- Documents:
 - Generic Safety System Requirements
 - AP1000 Safety System Requirements
 - Functional Requirements
 - System Hardware Requirements
 - Software Requirements Specification
 - System Interface Requirements
 - Requirements Phase V&V Report
 - Requirements Phase RTM
 - Project Document Index



AP1000 I&C Status - Hardware and Software Development Phase

AP1000

- Life Cycle Activity Group: Design and Implementation Activities
- Documents:
 - System Design Specification
 - System Architecture Drawings
 - Hardware Design Drawings
 - CM Release Report
 - Custom Software Element Design Specifications
 - Reusable Software Type Specifications
 - Module/Unit Test Procedures
 - Module/Unit Test Reports
 - BPL Software Design Description



AP1000 I&C Status - Hardware and Software Development Phase

AP1000

- Documents (continued):
 - LCL Software Design Description
 - ITP Software Design Description
 - ILC Software Design Description
 - MUX Software Design Description
 - MTP Software Design Description
 - Design and Implementation Phase V&V Reports
 - Design and Implementation Phase RTM
 - Project Document Index



AP1000 System Integration and Test Phase



- Life Cycle Activity Group: Integration and Validation Activities
- Proposed Review: TBD after plant (hardware) order



AP1000 Installation Phase



- Life Cycle Activity Group: Installation Activities
- Proposed Review: TBD after plant (hardware) order



AP1000 Human Factors Engineering (HFE) Program

AP1000 HFE Program

- The AP1000 Control Centers & Human-System Interface design follows a formal design process (DCD Ch.18) addressing the 12 elements of NUREG-0711.
- 12 Elements of the HFE Program
 - Planning
 - 1. HFE Program management
 - Analysis
 - 2. Operating Experience Review
 - 3. Functional requirements Analysis & Function Allocation
 - 4. Task Analysis
 - 5. Staffing
 - 6. Integration of Human Reliability Analysis with HFE

AP1000 HFE Program

AP1000

- 12 Elements of the HFE Program (continued)
 - Design
 - 7. Human System Interface (HSI) Design
 - 8. Procedure Development
 - 9. Training Program Development
 - Verification and Validation
 - 10. HFE Verification and validation
 - Operation
 - 11. Design Implementation
 - 12. Human Performance Monitoring

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AP1000 HFE Program Status

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- 12 Elements are placed in 3 categories:
 - Closed in Design Cert, no COL actions (2)
 - Closable at or before Combined Operating License (COL) Application (8)
 - Closed after COL Application, prior to operation (2)

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AP1000 HFE Program Status

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- Elements Closed in Design Certification :
 - Operating Experience Review (18.3)
 - Functional Requirements Analysis/Function Allocation (18.4)
- HFE Elements Closable at/before COL :
 - HFE Program Implementation (18.2) – Detailed Plan Has Been Issued & is Being Executed.
 - Task Analysis (18.5) – In Progress; MCR Staffing Roles, Responsibilities & Operational Philosophy Currently Being Defined
 - Staffing (18.6) – In Progress
 - Integration of HRA with HFE Design (18.7) – In Progress



AP1000 HFE Program Status

AP1000

- HFE Elements Closable at/before COL (continued):
 - HSI Design (18.8)
 - Initial Functional Design Issued
 - Preliminary Design Review of the Functional Design Completed
 - Rapid Prototype of HSI Resources and AP1000 Simulator Being Used For Engineering Testing
 - Procedure Development (18.9) – In Progress
 - Training Program Development (18.10) – In Progress (Enercon)
 - Human Performance Monitoring (18.14) – In Progress (Enercon)
- HFE Elements Closed After COL:
 - HFE Verification & Validation (18.11) – Detailed V&V Plan To Be Developed Later This Year, Execution Will Be Completed After COL Application
 - Design Implementation (18.13) – Addressed by HFE V&V Element

