18.8 Procedure Development

Procedures are essential to plant safety because they support and guide personnel interactions with plant systems and personnel responses to plant-related events. Procedures and the human system interfaces (HSI) are designed in parallel using similar processes and incorporating the same accident analyses; the evaluation processes used are also interrelated. Human factors principles are applied to aspects of the interface to verify complete integration and consistency. Refer to Section 3.2 of the AREVA NP U.S. EPR Human Factors Procedure Implementation Plan (Reference 1) for a generic outline of HFE program input to the procedure development process for the U.S. EPR.

A COL applicant that references the U.S. EPR design certification will describe how HFE principles and criteria are incorporated into the development program for site procedures.

18.8.1 Objectives and Scope

From the perspective of the HFE program, the objectives of procedure development activities are to develop procedures that are technically accurate, comprehensive, explicit, easy to use, and validated (i.e., the user can comply with the requirements of each step).

HFE guidelines are applied to all procedures associated with plant operations and testing:

- Generic Technical Guidelines (GTG) for emergency operating procedures.
- Plant and system operations (including startup, power, and shutdown operations).
- Abnormal and emergency operations.
- Alarm response.
- Equipment testing.

18.8.2 Methodology

Procedure development activities consider the following aspects:

- Plant design basis.
- System-based technical requirements and specifications.
- Results of task analyses (TA).

- Risk-important human actions (HA) identified in the human reliability analysis (HRA), probabilistic risk assessment (PRA), and operating experience review (OER).
- Initiating events to be considered in emergency operating procedures (EOP), including those events in the design bases.
- GTG for EOP.

Operational guidelines are provided to the COL applicant referencing the U.S. EPR standard design to assist in the development of plant-specific normal operating, abnormal operating, alarm response, and EOPs that incorporate the aspects of the HSI design appropriate to the completion of the plant-specific procedure (see Section 13.5.2.1.3). Generic plant operational guidelines are part of procedure development and are a significant contribution to HSI design because they are developed or modified to reflect the characteristics and functions of the screen-based or conventional HSIs, as appropriate.

The procedure implementation plan (Reference 1) describes:

- The basis or starting point for procedure development (i.e., how the TA (see Section 18.4) and procedure development interrelate).
- The content of procedures.
- How the HSI style guide (see Section 18.7.6.1) integrates with the procedure writer's guide.
- How procedures are verified and validated.
- The justification for using electronic operating procedures instead of paper-based procedures.

18.8.2.1 Procedure Writer's Guide

A procedure writer's guide is a necessary component of the procedure development program to establish consistency in organization, style, and content. This guide specifies which procedures fall within the purview of the guide. The procedure writer's guide and the HSI style guide (Section 18.7.6.1) are used concurrently while developing procedures that will provide consistency with terminology, abbreviations, and the use of component coding.

18.8.2.2 Verification and Validation of Procedures

Both the electronic and paper-based procedures are verified and validated prior to the completion of the HSI design using a high-fidelity simulator and are used as input to the integrated system validation (ISV), see Section 18.10.3.5.

18.8.2.3 Electronic Procedures

Operating procedures are implemented in a screen-based format that provides access to process information by direct links. These electronic procedures also provide access to related information and direct the operator to the appropriate control screens. Refer to Section 6.2.9 of the U.S. EPR Human Factors Program Management Plan (Reference 1) for further details on the development of electronic procedures.

Paper-based procedures serve as backup to screen-based (i.e., electronic) procedures and contain the same guidance and format. Hard copy backups of operating procedures are provided in the main control room (MCR), remote shutdown station (RSS), and the Technical Support Center (TSC) in the event that a failure of the operating procedure computer occurs. Aside from differences in how electronic and hard copy procedures are used (i.e., the navigation and layout) as well as the availability of live data, electronic and hard copy procedures contain the same information in the same format. Adequate space is provided at appropriate workstations in the MCR and RSS for operators to display paper-based procedures, when required.

18.8.3 Results

A results summary report addresses the final set of procedures developed using the established methodology. The results summary report includes:

- The results of verification and validation (V&V) activities as they relate to procedure development.
- How procedures will be maintained and updates controlled.
- A description of how operators access and use procedures, especially during operational events including:
  - Storage of procedures.
  - Ease of operator access to the correct procedures.

18.8.4 References

1. U.S. EPR Human Factors Procedure Implementation Plan, AREVA NP Inc., 2009.

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