18.5 Staffing and Qualifications

Initial staffing assumptions are listed in the Human Factors Engineering (HFE) Program Management Plan (Reference 1). Analysis of actual staffing numbers is an iterative process inherent in task analysis. Initial assumptions are reviewed, validated, and modified as necessary following analyses.

A COL applicant that references the U.S. EPR design will confirm that actual staffing levels and qualifications of plant personnel specified in Section 13.1 of the COL application remain bounded by regulatory requirements and results of the staffing and qualifications analysis.

18.5.1 Objectives and Scope of Analysis

For developing the conceptual design for HSIs, and considering the minimum staffing requirements established in 10 CFR 50.54 (i) through (m), and as defined in Section 18.1.1.5, a U.S. EPR design goal is to design the plant and the HSI so that three licensed operators can safely monitor and control the plant from the MCR under all operating conditions, including normal operation, startup, shutdown, abnormal operation, and accidents. Because of the levels of automation inherent in the instrumentation and controls (I&C) architecture, only one licensed operator is needed at the controls during normal power operations. A second licensed operator is required by law to be on shift to provide defense in depth; the second licensed operator is not required to be continuously at the controls. In addition, a senior reactor operator (SRO) licensed control room supervisor shall remain present or readily available at all times in accordance with 10 CFR 50.54 (m). U.S. EPR design input assumptions also require that each operating crew include an SRO licensed shift manager (SM) and a number of non-licensed operators (NLO).

The objective of the workload analyses is to demonstrate that the HSI design and the number, roles, and responsibilities of the plant operating staff is able to adequately meet the demands of the processes of the plant. The initial assumption for the roles and responsibilities of operators during a full range of operating conditions is documented in Section 2.2.2.1 of the HFE Program Management Plan (Reference 1). The initial staffing assumption is based on operational experience for similar PWR designs.

To obtain an optimum staffing level for the U.S. EPR, factors associated with other elements of the HFE program are considered. For example:

- The operating experience review (OER), Section 18.2, identifies staffing level related aspects of operating plants of similar design under various conditions and operating modes.

- Functional allocation (FA) decisions, Section 18.3, are evaluated to achieve maximized performance without placing excessive demands upon the operators, and to determine the monitoring tasks required of operators when functions are automated.

- Task analysis (TA), Section 18.4, provides input to the MCR staffing levels by including workload analysis as part of the overall TA process. The objective is to verify that the control room HSI adequately supports operator performance. Workload analysis must carefully consider assumed roles and responsibilities and qualification requirements of operators.

- Human reliability analyses (HRA), Section 18.6, provides input to the consideration of staffing levels on plant safety and reliability. In particular, risk-significant or time critical human actions (HA) are examined during the TA to determine the need for reassignment, changes to operator roles, or the need to change the number of operators required.

- The role of the operator is an important consideration in the HSI design process. Section 18.7 addresses the engineering process of optimizing coordinated operator actions, the demand on operators during the use of control elements and display elements concurrently, and the design of effective support.

18.5.2 Staffing and Qualifications Analysis Methodology

To obtain an optimum staffing level, the initial staffing assumption (Reference 1) is iterated as a result of task analysis. Initially, tasks are assigned to crew members based on operating experience and on established roles and responsibilities as noted in Reference 1. The process then builds on these assumptions. Changes in team roles and responsibilities result from the adjustments to individual crew member responsibilities. Finally, individual team member qualification requirements evolve with changes in team and individual roles.

18.5.3 Results

The staffing and qualification analysis is summarized within task analysis (Reference 2) and includes an evaluation of the number and qualifications of personnel needed to operate and test the U.S. EPR based on the HSI design features for normal, abnormal, and emergency conditions.

18.5.4 References

1. [*ANP-10327P, Revision 0, "U.S. EPR HFE Program Management Plan Technical Report," AREVA NP Inc., April 2013.*

2. *U.S. EPR Task Analysis Implementation Plan, AREVA NP Inc., 2011.*]*

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