

## INTERIM STAFF GUIDANCE - MINIMUM INVENTORY OF HUMAN SYSTEM INTERFACES

### DESCRIPTION

The purpose of this interim staff guidance is to better define the minimum inventory of human system interfaces (i.e., alarms, controls, and displays) needed to implement the plant's emergency operating procedures, bring the plant to a safe condition, and to carry out those human actions shown to be important from the applicant's probabilistic risk assessment. The improved definition and associated review criteria should minimize any inconsistencies in the staff review of a design-specific or plant-specific minimum inventory of human system interfaces.

### STAFF POSITION

#### Development Process

1. The minimum inventory of human system interfaces in the main control room and at the remote shutdown panel should be identified.
  - a. The main control room minimum inventory should include the human system interfaces that the operator always needs available to:
    - i. Monitor the status of fission product barriers,
    - ii. Perform and confirm a reactor trip,
    - iii. Perform and confirm a controlled shutdown of the reactor using the normal or preferred means,
    - iv. Actuate safety related systems that have critical safety functions of protecting the fission product barriers, and
    - v. For analyzed failure conditions of the normal human system interfaces, maintain the current plant operating condition and power level until the human system interfaces are restored in accordance with applicable regulatory requirements.
  - b. The minimum inventory at the remote shutdown panel should include the human system interfaces that the operator always needs available to:
    - i. Monitor the status of fission product barriers,
    - ii. Perform and confirm a reactor trip, and
    - iii. Perform and confirm a controlled shutdown of the reactor using the normal or preferred means.
  - c. The minimum inventory of human system interfaces in the main control room and at the remote shutdown panel should:
    - i. Be readily accessible to the operator and
    - ii. Meet all the applicable regulatory requirements for independence, diversity and defense-in-depth, equipment qualification, and quality.

## Selection Criteria

2. Applicants seeking approval of a new main control room or remote shutdown panel should provide a description of the process that will be used to identify the minimum inventory in the main control room and at the remote shutdown panel.

At a minimum, the description of the identification process should include discussion of:

- a. the selection criteria,
  - b. the functions and tasks need to be supported by the minimum inventory human system interfaces,
  - c. the design requirements that apply to the human system interfaces including those imposed by regulatory requirements, and particularly addressing requirements related to qualification, independence, and accessibility,
  - a. the use of plant-specific probabilistic risk assessment that may identify operator actions or tasks that are risk significant,
  - b. the guidance provided in Regulatory Guide 1.97, Rev. 4,
  - c. the manual operator actions credited in the safety analysis or plant-specific emergency operating procedures (if available) for safety and non-safety success paths, and
  - d. the diversity and defense-in-depth evaluation that may identify any specific manual operator actions credited for coping with common cause failures of digital protection systems.
3. Applicants seeking approval of a new main control room or remote shutdown panel should provide a description of the process that will be used to verify the completeness of the minimum inventory in the main control room and at the remote shutdown panel.

At a minimum the description of the verification process should include discussion of:

- a. The use of generic technical guidelines for developing emergency operating procedures or plant-specific emergency operating procedures,
  - b. the function-based task analysis that describes the operator manual actions necessary to bring the reactor to a safe shutdown under conditions where the primary instrumentation is either available and unavailable,
  - c. the operator manual actions identified through the plant-specific probabilistic risk assessment or plant-specific human reliability analysis,
  - d. the critical operator manual actions credited for diversity and defense-in-depth (including those for coping with common cause failures ), and
  - e. discussion of the use of a full-scope simulator that meets the guidance in ANSI/ANS 3.5.
4. The completeness of the minimum inventory should be verified once the control room design has been implemented (e.g., construction or modification of full-scope or plant-reference simulator).
  5. The as-built main control room and remote shutdown facility should be evaluated to assure that they contain all the minimum inventory determined from the development process and selection criteria.

6. The applicable sections of the plant's Design Certification Document and Update Final Safety Analysis Report should be updated to:
  - a. Include a description of the process used to identify the minimum inventory of human system interfaces (i.e., alarms, controls, displays) in the main control room and at the remote shutdown panel,
  - b. Include a description of the identified failure conditions of the normal human system interfaces, and
  - c. Include the list of the minimum inventory of human system interfaces (i.e., alarms, controls, displays) in the main control room and at the remote shutdown panel.

## **STAFF RATIONALE**

The staff review of an applicant's minimum inventory will be multi-disciplinary consisting of inputs from human factors engineering; instrumentation and controls; risk assessment; plant, reactor, and electrical engineering.

As stated in SECY 92-053, the staff identified control room design and advanced instrumentation and controls as areas where detailed design information may not be available for staff review during a design certification. Since then, the staff has developed a two-part approach for the review of the human factor aspects of the control room design. The first part involves a review to establish the minimum inventory of human system interfaces necessary for the operators to implement the emergency operating procedures, bring the plant to a safe condition, and to carry out those human actions shown to be important from the applicant's PRA. The minimum inventory will be included in the design certification. The second part of the staff's review will utilize design acceptance criteria to ensure the implementation of a systematic approach to the incorporation of human factors principles in completing the design of the control room, such as alarms, displays, and controls.

## **REFERENCES**

1. 10 CFR 50.34(f) - post-TMI requirements for improved safety monitoring and control
2. NUREG-0800 Chapter 18 - guidance on Safety Parameter Display Systems
3. NUREG-0700 - guidance on reviewing human factors aspects of HSI design
4. NUREG-0711 - guidance on task analysis, PRA/HRA, risk-important operator actions
5. Regulatory Guide 1.97 - criteria for accident monitoring instrumentation
6. Regulatory Guide 1.47 - guidance on bypassed and inoperable status indication
7. Regulatory Guide 1.62 - guidance on manual initiation of protective actions
8. NUREG-0800 Chapter 7, Branch Technical Position (BTP) 7-19 - guidance on diversity and defense-in-depth

9. IEEE 603 - standard criteria for safety systems
10. ANSI/ANS 3.5 - guidance for the design and application of nuclear power plant simulators
11. SECY 92-053 - guidance on the use of DAC
12. SECY 93-087 - guidance on policy, technical and licensing issues related to ALWR designs