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Graded Approach to Human Factors Engineering

Highly-Integrated Control Rooms – Human Factors Meeting

November 13, 2007

Washington, DC

Graded Approach to HFE

- Graded Approach to HFE: There currently is no clear guidance or acceptance criteria on a process to implement a graded approach to HFE.

- NUREG 0711 and the SRP allow a graded approach to reviewing HFE analyses and activities but do not provide guidance on how to do this. NUREG 1764 describes a graded, risk-informed process for HFE reviews, but it is narrowly focused on review of changes to credited operator actions. There is no guidance available for determining the specific types of HFE activities and levels of rigor that should be applied in those activities for designs or design changes having different levels of complexity and risk. NEI Human Factors Task Force will prepare report.

Methodology for Using a Graded Approach to Human Factors Engineering

- Currently there is no clear guidance or acceptance criteria on a process to implement a graded approach to HFE
- Review existing NRC regulatory guidance, positions, and acceptance criteria
- Develop industry guidance report for a graded approach to the review of human factors aspects of control rooms to facilitate consistent and efficient licensing
- Goal is that NRC endorse this industry guidance report

Methodology for Using a Graded Approach to Human Factors Engineering

- Scope:
  - Provide guidance for a methodology to apply a graded approach to the performance of human factors engineering (HFE) activities for large scale modifications to control rooms and other human-systems interfaces (HSI) in existing commercial nuclear power plants and for the design of control rooms and HSI for new commercial nuclear power plants
  - Describe an approach to determine risk significance of the modification or new plant design feature
  - Provide a brief description of the elements of HFE

Methodology for Using a Graded Approach to Human Factors Engineering

- Content:
  - Section 1 of this report provides a background for the preparation of this industry position report. This description summarizes the current regulatory position for the application of a graded approach for the HFE activities.
  - Section 2 of this report defines an approach for establishing an appropriate level of HFE activities. The approach uses a two step process:
    - The first step makes an initial screening risk estimation. This risk estimation evaluates the significance that the modification or new design feature can have. Risk drivers include nuclear safety, personnel safety and investment risk. Nuclear safety risk evaluation is based on the concepts developed in NUREG-1764.

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- The second step of the risk screening is qualitative and allows adjusting the initial evaluation considering secondary factors that cannot be taken into account quantitatively.
- The results of these two steps determine the appropriate level of HFE activities. A Level 1 risk determination will require the most complete application of HFE and will include most or all of the review elements from the HFE program. A Level 2 will require a reduced or more focused level of HFE. For a Level 3, a minimum set HFE activities is defined.

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- Content (continued):
  - Section 3 of this report describes the critical HFE activities for a Level 1 evaluation and discusses how the conduct of these activities may be adjusted for a Level 2 and Level 3 evaluation.
  - Appendix A provides brief hypothetical examples of Level 1, Level 2, and Level 3 HFE activities.
  - Appendix B provides a method for determining risk importance of human actions that affect initiating events.
  - Appendix C provides a qualitative assessment of human action safety significance (based on NUREG 1764).

Methodology for Using a Graded Approach to Human Factors Engineering

- Status:
  - Being drafted
- Future Action:
  - Issue for Task Force review (December 2007)
  - Address comments from Task Force
  - Issue for NRC review
  - Address comments from NRC
  - Gain acceptance of the methodology proposed to apply a graded approach to performance of HFE