

**DRAFT**

# When is a Human Factors Review Appropriate?

Development of a Human Factors  
Screening Tool for Nuclear Regulatory  
Commission Project Managers

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# Human Factors at NRC

- NRC Mission- protect public from radiation
  - Licenses, oversight, enforcement, rulemaking, research
  - Application for initial license / license amendment request for modifications
    - All new initial licenses automatically have HF reviews
    - Some modifications need HF reviews
- Human Factors
  - 10 CFR 50.34 “state-of-the-art human factors principles”
    - Chapter 18 of Standard Review Plan
    - NUREG-0711 - HF Programs
    - Other NUREGs
  - Focus on Safety (not efficiency, user experience, etc.)

# Project Managers (PM) Screen Incoming License Amendments

- PM coordinates large work projects
  - Set project schedules
  - Coordinates communications with licensees
  - Determine which technical areas are related to a particular licensing activity
    - Must decide which technical areas must review a license amendment (this includes human factors)

# Problem

- PMs understanding of HFE varies greatly
  - Fail to recognize, or underestimate significance of HFE issues in LARs
  - Potentially consequences:
    - Jeopardizes schedules
    - Displacement of other work
    - Create poor precedent (challenges future work)
    - Damage to reputation of agency
    - Potential safety consequence

# Goal

- Help PMs:
  - Accurately identify human factors issues
    - Correctly identify HF issues when they are relevant
    - NOT identifying HF issues when they are NOT relevant
  - Promptly identify human factors issues
    - Identify during initial screening process
      - Maximize time for technical review
      - Avoids some of consequences

# Signal Detection

		State of the World: Human Factors (HF) Issues in License Amendment?	
		HF Review Needed	HF Review NOT Needed
Project Manager (PM) Behavior	PM Promptly Requests HF Review	Hit	False Alarm
	PM Does NOT Promptly Request HF Review	Miss	Correct Rejection

# Costs of Errors

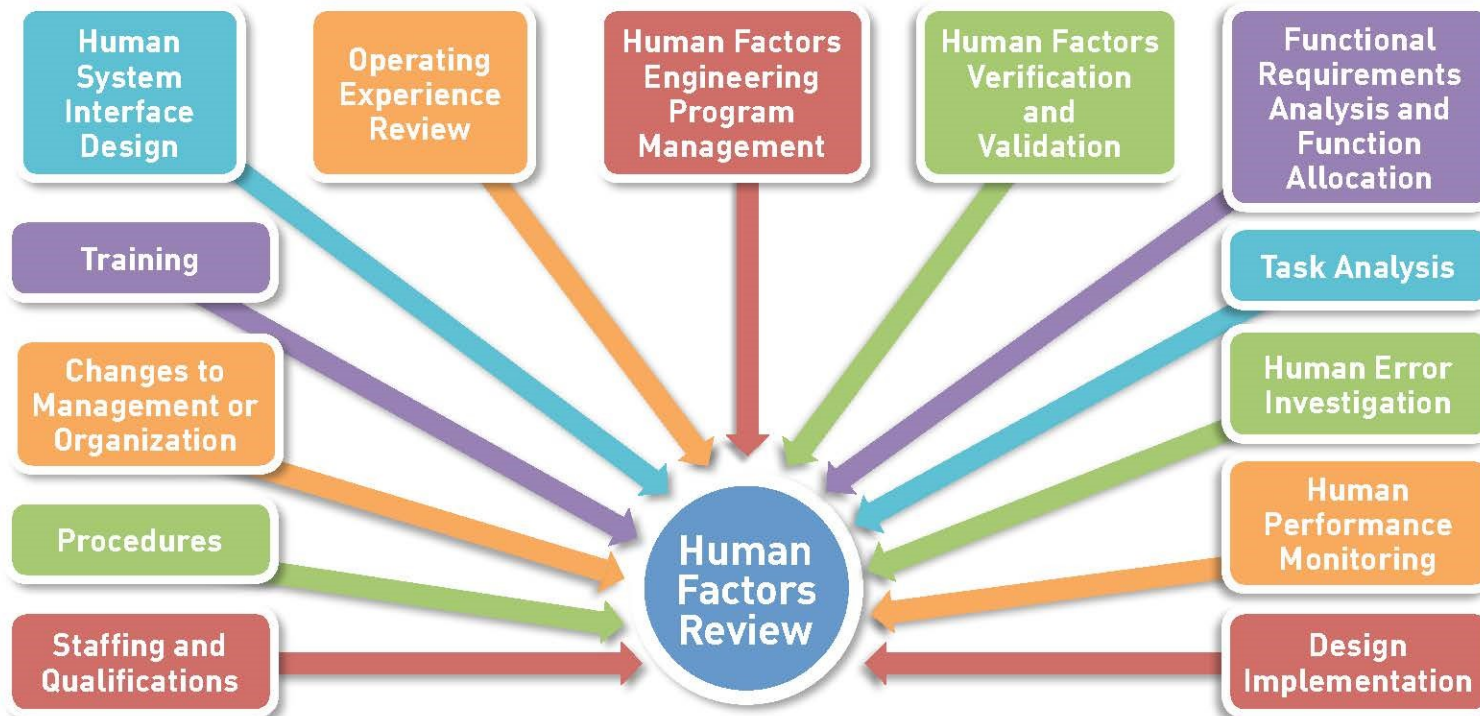
- Cost of Miss:
  - **Potentially unsafe modification put into service**
  - Loss of credibility
  - Poor precedent
- Cost of “Late Identification” (Initial Miss -> Eventual Hit)
  - Schedule Slippage
  - Loss of credibility
  - Displacement of other work
- Cost of False Alarm
  - Resources used for HF screening – detracts from resources available for other work

# Development of Desk Guide

- Use desk guide to improve sensitivity of PMs
  - Provide training
- Illustrate the breadth of human factors reach
  - Based on NRC guidance and interviews with senior staff
- Directions
- 23 Yes/No Screening Questions
- Usability: Minimize jargon
  - Must be useful to PMs
  - No authority to mandate use



# When is a Human Factors Review Appropriate?



NRC human factors reviews address programs, procedures, training, plant design features, and operator manual actions related to operator performance during normal and accident conditions. Human factors considerations are appropriate for some of the licensing actions taken by the NRC. Sometimes it is fairly obvious to include human

factors, but occasionally it is less clear. This card can be used to determine if a human factors review is necessary for a particular licensing action. Answering yes to any question here is an indication that a human factors review may be appropriate. Please contact the human factors branch if you are unsure if a human factors review is needed.

## Does the License Amendment or Exemption Request:

- ✓ Propose changes to the controls, displays, alarms, or tools in the control room, local workstations, remote shutdown workstation, or the technical support center?
- ✓ Add, delete, or modify operator manual actions?
- ✓ Include time-critical manual actions?
- ✓ Cause changes in the operator skills, knowledge, or abilities needed to successfully complete manual actions?
- ✓ Change the amount of time needed or available to complete a manual action?
- ✓ Have the potential for performance shaping factors (such as stress, lighting, communication, task complexity, ergonomics, etc.) to influence the reliability of manual actions?
- ✓ Propose changes to the control room, human-system interfaces, procedures, or training that increase operator workload?
- ✓ Use automation to replace a formerly manual action?
- ✓ Use a manual action to replace a formerly automated action?
- ✓ Include secondary tasks (such as emergency declaration notifications or fire brigade duties) that are likely to divert operator attention or other resources away from important manual actions?
- ✓ Cause changes to the number of staff available to perform tasks?
- ✓ Resemble licensing actions from other facilities that have experienced human performance problems as a result of similar changes?
- ✓ Propose using components, tools, displays, etc. for a purpose other than the purpose for which it was designed?
- ✓ Include permanent or temporary compensatory actions to address issues with the facility?
- ✓ Influence operator fatigue in a negative way. Note that fatigue occurs on multiple levels including: 1) acute fatigue caused by several repetitions of an action within a short period of time, 2) long work shifts, or 3) sustained stressful activities over several weeks or months.
- ✓ Involve leaving non-functioning legacy equipment installed next to functioning new equipment or having old and new systems both functioning simultaneously?
- ✓ Have the potential for increased human error due to modifications planned while the unit is online/offline?
- ✓ Add, delete, or change procedures or technical specifications?
- ✓ Include human actions that are likely to change over time (such as due to future planned modifications or infrequently performed operations that may be forgotten)?
- ✓ Change the management organization in a way that may prevent human performance issues from being completely addressed or in a way that may affect safety culture?
- ✓ Need to be submitted to resolve a human performance Licensee Event Report (LER)?
- ✓ Relate to a 10 CFR Part 21 defect report on a human-system interface or vendor manual/instructions?

# Implementation and Outreach

- Reviewed by PMs before implementation
- Requested to speak at PM Division Meeting
  - Operating Fleet PMs
- Brief presentation
  - Problem of Missed Reviews
  - Introduction to Desk Guide
  - Question & Answer Discussion
- Routinely share the card with PMs in other organizations
- Available on SharePoint and in “ADAMs”

# Outcomes

- Formal metrics do not exist to capture MISSES
  - However, noted a sharp increase in requests to screen (Increase in HITS/FA)
    - Presume Decrease in MISSES
- Screening requests provided many opportunities to teach PMs about human factors perspectives and concerns, thus increasing knowledge about HF in general.

# Conclusions

HF professionals can apply HF skills to improve HF processes

- Signal Detection Theory was applied to improve an organizational process
- Evidence suggests it was effective
- Low Cost
- Improved HF knowledge within the organization