**BACKGROUND INFORMATION**

# Workshop on Human Factors Considerations for Remote Operation of Nuclear Facilities

January 31st and February 1st, 2024
U.S. Nuclear Regulatory Commission Headquarters
Rockville, MD 20852

The goals of this workshop are to 1) understand concepts of operations the nuclear industry is considering that may include elements of remote operation, and 2) gain insights regarding how well-suited NRC's current guidance is for the human factors review of these concepts. The NRC staff is particularly interested in identifying areas where NRC human factors guidance should be updated, revised, or developed to address limitations that could affect the effectiveness, efficiency, or timeliness of staff license application reviews. Guidance documents that support human factors licensing reviews include:

- NUREG-0711, "Human Factors Engineering Program Review Model"
- NUREG-0700, "Human-System Interface Design Review Guidelines"
- NUREG-1764, "Guidance for the Review of Changes to Human Actions"
- NUREG-1791, "Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)"
- NUREG/CR-3331, "A Methodology for Allocating Nuclear Power Plant Control Functions to Human or Automatic Control"
- NUREG/CR-7202, "NRC Reviewer Aid for Evaluating the Human Performance Aspects Related to the Design and Operation of Small Modular Reactors"
- NUREG-1852, "Demonstrating the Feasibility and Reliability of Operator Actions in response to Fire"
- Regulatory Guide 5.73, "Fatigue Management for Nuclear Power Plant Personnel"

One means of organizing human factors considerations for the design and operation of nuclear facilities is by using the seven elements of a concept of operations, as identified in § 53.730(c) of the draft proposed Part 53 rulemaking. The seven elements of a concept of operations are further described in Appendix A of the draft Interim Staff Guidance, "Development of Scalable Human Factors Engineering Review Plans" (DRO-ISG-2023-03). The seven elements are:

- Plant Mission/Goals
- Roles and Responsibilities of Personnel and Automation
- Staffing, Qualifications, and Training
- Management of Normal Operations
- Management of Off-Normal Conditions and Emergencies
- Management of Maintenance and Modifications
- Management of Tests, Inspections, and Surveillances

Questions pertaining to the human factors considerations for the remote operation of nuclear facilities are included below and organized by these seven elements. These questions may be useful to consider when preparing for the workshop.

- **Plant Mission/Goals**
  - What will be the primary mission(s) of the reactor facility?
  - What are the facility's safety and emergency response functions?
- **Roles and Responsibilities of Personnel and Automation**
  - What will be the role of personnel in performing and ensuring the achievement of plant safety and emergency response functions?
  - What role will plant personnel have in other facility mission functions?
  - From where will the personnel role in each of these functions be achieved?
- **Staffing, Qualifications, and Training**
  - What are the planned number and qualifications of onsite staff and remote staff?
  - What staffing plan changes are anticipated, if any, over the course of a facility license?
  - Where will personnel be trained and qualified (e.g., at the reactor facility, at a remote operations facility, other)?
- **Management of Normal Operations**
  - What will be the roles of personnel in the monitoring and control of normal operations (e.g., start-up, power level control, shutdown, refueling)?
  - Where will personnel perform the duties to fulfill these roles?
- **Management of Off-Normal Conditions and Emergencies**
  - What will be the roles of personnel in responding to off-normal and emergency conditions?
  - Where will personnel perform the duties to fulfill these roles?
  - Will response to off-normal or emergency conditions require personnel to be dispatched to the reactor site? If so, from where?
  - How will a loss or degradation of communications (e.g., control signals, safety parameters) between the reactor facility and remote operations facility be managed?
- **Management of Maintenance and Modifications**
  - What will be the roles of personnel in performing maintenance and modifications?
  - Where will personnel perform the duties to fulfill these roles?
- **Management of Tests, Inspections, and Surveillances**
  - What will be the roles of personnel in tests, inspections, and surveillances?
  - Where will personnel perform the duties to fulfill these roles?