

OPERATING EXPERIENCE SMART SAMPLE (OPESS) FY 2010-02

“Sample Selections for Reviewing Licensed Operator Examinations and Training Conducted on the Plant-Referenced Simulator”

Note: This is a public NRC document.
Highlighted hyperlinked documents should have active links.

OBJECTIVE

To support NRC inspector's review of licensed operators' requalification testing and training activities. This Operating Experience Smart Sample (OpESS) provides additional information for sample selections when reviewing licensed operator examinations and training conducted on the plant-referenced simulator.

APPLICABILITY

All licensed operating commercial nuclear reactors.

BACKGROUND

This OpESS is based on the results of an Augmented Inspection Team (AIT) inspection at the H.B. Robinson plant (ADAMS Accession No. ML101830101), and was developed to serve as an aid to inspectors in the inspection of licensed operator requalification activities. This OpESS focuses attention on licensees' training for complex transients/complicated trips.

The Robinson event involved fires in electrical equipment, a reactor trip, a subsequent safety injection actuation, and an Alert emergency declaration. This event was significantly complicated by equipment malfunctions and weaknesses in fundamental operator competencies when responding to the event. Specifically, the AIT determined that control room operators failed to identify important off-normal parameters and alarms in a timely manner and that the second electrical fault and fire was caused by inappropriate operator actions. The fact that operators did not recognize the RCS cooldown was a major contributor to the overall significance of this event.

Certain aspects of the Robinson event made it more challenging than most scenarios licensees would likely develop for licensed operator requalification training and evaluation. However, it is possible that operators may be exposed to many of these aspects during a shift and very likely that operators will encounter these aspects during events at nuclear plants. Therefore, these aspects should be considered in the development of training scenarios. Some of these aspects included:

- Minimum shift manning at single-unit site.
- Main control room crew members not in normal positions (new STA on shift approximately one month, SRO normally stood watch as RO, BOP normally stood watch as SRO.)

- Shift Manager with weak command and control skills.
- Plant fire resulting in additional control room distractions.
- Concurrent and extended performance of abnormal operating procedure for fire by BOP operator, precluding him from monitoring plant parameters and performing emergency procedures.
- Experienced Work Control Center SRO unavailable to assist main control room due to performing duties of Fire Brigade Incident Commander.
- Loss of multiple electrical busses.
- Momentary loss of instrument bus.
- The crew had not received training similar to this type of event (loss of multiple electrical busses coincident with plant fire.)

NUREG/CR-6883, The SPAR-H Human Reliability Analysis Method, presents a process for estimating the human error probabilities associated with operator and crew actions and decisions in response to initiating events at commercial U.S. nuclear power plants. The process accounts for the context associated with human failure events by using performance-shaping factors. These factors include the following:

- Available time
- Stress and stressors
- Experience and training
- Complexity
- Ergonomics (including the human-machine interface)
- Procedures
- Fitness for duty
- Work processes.

The aspects of the Robinson event listed earlier align with the performance shaping factors of Stress, Experience/Training, and Complexity.

Complexity refers to how difficult a task is to perform in the given context, considering both the task and the environment in which it is to be performed. The more difficult the task is to perform, the greater the chance for human error. Complexity, as used in the SPAR-H Method, considers the following factors:

- Parallel Tasks
- Multiple Equipment Unavailable
- Multiple Faults
- High Degree of Memorization Required
- System Interdependencies not Well Defined
- Task Requires Coordination with ex-Control Room Activities
- Symptoms of One Fault Mask Other Faults
- Large Amounts of Communication Required
- Transitioning Between Multiple Procedures
- Misleading or Absent Indicators
- Mental Calculations Required
- Large Number of Actions Required
- Large Number of Distractions Present

- Low Fault Tolerance Levels

The Robinson event contained many of the elements of complexity listed above.

INSPECTION GUIDANCE

Resident inspectors should observe simulator evaluation or training that permits the inspector to evaluate the effectiveness of the licensee's training for complex transients/complicated trips. While complex training scenarios may not have a high plant safety consequence, or hold the same consequence for a crew as an evaluated scenario, they may expose significant weaknesses in crew competencies, procedures, operating strategies, and training.

Inspectors should note however, that the NRC does not specify requirements for the quantity or content of simulator training contained in licensee operator requalification training programs.

Challenging scenarios may include related aspects from the list below:

- Minimum available resources (control room and field operator staffing.)
- Control room team members performing unfamiliar roles.
- Changing plant/system parameters with a consequence for operator inaction.
- Loss of instrumentation and alarms normally used for event diagnosis.
- Require prioritization of multiple alarms or instrument readings.
- Coordination and concurrent use of multiple procedures.
- Require operators to take manual control of automatic functions.
- Widespread loss of motive force (electrical power or air pressure) necessary to operate primary or secondary side equipment used for event mitigation.
- Widespread loss of control power supplying major components (e.g. loss of instrument busses).
- Events require use of procedures/steps that are not exercised frequently.
Note: This may be due to simulator training time constraints (e.g. deep in ECA or AOP procedures) or because the event does not provide evaluators with a good tool to assess decision-making (e.g. extended loss of major systems such as instrument air, service water, component cooling water, or DC power.)
- Events that could require mitigation to a degree that is not normally demonstrated in the simulator (e.g. a fire that requires deenergizing plant equipment and using dedicated shutdown procedures rather than merely notifying the fire brigade.)
- Require extensive coordination between the control room and organizations outside the control room mitigating operational consequences of the event, e.g. large plant fire or security events.
- Difficult to model or simulate, e.g. main control room evacuation / plant control from alternate locations.

The following list contains a selection of OpE that includes occurrences that either may have further complicated a follow-on event or were complicated events in-and-of themselves. Licensees could use anomalies similar to ones found in the selection to expose trainees to potential real-life complex scenarios.

IN 2010-09	04/14/2010	Importance of Understanding Circuit Breaker Control Power Indications
IN 2009-22	10/02/2009	Recent Human Performance Issues at Nuclear Power Plants
IN 2009-11	07/07/2009	Configuration Control Errors
IN 2007-11	03/06/2007	Recent Operator Performance Issues at Nuclear Power Plants

BASELINE INSPECTION PROCEDURES AND SUPPORTING DOCUMENTS

[IP 71111.11](#), Licensed Operator Requalification Program

[NUREG-1021](#), Operator Licensing Examination Standards for Power Reactors, Rev. 1, Sup. 1, Appendix D, Simulator Testing Guidelines

[NUREG/CR-6883](#), The SPAR-H Human Reliability Analysis Method

[H.B. Robinson Steam Electric Plant - Augmented Inspection Team Report 05000261/2010009](#)

REPORTING INSPECTION RESULTS / TIME CHARGES / ADDITIONAL ISSUES:

Document any inspection result findings, as applicable, in an integrated inspection report (i.e., quarterly inspection report) and reference the title/OpESS number (example: **Operating Experience Smart Sample (OpESS) FY 2010-02 “Sample Selections for Reviewing Licensed Operator Examinations and Training Conducted on the Plant-Referenced Simulator”**)

If no findings are identified document completion of the OpESS using the “OpESS number/ title” under the applicable inspection attachment (i.e., 1R11, 4AO2,) stating that no findings of significance were identified.

Inspection time for this OpESS is to be charged to the normal baseline procedure under which it is being documented (along with any routine preparation and documentation charge times).

CONTACTS:

For questions regarding the performance, documentation or additional issues related to this OpESS, discuss with your branch chief, or if necessary contact:

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