NEI SIMULATOR WORKSHOP

Frequently Asked Simulator Questions

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Question Topical Areas

- Simulator Rule Issues
- Use of the Simulator for Applicant Eligibility Requirements
- Performance Testing
- Simulator Fidelity
- Implementation of Requal. Inspection Procedure (IP 71111.11)
- Summary and Transition Issues

How does the NRC ensure simulator fidelity now that there is no requirement for certification?

- IP 71111.11 is used to assess compliance with 10 CFR 55.46, Continued assurance of simulator fidelity. Inspectors will:
  - Review performance tests
  - Review discrepancies (modeling and hardware)
  - Review results of any uncorrected performance test failures …, prior to or concurrent with preparations for each operating test or requalification program inspection
  - Assess whether or not fidelity issues affect the provisions for license application, examination, and test integrity

What are the consequences and potential impact to our operator licensing programs if my simulator does not meet the regulations?

- Could result in the Commission not accepting the use of the plant-referenced simulator for
  - conducting operating tests, 55.45(a)
  - requalification training, 55.59(c)(3)
  - or for performing control manipulations that affect reactivity to establish eligibility for an operator's license, 55.31(a)(5)

In order to take advantage of using the plant referenced simulator for license applicants to perform reactivity manipulations per the revised 10 CFR 55, does a plant also need to adopt the 1998 revision of ANSI/ANS-3.5 ?

- No
- Editions of ANSI/ANS-3.5 that were previously endorsed by the NRC remain acceptable methods of meeting the regulations

Does my simulation facility have to meet certain performance criteria in order to take credit for reactivity manipulations to meet experience requirements? If so, what are they?

- Yes
- Nuclear and thermal-hydraulic characteristics must replicate the most recent core load in the reference plant for which a license is being sought
- Significant control manipulations are completed without procedural exceptions, simulator performance exceptions, or deviation from the approved training scenario sequence

If core reload changes are so small, could you do an evaluation to show that a change in the model is not necessary?

- Replication of the most recent core load for which a license is being sought is required by the rule and is key to ensuring that the applicant is being credited for “like-kind” experience with regard to control manipulations that affect reactivity or power level
- The NRC staff would expect to see evidence that simulator models have been updated to ensure replication, which would include simulator core performance testing that demonstrates acceptance criteria have been met.

We do not like to change the core model in the middle or end of a training class. How much time lag is allowed to replicate the most recent core?

- Use of the plant-reference simulator is one of two options (plant and or simulator) available to meet the eligibility requirements
- If the plant is in a refueling outage, the core just previous to the outage is acceptable

We had a core change but have not yet changed the simulator to reflect the change. If the previous and current core loads are basically the same, is it acceptable to perform the required control manipulations on the previous core load?

- Refer to previous slide

How does a facility licensee meet the requirements for conducting performance testing, 55.46(d)(1)?

- RG 1.149 describes methods acceptable for complying with those portions of the NRC's regulations associated with approval or acceptance of a simulation facility
- ANSI/ANS-3.5 sets forth specific performance testing criteria
- If meeting ANSI/ANS-3.5, then performance testing requirements are met

How does the NRC check if a simulation facility has not conducted performance testing in a manner that satisfies 55.46(d)(1)?

- Each version of ANSI/ANS-3.5 sets forth the type of performance testing to be conducted
- Performance tests may be reviewed on a sampling basis by the NRC during a requalification program inspection (IP-71111.11)

We do quite a bit of testing the core models, especially after we modify the model for a new fuel load. These tests provide data that is forwarded to our fuel engineers and they compare it with the actual core design data. What type of criteria does the NRC look at, if during an inspection, the crediting of simulator reactivity manipulations becomes an issue?

- Simulator performance test results, especially core tests performed in real time on the simulator using only operator actions
- Simulator discrepancies with regard to nuclear and thermal-hydraulic characteristics
- Completion of significant control manipulations that affect reactivity or power level without procedural exceptions, simulator performance exceptions, or deviation from approved training scenario sequences
- Uncorrected performance test discrepancies for impact on operator actions (negative transfer to actual plant evolution)
- Fidelity issues which affect the provisions for license application, examination, and test integrity

Can a licensee solely use subject matter experts (SMEs) to obtain performance tests results?

- No
- Performance test results are obtained by testing conducted to verify a simulation facility's performance as compared to actual or predicted referenced plant performance
- SME should only perform assessments and make recommendations in a particular subject area
- ANSI/ANS-3.5 allows data derived from engineering evaluation or operational assessment by SMEs for specific conditions and then compare those to simulator performance tests.

What type of simulator performance tests are expected to be run for core testing?

- Specific tests generally include, but are not limited to those test associated with low power physics tests conducted following a core load change
- Other core type tests which demonstrate expected plant response to operator input
- Tests which demonstrate nuclear and thermal hydraulic characteristics are as designed

Would nuclear and thermal-hydraulic models design prior to 1990 that have fewer than 100 nodes meet the requirements of 55.46(c)(2)(i)?

- Model size and complexity are not a criteria for meeting the requirements
- Model must be sufficient in scope and fidelity for the intended purpose it is being used for
- Models relating to nuclear and thermal hydraulic characteristics must replicate the most recent core load in the nuclear power plant for which a license is being sought

What ANSI/ANS-3.5 criteria are there to be able to say that a simulator is accurate enough to allow credit for reactivity manipulations? Should the criteria be based on core model performance only, i.e., start-up physics testing data, or be solely operationally based since that is what the operator really observes and reacts to, or should it be some combination of these?

- The NRC staff would minimally expect to see simulator core performance tests demonstrating that acceptance criteria have been met
- This issue should be addressed by the ANS-3.5 Working Group in its next revision of the standard
- Simulator capability criteria, performance, and fidelity expectations are addressed in the standards (Refer to Section 4.1 for ’93/’98 version and Section 4 for ’85 version)
- Interim clarification, if so determined, should come from ANS-3.5 WG

What is the purpose of headquarters inspector visits to simulation facilities?

- Headquarter staff on occasion, assist regional inspectors on requal program inspections
- As a result of IP-71111.11 (8/20/02) being revised to incorporate the simulator rule, the staff ensures that the revised IP is appropriate for adequately reviewing, evaluating and assessing the simulator facility for compliance with the simulator rule

If utilities are doing reactivity manipulations on their simulators, should they expect a more thorough/detailed IP-71111.11 inspection?

- Yes
- If the simulator is being used to meet eligibility requirements, then inspector is expected to verify compliance with Section 55.46(c)(2)(i) and (ii) and
- Assurance that simulator is sufficient in scope and fidelity and is suitable for the purpose it is being use

What direction has been provided to NRC Examiners for evaluating simulator operational performance and physical fidelity?

- Examiners/inspectors receive guidance from headquarters staff with regard to implementation of the simulator rule via the revised IP
- At the last examiner's conference, staff received direction on the scope and conduct of the simulation facility inspection
- Staff follow establish field policy procedures for conducting inspections while on site (IP-71111.11)

What might my simulator support personnel expect from an IP-71111.11 inspection?

- Inspectors follow guidance in the NRC Inspection Manual, which contains objectives and procedures to use for each type of inspection
- If an inspection shows that a licensee is not safely conducting an activity or safely operating a facility, we inform the licensee of any problems that we find and ensure that they are addressed
- We continue to inspect that activity or facility until the problems are corrected
- IP-71111.11 is a baseline inspection procedure

Do all malfunctions listed in ’98 standard need to be tested as part of the operability testing?

- The 1998 standard does not prescribe the specific number and type of malfunctions to be tested as part of operability testing. The list referred to in the standard addresses malfunctions which shall be included in the simulator’s capability
- Scenario-based testing may be used to satisfy operability testing requirements when the same malfunction is exercised

Are simulator scenarios required to be tested before every use, including those used to support initial license candidate training programs?

- ANSI/ANS-3.5-1998 requires scenarios developed for the simulator, including the appropriate instructor interfaces and cueing, shall be tested before use for operator training or examination
- If the tests are not superceded by a later revision, or the test results would not be different due to a simulator modification, then the tests need not be conducted before every use
- The latest record of the conduct of these tests and the evaluation of the test results shall be maintained

How does scenario-based testing interface with simulator performance testing?

- Scenario-based testing (SBT) is unique to ’98 standard
- Simulator performance testing comprises operability and scenario-based testing
- Simulator operability testing credit may be taken for having performed those normal evolutions, malfunctions, local operator actions, and other features exercised by the scenario during SBT or operator training provided that: (1) evolutions performed IAW reference unit procedures and, (2) SBT results are evaluated and documented

We are operating under the ’85 standard, is there any guidance on documenting our transition to the ’98 standard?

- The licensees existing commitment to an earlier standard should be modified through your commitment control program to reflect the transition to the 1998 standard
- A procedure or description laying out how the details of how the transition will be carried out is recommended

What kind of feedback has the revised IP generated so far and are there any trends or lessons learned?

- Revised IP is a good tool to use to ensure compliance with the simulator rule
- Simulator fidelity is being reviewed more closely than in the past
- Incidents of negative training are rare
- Generally, most simulator discrepancy and corrective action programs are established and working well
- Replication of nuclear and thermal hydraulic characteristics which affect reactivity and power level will continue to be challenged
- Simulator performance test results will be challenged
- Continued assurance of simulator fidelity will be on-going