

May 19, 2005

MEMORANDUM TO: Catherine Haney, Director
Policy and Rulemaking Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

FROM: Joseph L. Birmingham, Project Manager */RA/*
Policy and Rulemaking Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF APRIL 5, 2005, PUBLIC MEETING WITH INDUSTRY
FOCUS GROUP REGARDING SIMULATOR ISSUES

On April 5, 2005, the U.S. Nuclear Regulatory Commission (NRC) staff held a public meeting with representatives from the Institute of Nuclear Power Operations (INPO), Nuclear Energy Institute (NEI), NEI-sponsored Focus Group on Operator Licensing Issues, and representatives from several U.S. power reactor facility licensees at NEI headquarters office in Washington, D.C., to discuss plant-referenced simulator issues. Over the past two years, a number of simulator fidelity and performance testing issues have been identified that have raised staff concerns regarding the potential for resultant negative training. Attachment 1 lists the attendees at the public meeting.

The public meeting helped to promote better communication and understanding of the NRC staff's and industry's concerns with regard to specific simulator issues. Attachment 2 is the agenda for the meeting. The discussion topics are summarized in Attachment 3.

Representatives of the NRC and the industry agreed that this meeting was useful for the exchange of information on this subject.

Project No. 689

Attachments: As stated

cc: Mr. Jim Davis, Director
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Nuclear Energy Institute
Suite 400
1776 I Street, NW
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CONTACT: Lawrence Vick, NRR/DIPM
(301) 415-3181

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RidsNrrDripRPRP

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List of Attendees - NRC /INPO- NEI Focus Group Meeting - April 5, 2005	
Name	Organization
1- Bruce Boger	NRC / NRR
2 - Dave Trimble	NRC / NRR
3 - Fred Guenther	NRC / NRR
4 - George Usova	NRC / NRR
5 - Richard Pelton	NRC / NRR
6 - Dave Muller	NRC / NRR
7 - Lawrence Vick	NRC / NRR
8 - Richard Conte	NRC / RI
9 - Peter Presby	NRC / RI
10 - Gerry Laska	NRC / RII
11 - Roger Lanksbury	NRC / RIII
12 - Hironori Peterson	NRC / RIII
13- Tony Gody	NRC / RIV
14 - Paul Gage	NRC / RIV
15 - James Davis	Nuclear Energy Institute
16 - Fred Riedel	Palo Verde, Arizona Public Service
17 - Joel Sorensen	Point Beach, Nuclear Management Company
18 - Gregg Ludlam	Robinson, CP&L, Progress Energy
19 - Kent Hamlin	Institute of Nuclear Power Operations
20 - Dennis Koutouzis	Institute of Nuclear Power Operations, ANS 3.5 Working Group
21 - Timothy Dennis	Individual, Chair, ANS-3.5 Working Group
22 - Mike Shelly	Entergy Nuclear South
23 - Frank Terrelli	Susquehanna, PPL, Mid-Atlantic Training Group
24 - Scott Halverson	Callaway, AmerenUE, Utility Simulator Users Group
25 - Mike Wyattt	Exelon Nuclear
26 - Jim Florence	Cooper Nuclear Station, NPPD, ANS 3.5 Working Group
27 - Rich Robenstein	Entergy, Indian Point Energy Center

AGENDA FOR PUBLIC MEETING WITH INDUSTRY FOCUS GROUP (FG)
ON SIMULATOR ISSUES

April 5, 2005; 8:00 a.m. - 3:00 p.m.
Nuclear Energy Institute
1776 I Street, NW Suite 400
Washington, D.C. 20006-3708

Meeting begins at 8:00 a.m.

Lead

- Welcome and Introductions NRC/NEI
- Discussion on assurance for simulator fidelity NRC/NEI
- Public comment or questions Public
- Break about 10:00 a.m.
- Continue discussion on assurance of simulator fidelity NEI
- Public comment or questions Public
- Break for lunch about 12:00 noon, Resume 1:00 p.m.
- Resume discussion on assurance of simulator fidelity NRC/NEI
- Public comment or questions Public
- Summary and conclusion NRC/NEI
- Adjourn about 3:00 p.m.

DISCUSSION SUMMARY

General

On January 27, 2005, the U.S. Nuclear Regulatory Commission (NRC) staff met with the Industry Focus Group On Operator Licensing Issues (FG). During that meeting, the FG proposed that key stakeholders involved with simulator fidelity and testing meet to identify the issues and develop whatever guidance is necessary to clarify the requirements and expectations. The FG suggested that the Nuclear Energy Institute (NEI) and the Institute of Nuclear Power Operations (INPO) propose a date and coordinate the effort. The NRC staff acknowledged that this was a good suggestion and agreed to participate, as necessary. On April 5, 2005, the NRC staff met in a public meeting with industry representatives and members of the public at NEI's office in Washington, D.C., to continue discussions on simulator issues.

Jim Davis of NEI, as host, welcomed attendees, discussed logistics and then turned over the meeting to Kent Hamlin of INPO. Mr. Hamlin provided a brief history on the use of plant-referenced simulators, accreditation and the reasons for this meeting. Mr. Hamlin explained that the industry attendees, represented a cross-section of industry personnel from a variety of job positions, all regional training groups, large and small companies, and other industry organizations involved with plant-referenced simulators (e.g., the ANSI/ANS 3.5 Working Group and Utility Simulator Users Group (USUG)). He also explained that the industry group assembled at the meeting would not be an ongoing working group. Instead, the FG or other existing organizations would continue the specific work or action items that came out of this meeting. Industry attendees offered what they perceived as pertinent simulator issues and what they wanted to get out of the meeting.

Bruce Boger, the Director, Division of Inspection Program Management (DIPM) in the Office of Nuclear Reactor Regulation (NRR) at NRC, expressed his appreciation for the opportunity to engage industry representatives and others present to help resolve simulator issues. Mr. Boger explained that the NRC's vision is to get all facility licensees on the same ANS 3.5 consensus standard that includes an effective simulator testing program. He further envisioned that once certain simulator issues are satisfactorily resolved, then it should be easier for all to go forward and be on the same standard. Dave Trimble, Chief of Operator Licensing and Human Performance in DIPM, noted that, as can be seen from the level of NRC participation, the NRC places a high level of importance on plant-referenced simulators used to meet regulatory requirements and the issues that are on the table. Mr. Trimble reminded everyone of the need to comply with the Commission's simulator rule under 10 CFR Part 55.46.

The meeting proceeded with the group focusing on four simulator issues: (a) simulator negative training; (b) implementation of simulator modifications; (c) expectations for simulator core model testing; (d) simulator performance testing and acceptance criteria, including simulator scenario-based tests.

Simulator Negative Training

Scott Halverson, Chairman of USUG, noted that the most current adopted standard defines negative training as: “*Training on a simulator whose configuration or performance leads the operator to incorrect response or understanding of the reference unit.*” Rich Robenstein, of Entergy, pointed out that industry’s primary concern is “... how to know that the simulator models are good enough to prevent negative training...” Gregg Ludham, of Progress Energy, explained that industry believes that most facility licensees have adequate simulator configuration and management programs in place to prevent or reduce the chance of being negatively trained. Jim Davis, of NEI, noted it is very rare that a simulator fidelity issue has negatively impacted operator action(s) on an actual plant, which suggests that the simulators are generally suitable and adequate. However, the meeting participants did not disagree with the NRC staff’s belief that negative training or conditioning on a simulator with insufficient scope and fidelity is not acceptable and pledged to continue to seek out and correct fidelity discrepancies of this nature. Also, a member of the industry stated that, for the most part, he would not take issue with the NRC’s simulator green findings with respect to negative training. Dennis Koutouzis, of INPO, cautioned that inadequate simulator training rather than simulator fidelity issues may be the major contributor to inappropriate operator actions during actual plant events.

Dave Trimble, of NRC, emphasized that simulator negative training is subject to scrutiny when discovered (e.g., while conducting IP-71111.11 inspections) to ensure that timely and appropriate corrective actions are taken to eliminate, or reduce the negative impact on operator actions in the actual control room. Mr. Trimble provided examples of actual plant events which revealed that incorrect simulator fidelity was a contributor to negative training (e.g., reactor vessel water level shrink/swell; main steam isolation valve closure times; and core decay heat, etc.) and illustrated how insufficient simulator performance (scope and fidelity) can contribute to incorrect operator response or understanding of the reference plant. Mr. Trimble indicated that the staff is developing improved criteria for determining when fidelity problems have resulted in negative training that would be considered a green finding. He emphasized the importance of post event testing.

Implementation of Plant Modifications on the Simulator

Fred Riedel, of Arizona Public Service, discussed industry’s viewpoint on implementation of plant modifications on the simulator (before and after installation of modifications on the plant). Mr. Riedel asked for the NRC staff’s views on when deviations between the simulator and the plant become significant enough for the simulator to no longer be considered plant-referenced. Mike Wyatt, of Exelon, emphasized that the ANS-3.5 standard allows sufficient latitude to accommodate plant modifications when the simulator follows the reference plant as well as when the simulator leads the plant (especially when training needs assessments support installing the modification on the simulator before it is on the plant.) Other industry attendees discussed some concern that NRC inspectors may have not been fully cognizant of the ANS-3.5 standard with regard to implementation of simulator modifications and that better communication would alleviate most concerns. Mr. Trimble acknowledged that preinstalling and evaluating modifications on the simulator is generally a good practice, but cautioned that what is most important is that licensees recognize the potential for negative training created by these modifications and that they appropriately compensate for those effects through classroom

training. It is also important that licensees inform the NRC of significant differences between the plant and the simulator prior to initial operator licensing examinations / operating tests (most important) and annual operator requalification examinations. Such communications are addressed in NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," and do not require a formal letter. The NRC staff noted that it will be rare that a plant-referenced simulator will become non-plant referenced. Rich Conte, NRC Region I Branch Chief, provided one example of a simulator modification that was successfully installed before-the-fact by several licensees, e.g., digital feed-water controller modification. For these cases, effective communication between the staff and the industry alleviated simulator implementation concerns.

Simulator Core Model Replication Expectations

Gregg Ludlam, of Progress Energy, sought the staff's view with regard to "...how good is good enough?" when it comes to simulator core model replication as a prerequisite for crediting reactivity manipulations for meeting operator candidate experience eligibility requirements. Mr. Trimble, of NRC, explained that, in general, simulator core model performance should be validated or confirmed by conducting the same or similar core performance tests as prescribed in the reference plant's procedures. Mr. Trimble pointed out that the NRC generally agrees with industry on the scope and acceptance criteria of Pressurized Water Reactor (PWR) simulator core testing. However, for Boiling Water Reactor (BWR) simulator core models, the NRC lacks confidence that the core models are being adequately tested and compared to actual plant performance because core physics tests employed in the plant are not always used to test simulator core modeling. Mr. Ludlam indicated that industry would make a concerted effort, through one entity (e.g., INPO or NEI), to develop guidance for proper BWR core model performance testing and to make it available to NRC staff for review and comment. Mr. Ludlam pointed out that very few BWR simulators are being utilized for reactivity manipulations to meet experience eligibility requirements due, in large part, to this one issue. Mr. Trimble explained that the NRC staff is aware of one initiative or proposal by the Mid-Atlantic Training Managers Group (MANTG) to address BWR core model performance testing. Mr. Trimble reminded industry that core model performance test acceptance criteria must be included in the industry's approach to provide assurance that the nuclear and thermal hydraulic characteristics are being replicated and that the test results are comparable (e.g., use same acceptance criteria as used in the plant) with the reference plant's core performance.

Simulator Performance Testing, Acceptance Criteria, and Scenario-based Tests

Dave Trimble discussed staff concerns with the use of operating tests as simulator performance tests in the absence of adequate acceptance criteria and without sufficient focus on simulator performance. The operating test scenarios have become known as simulator scenario-based tests (SBTs) and are further described in the ANSI/ANS-3.5-1998 standard. Mr. Trimble explained the staff's disappointment with industry's simulator SBT performance tests to date and noted that the NRC's concerns with SBTs have been documented in IP-71111.11 inspection reports as Unresolved Items (URI). He noted that the simulator operating test scenarios were derived and based on criteria in NRC's NUREG-1021, which emphasizes the expected performance of the operator(s) rather than performance of the simulator compared to the actual or predicted plant performance. Mr. Trimble pointed out that inspectors have concerns such as: (1) inadequate performance testing conducted to verify simulator performance as compared to actual or predicted reference plant performance; (2) inadequate

test documentation to support test results or conclusions; (3) over-reliance on subject-matter-experts (SMEs) to predict expected plant response; (4) use of over-simplified checklists attesting that simulator performance is acceptable; (5) lack of key component, system, or parameter acceptance criteria, with respect to direction, alarms, and automatic actions; (6) inability of SBTs as currently implemented to identify long-standing (due to inadequate original validation) fidelity discrepancies; and (7) over-reliance on plant procedures as performance test procedures.

Several industry attendees expressed various viewpoints with regard to simulator SBT performance testing and acceptance criteria, including the belief that successful completion of plant procedures is all that is needed for SBTs to provide adequate and continuous assurance of simulator fidelity. The NRC staff responded that acceptance criteria (for comparing the simulator to plant performance) as described in the ANSI/ANS-3.5 standards (e.g., in Section 4.1.4 of the 1998 standard) are necessary to satisfy the definition of performance testing in 10 CFR 55.4 and to support training (which is the objective of SBTs) for adequate simulator performance testing. Mr. Trimble explained that such acceptance criteria need to be included in performance tests and that simulator performance needs to be demonstrated, compared to the criteria, and documented as opposed to simply being inferred. The NRC staff discussed various examples of inadequate simulator performance tests that had insufficient acceptance test criteria.

Mr. Trimble explained that the staff had developed and conducted a PWR simulator SBT performance test at the NRC's Technical Training Center (TTC) as an independent check on feasibility and to better understand the industry's difficulty with the SBT issue. He explained that the staff was able to validate the feasibility of an SBT approach in which expected simulator performance is identified in advance of the test. However, it was pointed out that a modest level of up-front effort (approximately 10 hours +/- per scenario before conduct of the test) was required to adequately capture the performance expectations for SBT. Generally, the simulator performance expectations were limited to first order effects when testing malfunctions and integrated effects for transients and normal evolutions. The SBT included use of applicable procedures, key parameters, pertinent alarms, and automatic actions. Mr. Trimble informed the group that the staff will share its SBT testing experience with industry after completing internal review and comment. The NRC staff agreed to work with industry representatives to help resolve concerns with SBTs.

Several industry representatives were surprised that NRC is disappointed with simulator SBTs and did not understand the staff's concerns with the current practice of using simulator operating tests as simulator performance tests. Scott Halverson, of USUG, expressed his belief that simulator SBTs adequately meet the intent of the ANSI/ANS-3.5-1998 standard as described in Section 4.4.3.2. Mr. Halverson expressed his view that there is no need to change the current approach and that SBTs had revealed more simulator discrepancies than the previous stand-alone-type malfunction testing. Other industry attendees advocated that: (1) the current SBT approach is adequate because it extensively makes use of plant procedures (e.g., comparison by inference - operators can conduct the same procedure on the simulator as they do on the plant); (2) it is appropriate to rely on SMEs for validating expected plant response; (3) the use of a checklist attesting to proper simulator performance is cost effective and saves resources; and (4) the operators are adequately trained in the simulator to respond to simulated plant conditions and take actions accordingly - it is not material that the simulated condition has fidelity issues or not.

Mr. Trimble cautioned that there is danger in over-reliance on training to compensate for deficiencies in simulator fidelity or, worse, in relying on training as a basis for not correcting simulator fidelity problems.

Kent Hamlin, of INPO, expressed that the industry group is interested in working with the NRC staff to reach consensus on an acceptable simulator SBT approach to alleviate regulatory concerns and proposed to make available a plant-referenced simulator (tentatively Millstone 3) to demonstrate the process. He proposed that during the month of August 2005 some time can be set aside for such an SBT demonstration and to subsequently work out any issues before final release and implementation. Mr. Trimble agreed that the staff would plan to participate in the August 2005 demonstration for the purpose of resolving regulatory concerns with SBTs.

Public Meeting Action Items

The NRC staff and industry representatives mutually agreed to the following action items as a result of the public meeting:

- 1 - The NRC and industry will rely on the FG for further interactions on the simulator issues identified in this meeting.
- 2 - The FG will encourage facility licensees to remain on the ANSI/ANS-3.5 standard to which they are currently committed until the simulator SBT issues are resolved.
- 3 - Participants will jointly work to resolve outstanding simulator SBT performance test issues. Industry will obtain time in August 2005 on a plant-reference simulator for a joint NRC/Industry simulator SBT performance test demonstration.
- 4 - The NRC staff will provide industry an opportunity to review the NRC-developed simulator SBT approach prior to joint SBT demonstration.
- 5 - Industry will formally provide to the NRC staff for review and comment its consensus white paper on simulator core performance testing for BWRs.
- 6 - Under INPO-lead, the industry will provide its view on appropriate criteria for determining what simulator deficiencies should be communicated to the NRC prior to operating tests.
- 7 - Industry will provide to the staff a proposed approach to SBT that could then be compared to that developed by the NRC. The industry indicated that its approach would likely utilize NUREG-1021's, Appendix D, Form ES-D-2, "Required Operator Actions," to specify expected simulator performance and acceptance test criteria.

The NRC asked the industry to identify a means for licensees who cannot locate initial verification and validation testing records to reestablish that equivalent baseline testing in a cost effective manner.

Other - Status of Next Ans-3.5 Standard

Tim Dennis, Chairman of the ANS-3.5 Working Group, provided a brief status report on the next revision of the consensus standard. He reported that the Working Group had essentially completed its work on the next standard and that it is before the ANS 21 Committee for review and comment. Mr. Dennis expects the standard to be available for adoption before the end of 2005, subject to required protocols for formal publication. He also noted that the new standard has incorporated several of the simulator concerns (such as core performance testing, post-event testing, and simulator SBT acceptance criteria) addressed by the group at this meeting and believes that once the SBT issues have been resolved, it would not be difficult for anyone to move to the new standard.

Public Meeting Participation and Feedback

Members of the public were provided an opportunity to ask questions and participate in the simulator issues discussions. Two NRC public meeting feedback comments were received at the conclusion of the meeting. One individual noted that the meeting started in too small a room (the meeting was moved to larger room before starting the meeting) and that building construction noise was a challenge (it was subsequently terminated). Another individual noted that he was impressed with the cross section of the industry and NRC staff present. He also noted that many issues have been resolved via open communications, that SBT appears to be the major outstanding issue, that retention of testing documentation for configuration testing appears to be a "silent" issue, and that validation testing appears to have been moved off the radar screen (e.g., a reminder may be needed for this item). No other public questions or comments were brought forward to the group.