ANS Issues Clarification on ANSI/ANS-3.5-2009, "Nuclear Power Plant Simulators for Use in Operator Training."

(*Nuclear News*, December 2010)

Inquiry: In the standard, stimulated components are defined as follows: Hardware/software components that are integrated with the simulator process via simulator inputs/outputs that perform their functions parallel to, and either independently of or synchronized with, the simulation process.

This definition of stimulated components appears to include simulator control board data-loggers and visual recorders. These devices have imbedded intelligence that can perform various manipulations of stored data, such as trending. The stored data comes directly from simulator outputs.

Further, Section 3.3.3 of the standard, paragraph three states: For stimulated components that store historical data or whose performance is dependent on history, requirements for freeze, run, initial condition reset, snapshot, and backtrack shall be included.

Is it the intent of the standard that Section 3.3.3, paragraph three, shall be applicable to the afore mentioned "smart" control board recorders such as the Yokogawa and Honeywell visual recorders presently installed in many nuclear plant simulators?

These devices "store historical data" by definition as they are "recorders." Thus, Section 3.3.3 should apply. However, these devices do not have the capability to perform the initial condition reset, snapshot, and backtrack functions.

If it is the intent of the standard to define these smart devices as stimulated components, then few nuclear plants simulators could claim to meet the requirements of the standard.

Response:

Commentary: An important theme in the ANSI/ANS-3.5-2009 standard is the avoidance of negative training in the operator training environment. It is essential that the student view the same data regardless of the means by which the data is accessed. For instance, historical data could be obtained from a process computer, trend graphs, trend charts, or history on a digital recorder. To the extent possible, the student should find the same data value at the same previous time step. This leads naturally to the requirements of Section 3.3.3 and to stimulated components in particular. In general, the first paragraph of Section 3.3.3 states the entire simulator must participate in simulator unique functions. Recognizing the older hardware generation of certain stimulated devices, this requirement is relaxed to some degree for the unique category of stimulated components. If stimulated devices can comply with Section 3.3.3, then the requirements are obviously satisfied. If not, then the standard requires a Training Needs Assessment be performed to identify any potential impact to the student of viewing different data values at the same previous time step via different means.

Requirement: The definition of Stimulated Components is: Hardware/software components that are integrated with the simulator

process via simulator inputs/outputs that perform their functions parallel to, and either independently of or synchronized with, the simulation process.

It is the intent of Section 3.3.3, third paragraph, to be applicable to stimulated components that store historical data if the device is integrated with the simulator process via simulator inputs/outputs and performs its function parallel to, and either independently of or synchronized with, the simulation process. If the stimulated component meets this applicability, then it is required to participate in the simulator unique functions as specified in Section 3.3.3.

If a device is considered to be a stimulated component per Section 3.3.3, then consideration of Section 4.3.3 also applies; "For a stimulated component it shall be documented that noticeable differences have been defined and that a training needs assessment has been performed in accordance with Sec. 4.2.1.4." Section 4.3.3 shall be utilized to justify why a stimulated component does not have to meet the requirements for freeze, run, initial condition reset, snapshot, and backtrack.

Inquiry: In Section 3.4.3.3, Simulator Reactor Core Performance Testing, what do you specify as appropriate reactor core performance testing?

Response: Section 4.4.3.3, states that “Simulator reactor core performance testing shall be conducted each reference unit fuel cycle. Testing shall be performed in accordance with the reference unit procedures and shall be compared and demonstrated to replicate the response of the reference unit. It shall be demonstrated that the simulator response during conduct of simulator reactor core performance testing meets the reference unit procedures’ acceptance criteria.”

The ANSI/ANS-3.5-2009 standard, by design, does not prescribe core performance testing methodology. Currently, each simulation facility is responsible for creating a method to demonstrate adequate simulator core performance.

Inquiry: In Section 3.4.3.3, why did you include reactor core performance testing as a requirement; was it because of a U.S. Nuclear Regulatory Commission (NRC) requirement and/or an industry issue?

Response: It was anticipated that the industry would take advantage of a regulatory option to utilize the simulator for reactivity manipulation experience credit.

Ref: (1) Code of Federal Regulations, Simulation Facilities, 10CFR55.46(c)(2)(i)
(2) Code of Federal Regulation, Operator’s License Applications, 10CFR55.31 (a)(5)

On November 16, 2001, the NRC amended its rules (66 FR 52667, Oct. 17, 2001) as described in 10 CFR 55.46 (c) so that facility licensees could utilize their nuclear power plant-referenced simulator instead of the actual nuclear plant for performing control manipulations that affect reactivity to establish eligibility for an operator's license as described in 10 CFR 55.31(a)(5). The ANS-3.5 Working Group recognized and supported the need for having a requirement for simulator core performance testing since there is a direct benefit for using the simulator rather than the actual plant to meet the regulatory requirement.

Commentary: It is important to distinguish between update and upgrade to facilitate the following discussion. Update means incorporating new data into the simulator design database. Upgrade means changing the simulator to match the reference unit.

Inquiry: In Section 5.1.2.1, Initial Update, why do you specify the initial update within 18 months?

Response: Section 5.1.2.1 applies to the first update of the simulator design database following the reference unit's commercial operation date or the simulator's operational date, whichever is later. Eighteen months provides ample time after the reference unit's commercial operation date or the simulator's operational date to review and determine the need for a simulator modification. Eighteen months was assumed to be a reasonable amount of time to update the simulator design database following new reference unit commissioning; this period of time anticipates that more effort is required to review and determine the need for a simulator modification after unit startup and commissioning tests are completed.

Inquiry: In Section 5.1.2.2, Subsequent Update, why do you specify the subsequent update within 12 months?

Response: Section 5.1.2.2 applies to each new design database update following the initial update. Twelve months provides ample time to review and determine the need for a simulator modification after the initial design database update.

Inquiry: In Section 5.3.1.1, Initial Upgrade, why do you specify the initial upgrade within 30 months?

Response: Section 5.3.1.1 applies to plant modifications that impact the simulator following its initial construction. Thirty months provides ample time after the reference unit’s commercial operation date or the simulator’s operational date to implement plant modifications received during simulator construction. The complexity of the plant modification can require a long period of time to implement. Thirty months is based on the total allowable time period associated with the simulator’s design database update (eighteen months for the initial update and twelve months for the subsequent upgrade). Thirty months to implement reference unit modifications allows for the review and applicability determination of new data over both time periods. By the end of thirty months, new data reviewed during the initial and subsequent design database updates shall be implemented to the simulator via an initial upgrade.

Inquiry: In Section 5.3.1.2, Subsequent Upgrade, why do you specify the subsequent upgrade within 24 months?

Response: Section 5.3.1.2 applies to plant modifications that may have some impact to the simulator following the initial upgrade. Twenty-four months provides ample time after the reference unit modification is determined to be operational (or in-service) to implement the plant’s modification to the simulator (twelve months to identify the reference unit modification and twelve months to implement the reference unit modification). Twenty-four months provides ample time to implement the plant modification based on the needs of the operator training program.