Power Plant Simulation Conference 2017
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James B. Florence
ANS-3.5 Working Group
ANS-3.5 Topic Overview

- Introduce ANS-3.5 Working Group
- ANS-3.5-201x Project Status
- ANS-3.5 Standards Transition Status
- Questions
Officers

- Jim Florence (Cooper) – Chair
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George McCullough (IFE)
Michael Petersen (Monticello/Prairie Island)
Pablo Rey (Tecnatom – Spain)
James Sale (Independent)
Frank Tarselli (Independent)
Approved Scope:

- This standard establishes the functional requirements for full scope nuclear power plant control room simulators that are subject to U.S. Nuclear Regulatory Commission (NRC) regulation for use in operator training and examination. The standard also establishes criteria for the scope of simulation, performance, and functional capabilities of nuclear power plant control room simulators.

- This standard does not establish criteria for the use of simulators in operator training programs.
STATUS TO DATE

- ANS-3.5-201x submitted to the American Nuclear Society on 01/16/14 to begin formal review process

- ANS Large Light Water Reactors Consensus (LLWRC) Committee completed review on 03/16/14

- Public review period closed 09/10/14

- ANS-3.5 Working Group met in January 2015 to review/incorporate public/LLWRC comments.
ON-GOING EFFORT

- LLWRC Comment resolution continues...

- A second public & LLWRC review will be required in 2017 due to address changes made from comment resolution (a focused review – substantive changes only)
Currently, at least five changes due to public/LLWRC comments are considered substantive and require a second review period:

- Section 3.4.2 “Simulator transient testing” – “the transient selection process shall (from should to shall) use the following references…”

- Section 4.1.1 "Real time and repeatability" reincorporates acceptance criteria from the ANS-3.5-2009 Standard.
Section 4.1.2 "Limits of Simulation" - adds a new test requirement:

- A limits of simulation notification test shall be conducted: upon initial implementation of limits of simulation; and whenever there is a change or modification to the limits of simulation.

Section 5.1.1 “Simulator design baseline” – “The simulator design baseline shall include (includes) the following...”

Section 5.2.1 "Resolution of simulator discrepancies" – “Measures shall be established to assure that simulator discrepancies are promptly identified and corrected”.

What’s Different in the 201x Standard?

- Addresses comments from the original 2009 Standard review effort
- Addresses next generation simulators
- Deleted/modified definitions; introduced “discrepancy” in lieu of noticeable difference, deviation and deficiency
Deleted Malfunction List in Section 3.1.4; new appendix proposed to provide examples of acceptable malfunction capabilities. These examples are derived from the "control manipulations/plant evolutions" list identified in The Code of Federal Regulations, Part 10CFR55.59 "Requalification" § (c)(3)(i).

Changed Section 3.4/4.4 to from "Simulator Testing" to "Performance Testing"

Moved verification/validation testing to Section 5, Configuration Management

Moved Assessment of Deviations to Section 5
Defined Testing Periodicities
  ◦ Limits of Simulation
  ◦ Steady-state & Normal Evolutions
  ◦ Malfunctions
  ◦ Physical Fidelity & Human Factors
  ◦ Instructor Station
  ◦ Real Time & Repeatability

Defined testing configurations for various performance tests (fully integrated vs. non-integrated)

No changes to scenario-based testing!!!
Section 5:
- initial design vs. change control
- performance benchmark (steady-state/transient testing)
- noticeable differences
- resolution of discrepancies
- verification/validation testing
Appendix B deleted; transient list deleted, steady-state parameters moved to Section 4

Clarified that previously selected transients may be used (for legacy plants)

Re-lettered Appendices C & D

Readability/clarity
• A Full History of Full Scope Nuclear Power Plant (NPP) Simulators as related to the ANSI/ANS-3.5 Standards

• Earliest NPP Simulators were constructed upon specifications only (through the '70s)
  - General Electric (Dresden 2)
  - Babcock and Wilcox (Rancho Seco)
  - Combustion Engineering (Calvert Cliffs)
  - Westinghouse (Zion)
  - Indian Point 2 (Consolidated Edison of New York)
  - TVA (Browns Ferry, Sequoyah, Watts Bar)
ANS-3.5 Standards Adoption History

- The age of utility-owned Simulators began in the late '70s (ConEd – Indian Point 2, TVA – Browns Ferry 2/Sequoyah/Watts Bar, VEPCO – Surry)
- The '80s was the time of a utility-owned Simulator for every unique reference unit
- Simulators for the new Reactor phase are being purchased within the Nuclear Steam Supply System contract (all COLs applications are referenced to ANS-3.5-1998)
- Vogtle 3&4, Summer 2&3
- New Reactor phase of Simulators are scheduled for delivery in order that operators can be trained and licensed before criticality
ANS-3.5 Transition Status

ANS-3.5 in 2015

- Simulators on 1985 Standard: 11
- Simulators on 1993 Standard: 4
- Simulators on 1998 Standard: 53
- Simulators on 2009 Standard: 78%
ANS-3.5 Transition Status

ANS-3.5 in 2016

- Simulators on 1985 Standard: 10
- Simulators on 1993 Standard: 3
- Simulators on 1998 Standard: 54
- Simulators on 2009 Standard: 81%

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ANS-3.5 Commitments

ANS-3.5 COMMITMENTS (16 January 2017 incomplete data before 2006)
The ANS-3.5 WebPages can be accessed via:
- www.ans.org
- https://www.usug.org/

Find:
- Scope Statement
- Membership Contact Information
- Meeting Locations
- Meeting Minutes
- Link to ANS-3.5 Clarifications
- How to submit clarification requests
Western Services Corporation
January 2015