ANS 3.5 Working Group Meeting Minutes
American Nuclear Society
Chiltonville Training Center, Plymouth, MA
2013 July 23-26

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1. Visitors

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2. Membership and Attendance

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3. Action Items

3.1 Action Item Quick-look Table

Open	Complete	Carried to Next Standard

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67			

3.2 Action Items

No.	Status	Date	Assigned To:	Work Assignment
1		2010oct05	**Florence Lawter Sale**	Appoint new members for officer development (job shadow for position development). Parliamentarian Assist Lawter, Sale
2	2011nov17: Closed	2010oct06	**Koutouzis** McCullough	2009 AI-60 Define the Term **Training Needs Assessment** in such a manner that it is clear in intent to both Training and Simulator staff 2011nov17: The WG agreed the definition of "Training Needs Assessment" is adequate
3	2012Aug30: Closed	2010oct06	**Vick** Tarselli (BWR) Petersen (BWR) Rey (BWR) Goodman (PWR) McDade (PWR) Sale (PWR)	2009 AI-126 Consider adding Performance Test Program in next standard. New Appendix that gives example Performance Testing Program. 2012aug30: AI-3 is closed with the creation of AI-43 A draft Appendix was presented. AI-43 was created for additional consideration.

4	2011jun08: Closed items - 1, 3, 4 2011nov16: Closed Item 2	2010oct06	**Tarselli** Vick Chang Fraser Felker	2009 AI-132 ~~1. Review Malfunction Testing~~. 2011jun08 Closed 2. Are all list required? ~~3. What constitutes Malfunction testing is unclear~~ 2011jun08 Closed ~~4. Better define Malfunction causes~~. 2011jun08 Closed 2011jun08 2. AI-4 remains open pending review of Section 3.1.4 List. The remaining issue is relevance of the Malfunction list in Section 3.1.4 to the 201x standard. Additional consideration is if the malfunction list in section 3.1.4 should remain, be deleted or moved. 2011nov16 Closed by Motion
5	2011jun08: Closed 2011nov16: Wording change.	2010oct06	**McCullough** Florence Tarselli Colby	2009 AI-134 Minimum testing Periodicity Build Periodicity into the standard 2011jun09 Closed with Motions Realtime/Repeatability testing periodicity moved to AI-10 2011nov16: Added the word capability: An instructor station capability test shall be conducted

6	2012aug30: Closed	2010oct06	**Welchel** Lawter Petersen McDade Goodman	2009 AI-147 2009 AI-180 Non-fully integrated mode performance testing Where applicable run performance test off-line 2011jun08 Discussion 2011nov18 Welchel New Definition and Sec. 3.4.3 change proposed for consideration. Discussion tabled 2012aug29 Motion Not Carried. AI-6 is not closed and will consider additional input based on the discussions and member feedback. 2012aug30 Motion Carried New AI-44: AI-6 Motion Carried Simple Majority: Consult ANS-21 (Maintenance Operations Testing & Training) subcommittee for determination if this change is a Substantive Change. 2012sep21: The following reply was received from Carl Mazzola: **This is a substantive change. Another sentence was added with a shall statement.** AI-6 passed with a 8-For and 7-Against. Substantative change requires Consensus requiring a 75% approval. Therefore AI-6 status is **Not Carried**. AI-6 minutes status has been updated to: **Not Carried**. 2012dec05: AI-6 is Closed

7	2012aug30: Closed	2010oct06	**Vick** Goldman	2009 AI-150 Review the term Power Range for consistency Confusion about the term Power Range. 2012aug30 AI-7 is closed. Power range has been removed in 3 of 5 instances in the present draft standard. The remaining two instances are consistent.
8	2011jun09: Closed	2010oct06	**Chang** Tarselli Felker	2009 AI-162 Review Appendix B parameters against the standard body MANTG comments App. B parameters and std body are not consistent. 2011jun09 – A parliamentary issue regarding motion results. See AI-26 2011nov16: AI-8 was reviewed and changed to "Carried". See Summer minutes Section 5.4.

9	2012aug29: Closed	2010oct06	**Felker** Lawter McCullough Fraser Colby Goodman McDade Koutouzis Rey Sale	2009 AI-163 Next generation simulators New builds. Public review comments that the WG did not considered new builds. Examine unique issues with new builds. Review will ask if 3.5-2009 provides sufficient guidance for new builds. Focus: Transients (AI-9 Closed Granbury Resort) Malfunctions (Closed AI-4 VC Summer) Configuration management DCS Appendix D Review (Limited Scope applications) Lawter 2011jun10 – Info presented. Next meeting will propose the first of several anticipated standard changes. 2012Mar14 – Motion Rewrites Sections 3.4.3.1/4.4.3.1 and deleted Appendix B 2012aug29 – Working Group discussed Appendix D and agreed to no changes. The Working Group agreed to closed AI-9.
10	2011nov16: Closed	2010oct06	**McCullough** Felker McDade Goldman	2009 AI-179 Real-time and Repeatability testing Periodicity 2009 Public review comments. Methodology to demonstrate real-time. 2011jun10 Carried from AI-5 Realtime/Repeatability -Establish Realtime/Repeatability Periodicity Testing Requirement 2011nov16 Closed by Motion.

11	2012Mar16: Closed	2010oct06	**Goodman** Vick Petersen Chang	2009 AI-181 Section 5 rewrite 2009 Westrain Comment #60 Configuration Management expectations needs strengthening Performance based. V&V is part of configuration mgt. (Section 4) possible a better fit in Section 5 2011nov15 – Section 5.4 references Section 4.4 and should reference 4.2 2012Mar16: Closed with three AI motions
12	2010oct22: Closed	2010oct06	**Florence**	Invite ANS-21 Chair to WG meeting ANS-21 Chair Gene Carpenter Two White Flint North Washington, DC 20555-0001 **Mobile Ph**: 202-579-5155 **Work Ph**: 301-415-7333 **Email**: gene.carpenter@nrc.gov
13	2011jan28: Closed	2010oct06	**Florence**	Send letters of appointment to new working group members and their respective facility management Letter to new working group member and manager.
14	2011jan28: Closed	2010oct06	**Florence**	Coordinate next ANS-3.5 Meeting at the Crystal River Nuclear Power Plant in January 2011
15	2011jan28: Closed	2010oct06	**Florence**	2009 AI-185 Send a letter to the NEI in an effort to promote NEI participation in the ANS-3.5 Working Group and to develop a more collaborative relationship.

16	2012aug29: Closed	2011jan28	**Sale** Rey McCullough Tarselli Chang Koutouzis	Consider the option to include other uses of the simulator in footnote 1 on Page 1 of the Standard (e.g. - technical support). This was a consideration during the development of the scope statement in lieu of explicitly mentioning other uses of the simulator in the scope statement. 2012aug29 – Presentation and discussion. WG agreed to close AI-16 with no action.
17	2012Mar14: Closed	2011jan28	**McDade** Tarselli Koutouzis Petersen	Consider placing language in Section 1.2 Background to insert "experience requirements": `It is intended that in meeting the criteria of this standard, the simulator will be sufficiently complete and accurate to meet the training needs of the industry as well as the requirements of the NRC, as described in *Code of Federal Regulations*, Title 10, "Energy," Part 55, "Operators' Licenses" (10CFR55) **and station mandated experience requirements** Consider language in Section 1.2 Background to add clarification regarding control manipulations allowed by 10CFR55.46 and how this standard supports it. 2012mar14 – team recommended closure. Standard is sufficient.

18		2011jan28	**Florence** Rey Holl Fraser	1) Contact ANS to determine international opportunities in Standard development. 2) Consider language in Section 1.2 Background to mention use of this standard by the international community. 3) Additional consideration in the Standard body for the international community. Acknowledge international regulatory authorities. 2012aug29: The recommended wording will be considered during the final read of the standard. The wording is to be inserted in the Foreword and its location will be determined at that time.
19	2012nov18: Closed	2011jan28	**Tarselli** McCullough Goodman Chang Rey	Review the list below for inclusion into ANS 3.5 or other standards and basis for the recommendation: • Engineering Assist • Simulation Assisted Engineering • EP • DCS Logic Control Validation • HFE – Human Factors Engineering • Tech Training – I&C / Mechanical • PR Tours • Process Flow Diagrams • Spec. Operating Parameters • PRA • SAMG

20	2012aug30: Closed	2011jan28	**McCullough** Colby Tarselli Lawter Fraser	Identify areas in the standard that can be improved to address DCS 2012aug30: Closed by Motion
21	2011jun10: Closed	2011jan28	**McCullough** Felker Koutouzis Lawter Goodman	Evaluate the need for inclusion into the standard other simulation devices derived directly from the full scope control room simulator. 2011jun10 – Presentation and discussion. No additional discussion and action will be taken. This AI is closed.
22	2012aug30: Closed	2011jan28	**Lawter** Sale Welchel Vick Felker	Review the recent regulatory cyber security guidance and OE to determine if cyber security should be included in the standard. 2012aug30: Power Point presentation. Recommendation to close AI-22. AI-22 is closed
23	2012aug28: Closed	2011jan28	**Vick** Tarselli Rey Sale Florence Chang	Evaluate the need for including into Section 3.3.1 a set of IC criteria for ICs that are to be used when conducting the performance tests required by this standard. 2011jun10 – Proposal made. Additional consideration required. 2012aug28: present requirements are sufficient.
24	2011feb01: Closed	2011jan28	**Florence**	Submit PINS Form to ANS Administrator 2011feb01 PINS has been submitted.

25	2012mar13: Closed	2011jun10	**Chang**	The following Appendix B Steady State parameters were considered in AI-8. BWR - control rod drive hydraulic system flow and temperature - secondary plant heat balance data PWR - containment pressure - boron concentration - pressurizer temperature - control rod positions - secondary plant heat balance These parameters should be reviewed for inclusion into the standard body Steady State parameter list. 2012mar13: Closed by Motion

26	2012dec05: Closed	2011jun10	**Florence**	Review and recommend modifications to the Rule of the Chair related to quorum in session. Interim Voting (Motions – Substantive Changes) shall be by Consensus (75% [rounded up] of quorum in session); Rule of the Chair for the remainder of the meeting: Interim Voting (Motions – Substantive Changes) shall be by Consensus (75% [rounded up] of voting membership present); 2011nov15: Additional consideration is needed to determine if previously "Not-carried" Motions are affected by the revised Rule of the Chair. 2012dec05: At the Granbury Resort Conference meeting, the Vick report (Section 5.10) concluded there are no Motions affected by the revised Rule of the Chair. AI-26 is Closed.
27	2011nov15: Closed	2011jun10	**Florence**	Define Substantive Change with regards to Motion "Carried" threshold. 2011nov15: Closed with AI-26 discussion.
28	2012aug30: Closed	2011jun10	**Felker** Chang Sale	Review and report to the WG the usage of the terms: **If available** versus **As applicable**. 2012aug30: Closed with AI-28 discussion.

29	2011nov17: Closed	2011jun10	**Rey** Tarselli	Review Normal Operating procedures Surveillance testing with regards to periodicity testing. It should be clarified what Normal Evolutions defined in 3.1.2.2 shall be tested with the frequency established in 4.1.3.2 2011nov17: Closed by Motion: Carried Text substitution in section 4.1.3.2 Normal evolutions
30	2012Mar14: Closed	2011jun10	**Sale**	Review Appendix B Steady State section for deletion. 2012mar14 – AI-9 deleted Appendix. This AI is closed.
31	2011nov18: Closed	2011jun10	**Petersen** Chang	Review list nomenclature for consistency 2011nov18: Closed by Motion Carried.
32	2012dec11: Closed	2011nov17	**McCullough**	Verify testing periodicity terminology consistency across section 4. 2012dec11 McCullough lead a discussion reviewing the sections and consistency. There is consistency across Section 4.0. AI-32 is closed.
33	2012aug30: Closed	2011nov18	**Welchel**	Review use and consistency of term Fully Integrated, partially-integrated and Non-integrated, and Standalone with regards to Sections 3 and 4. 2012aug30 – Review indicates the Section 5 rewrite consolidated these terms. AI-33 Closed.

34	2012Mar16: Closed	2012Mar14	**Colby**	AI-9 deleted Appendix B, this AI is to review/cleanup remaining references to Appendix B 2012mar16: Closed Two Column Document Rev 4 updated.
35	2012Mar15: Closed	2012Mar15	**Felker** Colby	AI-5 Review the usage of "preference" and "shall" in Section 5.1.2 2012mar15: Closed - The working group reviewed the definitions of "preference" and "precedence". The list may be a precedence list but preference is adequate.
36	2012aug30: Closed	2012Mar15	**McCullough** Goodman	Consider replacing the opening paragraph in Section 5. With the following: A configuration management program shall be established to provide a means for demonstrating compliance with Sec. 3, "General Requirements." Section 5.1 is for initial simulator construction or for re-baselining the simulator design, else use Section 5.2. 2012aug30: Closed with AI-36 discussion.
37	2012dec11: Closed	2012Mar15	**Chang** Fraser Goodman	Consider definitions for "benchmark" and "baseline". 2012dec11 Recommendation is to close AI-37 with no action.
38	2012aug30: Closed	2012Mar15	**Rey** Goodman	With the new Section 5 (AI-11 2012mar15), Section 5.3 Assessment of Deviations, review the assessment parameters for adequacy as they apply to operational performance. Previously, the items only applied to physical fidelity. 2012aug30: Closed with AI-38 discussion.
39	2012aug28: Closed	2012Mar15	**Goodman** Chang	Consider revising Section 5.1 to include verification and validation as it applies to initial simulator construction. 2012aug28 – Closed by agreement

40	2012Mar15: Closed	2012Mar15	**Goodman**	Section D.2 cleanup references to 3.2.1.4 and in Section D.3 cleanup references to 4.2.1.4. Closed by Motion
41	2012aug28: Closed		**Goodman** Welchel Dennis Felker	Additional review of Section 3.4.1/3.4.2/4.4.1/4.4.2 - Previous sections 3.4.1/3.4.2/4.4.1/4.4.2 use the word "Demonstrate". The new words in Section 5 do not include the word "Demonstrate" - The new Background section no longer refers to V&V, and includes no reference to CM - Review IEEE and ANS 3.5 for alignment of V&V requirements - Review the redefined intent of testing. Is the purpose of testing to "ensure no noticeable differences exist" or is it to "indentify noticeable differences that need to be resolved". (responsibility Dennis) 2012aug28 – Closed by agreement
42	2012aug30: Closed		**Chang**	Review the use of "Because" in the first paragraph of section 5.1.2 Simulator Performance Benchmark. Consider "If" or "When". Multiple baseline data are not always available and sometimes no data is available. 2012aug30: Editorial Change. AI-42 is Closed.

43	2013apr02: Closed by Motion	2012aug30 Avila Beach	**Vick** Lawter Rey Sale Tarselli Cupp Florence	Review the AI-3 proposed Appendix for possible integration into the draft standard. Also, explore ANS Guidelines as a means to distribute the Performance Testing guidance. 2012dec13 Several versions were presented and discussed. WG agreed to continue additional discussion. 2013apr02: Proposal #1 occupied the majority time of discussion. After several hours of discussion a straw poll indicated lack of support.
44	2012sep21: Closed by Email from Carl Mazzola.	2012aug30	**Florence**	AI-6 Motion Carried Simple Majority: Consult ANS-21 (Maintenance Operations Testing & Training) subcommittee for possible Substantive Change. 2012sep21: The following reply was received from Carl Mazzola: **This is a substantive change. Another sentence was added with a shall statement.** AI-6 passed with a 8-For and 7-Against. Substantative change requires Consensus requiring a 75% approval. Therefore AI-6 status is Not Carried. AI-6 minutes status has been updated to: Not Carried. 2012dec05: AI-44 is Closed
45	2012dec11: Closed	2012aug31	**Chang** Rey Colby Vick	New definition for human-machine interface. 2012dec11 No definition is needed for human machine interface (HMI). New AI-49 changes HMI to HSI. AI-45 is closed.

46	2012dec11: Closed	2012aug31	**Petersen** Goldman Fraser Rey	Review evolution limitations and Limit of simulation for continued applicability. 2012dec11 A straw poll indicated no additional changes are required. AI-46 is closed.
47	2012dec12: Closed	2012aug31	**Mcdade** Florence Felker	Review Scope statement to include additional exclusions. 2012dec12 Closed by Motion. Revised Section 1.2 Background
48	2012dec12: Closed	2012aug31	**Chang** Rey Gagnon	Review the standard for extended length scenarios and possible guidance. 2012dec12 Closed. New AI-50
49	2012dec11: Closed	2012dec11	**McCullough**	2012dec11 Reference AI-45 Update the standard changing all references of human machine interface to human system interface. Closed by Motion.
50		2012dec12	**Florence** Petersen Gagnon Rey Chang	2012dec12 Update the Foreword to assure the industry that consideration of events such as the Fukushima event, extended length scenarios, EP Drills, etc. i.e. non standard scope scenarios were discussed and determined not to be within the scope of the standard.

51	Closed: 2013apr03 by Motion	2012dec13	**Goodman** Rey Vick Cupp	2012dec13 New AI-51 – Possible revision to Section 4.4.3 Simulator reactor core performance testing. Closed: 2013apr03 by Motion. Replaced Section 4.4.3
52	2013jul25: Closed		**Felker** Colby	2013apr05 Strengthen the comments: Appendix B deletion Section 3.1.4 Malfunction List deletion 2013jul25 WG agreed to closed AI-52. See 2013jul25 minutes for closure description.
53	2013jul25: Closed		**Colby**	2013apr05 Blank Appendix Allowed? 2013jul25 Final Read Item Appendices have been adjusted. ANS input is that blank Appendices are not allowed.

54	2013jul25: Closed		**Goodman**	2013apr05 Section 3.4 and 3.4.4 review for PEST testing requirement. Evaluate the requirement to perform PEST testing in section 3.4.4 in a fully integrated mode of operation. 2013jul24 – Parking lot item: 4.2.2/4.1.3 No periodicity needs to be addressed when this AI is resolved. 4.2.2 – No change 4.1.3 – AI-54 Steady-state is listed in two sections 4.1.3and 4.4.1 and periodicity is defined only in Section 4.4.1. This item is left open pending AI-54 discussion 2013jul25 Goodman discussion. Closed by Motion.
55			**Florence**	2013jul23 Contact Pat Schroeder is Section 6. Is boilerplate. What is the purpose of Section 6.0 Is Appendix Header boilerplate. Determine standard language for Section 6; currently, we identify one reference; lead in paragraph suggests more than one paragraph. IN addition, this section paragraph is difficult to understand

56	2013jul26: Closed		**Florence**	2013jul23 In the "American National Standard" front section of the standard; send the technical edits to ANS (Pat Schroeder) as information only… (Chang & Florence) 2013jul26 Email sent to ANS Pat Schroeder
57	2013jul26: Closed		**Chang**	2013jul23 Verify all uses of "by this section" for change consideration to "in this section" for consistency throughout standard 2013jul26 Review with recommendation to make no change
58	2013jul25: Closed		**Chang**	2013jul23 Line 199 in tech edit spreadsheet – delete "steady-state test" in Section 4.4.1 2013jul25 Closed by Motion: Motion (Carried): Operability to Transient Term Update
59	2013jul25: Closed		**Chang**	2013jul23 Lines 221 & 222 in tech edit spreadsheet; identify the role that procedures have in Section 4.4.4 2013jul25: Closed Motion (Carried): AI-59 PEST use of Unit procedure
60	2013jul25: Closed		**Florence**	2013jul23 2013jul25: Closed to AI-55

61	2013jul25: Closed		**Felker** Mirshah Tarselli	2013jul24 Review Two-column document technical edit reviews for correctness. 2013jul25: Closed Review completed with no comment.
62			**Colby**	2013jul24 Review Footnotes and Footnote numbering in the final document before sending for comment/approval. Review the standard references to Appendices to ensure correct reference/tie
63	Closed: 2013jul24		**Colby**	2013jul24 Parking lot Item: A.1 – should “evaluation” be “examination”? Section A.1 Change “evaluation” to “examination” and “tool” to “device”.
64	2013jul26: Closed		**Chang**	2013jul25 Review uses of "by this section" 2013jul26 Review with recommendation to make no change
65			**Colby**	2013jul25 Tech Edit Items List in Sections 4.1.3.2 2013jul26 Two column document updated. Completed

66			**Colby**	2013jul25 AI-66 Tech Edit Items List in Sections 4.1.4, 4.4.1, 4.4.2 Remove list capitalization 2013jul26 Two column document updated. Completed
67			**Rey** Tarselli Goodman McCullough	2013jul25 Include Steady-state and normal evolutions as Performance test. Possibly separate Steady-state and Normal evolutions without creating additional burden. Reference AI-54 for consideration.

4. Working Group Procedural Rules

4.1 Rules of the Chair

- Interim Voting (Motions – Substantive Changes) shall be by Consensus (75% [rounded up] of quorum in session);
- The Chair rules that no Motions will be accepted when not in session;
- Administrative issues by simple majority (quorum in session);
- The Chair shall be informed of absences;
- The absent member is encouraged to send a proxy;
- A Proxy shall have voting privileges;
- Members shall attend the full length of the meeting;
- Word 7.0 shall be the document format;
- The Host shall collect and send all handout material for absent members without proxy;
- Robert's Rules of Order shall be used as a general guide;
- Guest Individual Contributors may receive working copy of the draft standard based on need;
- Chair approval shall be required for distribution of working copies of the draft standard;
- Members shall not Vote against their own non-amended Motion;
- The WG will through the course of normal business, generate confidential documentation applicable to the WG charter. As a result of this business, documentation could be released to the public through approved minutes posted on the ANS 3.5 WEB site. Other information may be released to the public as deemed appropriate by the WG Chair or Vice-Chair. In addition, information may be supplied to non-working group members on a need-to-know basis for the purpose of review and comment;
- When Abstention Votes are present the Majority (> 50%), Super Majority (2/3), Consensus (75%) levels are recalculated by subtracting the Abstention Votes count from the Members Present count;
- Non-substantive change requires Majority Vote;
- Appendices changes are non-substantives;
- Substantive requires Consensus Vote;
- Substantive Change: A substantive change in a proposed American National Standard is one that directly and materially affects the use of the standard. Examples of substantive changes are below:
  - "shall" to "should" or "should" to "shall";
  - addition, deletion or revision of requirements, regardless of the number of changes;
  - Addition of mandatory compliance with referenced standards.

4.2 Rules Enacted by the Working Group

Missing two consecutive meetings in a row without representation could result in loss of membership on the committee.

5. Tuesday 2013 April 1 (0800)

5.1 Introduction (0800)

5.2 Roll Call

Members Present:

Jim Florence
Bob Felker - Proxy
Keith Welchel
F.J. (Butch) Colby
Lawrence (Larry) Vick
George McCullough
Frank Tarselli
SK Chang
Robert Goldman - Proxy
David Goodman
Jody Lawter
Mac McDade
Michael Petersen
Bill Hendy - Proxy
Pablo Rey
Jim Sale – Proxy
William Fraser

Proxy/Visitors:

Tim Dennis
Vincent Gagnon
Winston AuDuong
Majid Mirashah

5.3 Consensus Level

17 - Voting members
17 - Voting members Present (4 Proxy Vote)
9 - Quorum (Majority Total Membership)
13 - Consensus (≥ 75% votes)
12 – Super Majority (≥ 2/3 Votes)
9 – Majority (> 50% votes)

5.4 Motion (Carried): Agenda Rev 0 Approval

Motion: **Carried** • 17 – For • 0 – Against • 0 – Abstained
Date 2013Jul23 **Motion**: Approve Agenda Rev 0

5.5 Officers reports

Florence (Chair)	No Report
Welchel (Secretary)	No report
Colby (Editor)	No report
Chang (Style Editor)	No report
Vick (Parliamentarian)	No report

5.6 Industry Update

INPO	No Update
USUG - Florence	No Update
Dennis	Standards Adoption Update: 60% (43) - 2009 17% (12) - 1998 24% (17) - 1985 Projected Adoption by end of 2013 14 remaining in 2013 5 in 2014 Beaver Valley 1 Beaver Valley 2 Enrico Fermi Palo Verde 1 (2) Vogtle 1 10 no plans to transition 4 new construction: will establish use as limited-scope simulators under Appendix D of the 1998 Standard this year very soon if not already Vogtle 3 V C Summer 2
WESTRAIN - Goodman	No Update
NEI - Petersen	No Update
SSNTA	No Update

5.7 INPO and NRC Tech Edit review (Colby/Chang)

The day was spent reviewing the Tech Edit spreadsheet. Each item was reviewed and categorized as Change (Green), Delete (Red) and additional consideration (Yellow). File Tech Editing Review rev 13.xlsx contains the Tech Spec Item review.

The following table contains Action Items created during the review:

54	**Goodman**	2013apr05 Section 3.4 and 3.4.4 review for PEST testing requirement. Evaluate the requirement to perform PEST testing in section 3.4.4 in a fully integrated mode of operation.
55	**Florence**	2013jul23 Contact Pat Shroeder is Section 6. Is boilerplate. What is the purpose of Section 6.0 Is Appendix Header boilerplate.
56	**Florence**	2013jul23 In the "American National Standard" front section of the standard; send the technical edits to ANS (Pat Schroeder) as information only… (Chang & Florence)
57	**Chang**	2013jul23 Verify all uses of "by this section" for change consideration to "in this section" for consistency throughout standard
58	**Chang**	2013jul23 Line 199 in tech edit spreadsheet – delete "steady-state test" in Section 4.4.1
59	**Chang**	2013jul23 Lines 221 & 222 in tech edit spreadsheet; identify the role that procedures have in Section 4.4.4
60	**Florence**	2013jul23 Determine standard language for Section 6; currently, we identify one reference; lead in paragraph suggests more than one paragraph. IN addition, this section paragraph is difficult to understand

5.8 Recessed: 1735

6. Wednesday 2013 July 24 (0800)

6.1 Roll Call

Jim Florence
Bob Felker - Proxy
Keith Welchel
F.J. (Butch) Colby
Lawrence (Larry) Vick
George McCullough
Frank Tarselli
SK Chang
Robert Goldman - Proxy
David Goodman
Jody Lawter
Mac McDade
Michael Petersen
Bill Hendy - Proxy
Pablo Rey
Jim Sale – Proxy
William Fraser

Proxy/Visitors:

Tim Dennis
Vincent Gagnon
Winston AuDuong
Majid Mirashah

6.2 Consensus Level

17 - Voting members
17 - Voting members Present (4 Proxy Vote)
9 - Quorum (Majority Total Membership)
13 - Consensus (≥ 75% votes)
12 – Super Majority (≥ 2/3 Votes)
9 – Majority (> 50% votes)

6.3 Motion (Carried): Palo Verde Minutes Approval

Motion: **Carried** • 17 – For • 0 – Against • 0 – Abstained
Date 2013jul24 **Motion**: Approve Palo Verde (STARS Alliance Building) Minutes Approved version 14

6.4 Motion (Carried): Tech Edit Item Approval

Motion: **Carried** • 17 – For • 0 – Against • 0 – Abstained
Date 2013jul24

Motion:

Accept the 66 technical edits (Green) Sheet Items, reviewed by the working group, that are in file "Tech Editing Review rev 14.xlsx" dated: 2013jul24 09:07.

Note: These Tech Edit Approved Items will be incorporated into the Two-column document for later approval. The file contains the Approved (Green), Deleted (Red) and Additional Discussion (Yellow).

Reason:

- This tech editing work was the recommendation of the working group Chairman
- The working group solicited input from expert technical writers from the NRC and INPO on the correct implication of the English language as it pertains to this technical requirements document.

6.5 AI-61 (Felker) Review Two-column document technical edit reviews

Review Two-column document technical edit reviews for correctness.

Assigned: Felker, Mirashah

6.6 Action Item review and recommendations:

The working group spent the majority of the day reviewing the Final Read Action Items.

6.7 Motion (Carried): Delete definition (Section 2) Passive Failure

Motion: **Carried** • 15 – For • 2 – Against • 0 – Abstained
Date 2013jul24 **Motion**: Delete the definition "passive failure" from the definitions Section 2. **Reason**: Passive Failure is no longer used in the Standard

Reason Against:

Term is a good term in the standard. Term is still useful
Passive Failures should be a generic capability

6.8 Motion (Carried): Section 2 definition of reference unit - Delete docket number from the definition

Motion: **Carried** • 17 – For • 0 – Against • 0 – Abstained
Date 2013jul24 **Motion**: Change Section 2 definition for reference unit from: The specific nuclear power plant unit, identified by a unique docket number, from which the simulator control room configuration, system control arrangement, and simulator design data are derived. To

The specific nuclear power plant unit from which the simulator control room configuration, system control arrangement, and simulator design data are derived.

Reason: Some nuclear plants do not have docket numbers.

6.9 Motion (Carried): Section 2 definition of fast time

Motion: **Carried**

- 11 – For
- 5 – Against
- 1 – Abstained

Date 2013jul24

Motion:

Change Section 2 definition fast time from:

To increase the rate of simulation for some or all computed values with respect to real time.

To

A function of the simulation software which increases the rate of simulation for some or all computed values with respect to real time.

Reason: Current definition defines a verb. The updated definition defines a noun.

Against:

Previous definition is sufficient.
Unnecessary change to definition.
Unnecessarily complicates definition.

6.10 Motion (Carried): Section 2 definition of slow time

Motion: **Carried**
- 14 – For
- 3 – Against
- 0 – Abstained

Date 2013jul24

Motion:

Change Section 2 definition slow time from:

To decrease the rate of simulation for some or all computed values with respect to real time.

To

A function of the simulation software which decreases the rate of simulation for some or all computed values with respect to real time.

Reason: Current definition defines a verb. The updated definition defines a noun.

Against:

Previous definition is sufficient.
Unnecessary change to definition.
Unnecessarily complicates definition.

6.11 Motion (Carried): Section 3.3.2 Replace first paragraph

Motion: **Carried**
- 16 – For
- 1 – Against
- 0 – Abstained

Date 2013jul24

Motion:

Change The first paragraph in Section 3.3.2 from:

> The simulator shall be capable of initiating the malfunctions required in Sec. 3.1.4 and as required by the accredited licensed operator training program.

To

> The simulator shall be capable of initiating the malfunctions required in Sec. 3.1.4.

Reason: "as required by the accredited licensed operator training program" is referenced in Section 3.1.4.

Against: Unnecessary change

6.12 Motion (Carried): Section 4.4, 4.4.1 and 4.4.3 Consistency

Motion: **Carried**

- 17 – For
- 0 – Against
- 0 – Abstained

Date 2013jul24

Motion:

> **This Motion changes Sections 4.4, 4.4.1 and 4.4.3.**
>
> **Section 4.4 – Change the last paragraph from:**
>
> It shall be demonstrated that simulator performance testing is conducted as specified below. A record of the conduct of these tests, and data comparison that the results meet reference unit data, shall be maintained

To:

It shall be demonstrated that simulator performance testing is conducted as specified below. A record of the conduct of these tests and their evaluations shall be maintained.{Footnote: Appendix A provides examples of acceptable simulator performance test documentation}

Section 4.4.1 - Delete the last sentence and footnote: "A record of the conduct of this test and its evaluation shall be maintained."

Section 4.4.3 - Delete the last sentence and footnote: "A record of the conduct of this test and its evaluation shall be maintained."

Reason: Remove redundant documentation requirements and the requirement to meet reference unit data may not be consistent with SBT documentation requirements.

6.13 Motion (Not Carried): Section 4.3.4 Remove requirement for operator notification

Substantive requires Consensus Vote; 13 - Consensus (≥ 75% votes)
Substantive Change: A substantive change in a proposed American National Standard is one that directly and materially affects the use of the standard. Examples of substantive changes are below:

- "shall" to "should" or "should" to "shall";
- addition, deletion or revision of requirements, regardless of the number of changes;
- Addition of mandatory compliance with referenced standards.

Motion: **Not Carried**

- 10 – For
- 7 – Against
- 0 – Abstained

Date 2013jul24

Motion:

Change the first paragraph in Section 4.3.4 from:

It shall be demonstrated that the capability exists to reproduce the local operator actions required by Sec. 3.3.4 and the accredited licensed operator training program. The introduction of the local operator action shall not alert the operators to pending events other than by indications that would occur in the reference unit.

To

It shall be demonstrated that the capability exists to reproduce the local operator actions required by Sec. 3.3.4 and the accredited licensed operator training program.

Reason:.No longer needed.

Against:
As written is correct.
Requirement is valid
No need to change

6.14 Motion (Not Carried): Section 5.3 Add the word Knowledge to Item (6)

Substantive requires Consensus Vote; 13 - Consensus (≥ 75% votes)
Substantive Change: A substantive change in a proposed American National Standard is one that directly and materially affects the use of the standard. Examples of substantive changes are below:

- "shall" to "should" or "should" to "shall";
- addition, deletion or revision of requirements, regardless of the number of changes;
- Addition of mandatory compliance with referenced standards.

Motion: **Not Carried**

- 8 – For
- 9 – Against
- 0 – Abstained

Date 2013jul24

Motion:

Change Section 5.3, item 6 to read:

(6) the review of operational experience to identify the potential for operator error or the necessity for reinforcement of the knowledge and skills required for the task.

Reason: Knowledge is a critical aspect of operator fundamental. It goes hand in hand with the skills. Operators should understand what they are doing and what to expect before taking any actions.

Against:
Knowledge is classroom
Knowledge is embedded in Experience
Sufficient as written
Unintentionally expands the requirement

6.15 Motion (No Vote): Section 5.3 TNA required for each discrepancy

Motion:
- x – For
- x – Against
- x – Abstained

Date 2013jul24

Motion:

Section 5.3 – Change the lead paragraph from:

A training needs assessment shall be performed for each noticeable difference to determine if a change to the simulator is required. Noticeable differences that do not impact the actions to be taken by the operator or do not detract from training are acceptable and are not required to be

corrected. The following parameters should be evaluated to determine if the difference has an impact on the actions to be taken by the operators:

to:

Noticeable differences that impact the actions to be taken by the operator shall be corrected unless a training needs assessment has determined that a change to the simulator is not required. The following parameters should be evaluated to determine if the difference has an impact on the actions to be taken by the operators:

Reason: Could be implied a TNA is required for every simulator noticeable difference.

6.16 Amended Motion (Carried): Section 5.3 TNA required for each discrepancy

Motion: **Carried**

- 15 – For
- 2 – Against
- 0 – Abstained

Date 2013jul24

Motion:

Section 5.3 – Change the lead paragraph from:

A training needs assessment shall be performed for each noticeable difference to determine if a change to the simulator is required. Noticeable differences that do not impact the actions to be taken by the operator or do not detract from training are acceptable and are not required to be corrected. The following parameters should be evaluated to determine if the difference has an impact on the actions to be taken by the operators:

to:

Noticeable differences shall be corrected unless a training needs assessment has determined that a change to the simulator is not required. Noticeable differences that do not impact the actions to be taken by the operator or do not detract from training are acceptable and are not required to be corrected. The following parameters should be evaluated to determine if the difference has an impact on the actions to be taken by the operators:

Reason: Could be implied a TNA is required for every simulator noticeable difference.

Against:

No change necessary
Not comfortable with the logic

6.17 Recessed: 1730

7. Thursday 2013 July 25 (0800)

7.1 Roll Call

Jim Florence
Bob Felker - Proxy
Keith Welchel
F.J. (Butch) Colby
Lawrence (Larry) Vick
George McCullough
Frank Tarselli
SK Chang
David Goodman
Jody Lawter
Mac McDade
Michael Petersen
Bill Hendy - Proxy
Pablo Rey
Jim Sale – Proxy
William Fraser

Proxy/Visitors:

Tim Dennis
Vincent Gagnon
Majid Mirashah

7.2 Consensus Level

16 - Voting members
16 - Voting members Present (3 Proxy Votes)
9 - Quorum (Majority Total Membership)
12 - Consensus (≥ 75% votes)
11 – Super Majority (≥ 2/3 Votes)
9 – Majority (> 50% votes)

7.3 Final read Action Items Resolution

Items in RED required additional attention at the time of the read.

Section	Action Description	Team	Status	Proposal	Resolution
N/A	Globally referencing sections by title consistency. Some have the name and some do not.	Goodman Chang	Closed	Suggest editorial change to remove title of referenced section in paragraphs: 3.1, 3.1.4, 3.3.5, 4.3.5, 5, and 5.2.3	Editorial change No Action.
N/A	AI owners ensure detailed notes are incorporated so that an un-informed reader can understand.	Florence Colby Felker	Closed	See AI-52.docx for sections 3.1.4, 3.4.1 and Appendix "B".	WG reviewed Felker Comments for AI-52. AI-52 text will be incorporated into the minutes during AI-52 discussion.
N/A	Review all numbered list for correct format (e.g. 1) (1) 1.)	Fraser Chang	Closed	Close with no action.	Team found no inconsistencies in the standard. Closed with no action.
¶ 1.2	10CFR55 reference allowed? Why?	Florence	Closed	The Policy Manual for the ANS Standards Committee and the NFSC Policy and Procedures	ANS policy manual and NFCS policy manual allow reference to 10 CFR 55.

				Manual allow reference to 10CFR55 in Section 1.2 of the ANS-3.5-201X Standard.	
N/A	Passive failure is no longer used in the standard. Definitions Section review is required.	Goodman Chang	Closed	Remove definition for "Passive failure". This term is not used in the body of the standard.	**Motion**: Delete the definition "passive failure" from the definitions Section 2. **Reason**: Passive Failure is no longer used in the Standard.
N/A	Reference unit: review use of "docket number" since docket number does not apply to international simulators.	Chang Rey	Closed	Included in tech editing review.	**Motion**: Change Section 2 definition for reference unit from: The specific nuclear power plant unit, identified by a unique docket number, from which the simulator control room configuration, system control arrangement, and simulator design data are derived. To The specific nuclear power plant unit from which the simulator control room configuration, system control arrangement, and simulator design data are derived. **Reason**: Some nuclear plants do not have docket numbers.
	Definition Replay and Fasttime:	Lawter	Closed		Motion:

	Replay is the playback of a recorded session and not the recording of the session.	Fraser			Change Section 2 definition fast time from: To increase the rate of simulation for some or all computed values with respect to real time. To A function of the simulation software which increases the rate of simulation for some or all computed values with respect to real time.
	Initial Condition	Fraser Tarselli	Closed		Current definition is fine.
	Snapshot	Fraser Tarselli	Closed		Current definition is fine.
	"Benchmark" definition needed? (Already covered AI-37).	Hendy Goodman	Closed	Simulator performance benchmark is fully described in section 5.1.2. This has already been discussed and closed in AI-37.	Simulator performance benchmark is fully described in section 5.1.2. This has already been discussed and closed in AI-37.
	Definition needed for "scenario".	Hendy Vick	Closed		Already defined.
	Review and possibly expand stimulated components to include other types such as emulated, hybrid, etc.	Felker Tarselli	Closed	No change recommended. The "stimulated component" definition uses the term "hardware/software component"; this term encompasses emulated,	No change recommended. The "stimulated component" definition uses the term "hardware/software component"; this term encompasses emulated,

				hybrid, DCS and/or HMI component.	hybrid, DCS and/or HMI component.
	3.1.3.2 - Why is "operator-conducted surveillance testing on safety related equipment or systems" in the list?	Colby Felker	Closed	Basis does not exist in 10CFR55. If there is no basis in regulatory space then we really don't see where this item adds anything nor should it remain.	No action recommended. It's a holdover from previous standards.
	3.1.4/A.1.3 Item 4 Use of "reach, exceed and exceeded" use consistency.	Chang	Closed	Change the word "reach" or its variations to "exceed" or its variations as appropriate, just to be consistent.	No change Use of reach and exceed were reviewed and inconsistencies noted were not considered needing change.
	3.3.2 Delete everything starting with the word "and". Modify the first sentence.	Tarselli Rey	Closed		Motion: Change The first paragraph in Section 3.3.2 from: The simulator shall be capable of initiating the malfunctions required in Sec. 3.1.4 and as required by the accredited licensed operator training program. To The simulator shall be capable of initiating the malfunctions required in Sec. 3.1.4.

	3.3.2/4.3.4 remove the word "licensed" and just use "accredited operator training programs".	Tarselli Rey Hendy	Closed		No longer valid due to change in Section 3.3.2 See previous item.
	3.2.2.1 change "describe" to "require" for consistency.	Tarselli	Closed		Review with no change.
	3.1.4 INPO SOER is no longer used… IER.	Hendy Vick	Closed		Tech Edit Update.
	3.1.4 Consider adding DCD, new Builds have DCD in addition to FSAR.	Felker Lawter	Closed	Change item # 6 to read: (6) reference unit Safety Analysis Report or Design Control Document	No change. DCD's evolve into FSAR which are already referenced. AI-60 – Dennis Determine acronym for IER. Industry Event Report or INPO Event Report.
	3.2.2.2 Is a scoping section. The last sentence has nothing to do with the topic. Consider deleting the last sentence.	Felker Fraser Hendricsen	Closed	No change; after reading it again it does seem to make sense where it is.	No change; after reading it again it does seem to make sense where it is.
	3.3.4/4.3.4 Multi-unit interaction. No test criteria for Multi-Unit testing.	Felker Goodman	Closed	Add new requirement to 4.3.4 as follows: "It shall be demonstrated that the simulator permits the instructor to control common resources available from the other unit or units that impact	No change. Present testing requirements are satisfactory.

				operator response on the reference unit."	
	3.3.5/4.3.5 Review the use of parametric. Is it outdated.	Lawter Fraser	Closed		No change. The word "parametric" is still relevant.
	3.4/5.2.3.2 Stand-alone mode may need a definition.	Felker Goodman Tarselli	Closed		No change. Stand-alone does not need a definition.
	3.4.2 Modify the last sentence to include "evaluated scenarios".	Hendy Tarselli	OPEN		Evaluated scenarios are different than training. Additional input from Hendy required.
	3.1.3 does instrumentation cover DCS HSI type devices (see 3.2.1.2 and 4.2.1.2).	Felker Rey Tarselli	Closed	Existing words are adequate; no further action is required.	No change. Existing words are adequate; no further action is required.
	Non-existent systems do not have number. No corresponding section 3 to 4 or 4 to 3. Example 4.1.3.1.1 and no 3.1.3.1.1.	Rey Fraser	Close		See Tech Edit below:

Tech Edit: Replace Sections 4.1.3.1.1, 4.1.3.1.2, 4.1.3.1.3, 4.1.3.1.4 with

(1) It shall be demonstrated that the following PWR parameters match reference unit data within 1% of the reference unit instrument loop range:

- average reactor coolant system temperature;
- reactor coolant system hot leg temperature;

- reactor coolant system cold leg temperature;
- reactor core thermal power;
- nuclear instrumentation power indication;
- pressurizer pressure;
- steam generator pressure;
- pressurizer level.

(2) It shall be demonstrated that the following PWR parameters match reference unit data within 2% of the reference unit instrument loop range:

- steam generator feed flow;
- reactor coolant system flow;
- steam generator level;
- letdown flow;
- charging flow;
- main steam flow;
- main turbine first stage pressure;
- main generator gross electrical power.

(3) It shall be demonstrated that the following BWR parameters match reference unit data within 1% of the reference unit instrument loop range:

- reactor core thermal power;
- reactor narrow range pressure;
- reactor wide range pressure;
- total core flow.

(4) It shall be demonstrated that the following BWR parameters match reference unit data within 2% of the reference unit instrument loop range:

- average power range monitor readings;
- feedwater temperature (after the last feedwater heating stage);
- total main steam flow;
- individual recirculation loop flows;

• total feedwater flow; • main turbine steam flow; • main condenser vacuum; • individual calibrated jet pump flow; • narrow range reactor water level; • control rod drive system flow and temperature; • main generator gross electrical power.					
	4.1.3.1.1 remove: Note: This was changed in later meetings.	Colby	Closed	In two-column document Rev 7h. Approved change from the April 2-5 Palo Verde meeting. Action Item #52 Due to the re-ordering the numbering of Appendix C to Appendix B, the footnote will need to be changed to Appendix B Reason: • Refer to wording above for the deletion of Appendix B • This is considered a Tech Editing change	The text "This was changed in later meetings. was deleted and the Comment was kept.
	4.1.3.1 are all parameters applicable to all designs.	Florence Goldman	Closed	Modify all lead-in sentences in Section 4.1.3.1 to "It shall be	No change

				demonstrated that the following (PWR/BWR) parameters (as applicable to plant design) match reference unit data within 1% of the reference unit instrument loop range.	Section 4.3.1 already allows for data comparison for which reference unit data is available.
	4.1.3.2 Why are Normal Evolutions required testing Once Per Fuel Cycle.	Felker Hendricsen	Closed		No change. Adequate
	4.1.3.1.4 two parameters in one bullet: "control rod drive system flow and temperature.	Tarselli	Closed		No change. Adequate
	4.4.3 Use of Predicted versus using Best Estimate that is defined. Predicted is not defined.	Hendy Goodman	Closed	The phrase "actual or predicted" appears in 4.4.1, 4.4.3, 5.2.3.2, and the definition of performance testing. Suggest changing the word "predicted" to "best estimate" in all places.	No Change Both are used. No conclusion either is better for a particular use. Usage is appropriate and consistent with 10CFR language.
	4.3.3 Second paragraph, change defined to identified.	Goodman	Closed	Suggest editorial change from "defined" to "identified".	Tech Edit: Change Second paragraph in Section 4.3.3 from: 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. 5. To For a stimulated component it shall be documented that noticeable differences have been identified and that a training needs assessment has been performed in accordance with Sec. 5.
	4.4. Second Paragraph, second sentence – "maintain records" is duplicated in the sub sections. It's in three of the four. Make consistent.	Goodman Welchel	Closed	Remove sentence "A record of the conduct of this test and its evaluation shall be maintained." From sections 4.4.1 and 4.4.3. Replace the last sentence in 4.4 "A record of the conduct of these tests, and data comparison that the results meet reference unit data, shall be maintained." With the sentence "A record of the conduct of these tests and	**Motion:** **This Motion changes Sections 4.4, 4.4.1 and 4.4.3.** **Section 4.4 – Change the last paragraph from:** It shall be demonstrated that simulator performance testing is conducted as specified below. A record of the conduct of these tests, and data comparison that the results meet reference unit data, shall be maintained **To:** It shall be demonstrated that

				evaluation shall be maintained."	simulator performance testing is conducted as specified below. A record of the conduct of these tests and their evaluations shall be maintained.{Footnote: Appendix A provides examples of acceptable simulator performance test documentation} **Section 4.4.1 -** Delete the last sentence and footnote: "A record of the conduct of this test and its evaluation shall be maintained." **Section 4.4.3 -** Delete the last sentence and footnote: "A record of the conduct of this test and its evaluation shall be maintained."
	4.1.3.1 Footnote 6 and 7 are incomplete.	Goodman Colby	Closed	Existing footnote is acceptable.	No change. Existing footnote is acceptable.
	4.3.5 the plot may no longer be a common use term. Review for possibly removal.	Fraser Goldman	Closed		No change. Review of the use of the word "plot" indicates it is widely used.
	4.3.2 reword for clarity. First line	Fraser	Closed		No change.

	needs work.	Goldman			Reflects back to the title.
	4.2.2/4.1.3 No periodicity.	Rey McCullough	Closed		4.2.2 – No change 4.1.3 – AI-54 Steadystate is listed in two section 4.1.3and 4.4.1 and periodicity is defined only in Section 4.4.1. This item is left open pending AI-54 discussion
	4.4.1/4.1.3.1 repeating testing requirements steady-state operation and for operability testing. Reference AI-9.	Rey Vick Felker	Closed		No change. Intent of each section describe unique testing requirements.
	4.4.1/5.2.3.2 Second paragraph use “best estimate” versus “predicted”.	Hendy Goodman	Closed	See previous recommendation above.	No Change Both are used. No conclusion either is better for a particular use. Usage is appropriate and consistent with 10CFR language.
	4.3.4 Review for clarity: The introduction of the local operator action shall not alert the operators to pending events other than by indications that would occur in the reference unit.	Chang Vick	Closed		Motion Not Carried **Change the first paragraph in Section 4.3.4 from:** It shall be demonstrated that the capability exists to reproduce the local operator actions required by Sec. 3.3.4

					and the accredited licensed operator training program. The introduction of the local operator action shall not alert the operators to pending events other than by indications that would occur in the reference unit. **To** It shall be demonstrated that the capability exists to reproduce the local operator actions required by Sec. 3.3.4 and the accredited licensed operator training program.
	4.4 remove "NOTE: Moved from section 4.4.3".	Colby	Closed	Not in the single column document yet.	Test Removed
	5.1.1 was "Current approved software" intentionally deleted. Review the original motion.	Goodman	Closed	This item was intentionally left out of the original motion in AI-11.	No change This item was intentionally left out of the original motion in AI-11.
	5.3 item 6 add "knowledge and" before skills.	Chang Goodman	Closed		Motion Not carried Motion: Change Section 5.3, item 6 to read: (6) the review of operational experience to identify the potential for operator error

					or the necessity for reinforcement of the knowledge and skills required for the task.
	5.2.3.1 Should there be a statement that Verification testing is needed before use in operator training.	Chang Goodman	Closed		No change. Current guidance is adequate. Strawpoll did not indicate support.
	Review Section 5 for use of sub numbering: e.g. – (1) versus 1 (Sections 5.1.2, 5.2, 5.2.2.	Chang	Closed	Close with no action.	No change. Review indicates numbering is adequate.
	5.3 – is a TNA required for each discrepancy?	Florence Goodman	Closed	Suggest adding to first sentence of 5.3 from "A training needs assessment shall be performed for each noticeable difference to determine if a change to the simulator is required." to: *"Noticeable differences shall be corrected unless a training needs assessment has determined that a change to the simulator is not required."*	Motion: **Section 5.3 – Change the lead paragraph from:** A training needs assessment shall be performed for each noticeable difference to determine if a change to the simulator is required. Noticeable differences that do not impact the actions to be taken by the operator or do not detract from training are acceptable and are not required to be corrected. The following parameters should be evaluated to

					determine if the difference has an impact on the actions to be taken by the operators: **to:** Noticeable differences shall be corrected unless a training needs assessment has determined that a change to the simulator is not required. Noticeable differences that do not impact the actions to be taken by the operator or do not detract from training are acceptable and are not required to be corrected. The following parameters should be evaluated to determine if the difference has an impact on the actions to be taken by the operators
	5.2.2 – paragraph implies a plant modification could be considered a discrepancy.	Florence Goodman	Closed	The terms deviation, deficiency, and modification are used in the definition of a training needs assessment. Discrepancies are differences, not necessarily deficiencies.	No change The terms deviation, deficiency, and modification are used in the definition of a training needs assessment. Discrepancies are differences, not necessarily deficiencies.
	5.2.3 – “affect” or “affects”?	Chang	Closed	Do not recommend any	No change

				changes.	Grammar is correct.
	Review Appendix A for continued use.	??	Closed		No Change Appendix will remain.
	A.1 – should "evaluation" be "examination"?	Florence Chang	Closed	Change "evaluation" to "examination" and "tool" to "device" in the context of operator activities.	AI-63 Assigned Change "evaluation" to "examination" and "tool" to "device".
	A.1.1 Items (1) through (3) – why?	Florence Welchel	Closed	No change; information provided in Section A.1.1 provides familiarization with the specific simulator.	No change No change; information provided in Section A.1.1 provides familiarization with the specific simulator.
	Appendix A.2 review for clarity Structure (Rey); does it align appropriately with Section 5? (Florence)	Rey Florence	Closed	Delete Section A.2 since it is now covered by 5.1.1.	No change List are examples only.
	A.3 – capitalization of items (1) through (3)??	Florence	Closed	Allow INPO, NRC and ANS technical editors to make this call.	See Tech Edit Review A42
	Appendix A.3 Simulator documentation – The bullets need to be reviewed for correct grammar, punctuation.	Hendy Chang	Closed		See Tech Edit Review A42

	Appendix A.2 the list may be outdated (e..g. annunciators book, process computer book). The list should be bought up to date. The Appendix A List in general needs consideration.	Felker McDade	Closed	Delete Section A.2 since it is now covered by 5.1.1.	No change List are examples only.
	Re-designate Appendices. The content in Appendix B was deleted only.	Colby	Closed	Refer to write up for AI 53.	AI-53 Appendices have been adjusted. ANS input is that blank Appendices are not allowed.
	Appendix C – Examples: words following ";" should not be capitalized. Some grammatical restructuring may be required in this section.	Florence Chang	Closed	Allow INPO, NRC and ANS technical editors to make this call.	Allow INPO, NRC and ANS technical editors to make this call.
	D.2 3.1.3 the word discussion is in () why? Note: Appendices have been reordered and D.2 3.1.3 is now C.2.3.1.3.	Chang Goodman	Closed	Delete "(discussion)"; it started with the 98 Standard.	See Tech Edit Item C7 (Chang)
	D.1. Second paragraph third sentence change "analysis of training requirement" to "a training needs assessment."	Lawter Goodman	Closed	Suggest editorial change "analysis of training requirement" to "a training needs assessment." In section	No change Current language is sufficient

				C.1.	
	D.2 Section 3.1.4: delete "list of malfunctions".	Florence	Closed	This reference is still applicable to Section 3.1.4.	See Tech Edit Item C8 (Chang)
	D.2 – Sections 3.2.1.1 and 4.2.1.1 – change title of this section.	Colby Chang	Closed	Completed.	Completed. In Two column document Rev 8.

7.4 Motion (Carried): Section 3.1.4 Item (1)

This is a Tech Edit update.

Motion: **Carried**
- 14 – For
- 1 – Against
- 1 – Abstained

Date 2013jul25

Motion:

Change Item (1) in 3.1.4 from:

(1) Licensee Event Reports, Significant Event Reports, and Significant Operating Experience Reports;

To

(1) industry event reports such as Licensee Event Reports, Significant Event Reports, INPO Event Reports, and Significant Operating Experience Reports;

Reason: Add INPO Event reports and suggest limitations in the number of reports that need to be review.

Against:

Needlessly expands the number of considerations

7.4.1.1 AI-52 Closure

Action Item # 52 Closure

Reason for change to ANS 3.5 Standard for sections 3.1.4, 3.4.1 and removal of the previous Appendix "B"

- Reason for change to ANS 3.5 Standard for sections 3.1.4, 3.4.1 and removal of the previous Appendix "B"
- During the comment resolution phase of the ANS 3.5 2009 standard development, the working group received two similar comments regarding applicability of the standard for "new build" commercial nuclear power plants:

1) Add sentence to end of the first paragraph in the Forward "The "Foreword" to the standard should explain whether and how the standard is applicable to next-generation LWRs as well as to non-LWRs" and

2) "This standard provides absolutely no guidance for the "next gen" power plant licensees".

- The working group acknowledged these comments and added the following sentence to the Foreword "This revision of the standard does not preclude applying the functional requirements and criteria of this standard to next-generation reactors". Additionally, the working group created an action item for the next ANS 3.5 Working Group to examine potential changes to the standard considering the various reactor designs offered for new build plants. Action Item #9 was created and a subcommittee tasked with researching the possible designs and whether the 2009 version of the standard provided sufficient guidance for a plant reference simulator for those designs. The subcommittee catalogued the various Chapter 15 DCD filings for the most popular designs and considered the category of Small Modular Reactors generically. The following designs were reviewed:

Design Certifications Submitted:

GEH ABWR
Toshiba ABWR
West AP1000

GEH ESBWR
Areva US EPR
MHI US APWR

Expected Design Certifications:

KEPRI APR1400
NuScale SMR PWR
Toshiba 4S Liquid Metal
West SMR
Babcock & Wilcox mPower PWR

- Priority was given to designs actually under construction in the United States and near term (5 year look forward) COL's. Over the course of the subcommittee's work, several of the candidates moved up and down within our priorities and resources were committed as available to review the AP1000, ABWR and GEH ESBWR.
- It became apparent to the subcommittee that portions of the malfunction list in section 3.1.4 and list of transients in Appendix "B" were problematic for the new builds since their intrinsic design precluded the possibility of such malfunctions or transients.
- Consideration was given to multiple lists based on reactor designs but the subcommittee rejected that approach as unwieldy and focused our efforts on identifying generic guidance that could be applied regardless of reactor type and regardless of whether the reactor was a legacy or new build design. That approach led to a malfunction concept necessary to support the requirements of 10CFR50.55 and the design specific SAT malfunctions. A similar concept was defined for transients and a process to determine the appropriate bounding transients for the particular reactor design was created.
- During the deliberations associated with these changes, the full committee realized the value not only to new builds but to the legacy plants as well in examining the simulator's malfunction suite and bounding transients from a dynamic process rather than static lists. Hence, we have made the recommended changes to these sections for full industry vetting.

Previous reasons:

- The list of 25 is not sufficient to meet this standard's scope:
- This standard establishes the functional requirements for full-scope nuclear power plant control room simulators for use in operator training and examination.)
- The standard also establishes criteria for the scope of simulation, performance, and functional capabilities of simulators.
- This standard does not address simulators for test, mobile, and research reactors, or for reactors not subject to U.S. Nuclear

Regulatory Commission (NRC) licensing.

AI-52 is Closed.

7.5 AI-54 (Goodman) Discussion

AI-54 was discussed

7.6 Motion (Carried): Operability to Transient Term Update

This is a Tech Edit update.

Motion: **Carried** • 15 – For • 1 – Against • 0 – Abstained
Date 2013jul25 **Motion**: **Section 3.4 replace the word "operability" with "transient"** **Replace Section 3.4.1 with:** 3.4.1 Simulator transient testing Simulator transient testing shall be conducted to confirm overall simulator model completeness and integration. Simulator transient performance shall be evaluated for a benchmark set of transients. The type and the number of transient performance tests selected shall be sufficient to

demonstrate integrated model performance within the scope of simulation. Preference should be given to those transients expected to occur during the life of the reference unit. The transient selection process should use the following references:

(1) reference unit design;
(2) operational transients;
(3) anticipated operational occurrences;
(4) faults of moderate frequency;
(5) loss-of-coolant accidents;
(6) design basis events.

Replace Section 4.4.1 with:

4.4.1 Simulator transient testing

Simulator transient testing shall be conducted once per reference unit fuel cycle by evaluating simulator transient performance for a benchmark set of transients. Simulator transient performance shall be demonstrated through the comparison of transient performance response to actual or predicted reference unit performance.

It shall be demonstrated that simulator response during the conduct of transient testing meets the following acceptance criteria:

(1) Any observable change in simulated parameters corresponds in direction to the change expected from actual or best estimate response of the reference unit;

(2) The simulator shall not fail to cause an alarm or automatic action if the reference unit would have caused an alarm or automatic action under identical circumstances;

(3) The simulator shall not cause an alarm or automatic action if the reference unit would not cause an alarm or automatic action under identical circumstances.

The minimum set of parameters to be monitored for each selected transient performance test

shall be those parameters required to evaluate integrated model performance.

Replace the first paragraph in Section 4.1.3.1 with:

Steady-state testing shall be conducted:

(1) upon completion of simulator initial construction;

(2) once per reference unit fuel cycle.

It shall be demonstrated that the simulator correctly represents the response of the reference unit at three different power levels spanning at least 50% of the operating range for which reference unit data is available. The simulator power levels at which the comparison is performed shall have been attained through continuous operation over the power range.

Replace the first paragraph in Section 5.1.2 with:

The simulator performance benchmark comprises the reference data necessary for the completion of steady-state testing defined in Sec. 4.1.3.1 and transient testing defined in Sec. 4.4.1 at the time the simulator is approved for use in operator training and examination. When multiple sources of baseline data are available, the order of preference to ensure simulator fidelity shall be as follows:

Replace the first paragraph in Section 5.2.4 with:

The simulator performance benchmark comprises the reference data necessary for the completion of steady-state testing defined in Sec. 4.1.3.1 and transient testing described in Sec. 4.4.1. The simulator performance benchmark shall be maintained current with the expected response of key parameters identified for each test.

Reason: Remove the term Operability and replace with Transient.

Against:

Goes beyond the initial motion objective and removes Steady-state from Performance tests to a capability.

By definition Steady State is a Performance test.
Appears the Scope is changed by replacing Operability with Transient. Operability and Transient are not equivalent.

7.7 AI-54 (Goodman) - Review PEST testing requirements

The following was presented for discussion. Modified wording is in RED

Proposed Version
3.4 Simulator performance testing Simulator performance testing shall be conducted to identify noticeable differences between the simulator control room or simulated systems when evaluated against the control room or systems of the reference unit. Noticeable differences shall be assessed in accordance with Sec. 5. Simulator performance testing comprises transient testing, scenario-based testing, reactor core performance testing, and post-event simulator testing. **The purpose, method, and acceptance criteria differ for each type of test. Performance tests shall be conducted in a manner consistent with the test purpose and in a manner sufficient to ensure that acceptance criteria are met.** **Successful completion of simulator performance testing and other tests described in Sec. 4 demonstrate that the simulator is sufficient in scope and fidelity to be used in operator training and examination.**

7.8 Motion (No Vote): PEST in partially integrated, or stand-alone mode of system operation

Substantive requires Consensus Vote; 13 - Consensus (≥ 75% votes)
Substantive Change: A substantive change in a proposed American National Standard is one that directly and materially affects the use of the standard. Examples of substantive changes are below:
"shall" to "should" or "should" to "shall";
addition, deletion or revision of requirements, regardless of the number of changes;
Addition of mandatory compliance with referenced standards

Motion:
- xx – For
- x – Against
- x – Abstained

Date 2013jul25

Motion:

Change the last paragraph in Section 3.4 to:

Simulator performance testing comprises transient testing, scenario-based testing, reactor core performance testing, and post-event simulator testing. Transient testing and scenario-based testing shall be performed in a fully integrated mode of operation. Reactor core performance testing and post-event simulator testing may be conducted in a fully integrated, partially integrated, or stand-alone mode of system operation.

Reason:.

Against:

7.9 Amended Motion (Carried): PEST in partially integrated, or stand-alone mode of system operation

Substantive requires Consensus Vote; 12 - Consensus (≥ 75% votes)
Substantive Change: A substantive change in a proposed American National Standard is one that directly and materially affects the use of the standard. Examples of substantive changes are below:
"shall" to "should" or "should" to "shall";
addition, deletion or revision of requirements, regardless of the number of changes;
Addition of mandatory compliance with referenced standards

Motion: **Carried**
- 12 – For
- 3 – Against
- 1 – Abstained

Date 2013jul25

Motion:

Change the last paragraph in Section 3.4 from:

Simulator performance testing comprises operability testing, scenario-based testing, reactor core performance testing, and post-event simulator testing. Operability testing, scenario-based testing, and post-event simulator testing shall be performed in a fully integrated mode of operation. Reactor core performance testing may be conducted in a fully integrated, partially integrated, or stand-alone mode of system operation.

to

Simulator performance testing comprises transient testing, scenario-based testing, reactor core performance testing, and post-event simulator testing. Transient testing and scenario-based testing shall be performed in a fully integrated mode of operation. Reactor core performance testing and post-event simulator testing may be conducted in a fully integrated, partially integrated, or stand-alone mode of system operation.

Reason: To provide greater flexibility in the conduct of PEST to maximize the availability of the simulator for testing purposes; This may require a non fully-integrated testing mode. The scope of the event may not require a fully integrated mode. Lack of simulator availability to construct and execute the PEST. Greater flexibility to encourage a more frequent conduct of PEST. Non fully-integrated testing mode enables the flexibility to match the unit event actions/timeline as closely as possible.

Against:
- Does not meet regulatory requirements
- Not being fully-integrated reduces the test validity of the test
- PEST to be used as confirmation should be run Full-integrated

AI-54 is closed.

7.10 Consensus Level

17 - Voting members
17 - Voting members Present (4 Proxy Vote)
9 - Quorum (Majority Total Membership)
13 - Consensus (≥ 75% votes)
12 – Super Majority (≥ 2/3 Votes)
9 – Majority (> 50% votes)

7.11 Motion (Carried): AI-59 PEST use of Unit procedure

Motion: **Carried**

- 17 – For
- 0 – Against
- 0 – Abstained

Date 2013jul25

Motion:

In Section 4.4.4 change the first list item from

(1) consider the sequence of events, consider operator actions, and be performed in accordance with reference unit procedures;

to:

(1) consider the sequence of events and operator actions as performed on the reference unit;

Reason: To be consistent with actual operator actions during the event. Unit procedures may not have been explicitly followed during the unit event.

AI-59 is closed.

7.12 AI-65 Tech Edit Items List in Sections 4.1.3.2

Update the Items List in Sections 4.1.3.2

(1) the reference unit startup test procedure acceptance criteria;
(2) the reference unit surveillance procedure acceptance criteria;
(3) the reference unit normal operating procedure acceptance criteria;
(4) any observable change in simulated parameters corresponds in direction to the change expected from actual or best estimate response of the reference unit;
(5) the simulator shall not fail to cause an alarm or automatic action if the reference unit would have caused an alarm or automatic action under identical circumstances;
(6) the simulator shall not cause an alarm or automatic action if the reference unit would not cause an alarm or automatic action under identical circumstances.

7.13 AI-66 Tech Edit Items List in Sections 4.1.4, 4.4.1, 4.4.2

Remove list capitalization

7.14 AI-64 Tech Edit Review uses of "by this section"

Review uses of "by this section"

7.15 Recessed: 1730

8. Friday 2013 July 26 (0800)

8.1 Roll Call

Members Present:

Jim Florence
Bob Felker - Proxy
Keith Welchel
F.J. (Butch) Colby
Lawrence (Larry) Vick
George McCullough
Frank Tarselli
SK Chang
Robert Goldman - Proxy
David Goodman
Mac McDade
Michael Petersen
Bill Hendy - Proxy
Pablo Rey
Jim Sale – Proxy
William Fraser

Proxy/Visitors:

Tim Dennis
Vincent Gagnon
Winston AuDuong
Majid Mirashah

8.2 Consensus Level

16 - Voting members
16 - Voting members Present (4 Proxy Vote)
9 - Quorum (Majority Total Membership)
12 - Consensus (≥ 75% votes)
11 – Super Majority (≥ 2/3 Votes)
9 – Majority (> 50% votes)

8.3 Chang – Use of "by"

Reviewed recommendation is to make no change.

8.4 Tech Edit Item review

All Tech Edit Items are closed.

8.5 AI-59 is close

8.6 AI-67 (Rey) Discussion: Move Steady-state and Normal Evolutions from Criteria to Performance

8.7 Motion (Not Carried): Move Steady-State and Normal Evolution to Section 4.4 Simulator performance testing

Substantive requires Consensus Vote; 12 - Consensus (≥ 75% votes)
Substantive Change: A substantive change in a proposed American National Standard is one that directly and materially affects the use of the standard. Examples of substantive changes are below:
"shall" to "should" or "should" to "shall";
addition, deletion or revision of requirements, regardless of the number of changes;
Addition of mandatory compliance with referenced standards

Motion: **Not Carried**
- 11 – For
- 5 – Against
- 0 – Abstained

Date 2013jul26

Motion:

Move Section 3.1.3 to Section 3.4.1.

Move Section 4.1.3 to Section 4.4.1.

Create Action Item to:

- renumber Section 3.1 as necessary
- renumber Section 4.1 as necessary
- renumber Section 3.4 as necessary
- renumber Section 4.4 as necessary
- review and update corresponding references associated with these changes.

Change second paragraph in Section 3.4 from:

Simulator performance testing comprises transient testing, scenario-based testing, reactor core performance testing, and post-event simulator testing. Transient testing and scenario-based testing shall be performed in a fully integrated mode of operation. Reactor core performance testing and post-event simulator testing may be conducted in a fully integrated, partially integrated, or stand-alone mode of system operation.

To:

Simulator performance testing comprises steady-state and normal evolution testing, transient testing, scenario-based testing, reactor core performance testing, and post-event simulator testing. Steady-

state and normal evolution testing, transient testing and scenario-based testing shall be performed in a fully integrated mode of operation. Reactor core performance testing and post-event simulator testing may be conducted in a fully integrated, partially integrated, or stand-alone mode of system operation.

Reason: Steady-State and Normal evolutions are performance based related. This update does not modify the scope of simulation required in section 3.2. Follow up to AI-54 (Motion) to eliminate duplicity.

Reason Against:
- Normal Evolutions into performance testing increases testing burden
- Would consider Steady-state only modification
- Possibly unintended consequences
- Documentation requirements unclear

8.8 New Consensus Level

Two working group members left early. New consensus level calculated.

14 - Voting members
14 - Voting members Present (4 Proxy Vote)
8 - Quorum (Majority Total Membership)
11 - Consensus (≥ 75% votes)
10 – Super Majority (≥ 2/3 Votes)
8 – Majority (> 50% votes)

8.9 Motion (Not Carried): Move Steady-State to Section 4.4 Simulator performance testing

Substantive requires Consensus Vote; 11 - Consensus (≥ 75% votes)
Substantive Change: A substantive change in a proposed American National Standard is one that directly and materially affects the use of the standard. Examples of substantive changes are below:
- "shall" to "should" or "should" to "shall";
- addition, deletion or revision of requirements, regardless of the number of changes;
- Addition of mandatory compliance with referenced standards

Motion: **Not Carried**

- 7 – For
- 7 – Against
- 0 – Abstained

Date 2013jul26

Motion:

Move Section 3.1.3.1 to Section 3.4.1.

Move Section 4.1.3.1 to Section 4.4.1.

Rename Section 3.1.3 and 4.1.3 to Normal Evolutions

Rename Section 3.4.1 and 4.4.1 to Steady-state operation testing

Create Action Item to:

- **renumber contents of Section 3.1.3 as necessary**
- **renumber contents of Section 4.1.3 as necessary**
- **renumber contents of Section 3.4.1 as necessary**
- **renumber contents of Section 4.4.1 as necessary**
- **renumber contents of Section 3.4 as necessary**
- **renumber contents of Section 4.4 as necessary**
- **review and update corresponding references associated with these changes.**

Change second paragraph in Section 3.4 from:

Simulator performance testing comprises transient testing, scenario-based testing, reactor core performance testing, and post-event simulator testing. Transient testing and scenario-based testing shall be performed in a fully integrated mode of operation. Reactor core performance testing and post-event simulator testing may be conducted in a fully integrated, partially integrated, or stand-alone mode of system operation.

To:

Simulator performance testing comprises steady-state testing, transient testing, scenario-based testing, reactor core performance testing, and post-event simulator testing. Steady-state testing, transient testing and scenario-based testing shall be performed in a fully integrated mode of operation. Reactor core performance testing and post-event simulator testing may be conducted in a fully integrated, partially integrated, or stand-alone mode of system operation.

Reason: Steady-State are performance based related. This update does not modify the scope of simulation required in section 3.2. Follow up to AI-54 (Motion) to eliminate duplicity.

Reason Against:

Steady-state and Normal Evolution need to be changed together
Motion does not address all the issues
Current structure is appropriate
No significant moving test to performance testing.
Time-pressure to make determination

8.10 Next Meeting Tentative

Florence will send Email requesting member availability.

Locations:

GSE - GA

8.11 Adjourned: 1150

9. Attachment 1 - Style Guide Review (SK Change)

201x Standard - Style Guide

1. **ANSI Style Guide-sheet – 2003**

   Available at http://www.ansi.org/

   A. General guide-lines
   - **Heavy emphasis on technical integrity (accurate, complete, consistent), a spelling error would only be a minor issue.**
   - **Consistency throughout the document: format, capitalization, etc..**

   B. Strong recommendations:
   - **No requirements in foreword, scope, background, definitions, footnotes.**
   - **Use of "shall" to indicate a requirement; use "should" to indicate a recommendation. Avoid use of "must".**
   - **References: full and complete. Annex is a preferred term to Appendix.**
   - **Number the footnotes sequentially.**

   C. Completeness and consistency of document:
   Pagination, indentation, punctuation, numbering of sections, footnotes, etc.: follow 2009 Standard.

2. **ANSI Style manual, 8th edition, version 1.0, 3/1/91. [historical]**

   http://www.new.ans.org/standards/resources/downloads/docs/ansi-stylemanual.pdf

This has been replaced by the 2003 guide, but ANS keeps it for reference.

3. ANS NFSC Policy and Procedures Manual

http://www.ans.org/standards/resources/downloads/docs/nfscpolicies.pdf
Section 7.3 Specifying Requirements in a Standard (Shall, Should, and May) (approved Jan 2010).
Directions given in the standard shall use "shall", "should", and "may":
Shall, to designate a mandatory action.
Should, to delineate a recommended action. "Should also indicates that the issue must be addressed and that either the recommended action shall be taken or an equivalent action shall be taken and a basis given for equivalency. "
May, to designate a permissive action.
Avoid "shall consider", "shall, if possible" and equivalent phrases
Note: Three occurrences of "shall consider" or equivalent are found in the 2009 Standard. These may deviate from NFSC rules.

Section 3.2.1.2, end of 1st paragraph: "The following items shall be considered:"

Section 3.2.1.3, end of 1st paragraph: "The following items shall be considered:"

Section 4.4.3.2, end of 4th paragraph: "Evaluation of the test data shall consider:"

Section 7.4 Use of units SI units shall be used either parenthetically with English units or SI units exclusively (approved Nov 2004).

It refers to the NBS publication concerning SI units:

NBS Special Publication 330, "The International System of Units (SI)," U.S. Department of Commerce, 1977.

The current version is "NIST Special Publication 330. 2008 Edition; U.S. Department of Commerce, National Institute of Standards and Technology" available at

http://physics.nist.gov/Pubs/SP330/sp330.pdf

The 2008 edition has no impact on the SI units used in Appendix C of the Standard:
MPa and °C

4. **Other References:**

Google dictionary: http://www.google.com/dictionary
Merriam-Webster: http://www.merriam-webster.com/

The Chicago Manual of Style. Chicago: University of Chicago.

Webster's New International Dictionary of the English Language (Unabridged). Springfield, MA: Merriam-Webster, Inc.