



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

August 19, 2010

MEMORANDUM TO: ACRS Members

FROM: Sherry Meador **/RA/**
 Technical Secretary, ACRS

SUBJECT: CERTIFICATION OF THE MEETING MINUTES FROM
 THE ADVISORY COMMITTEE ON REACTOR
 SAFEGUARDS 555th FULL COMMITTEE MEETING
 HELD ON SEPTEMBER 4-6, 2008 IN ROCKVILLE, MARYLAND

The minutes of the subject meeting were certified on June 19, 2008 as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment:
As stated



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

June 19, 2008

MEMORANDUM TO: Sherry Meador, Technical Secretary
Advisory Committee on Reactor Safeguards

FROM: Cayetano Santos, Chief */RA/*
Reactor Safety Branch
Advisory Committee on Reactor Safeguards

SUBJECT: MINUTES OF THE 552nd MEETING OF THE ADVISORY
COMMITTEE ON REACTOR SAFEGUARDS (ACRS),
May 8-10, 2008

I certify that based on my review of the minutes from the 552nd ACRS Full Committee meeting, and to the best of my knowledge and belief, I have observed no substantive errors or omissions in the record of this proceeding subject to the comments noted below.

OFFICE	ACRS	ACRS:RSB
NAME	SMeador	CSantos/sam
DATE	06/ 19 /08	06/ 19 /08

OFFICIAL RECORD COPY

CERTIFIED

Date Issued: June 11, 2008

Date Certified: June 19, 2008

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During its 555th meeting, September 4-6, 2008, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters and completed the following reports and memoranda:

REPORTS

Reports to Dale E. Klein, Chairman, NRC, from William J. Shack, Chairman, ACRS:

- Development of the TRACE Thermal-Hydraulic System Analysis Code, dated September 24, 2008
- Report on the Safety Aspects of the License Renewal Application for the Wolf Creek Generating Station, Unit 1, dated September 17, 2008

MEMORANDA

Memoranda to R. W. Borchardt, Executive Director for Operations, NRC, from Edwin M. Hackett, Executive Director, ACRS:

- Draft Final Revision to Regulatory Guides 10.7, 10.8, and 10.9, dated September 9, 2008
- Draft Regulatory Guides DG-1205, DG-1187, DG-1197, DG-1196, DG-3031, DG-0020, DG-5026, DG-1141, DG-3035, DG-5027, and DG-1203, dated September 9, 2008
- Proposed Interim Staff Guidance (ISG) DC/COL-ISG-06, dated September 9, 2008
- Withdrawal of Regulatory Guide (RG) 8.1, "Radiation Symbol," dated September 9, 2008

MINUTES OF THE 555th MEETING OF THE
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
September 4-6, 2008
ROCKVILLE, MARYLAND

The 555th meeting of the Advisory Committee on Reactor Safeguards (ACRS) was held in Conference Room 2B3, Two White Flint North Building, Rockville, Maryland, on September 4-6, 2008. Notice of this meeting was published in the *Federal Register* on August 22, 2008 (72 FR 49713-49714) (Appendix I). The purpose of this meeting was to discuss and take appropriate action on the items listed in the meeting schedule and outline (Appendix II). The meeting was open to public attendance.

A transcript of selected portions of the meeting is available in the NRC's Public Document Room at One White Flint North, Room 1F-19, 11555 Rockville Pike, Rockville, Maryland. Copies of the transcript are available for purchase from Neal R. Gross and Co., Inc., 1323 Rhode Island Avenue, NW, Washington, DC 20005. Transcripts are also available at no cost to download from, or review on, the Internet at <http://www.nrc.gov/ACRS/ACNW>.

ATTENDEES

ACRS Members: Dr. William J. Shack (Chairman), Dr. Mario V. Bonaca (Vice-Chairman), Dr. Said Abdel-Khalik (Member-at-Large), Dr. George E. Apostolakis, Dr. Sam Armijo, Dr. Sanjoy Banerjee, Dr. Dennis Bley, Mr. Charles Brown, Dr. Michael Corradini, Mr. Otto L. Maynard, Dr. Dana A. Powers, Mr. Harold Ray, Dr. Michael Ryan, Mr. John Sieber, and Mr. John Stetkar. For a list of other attendees, see Appendix III.

I. Chairman's Report (Open)

[Note: Mr. Sam Duraiswamy was the Designated Federal Official for this portion of the meeting.]

Dr. William J. Shack, Committee Chairman, convened the meeting at 8:30 a.m. In his opening remarks he announced that the meeting was being conducted in accordance with the provisions of the Federal Advisory Committee Act. He reviewed the agenda items for discussion and noted that no written comments or requests for time to make oral statements from members of the public had been received. Dr. Shack also noted that a transcript of the open portions of the meeting was being kept and speakers were requested to identify themselves and speak with clarity and volume. Dr. Shack announced that Mr. Charles Brown, Jr. is an official member of the committee with an expertise in digital instrumentation and control.

II. License Renewal Application and Final SER for the Wolf Creek Generating Station, Unit 1

[Note: Peter Wen was the Designated Federal Official for this portion of the meeting.]

The Committee met with representatives of the Wolf Creek Nuclear Operating Corporation (WCNOC) (the applicant) and the NRC staff to discuss the license renewal application (LRA) for the Wolf Creek Generating Station (WCGS) and the associated NRC staff's final Safety Evaluation Report (SER). The operating license for WCGS expires on March 11, 2025. The applicant has requested approval for continued operation for a period of 20 years beyond the current license expiration date. The applicant discussed the resolution of the five open items, of which, two items were related to scoping boundary of station blackout (SBO) recovery paths and the remaining three were related to metal fatigue. For closure of the SBO recovery paths related open items, the applicant submitted an amendment to the LRA by including: (a) a breaker at transmission system voltage on both the East and West switchyard bus and (b) an underground medium voltage switchyard cable. The staff reviewed this amendment and found it to be acceptable. For the metal fatigue issues, the applicant has committed to update the fatigue monitoring program baseline fatigue analyses as follows: (a) for the surge line hot leg nozzle, the applicant will account for the additional insurge and outsurge cycles accumulated in the early years of plant operation, during which thermal cycle counts were not collected in a systematic and rigorous manner, and (b) for the charging nozzles, the applicant will account for differential contribution of fatigue for each category of charging event. Based on the commitments made by the applicant, the staff concludes that the applicant has provided an acceptable basis for managing aging effect of environmentally assisted metal fatigue of surge line hot leg nozzle and charging nozzles in accordance with 10 CFR 54.21(c)(1)(iii).

The staff described its review and inspection of the applicant's scoping, screening, and aging management programs; the program implementation at WCGS; and resolution of the open items. The staff concluded that the requirement of 10 CFR 54.29(a) has been met. The Committee issued a report to the NRC Chairman on this matter, dated September 17, 2008. The Committee concluded that the programs established by the applicant to manage age-related degradation provide reasonable assurance that the WCGS can be operated in accordance with the current licensing basis for the period of extended operation without undue risk to the health and safety of the public. The Committee recommended that the WCNOC application for renewal of the operating license for WCGS should be approved.

III. Draft Final Revision 1 to Regulatory Guide 1.131, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants"

[Note: Mrs. Christina Antonescu was the Designated Federal Official for this portion of the meeting.]

The Committee met with representatives of the NRC staff to discuss Revision 1 of Draft Final Regulatory Guide 1.131, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants." The staff noted that the final Regulatory Guide will be issued as a new regulatory guide bearing the number 1.211.

This Guide endorses IEEE Standard 383-2003, "Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations," with some minor clarifications and/or exceptions. This Guide describes a method that the NRC staff considers acceptable for complying with the Commission's regulations for the qualification of safety-related cables and field splices for nuclear power plants. Some Committee members suggested that clarifications be added in the Guide regarding the definition of risk-significant safety-related equipment (e.g. cable). Also, it should be made clear: that (a) the scope of the Guide is limited to the safety-related cables; (b) the cables under Appendix R "Fire Protection Program for Nuclear Power Facilities" are not within the scope of this Guide; and (c) that there is a need for testing specialty cables with connectors. In addition, some members noted that the last Regulatory Position in this Guide does not offer any specific condition monitoring techniques to assess physical and operating conditions of the cable. It only mentions that some condition monitoring should be incorporated. The requirement for condition monitoring is being imposed without any condition monitoring techniques being endorsed by RG 1.131, Rev. 1. This introduction of cable monitoring establishes a requirement for testing with no defined test methodology or acceptance criteria. Also, the members expressed concern about the lack of adequate time to review the changes made to this Guide the day before the ACRS meeting.

A representative from the industry focus group on equipment qualification also made oral remarks at the meeting. The nuclear industry generally supports the proposed draft final Regulatory Guide except it opposes the requirements for condition monitoring of safety-related power, control, instrumentation, and control cables.

The Committee recommended that a revised copy of this Guide, concurred in by other Offices, be provided to the Committee for its review in a future ACRS meeting.

IV. TRACE Computer Code Peer Review

[Note: Mr. David Bessette was the Designated Federal Official for this portion of the meeting.]

The Committee met with representatives of the NRC staff to discuss the development of the TRACE thermal-hydraulic system analysis code and the outcome of the recently completed peer review. The peer reviewers identified no major deficiencies that preclude the use of TRACE for confirmatory analyses of postulated loss-of-coolant accidents (LOCAs) in current light water reactors (LWRs). Several improvements have been recommended by the peer reviewers and the staff has proposed a plan to address them. The Committee agreed with the recommended improvements and endorsed the staff's plan.

The staff noted that TRACE is now being used for performing small-break and large-break LOCA confirmatory analyses for the Browns Ferry Nuclear Plant extended power uprate (EPU). Plant decks are also being prepared to assist EPU reviews of other BWR designs, as well as Westinghouse, Combustion Engineering, and Babcock & Wilcox PWRs. Analyses of anticipated operational occurrences (AOOs) and chimney instabilities for the Economic Simplified Boiling Water Reactor (ESBWR), and assessments of applicability of TRACE to other new reactor designs are in progress.

The Committee issued a report to the NRC Chairman on this matter, dated September 24, 2008. The Committee concluded that significant progress has been made toward the incorporation of TRACE into the regulatory process. The Committee recommended that further peer review be conducted to evaluate the applicability of TRACE to new LWR designs, as well as for analysis of coupled reactor physics-thermal hydraulics issues related to EPU and expanded operating domains. The Committee also recommended that the capability to evaluate uncertainties in the TRACE code predictions be incorporated into TRACE. The Committee noted that the continued development of TRACE is necessary to keep pace with the evolving industry capabilities.

V. Anticipated Advanced Reactor Research Needs

[Note: Maitri Banerjee was the Designated Federal Official for this portion of the meeting.]

The Committee members discussed anticipated research needs in the area of advanced reactors and identified items to be discussed during the January 2009 Future Plant Designs Subcommittee and the February 2009 full Committee meetings. The Future Plant Designs Subcommittee Chair presented a chronology of recent developments in the area of advanced reactors and an outline of what should be addressed at these two meetings. The following subjects received considerable discussion: use of PRA to establish the licensing basis events; radiological consequence and source term research; and safety system performance and qualification. Some specific issues, unique to HTGR, will also be discussed at the above meetings. Following Commission guidance, HTGR is the current focus of the NRC advanced reactor research plan. The Committee plans to review the NRC advanced reactor research plan during its February 2009, meeting.

VI. Quality Assessment of Selected Research Projects

[Note: Dr. Hossein Nourbakhsh was the Designated Federal Official for this portion of the meeting.]

The Committee discussed the status of the quality assessment of the research projects on: "Assessment of Predictive Bias and the Influence of Manufacturing, Model, and Power Uncertainties in NRC Fuel Performance Code Predictions," and NUREG/CR - 6943, "A Study of Remote Visual Methods to Detect Cracking in Reactor Components." The Committee discussed the results of panel review and the numerical rating scores for these projects. The Committee plans to complete its report on the quality assessment of the research projects noted above during its October 2-4, 2008, meeting.

VII. Subcommittee Reports

Materials, Metallurgy, and Reactor Fuels Subcommittee Report

The Subcommittee on Materials, Metallurgy, and Reactor Fuels met with the NRC staff and representatives from AREVA, Global Nuclear Fuel, Westinghouse, and the Electric Power Research Institute on September 3, 2008, to discuss current fuel designs, new fuel designs, new cladding materials, lead test assembly program post-irradiation examinations, extended burnup experience, recent fuel performance experience, upcoming design and analytical methods.

The Committee recommended that the Subcommittee undertake more detailed reviews of the major topics and issues discussed during the Subcommittee meeting, including:

- New Zirconium base alloys for fuel cladding, guide tube, spacer and channel application
- New UO_2 formulations containing solid solution or grain boundary additives
- Selected topical reports containing significant changes in analytical methods

ESBWR Subcommittee Report

The ESBWR Subcommittee met with the NRC staff and representatives of General Electric Hitachi Nuclear Energy to discuss the PRA supporting the Safety Evaluation Report with Open Items associated with the Economic Simplified Boiling Water Reactor (ESBWR) Design Certification Application. The Subcommittee also continued a review of Section 19.2, on severe accident mitigation.

Chapter 19 of the ESBWR Design Control Document is not a complete description of the PRA. Instead, Chapter 19 presents the results of the PRA. A full description of the PRA was submitted in the form of a topical report, NEDO-33201. Although the Office of New Reactors (NRO) staff has reviewed this document, the review has been done in the context of the overall review of the ESBWR Design Control Document. There is no separate staff-generated safety evaluation for NEDO-33201. Consequently, the Subcommittee opted to interactively discuss four selected accident sequences with the applicant's staff and the NRO staff, with the objective of exploring the quality and completeness of the PRA. The Committee plans to discuss Chapters 19 and 22 and issue an interim letter during its meeting on October 2-4, 2008.

VIII. Executive Session

[Note: Mr. Frank Gillespie was the Designated Federal Official for this portion of the meeting.]

A. Reconciliation of ACRS Comments and Recommendations/EDO Commitments

- The Committee considered the EDO's response of July 8, 2008, to comments and recommendations included in the May 19, 2008, ACRS report concerning the draft NUREG/CR-6962, "Approaches for Using Traditional Probabilistic Risk Assessment Methods for Digital Systems." The Committee decided that it was satisfied with the EDO's response.
- The Committee considered the August 21, 2008, EDO response to the June 3, 2008, ACRS report on Susquehanna extended power uprate application. The EDO response states that the recommended void fraction uncertainty analyses are being performed. The Committee lauds the staff's effort to quantify the impact of void fraction uncertainties on the safety analyses. For any future inquiries or concerns on the Susquehanna EPU application, the EDO proposes that the Committee communicate directly with the Division of Safety Systems. Considering the Committee's mandate is to provide advice to the Commission as an independent advisory body, the Committee disagrees with the EDO's proposal. The ACRS full Committee and Subcommittee meetings are the appropriate forum for holding technical discussions and communications with specific Divisions and Offices of the NRC, including NRR, and other stakeholders.

- The Committee considered the August 27, 2008, EDO response to the July 23, 2008, ACRS report on Millstone Unit 3 stretch power uprate. The Committee decided that it was satisfied with the EDO's response.
- The Committee considered the August 15, 2008, EDO response to comments and recommendations included in the July 21, 2008, ACRS interim letter 4 on Chapter 3 of the NRC Staff's SER related to the ESBWR design. The Committee decided that it was satisfied with the EDO's response.

B. Report of the Planning and Procedures Subcommittee Meeting

Review of the Member Assignments and Priorities for ACRS Reports and Letters for the September ACRS Meeting

Member assignments and priorities for ACRS reports and letters for the September ACRS meeting were discussed. Reports and letters that would benefit from additional consideration at a future ACRS meeting were also discussed.

Anticipated Workload for ACRS Members

The anticipated workloads for ACRS members through November 2008 were discussed and the objectives were:

- Review the reasons for the scheduling of each activity and the expected work product and to make changes, as appropriate
- Manage the members' workload for these meetings
- Plan and schedule items for ACRS discussion of topical and emerging issues

Containment Overpressure Credit Issue

During the July 2008 meeting, the ACRS was briefed by representative of the Tennessee Valley Authority (TVA) regarding the containment overpressure credit issue related to the Browns Ferry Nuclear Plant. During the meeting, members provided feedback on the information presented by TVA. Due to a lack of time, the Committee did not discuss its position on this issue at the July meeting. Consequently, Dr. Bonaca suggested that the Committee discuss this matter during the September meeting and decide on a course of action.

In addition, in the June 26, 2008 Staff Requirements Memorandum (SRM), stemming from the ACRS meeting with the Commission on June 5, 2008, the Commission directed the staff to continue working to address Committee concerns on containment overpressurization and, as necessary and appropriate, provide timely policy decision paper to the Commission to resolve the disagreement. The Committee should discuss this matter and propose a future course of action.

We understand that the NRR staff is preparing White Paper on the Containment Overpressure issue. If it is provided to the ACRS in a timely manner, it will be scheduled for discussion at the October meeting.

Summary Matrix of ACRS Reports and Letters Issued During FY 2008

The ACRS Office should submit to the Commission the annual ACRS Operating Plan and Self-Assessment on October 31, 2008. In accordance with the Commission direction in the August 6, 1999 SRM, a summary matrix of ACRS reports and letters issued during FY-2008 should also be submitted along with the Operating Plan and Self-Assessment. In order to preclude violation of the ACRS Bylaws, the Committee should authorize the ACRS Executive Director and/or his designee to summarize the FY-2008 ACRS reports and letters.

Proposed Regulatory Guides

The staff issued the following Draft Regulatory Guides (DGs) for public comment:

- Proposed Revision 1 to Regulatory Guide 1.47 (DG-1205), "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems"

Proposed Revision 1 to Regulatory Guide 1.47 (DG-1205) endorses the Institute of Electrical and Electronics Engineers (IEEE) Standard 603-1991, "Criteria for Protection Systems for Nuclear Power Generating Stations," in place of IEEE Standard 279-1971 version. The IEEE Standard 603-1991 is more specific than IEEE Standard 279-1971 regarding bypassed and inoperable status indication.

- Proposed Revision 1 of Regulatory Guide 1.69, (DG-1187), "Concrete Radiation Shields and Generic Shield Testing for Nuclear Power Plants"

Proposed Revision 1 to Regulatory Guide 1.69 (DG-1187) subsumes the provisions of Regulatory Guide 2.1 "Shield Test Program for Evaluation of Installed Biological Shielding in Research and Training Reactors," as the staff plans to withdraw Regulatory Guide 2.1.

- Proposed Revision 2 of Regulatory Guide 1.90, (DG-1197), "Inservice Inspection of Prestressed Concrete Containment Structures with Grouted Tendons"

Proposed Revision 2 to Regulatory Guide 1.90 (DG-1197) cites the appropriate regulations and incorporates the appropriate level of pre-stress and inspection requirements for a 60-year plant life instead of a 40-year plant life. DG-1197 provides two acceptable alternative methods of inspecting containment structures with grouted tendons: (1) an in-service inspection (ISI) program based on monitoring the pre-stress level by means of instrumentation and (2) an ISI program based on pressure-testing the containment structure.

- Proposed Revision 2 of Regulatory Guide 1.107, (DG-1196), "Qualification for Cement Grouting for Prestressing Tendons in Containment Structures"

Proposed Revision 2 to Regulatory Guide 1.107 (DG-1196) cites the appropriate regulations, incorporates the latest technology advances in the American Society of Mechanical Engineers (ASME) code, and identifies an acceptable method to demonstrate that the proposed system (grouting of pre-stressing tendons) will provide a high level of reliability in the design and installation of the system. DG-1196 provides quality standards for using Portland cement grout to protect pre-stressing steel from corrosion.

- Proposed Revision 2 of Regulatory Guide 3.52, (DG-3031), "Standard Format and Content for the Health and Safety Sections of License Renewal Applications for Uranium Processing and Fuel Fabrication"

Proposed Revision 2 to Regulatory Guide 3.52 (DG-3031) endorses the procedure contained in NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility." While the regulations provide general information for filing license renewal applications, NUREG-1520 identifies the specific information to be submitted by an applicant and evaluated by the staff. This NUREG provides guidance on the information to be included in licensing applications and establishes a format for presenting the information. Using this standard format helps to ensure uniformity and completeness in the preparation of licensing applications.

- Proposed Revision 3 of Regulatory Guide 10.4, (DG-0020), "Guide for the Preparation of Applications for Licenses to Process Source Material"

Proposed Revision 3 to Regulatory Guide 10.4 (DG-0020) endorses the license application and review procedure to process source material as discussed in NUREG-1556, "Consolidated Guidance about Material Licenses." While the regulations provide general information for filing license renewal applications, NUREG-1556 identifies the specific information to be submitted by an applicant and evaluated by the staff. This NUREG provides guidance on the information to be included in licensing applications and establishes a format for presenting the information. Using this standard format helps to ensure uniformity and completeness in the preparation of licensing applications.

- Proposed new Regulatory Guide DG-5026, "Fatigue Management for Nuclear Power Plant Personnel"

DG-5026 is a proposed new Regulatory Guide developed in support of 10 CFR Part 26. The draft regulatory guide endorses (with modifications) the Nuclear Energy Institute (NEI) document NEI 06-11, Revision E, "Managing Personnel Fatigue at Nuclear Power Reactor Sites," dated June 2008.

- Proposed Revision 4 to Regulatory Guide 1.105 (DG-1141), "Setpoints for Safety-Related Instrumentation."

Proposed Revision 4 to Regulatory Guide 1.105 (DG-1141) endorses the American National Standard Institute (ANSI)/ Instrumentation, Systems, and Automation Society (ISA) Standard 67.04.01-2006. This standard incorporates the current industry consensus on instrument setpoints, and the information in the Regulatory Information Summary (RIS) 2006-017, which presents the NRC staff position on the requirements of 10 CFR 50.36, "Technical Specifications," regarding limiting safety system settings during periodic testing and calibration of instrument channels.

- Proposed Revision 1 to Regulatory Guide 3.16 (DG-3035), "General Fire Protection Guide for Plutonium Processing and Fuel Fabrication Plants."

This proposed revision is a complete re-write that refers to NUREG-1718, "Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility," Chapter 7, "Fire Protection," regarding what information an applicant should provide with their license application.

- Proposed Revision 1 to Regulatory Guide 5.12 (DG-5027), "General Use of Locks in Protection and Control of Facilities and Special Nuclear Materials."

This proposed revision endorses new and revised standards, including several General Services Administration (GSA) Standards such as Federal Specification FF-L-2740A, "Locks, Combination," FF-L-2890A, "Lock Extension (Pedestrian Door, Deadbolt)," and FF-L-2937, Amendment 1, "Combination Lock, Mechanical" as well as several ANSI and ASTM Standards.

- Proposed New Regulatory Guide DG-1203, "Containment Performance for Pressure Loads."

DG-1203 is a proposed new Regulatory Guide Which describes acceptable methods for demonstrating containment performance in nuclear power plants, in accordance with the regulatory requirements of 10 CFR Part 50, Appendix A, General Design Criteria 16, "Containment Design," and 50, "Containment Design Basis," and 10 CFR 50.44, "Combustible Gas Control for Nuclear Power Reactors."

Proposed Interim Staff Guidance

The staff issued proposed Interim Staff Guidance DC/COL-ISG-06, "Evaluation and Acceptance Criteria for 10 CFR 20.1406," for public comment.

DC/COL-ISG-06 is a new Interim Staff Guide which describes the evaluation and acceptance criteria that will be used by NRC staff in reaching a reasonable assurance finding that a Design Certification (DC) or Combined License (COL) applicant has demonstrated compliance with the regulatory requirements of 10 CFR Part 20.1406, "Minimization of Contamination," in accordance with the guidance provided in Regulatory Guide 4.21, "Minimization of Contamination and Waste Generation: Life Cycle Planning."

Withdrawal of Regulatory Guide 8.1, "Radiation Symbol"

The NRC is withdrawing the Regulatory Guide 8.1, issued in February 1973, because it is no longer required. Regulatory Guide 8.1 references 10 CFR 20.203 which has been deleted. It also endorses ANSI Standard N2.1-1969 which was withdrawn in 1999. The Regulatory Guide is no longer required because the current 10 CFR 20.1901, "Caution Signs," provides a specific description of the approved trefoil radiation symbol and no additional guidance is required.

Draft Final Regulatory Guides

- Draft Final Revision 2 to Regulatory Guide 10.7 (DG0017), “Guide for the Preparation of Applications for Licenses for Laboratory and industrial Use of Small Quantities of Byproduct Material”

This Guide provides guidance on the type of information to be submitted to the staff to evaluate an application for a specific license for laboratories and industries to use small quantities of byproduct material. This Guide endorses the methods and procedures for applying for a license for laboratory and industrial use of small quantities of by product material contained in the current version of NUREG-1556, Volume 7, “Consolidated Guidance About Materials Licenses: Program-Specific Guidance About Academic, Research and Development, and Other Licenses of Limited Scope.”

- Draft Final Revision 3 to Regulatory Guide 10.8 (DG018), “Guide for the Preparation of Applications for Medical Use Programs”

This Guide provides guidance on the type of information to be submitted to the staff for reviewing an application for material use license. This Guide endorses the methods and procedures for medical licensing applications contained in the current revision of NUREG-1556, Volume 9, “Consolidated Guidance About Material Licenses: Program – Specific Guidance About Medical Use Licenses.”

- Draft Final Revision 2 to Regulatory Guide 10.9 (DG019), “Guide for the Preparation of Applications for the Use of Self-Contained Dry Source-Storage Gamma Irradiators”

This guide provides guidance on the type of information to be submitted to the staff for reviewing applications of self-contained dry source-storage gamma irradiators. This Guide endorses the methods and procedures contained in NUREG-1556, Volume 5, “Consolidated guidance about materials Licenses: Program-Specific guidance about Self-shielded Irradiator Licenses.”

The Committee decided not to review the proposed versions of these Guides and requested an opportunity to review the draft final versions of these guides after reconciliation of public comments. Based on the review of these Guides, which incorporate public comments, Dr. Powers recommended that the Committee not review these Guides.

Informal Meetings with the NRC Staff/Interaction with the Industry

Informal meetings are being arranged by the NRC staff through direct contact with the members. This is not a good practice, since it compromises the independence of the ACRS. All meetings should be arranged by the appropriate ACRS staff engineer. In accordance with the Federal Advisory Committee Act, these meetings should be used solely to gather information for use by the Committee in its decisionmaking process. During such meetings:

- The members should not make recommendations or provide advice.
- The members could provide their views, but it should be stated clearly that those are their personal views and do not necessarily reflect those of the full Committee.
- An ACRS staff member should be present at these meetings.
- No significant technical issues should be discussed. To the extent feasible, these meetings should be limited to planning purpose.

In addition, members should not contact a licensee or applicant to discuss any Committee proposed position or an individual member view on matters being or expected to be reviewed by the ACRS Committee. The appropriate ACRS staff engineer should be notified, to gather information for use by the Committee in its deliberations.

Meeting With the Commission

The ACRS will meet with the Commission on Friday, November 7, 2008. After consulting with the ACRS Chairman, we informed the Office of SECY that there are no significant topics to discuss with the Commission in November and that the Commission consider postponing the meeting to March 2009.

On August 27, 2008, we received an email from SECY stating that the Commission definitely wants to meet with the ACRS in November and some of the topics the Commission would like to discuss include:

- Management of the Committee, including strategies for getting qualified candidates for membership and increasing diversity among the membership.
- Challenges in the coming year
- Committee views on power uprates for BWRs

The ACRS Chairman feels that the first topic should be discussed during a meeting with individual Commissioners.

The proposed topics for meeting with the Commission are as follows:

1. Overview
 - Accomplishments
 - Ongoing/Future ACRS Activities, including challenges in the coming year
2. PWR Sump Performance Issues
3. Committee views on Power uprates for BWRs
4. TRACE Computer Code Development

The Commission has requested to meet with the ACRS twice a year. To support two ACRS meetings with the Commission, the first meeting should be held in March/April and the second in October/November. SECY is seeking the Commissioners' views on this proposal.

Quadripartite Working Group Meeting

France's Groupe Permanent chargé de Réacteurs Nucleaires (GPR) will host the second Quadripartite Working Group (WG) meeting in France on October 9-10, 2008 on the general topic of "EPR". Drs. Bonaca and Powers, and Mr. Stetkar will be attending the meeting on behalf of ACRS. The proposed agenda, suggested topics for ACRS presentations and available draft presentations were discussed.

ACRS Retreat in 2009

The last ACRS retreat was held on January 26-27, 2006. The Committee should decide whether it would like to hold a retreat in 2009.

Impact of Continuing Resolution on FY2009 ACRS Activities

The Agency is preparing to operate under a Continuing Resolution (CR) beginning October 1, 2008, and continuing March 31, 2009. If the CR does remain in effect through FY2009, all NRC Offices have been asked to identify anticipated travel related costs. ACRS travel funds will be allocated bi-weekly and travel authorizations will be approved only a week prior to actual travel start dates.

Members Issue

Travel Request

- Dr. Ryan requests Committee approval and support to attend the NRC staff's Workshop on the Security and Continued Use of Cesium-137 Chloride Sources scheduled for September 29-30, 2008 at the Bethesda North Marriott Hotel.

The meeting was adjourned on Friday, September 5, 2008.



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001**

Appendix II

August 15, 2008

**AGENDA
555th ACRS MEETING
SEPTEMBER 4-6, 2008**

**THURSDAY, SEPTEMBER 4, 2008, CONFERENCE ROOM T-2B3, TWO WHITE FLINT
NORTH, ROCKVILLE, MARYLAND**

- 1) 8:30 - 8:35 A.M. Opening Remarks by the ACRS Chairman (Open) (WJS/CS/SD)
 - 1.1) Opening statement
 - 1.2) Items of current interest

- 2) 8:35 - 10:30 A.M. License Renewal Application and Final SER for the Wolf Creek Generating Station, Unit 1 (Open) (JDS/PW)
 - 2.1) Remarks by the Subcommittee Chairman
 - 2.2) Briefing by and discussions with representatives of the NRC staff and Wolf Creek Nuclear Operating Corporation regarding the license renewal application for the Wolf Creek Generating Station, Unit 1, and the associated NRC staff's final Safety Evaluation Report (SER).

Members of the public may provide their views, as appropriate.

10:30 - 10:45 A.M. * BREAK *****

- 3) 10:45 - 12:15 P.M. Draft Final Revision 1 to Regulatory Guide 1.131, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants" (Open) (OLM/CEA)
 - 3.1) Remarks by the Subcommittee Chairman
 - 3.2) Briefing by and discussions with representatives of the NRC staff regarding the draft final revision 1 to Regulatory Guide 1.131 and the NRC staff's resolution of public comments.

Representatives of the nuclear industry and members of the public may provide their views, as appropriate.

12:15 - 1:15 P.M. * LUNCH *****

- 4) 1:15 -3:15 P.M. TRACE Computer Code Peer Review (Open) (SB/DB)
- 4.1) Remarks by the Subcommittee Chairman
 - 4.2) Briefing by and discussions with representatives of the NRC staff regarding the findings of the Peer-Review Panel for the TRACE computer code and the staff's plans to address the Panel's findings.

Representatives of the nuclear industry and members of the public may provide their views, as appropriate.

3:15 - 3:30 P.M. * BREAK *****

- 5) 3:30 - 4:30 P.M. Anticipated Advanced Reactor Research Needs (Open) (MLC/MB)
Discussions among the ACRS members regarding the anticipated advanced reactor research needs and related matters.
- 6) 4:30 - 7:00 P.M. Preparation of ACRS Reports (Open)
Discussion of proposed ACRS reports on:
- 6.1) License Renewal Application for the Wolf Creek Generating Station, Unit 1 (JDS/PW)
 - 6.2) Draft Final Revision 1 to Regulatory Guide 1.131, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants" (OLM/CEA)
 - 6.3) TRACE Computer Code Peer Review (SB/DB)

FRIDAY SEPTEMBER 5, 2008, CONFERENCE ROOM T-2B3, TWO WHITE FLINT NORTH, ROCKVILLE, MARYLAND

- 7) 8:30 - 8:35 A.M. Opening Remarks by the ACRS Chairman (Open) (WJS/CS/SD)
- 8) 8:35 - 10:00 A.M. Quality Assessment of Selected Research Projects (Open) (DAP/HPN)
- 8.1) Remarks by the Subcommittee Chairman
 - 8.2) Report by and discussions with members of the ACRS Panels which performed the quality assessment of the NRC research projects on: FRAPCON / FRAPTRAN Code work at the Pacific Northwest National Laboratory (PNNL), and NUREG/CR - 6943, "A Study of Remote Visual Methods to Detect Cracking in Reactor Components."

10:00 - 10:15 A.M. * BREAK *****

- 9) 10:15 – 11:15 A.M. Future ACRS Activities/Report of the Planning and Procedures Subcommittee (Open/Closed) (WJS/AFD/SD)
9.1) Discussion of the recommendations of the Planning and Procedures Subcommittee regarding items proposed for consideration by the full Committee during future ACRS meetings.
9.2) Report of the Planning and Procedures Subcommittee on matters related to the conduct of ACRS business, including anticipated workload and member assignments.

[NOTE: A portion of this meeting may be closed pursuant to 5 U.S.C. 552b (c) (2) and (6) to discuss organizational and personnel matters that relate solely to internal personnel rules and practices of ACRS, and information the release of which would constitute a clearly unwarranted invasion of personal privacy.]

- 10) 11:15 - 11:30 A.M. Reconciliation of ACRS Comments and Recommendations (Open) (WJS/CS/AFD)
Discussion of the responses from the NRC Executive Director for Operations to comments and recommendations included in recent ACRS reports and letters.
- 11) 11:30 – 12:00 P.M. Subcommittee Reports (Open)
11.1) Report by and discussions with the Chairman of the ACRS Subcommittee on ESBWR regarding the review the PRA associated with the ESBWR that was discussed during the Subcommittee meeting on August 21-22, 2008. (MLC/HJV).
11.2) Report by and discussions with the Chairman of the ACRS Subcommittee on Materials, Metallurgy, and Reactor Fuels regarding various matters associated with reactor fuels that were discussed during the Subcommittee meeting on September 3, 2008, (JSA/CLB).

12:00 - 2:00 P.M. * LUNCH *****

- 12) 2:00 - 7:00 P.M. Preparation of ACRS Reports (Open)
Continued discussion of proposed ACRS reports on:
- 12.1) License Renewal Application for the Wolf Creek Generating Station, Unit 1 (JDS/PW)
- 12.2) Draft Final Revision 1 to Regulatory Guide 1.131, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants" (OLM/CEA)
- 12.3) TRACE Computer Code Peer Review (SB/DB)

**SATURDAY SEPTEMBER 6, 2008, CONFERENCE ROOM T-2B3, TWO WHITE FLINT
NORTH, ROCKVILLE, MARYLAND**

13) 8:30 - 12:00 P.M. Preparation of ACRS Reports (Open)

(10:30-10:45 A.M. BREAK) Continue discussion of proposed ACRS reports listed under Item 11.

14) 12:00 - 12:30 P.M. Miscellaneous (Open) (WJS/AFD)
Discussion of matters related to the conduct of Committee activities and specific issues that were not completed during previous meetings, as time and availability of information permit.

NOTES:

- During the days of the meeting, phone number 301-415-7360 should be used in order to access anyone in the ACRS Office.
- Presentation time should not exceed 50 percent of the total time allocated for a given item. The remaining 50 percent of the time is reserved for discussion.
- Thirty five (35) hard copies and one (1) electronic copy of the presentation materials should be provided to the ACRS in advance of the briefing.

555th ACRS Meeting List of Attendees
June 4, 2008

	<u>NAME</u>	<u>NRC ORGANIZATION</u>
1	H. Esmaili	RES
2	S. Wong	NRR
3	J. Foster	RES
4	T. Kolb	NRR
5	C. Hinten	RES
6	E. Goldfeiz	RES
7	R. Jenkins	RES
8	B. Wagner	RES
9	S. Lai	RES
10	D. O'Neal	RES
11	M. Stutzke	RES
12	P. Appignani	RES
13	J. Monninger	RES
14	D. Marksberry	RES
15	S. Sancaletar	RES
16	A. Kurtzky	RES
17	M. Fravonovich	NRR
18	D. Helton	RES
19	C. Lui	RES
20	G. Testaye	NRO
21	T. Roy	NRO
22	S. Arora	NRO
23	P. Hearn	NRO
24	S. Lu	NRO
25	J. Rycyna	NRO
26	M. Canova	NRO
27	J. Donohue	NRO
28	F. Forty	NRO
29	D. Dube	NRO
30	H. Phen	NRO

555th ACRS Meeting List of Attendees
June 4, 2008

29	J. Colaccino	NRO
30	B. Schnetzler	NSIR
31	T. Reed	NRR
	D. Rahn	NMSS
33	N. Gilles	NRO
34	P. Madden	NRO
35	P. Holahan	NSIR
36	J. Zimmerman	NRR
37	S. Ali	RES
38	B. Richter	NRR
39	R. Lois	NRR

555th ACRS Meeting List of Attendees
June 5, 2008

	NAME	NRC ORGANIZATION
1	E. ODonnell	RES
2	E. Roach	NRO
3	J. Shaperow	RES
4	J. Mitchell	RES

555th ACRS Meeting List of Attendees
June 6, 2008

	NAME	NRC ORGANIZATION
1	J. Thompson	NRP
2	W. Ward	NRO
3	N. Otto	NRO
4	M. Takacs	NRO
5	J. Perez	RES
6	J. Schmidt	NRR
7	J. Honcharik	NRO
8	E. Reichelt	NRO
9	R. Clement	NRO
10	L. Monica	NRO
11	D. Dube	NRO
12	L. Burkhart	NRO
13	H. Boltman	NRO
14	S. Schroer	NRO
15	R. Chazell	NRO
16	Y. Wong	NRO
17	P. Hearn	NRO
18	G. Hammer	NRO
19	Y. G.	NRO
20	A. Drozd	NRO
21	S. Monagene	NRO
22	R. Landry	NRO
23	M. Yoder	NRR
24	P. Klein	NRR
25	D. McGovern	NRO
26	J. Barr	RES
27	B. Ruland	NRR
28	A. Hiser	NRR
29	J. Burke	RES
30	M. Galloway	NRR
31	R. Artchizel	NRR
32	T. Koshy	RES

555th ACRS Meeting List of Attendees
June 4, 2008

	<u>NAME</u>	<u>OUTSIDE ORGANIZATION</u>
1	D. Algama	Mitsubishi Nuclear Energy Systems
2	R. Pederson	AREVA NP
3	V. Fregunese	AREVA NP
4	M. Parece	AREVA NP
5	S. Sloan	AREVA NP
6	R. Salm	AREVA NP
7	M. Carpenter	AREVA NP
8	P. Baker	AREVA NP
9	J. Tucker	AREVA NP
10	J. Mihalak	Uniston Nuclear Energy
11	C. Tally	AREVA
12	M. Owens	AREVA
13	T. Oswald	AREVA
14	R. Sgarro	PPL Nuclear Development
15	J. McLella	NARP
16	G. Zyby	Alion Science & Technology
17	D. Fischer	NUMARK Associates

555th ACRS Meeting List of Attendees
June 5, 2008

	<u>NAME</u>	<u>OUTSIDE ORGANIZATION</u>
1	<u>M. Purnell</u>	<u>TVA Licensing</u>
2	<u>J. D. Wolcott</u>	<u>TVA Licensing</u>

555th ACRS Meeting List of Attendees
June 6, 2008

	<u>NAME</u>	<u>OUTSIDE ORGANIZATION</u>
1	M. Kanzda	MNES
2	M. Onozuica	MNES
3	M. Hoshi	MHI
4	H. Arikawa	MHI
5	H. Teshima	MHI
6	M. Takashima	MHI
7	H. Hamamoto	MHI
8	M. Kikuta	MHI
9	Y. Ogata	MHI
10	M. Ishida	MNES
11	S. Watanabe	MNES
12	D. Wood	MHI
13	K. Kawai	MNES
14	S. Kaawanago	MNES
15	T. Hafesa	Worley Parsons
16	S. Unkewicg	Alion
17	T. Shiraishi	MHI
18	K. Yamauchi	MHI
19	D. Fischer	NUMARK Associates
20	M. Lucas	Luminant
21	K. Paulson	MNES
22	D. Lange	MNES
23	J. Butler	NEI



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001**

September 11, 2008

**AGENDA
556th ACRS MEETING
OCTOBER 2-4, 2008**

**THURSDAY, OCTOBER 2, 2008, CONFERENCE ROOM T-2B3, TWO WHITE FLINT NORTH,
ROCKVILLE, MARYLAND**

- 1) 8:30 - 8:35 A.M. Opening Remarks by the ACRS Chairman (Open) (WJS/CS/SD)
 - 1.1) Opening statement
 - 1.2) Items of current interest

- 2) 8:35 - 10:00 A.M. License Renewal Application and Final Safety Evaluation Report (SER) for the Shearon Harris Nuclear Power Plant, Unit 1 (Open) (JS/PW)
 - 2.1) Remarks by the Subcommittee Chairman
 - 2.2) Briefing by and discussions with representatives of the NRC staff and Carolina Power & Light Company regarding the license renewal application for the Shearon Harris Nuclear Power Plant, Unit 1, and the associated NRC staff's final Safety Evaluation Report (SER).

Members of the public may provide their views, as appropriate.

10:00 - 10:15 A.M. * BREAK *****

- 3) 10:15 -12:15 P.M. Status of Resolution of Generic Safety Issue (GSI)-191, "Assessment of Debris Accumulation on Pressurized-Water Reactor (PWR) Sump Performance" (Open) (SB/DAW/DB)
 - 3.1) Remarks by the Subcommittee Chairman
 - 3.2) Briefing by and discussions with representatives of the NRC staff and PWR Owners Group regarding the staff and industry activities associated with the resolution of GSI-191.

Representatives of the nuclear industry and members of the public may provide their views, as appropriate.

12:15 - 1:15 P.M. * LUNCH *****

- 4) 1:15 - 3:15 P.M. Selected Chapters of the SER Associated with the Economic Simplified Boiling Water Reactor (ESBWR) Design Certification Application (Open/Closed) (MLC/HJV)
- 4.1) Remarks by the Subcommittee Chairman
 - 4.2) Briefing by and discussions with representatives of the NRC staff and General Electric - Hitachi Nuclear Energy (GEH) regarding selected Chapters of the NRC staff's SER With Open Items associated with the ESBWR design certification application.

Members of the public may provide their views, as appropriate.

[NOTE: A portion of this session may be closed to protect information that is proprietary to GEH and its contractors pursuant to 5 U.S.C. 552b (c) (4).]

3:15 - 3:30 P.M. * BREAK *****

- 5) 3:30 - 4:00 P.M. Quality Assessment of Selected Research Projects (Open) (DAP/HPN)
- 5.1) Remarks by the Subcommittee Chairman
 - 5.2) Discussion of the draft final report on the quality assessment of the NRC research projects on: FRAPCON / FRAPTRAN Code work at the Pacific Northwest National Laboratory (PNNL), and NUREG/CR - 6943, "A Study of Remote Visual Methods to Detect Cracking in Reactor Components."

- 6) 4:00 - 5:15 P.M. Historical Perspectives and Insights on Reactor Consequence Analyses (Open) (WJS/HPN)
- Discussion of the draft White Paper prepared by Dr. Nourbakhsh, ACRS Senior Technical Advisor, regarding historical perspectives and insights on reactor consequence analyses.

5:15 - 5:30 P.M. * BREAK *****

- 7) 5:30 - 7:00 P.M. Preparation of ACRS Reports (Open)
- Discussion of proposed ACRS reports on:
- 7.1) License Renewal Application for the Shearon Harris Nuclear Power Plant, Unit 1 (JS/PW)
 - 7.2) Status of Resolution of Generic Safety Issue - 191 (SB/DAW/DB)
 - 7.3) Selected Chapters of the SER Associated with the ESBWR Design Certification Application (MLC/HJV)

**FRIDAY, OCTOBER 3, 2008, CONFERENCE ROOM T-2B3, TWO WHITE FLINT NORTH,
ROCKVILLE, MARYLAND**

- 8) 8:30 - 8:35 A.M. Opening Remarks by the ACRS Chairman (Open) (WJS/CS/SD)
- 9) 8:35 – 9:30 A.M. Future ACRS Activities/Report of the Planning and Procedures Subcommittee (Open/Closed) (WJS/EMH/SD)
- 9.1) Discussion of the recommendations of the Planning and Procedures Subcommittee regarding items proposed for consideration by the Full Committee during future ACRS meetings.
- 9.2) Report of the Planning and Procedures Subcommittee on matters related to the conduct of ACRS business, including anticipated workload and member assignments.
- [NOTE: A portion of this meeting may be closed pursuant to 5 U.S.C. 552b (c) (2) and (6) to discuss organizational and personnel matters that relate solely to internal personnel rules and practices of ACRS, and information the release of which would constitute a clearly unwarranted invasion of personal privacy.]**
- 10) 9:30 - 9:45 A.M. Reconciliation of ACRS Comments and Recommendations (Open) (WJS/CS/AFD)
Discussion of the responses from the NRC Executive Director for Operations to comments and recommendations included in recent ACRS reports and letters.
- 11) 9:45 – 10:00 A.M. Subcommittee Reports (Open)
- 11.1) Report by and discussions with the Chairman of the ACRS Subcommittee on Materials, Metallurgy, and Reactor Fuels regarding Proposed Supplemental Pressurized Thermal Shock Rule (10 CFR 50.61) that was discussed during the Subcommittee meeting on October 1, 2008. (WJS/CLB)
- 11.2) Report by and discussions with the Chairman of the ACRS Subcommittee on Reliability and PRA regarding the draft final NUREG-1855, "Guidance on the Treatment of Uncertainties in Risk-Informed Decisionmaking," that was discussed during the Subcommittee meeting on September 30, 2008. (GEA/HJV)

10:00 - 10:15 A.M. * BREAK *****

- 12) 10:15 – 11:30 A.M. Preparation for Meeting with the Commission on November 7, 2008 (Open) (WJS, et al. /EMH, et al.)
Discussion of proposed topics for a meeting with the Commission on November 7, 2008.

11:30 - 12:30 P.M. * LUNCH *****

- 13) 12:30 - 7:00 P.M. Preparation of ACRS Reports (Open)
Continued discussion of proposed ACRS reports on:
13.1) License Renewal Application for the Shearon Harris Nuclear Power Plant, Unit 1 (JS/PW)
13.2) Status of Resolution of Generic Safety Issue - 191 (SB/DAW/DB)
13.3) Selected Chapters of the SER Associated with the ESBWR Design Certification Application (MLC/HJV)

SATURDAY, OCTOBER 4, 2008, CONFERENCE ROOM T-2B3, TWO WHITE FLINT NORTH, ROCKVILLE, MARYLAND

- 14) 8:30 - 1:00 P.M. Preparation of ACRS Reports (Open)
(10:30-10:45 A.M. BREAK) Continue discussion of the proposed ACRS reports listed under Item 13.
- 15) 1:00 - 1:30 P.M. Miscellaneous (Open) (WJS/EMH)
Discussion of matters related to the conduct of Committee activities and specific issues that were not completed during previous meetings, as time and availability of information permit.

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LIST OF DOCUMENTS FROM THE
555th ACRS MEETING, SEPTEMBER 4-6, 2008

Agenda Item 2:

License Renewal Application and Final SER for the Wolf Creek Generating Station, Unit 1

1. Proposed Schedule
2. Status Report
3. Subcommittee Meeting Minutes
4. SBO Open Items (WCNOC Letter 3/29/08)
5. Open Item 4.3 (WCNOC Letter 11/30/07)
6. Metal Fatigue Open Items (WCNOC Letter 5/15/08)
7. Metal Fatigue Open Items (WCNOC Letter 6/9/08)

Agenda Item 3:

Draft Final Revision 1 to Regulatory Guide 1.131, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants"

8. Table of Contents
9. Proposed Agenda
10. Status Report
11. Draft Final Regulatory Guide 1.131, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants," Rev. 1
12. Redline strikeout in June 2007 DG -1132 to July 2008 Draft Final Regulatory Guide 1.131, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants," Rev.1
13. Redline strikeout from July to September 2008 Draft Final Regulatory Guide 1.131, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants," Rev. 1
14. Response to Public Comments for Draft Regulatory DG – 1132, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants," Proposed Revision to Regulatory Guide 1.131, Rev.1
15. IEEE Standard 383-2003, "IEEE Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations"

Agenda Item 4:
TRACE Computer Code Peer Review

16. Table of Contents
17. Proposed Schedule
18. Status Report
19. Memorandum, Dated June 18, 2008, from Farouk Eltawila, Director, Division of Safety Analysis, Office of Nuclear Regulatory Research, to Frank Gillespie, Executive Director, ACRS, Subject: TRANSMITTAL OF SUPPORT DOCUMENTS FOR THE TRACE COMPUTER CODE BRIEFING ON JULY 7, 2008 (ML081640398)
20. Theory Manual (ML071000097)
21. Assessment Manual and Appendices A, B and C (ML071200456, ML071200466, ML071200473)
22. Users Manual Volumes 1 (ML071200473) and 2 (ML071720510); Draft Reports from Peer Reviewers: Dominique Bestion (ML081640540), Peter Griffith (ML081640551), Marv Thurgood (ML081640564), and George Yadigaroglu (ML081640560)



**Advisory Committee on Reactor Safeguards (ACRS)
License Renewal Subcommittee
Wolf Creek Generating Station (WCGS)
Safety Evaluation Report (SER)**

September 4, 2008

Tam Tran, Project Manager
Office of Nuclear Reactor Regulation

Presentation Outline

- Overview of WCGS license renewal review
- License renewal Audit and Inspection
- SER Section 2: Scoping and Screening review results
- SER Section 3: Aging Management review results
- SER Section 4: Time-Limited Aging Analyses (TLAAs)

Overview (LRA)

- License Renewal Application (LRA) submitted September 2006
 - Located 3.5 miles northeast of the town of Burlington, in Coffey County, Kansas
 - Westinghouse PWR, carbon steel-lined concrete (DRYAMB) containment
 - 3565 megawatt thermal, 1228 megawatt electric
 - Facility Operating License Number NPF-42 expires March 11, 2025

Overview (SER)

- Safety Evaluation Report (SER) with Open Items issued to the applicant February 1, 2008
 - 95 RAI items issued
 - 5 Open Items (OIs)
 - No Confirmatory Items

Overview (SER) – con't

- Final Safety Evaluation Report (SER) issued to the applicant July 29, 2008
 - Closure of 2 SBO related OIs
 - Closure of 3 metal fatigue analysis related OIs

Audit and Inspection

- Scoping and Screening Methodology Audit
1/8 – 1/12, 2007
- Aging Management Program (AMP) Audit
3/26 – 3/30, 2007
- Aging Management Review (AMR) Audit
5/7 – 5/11, 2007
- Time-Limited Aging Analysis (TLAA) Audit
7/9 – 7/11, 2007
- Region IV Inspection (Scoping and Screening & AMP)
9/10 – 9/14, 2007 & 10/22 – 10/26, 2007
- Additional audit of metal fatigue for open item closure,
06/2008



License Renewal Inspections

Gregory Pick

Region IV Inspection Team Leader

Current Performance

- Green PIs & Findings
- Corrective Action Program
- Special Inspection – ECCS Voiding
- Mid-Cycle Performance Review

Inspection Results

- Scoping of nonsafety-related systems
- Aging Management Programs
- Amendment 5 corrected items
- Current License Basis Issue

SER Section 2: Structures and Components Subject to Aging Management Review

Section 2.1 Scoping and Screening Methodology

- Staff's audit and review concluded that the applicant's methodology is consistent with the requirements of 10 CFR 54.4 and 54.21.

Section 2.2 Plant-Level Scoping Results

- Consistent with 10 CFR 54.4, the staff found no omission of plant-level scoping systems and structures within the scope of license renewal.

Section 2.3 & 2.4 Scoping and Screening Results: Mechanical Systems and Structures

- As a result of staff review, the License Renewal Application was amended. The staff concludes no omission of mechanical components and structures within the scope of license renewal and subject to AMR, consistent with 10 CFR 54.4(a) and 10 CFR 54.21(a)(1).

Section 2.5 Scoping and Screening Results: Electrical and Instrumentation & Control Systems

- OI 2.5-1 is closed:
 - SBO recovery paths should be within the scope of license renewal to ensure offsite power can be restored to the plant.
 - The scoping boundary should be a circuit breaker for each path at transmission voltage.
 - Closure: Applicant submitted LRA amendment to include a circuit breaker for each path within the scope of LRA.

SER Section 3: Aging Management Review Results

Section 3.0.3 39 Aging Management Programs (AMPs) evaluated in the SER, consistent with GALL

	Plant specific	Consistent with GALL	With exception	With enhancement	With exception & enhancement
Existing	1	7	11	10	3
New	1	5	1		

Section 3.0.3.1.10 Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

- OI 3.0.3.1.10-1 is closed:
 - Medium Voltage Cables AMP (E3 AMP) does not include the underground medium voltage cables from 13.8 kV switchgear to transformer connecting the switchyard.
 - Cable connections are for SBO restoration of offsite power path to onsite distribution systems.
 - Closure: Applicant submitted LRA amendment to include the underground cable as a part of E3 AMP.

Section 3.5 Aging Management of In-Scope Inaccessible Concrete

Baseline information (* with future commitments on next slide) – data fluctuation is comparable with other plants (e.g., Pilgrim, Shearon Harris, etc.)

	Acceptance Criteria	WCGS (2005-2006)*	
		min	max
pH	>5.5	7.0	8.7
Chlorides	<500 ppm	5.0	41.2
Sulfates	<1500 ppm	30	717**

** measured during winter

Section 3.5 Aging Management of In-Scope Inaccessible Concrete (con't)

- Future commitments
 - Periodic testing of ground water will be performed as part of the Structures Monitoring Program.
 - Monitor chemistry of ground water twice every five years
 - Visual inspections of buried plant structures are performed when opportunistic excavation occurs. However, more frequent inspections may be performed based on prior inspection results, industry experience, or exposure to a significant event.

SER Section 4: Time-Limited Aging Analyses

Section 4.2 Reactor Vessel Neutron Embrittlement Analyses

- Reviews were performed to evaluate reactor vessel neutron embrittlement in terms of adjusted reference temperature (ART).
 - Neutron fluence and ART
 - Upper-shelf energy
 - Pressurized thermal shock
 - Pressure-temperature limits
 - The staff concludes that the reactor vessel neutron embrittlement analyses meet the review criteria in the Standard Review Plan.

Reactor Vessel RT_{PTS}

	40 calendar years 35 EFPYs	<u>60 calendar years</u> <u>54 EFPYs</u>	<u>RT_{PTS}</u> <u>10 CFR 50.61</u> <u>screening</u>
Fluence E > 1.0 MeV	2.23x10 ¹⁹ n/cm ²	3.51x10 ¹⁹ n/cm ²	--
Calculated RT _{PTS}	136° F	142° F	≤ 270 °F
Measured RT _{PTS}	105° F	109° F	≤ 270 °F

- Surveillance Capsule X was removed at 13.83 EFPYs with a lead factor of 4.3 for an equivalent exposure of 59.5 EFPYs.
- The limiting reactor vessel material is lower shell plate R2508-3.
- The projected peak fluence values for R2508-3 are 2.23x10¹⁹ n/cm² (35 EFPY/40 calendar years) and 3.51x10¹⁹ n/cm² (54 EFPY/60 calendar years).
- The calculational methodology adheres to the guidance of RG 1.190.

Upper Shelf Energy (USE) Decrease

Reactor vessel limiting material	Fluence $\times 10^{19}$ n/cm ² (E>1.0 MeV)	Unirradiated USE (ft-lb)	Measured USE (ft-lb)	Measured USE Decrease (%)	Predicted USE Decrease (RG 1.99, Rev. 2, %)	<u>54 EFPY Projected USE</u> (ft-lb)	<u>EOL USE Acceptance Criteria</u> (ft-lb)
Lower Shell Plate R2508-3	3.49	94 transverse	88*	6.4	25	69	≥ 50

* 88 ft-lb measured USE from Capsule V, fluence 2.22×10^{19} n/cm²

Section 4.3 Metal Fatigue Analyses

- OI 4.3: Staff was concerned with the applicant's:
 - (1) accounting of high-cycle fatigue due to flow-induced vibration in total fatigue usage factor calculation for reactor pressure vessel internals
 - (2) application of stress range reduction factor (SRRF) for cyclic conditions for reactor coolant sampling lines
- Closure: Staff's audit of supporting analyses confirmed
 - (1) fatigue usage from high-cycle fatigue was negligible due to low vibratory stresses.
 - (2) proper SRRF was used iaw the ASME Code Section III and SRP-LR Table 4.3-1.

Section 4.3 Metal Fatigue Analyses (con't)

- OI 4.3-1: Staff was concerned with the Applicant's use of the 1D transfer functions developed for the EAF fatigue evaluation of the charging and the surge line hot leg nozzles.
- Closure: Applicant performed confirmatory analyses of both nozzles using ASME Code Subsection NB-3200 procedure. Applicant committed to verify presence of charging nozzle thermal sleeve as part of its metal fatigue AMP in accordance with 10 CFR 54.21 (c)(1)(iii).

Section 4.3 Metal Fatigue Analyses (con't)

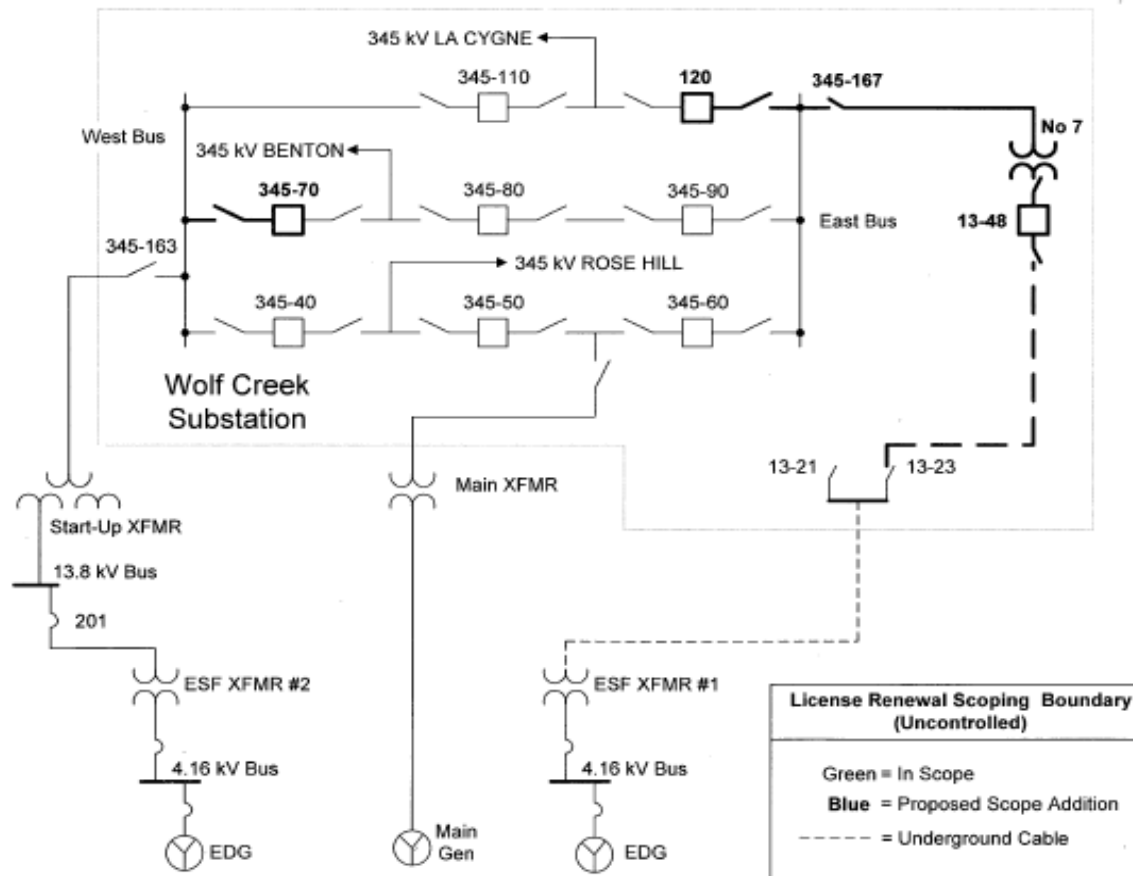
- OI 4.3-3: Staff was concerned with the Applicant's baseline fatigue calculations of the surge line hot leg nozzle for pre-MOP operation and of the charging nozzle based on the type of charging events.
- Closure: Applicant committed to update the fatigue baseline analyses as part of its metal fatigue AMP in accordance with 10 CFR 54.21 (c)(1)(iii).

Conclusion

On the basis of its review, the staff determines that the requirements of 10 CFR 54.29(a) have been met.

Backup Slides

OI 2.5-1 is closed:



Extra Slides

Section 2.1 Scoping Screening

- WCNOC has formal agreement with the TSO, Westar Energy Transmission Services (WETS).
- GL 2006-02 discussed the use of protocols between the nuclear power plant and the transmission system operator.

Section 2.2 Plant Level Scoping - EHC

- The Turbine Control Oil System has no intended function iaw 10 CFR 54.4(a).
- A portion of electrohydraulic control (EHC) system has intended function iaw 10 CFR 54.4(a)(3) via the electrical signal from AMSAC for activation of turbine trip under ATWS scenarios.
- The EHC cabinets that contain EHC components for receiving AMSAC signal and activating turbine trip are within scope.

SER Section 2: Structures and Components Subject to Aging Management Review (con't)

Section 2.3 Scoping and Screening Results: Mechanical Systems

- 10 Components added to the LRA subsequent to staff review

<u>System</u>	<u>Component</u>	<u>System</u>	<u>Component</u>
Fuel Pool Cooling	Strainer Spacer Ring	EDG Engine Jacket Cln	Vent Lines Flex Hoses Orifices
Compressed Air	Relief Valve Test Connections		
Main Steam	ADV Silencer		
Condensate Tank	CST Vent/Vacuum Relief		

Section 2.3 and 2.4 Scoping and Screening Mechanical Systems and Structures

- Condensate Storage Tank (CST) is within scope as mechanical component in Section 2.3.
- CST supporting structures (foundation and valve housing) are within scope as civil structure in Section 2.4.

- OI 2.5-1 (Regulatory Basis):
 - 10 CFR 54.4(a)(3)
 - 10 CFR 50.63
 - GDC 17
 - SRP-LR
 - WC TS 3.8

AMP on Inaccessible Medium Voltage Cables (con't)

- Inspection of cables is being addressed under CLB.
- EEEB is looking at qualification of the cables.
- The applicant will keep these cables dry prior to entering the period of extended operation.

SER Section 2: Structures and Components Subject to Aging Management Review

Summary

- The applicant's scoping and screening methodology meets the requirements of 10 CFR 54.4 and 54.21.
- Scoping and screening results from the LRA as amended included all SSCs within the scope of license renewal and subject to AMR.

Section 3.6.2.2.3 Loss of Conduction Strength Due to Corrosion

- The staff has reviewed the testing program by Ontario Hydroelectric for WCGS on the concern of loss of conduction strength due to corrosion of ACSR transmission conductor and found it acceptable.

Leakage Monitoring for RPV Studs

- Stud preload not monitored – uncertainty in frictional forces renders monitoring of stud preload ineffective.
- Loss of preload is predominantly due to gasket creep because of thermal cycling
- Monitor of leakage detects loss of preload indirectly.

Monitoring of CCCW HX for Thermal Performance

- Combination of leading-indicator measures to ensure timely corrective action
 - Periodical testing of CCW heat transfer capability
 - Periodical testing of CCW pressure boundary via NDE
 - Proposed enhancement of ISI to inspect check valves internal surfaces
 - Chemistry program monitoring ensures detection of HX performance degradation.

Small Crack in Inaccessible Area of Turbine Building Wall

- 3-hour fire barrier masonry wall is for commercial (insurance) purpose only.
- There is no 10 CFR 54.4(a)(1) component in the building.
- The building 10 CFR 54.4(a)(2) intended functions is to resist wind-loads.

Applicant's Operating History – inspection

- Fuel Oil Chemistry (interior coating failure) – latest 2006 result
- Buried piping corrosion – latest past-years result relative to decision to implement Buried Piping and Tanks Inspection AMP as possible CLB implementation.

Section 4.3 Metal Fatigue Analyses (3 OIs were identified related to metal fatigue analyses)

- WCGS SER with open items issued 2/01/2008
- Additional RAIs for closure of OIs issued 2/21/2008
- ACRS subcommittee review 3/05/2008
- Public meeting 5/01/2008
- Responses to RAIs provided 5/15/2008
- Additional supplemental information to comply with 10 CFR 54.21 (c)(1)(iii) provided 6/09/2008
- Staff accepted responses and issued Final SER 7/29/2008

Section 4.3 Metal Fatigue Analyses

(revised by John Fair)

- OI 4.3: For the purpose of license renewal, staff is to verify the following through an additional audit:
 - (1) Vibratory stresses are much less than thermal transient stresses.
 - (2) High-cycle fatigue is insignificant.
- Closure: Staff's audit of supporting analyses confirmed positive.

License Conditions

- The first license condition requires the applicant to include the UFSAR supplement required by 10 CFR 54.21(d) in the next UFSAR update, as required by 10 CFR 50.71(e), following the issuance of the renewed license.
- The second license condition requires future activities identified in the UFSAR supplement to be completed prior to the period of extended operation.
- The third license condition requires that all capsules in the reactor vessel that are removed and tested meet the requirements of American Society for Testing and Materials (ASTM) E 185-82 to the extent practicable for the configuration of the specimens in the capsule. Any changes to the capsule insertion and withdrawal schedule, including use of spare capsules, must be approved by the staff prior to implementation. All capsules placed in storage must be maintained for future insertion. Any changes to storage requirements must be approved by the staff, as required by 10 CFR Part 50, Appendix H.

End of Presentation

**Thank you for your time and
attention**



Regulatory Guide 1.211

Qualification of Safety-Related Cables and Field Splices

ACRS Meeting: September 4, 2008

Satish Aggarwal

Division of Engineering

Office of Nuclear Regulatory Research

301-415-6005

Regulatory Guide 1.211

BACKGROUND

Standards Activities: IEEE Std 383-1974

IEEE Std 383-2003 published
in June 2004.

Regulatory Activities: Regulatory Guide 1.131 was issued for comment in August 1977- endorsing IEEE Std 383-1974 with several exceptions. It remained a draft guide

RG 1.131 was never finalized. It will be withdrawn following the issuance of RG 1.211

DG-1132 was issued for public comment in June 2007 with 10 exceptions to IEEE Std 383-2003

Received comment letters from 5 organizations

Regulatory Guide 1.211

Scope

Power, and Instrumentation & Control cables, including signal and communication cables

- Splices
- Not Included: (1) Fiber Optics Cables
(2) Connectors

Regulatory Guide 1.211

IEEE Std 383-2003

- Provides general requirements, directions, and methods for qualifying safety-related cables and splices
- Must meet or exceed specific performance requirements throughout its installed life
- Requires a quality assurance program

Regulatory Guide 1.211

Objectives

- To ensure that safety-related cables (single, multi-conductor, multiplex, coaxial, triaxial, twinaxial) to perform during & following postulated design basis events
- To ensure that no failure mechanism exists leading to common-cause failures under postulated service conditions
- To establish “Qualified Life”

Regulatory Guide 1.211

Methods of Qualification

- Type Testing
- Operating experience
- Analysis as supplement
- Ongoing Qualification
- Qualification by analysis alone is NOT acceptable
- Type Testing is the preferred qualification method
- Documentation must be available in an auditable form

Regulatory Guide 1.211

Revised Regulatory Position In Response To Public Comments

- Exception 1: Sufficient information should be available for future engineering extrapolations
- Exception 2: Qualify Specialty Cables with its connectors
- Exception 3: Document stranding configuration.
- Exception 4: Document Manufacturing standards & date of manufacturer

Regulatory Guide 1.211

Revised Regulatory Position In Response To Public Comments

- Exception 5: Tests to include testing of specialty cables' electrical performance characteristics
- Exception 6: Manufacturer's inspection & maintenance requirements
- Exception 7: Monitoring of environmental conditions. Condition monitoring of risk-significant safety related power and I & C cables

Inspection, testing & monitoring programs
to detect degradation of cable insulation

Revised Regulatory Position In Response To Public Comments (September 3, 2008)

- Page 2 of RG, 4th para under Section “B. Discussion” is modified to read as follows:

In Clause 3.3 of IEEE Std 383-2003, an exact description of the “representative” cable is required to ensure that sufficient information is available for the “representative” cable to allow future extrapolation of the conclusions from the results of the type tested cable to other cables reported to be “represented” by the type test.

Revised Regulatory Position In Response To Public Comments (September 3, 2008)

- Page 3, Section C. REGULATORY POSITION (3) is modified to read as follows:

Clause 6.1.2, “coaxial, triaxial, and twinaxial cables,” should be supplemented to include appropriate connections for those test specimens used to address the concerns regarding differential shrinkage or expansion.

Revised Regulatory Position In Response To Public Comments (September 3, 2008)

- Page 2, last para, Section B. Discussion: Substitute the last sentence with the following:
Further, Clause 6.1.2 of IEEE Std 383-2003, requires that suitable test specimen lengths and configuration be included in the DBE test to evaluate the potential for conductor shorting or loss of critical dielectric characteristics due to differential shrinkage or expansion in coaxial and triaxial cables. The NRC staff has witnessed cables which have passed a qualification type test without connectors only to fail the test when the connectors were attached. The failure was traced to unequal thermal expansion of the different cable components fixed at both ends of the cable with connectors.



TRACE Regulatory Applications

555th Meeting of the ACRS

Mirela Gavrilas
Reactor Systems Applications Branch
Office of Nuclear Regulatory Research

September 4, 2008

TRACE uses in regulatory activities since the last ACRS review (March 2007)

- ESBWR DCD confirmatory calculations
 - LOCAs
 - *applicability report*
- EPR topical report review
 - LBLOCA methodology RAs
- Brown's Ferry EPU SER
 - SB and LB LOCAs
- GSI-191
 - scoping analyses

NRR user need 2008-002 for FY2008 through FY2010

nine plant decks to support EPU reviews

- BWR/3, BWR/4, and BWR/5
- Westinghouse 2-, 3-, and 4-loop
- CE
- B&W lowered loop

NRO pending user need

- ESBWR DCD confirmatory calculations
 - AOOs and upper plenum instability (in progress)
- EPR topical report reviews and DCD confirmatory calculations
 - LOCA audit calculations and transients
 - applicability report
- US APWR DCD confirmatory calculations
 - LOCAs and transients
 - applicability report; advanced accumulator
- ABWR DCD confirmatory calculations
 - LOCAs, AOOs, ATWS
- AP-1000 COL confirmatory calculations
 - LOCAs and transients
 - applicability report

Plant	Type	Event	Availability
Operating Plants			
Monticello	BWR/3	SBLOCA, LBLOCA, SBO	2008
Browns Ferry 1, 2, 3	BWR/4	SBLOCA, LBLOCA, SBO	Available
Nine Mile Point 2	BWR/5	SBLOCA, LBLOCA, SBO	2008
Point Beach 1, 2	W 2 loop	SBLOCA	2008
Prairie Island 1, 2	W 2 loop	SBLOCA, LBLOCA	2009
HB Robinson	W 3 loop	SBLOCA, LBLOCA, locked rotor	Available
Turkey Point 3, 4	W 3 loop	SBLOCA, LBLOCA	2009
North Anna	W 3 loop	Feed and bleed	2008
Seabrook 1	W412, 4 loop	SBLOCA, LBLOCA, SGTR	Available
Oconee 1, 2, 3	B&W lowered loop	SBLOCA, LBLOCA	Available
Crystal River 3	B&W lowered loop	SBLOCA, LBLOCA	2009
Calvert Cliffs 1, 2	CE 2 loop	SBLOCA, LBLOCA, loss of FW	Available
St. Lucie 1 & 2	CE 2 loop	SBLOCA, LBLOCA	2009
Ft. Calhoun	CE 2 loop	SBLOCA, LBLOCA	2009
New Reactors			
ESBWR	BWR	MSLB, BDLB, GDLB, AOL	Available
EPR	PWR	LBLOCA	Available
AP-1000	PWR	LBLOCA	Available
USAPWR	PWR	SBLOCA, LBLOCA, Transient TBD	2009
ABWR	BWR/6	SBLOCA, LBLOCA, Transient TBD	2009

Target Execution Times

Event	One-Dimensional Model TRACE Execution Time^{1, 2} / Problem Time	Three-Dimensional Vessel TRACE Execution Time² / Problem Time
Steady State Initialization	1	0.5 – 3
BWR LBLOCA	1 – 3	1 – 10
BWR SBLOCA	1	1 – 5
PWR LBLOCA	1 – 5	5 – 30
PWR SBLOCA	1	3 – 10

¹ The indicated execution times are goals for the TRACE one-dimensional vessel models.

² Typical execution times using an NRC agency PC with a Pentium 4 CPU at 2.80 GHz and 1.0 GB of RAM.

Conclusions

- within the next couple of years, the staff will be developing decks that represent every family of operating plants
- steep learning curve
 - BWR “sample” deck
 - LBLOCA in 20 minutes
 - SBLOCA in 40 minutes
 - still working on PWR “sample” deck
- improving user guidance and development of templates to enhance the usability of TRACE are as important at this stage as code error corrections



TRACE 5.0 Peer Review

Presentation to the ACRS Committee

William J. Krotiuk
Reactor Systems Analysis Branch
Office of Nuclear Regulatory Research
September 4, 2008

TRACE 5.0 Peer Review

- **Tasks**
 - Review TRACE code and documentation.
 - Produce reports that
 - summarize code strengths and deficiencies and
 - provide recommendations for code changes and improvements.
- **Priority Objectives**
 - Identify major deficiencies that preclude the use of TRACE for confirmatory thermal-hydraulic calculations.
 - Identify deficiencies that introduce significant errors in TRACE predictions.
 - Provide recommendations for substantive improvements.

TRACE 5.0 Peer Review – Panel Members

- International experts with extensive knowledge of thermal-hydraulic code models, methods and applications
 - Dominique Bestion
Research Director, Commissariat à l'Energie Atomique, CEA-Grenoble
 - Peter Griffith
Retired Professor of Mechanical Engineering, MIT
 - Marv Thurgood
CEO/Project Manager, John Marvin, Inc.
 - George Yadigaroglu
Professor Emeritus of Nuclear Engineering, Swiss Federal Institute of Technology in Zurich (ETHZ)

TRACE 5.0 Peer Review

- Material Supplied to Peer Reviewers
 - TRACE Documentation
 - Theory Manual
 - Assessment Manual and Appendices
 - User's Guide
 - Volume 1 Input Description
 - Volume 2 Modeling Guidelines
 - TRACE Code*
 - TRACE Version 5.0
 - Executable
 - Source
 - Sample problem input and output files

* Provided for completeness; reviewers were not required to run the code or review source coding.

TRACE 5.0 Peer Review – General Review Topics

- **Capabilities and Limitations**
 - Code mission, purpose, objectives, capabilities, limitations and range of applicability
- **Numerical Solution Methods**
 - Numerical solution scheme
 - Time and space averaging approaches
- **Fundamental Equations, Models and Correlations**
 - Are original published sources referenced along with supporting data?
 - Is the model or correlation applicable to, and accuracy appropriate for power reactor conditions?
 - Is the model or correlation implementation approach including any modifications sufficiently described?
- **General Quality**
 - Is the documentation well written, well organized and understandable?

TRACE 5.0 Peer Review – Specific Focus Areas

- Detailed review by one or more panel member
 - Conservation Equations Application
 - Thermal-Hydraulic Closure Relations and Physical Models
 - Numerical Solution Schemes
 - Nuclear System Components, Features and Models
 - Pumps, valves, fuel rod models and reactor kinetics
 - Test Assessment Matrix and Results
 - Sufficiency and completeness relative to other T/H codes

TRACE 5.0 Peer Review - Specific Focus Area Review Assignments

- Conservation Equations Application
 - M. Thurgood
 - G. Yadigaroglu
- Thermal-Hydraulic Closure Relations and Physical Models
 - D. Bestion
 - G. Yadigaroglu
- Numerical Solution Methods
 - M. Thurgood
- Nuclear System Components, Features and Physical Models
 - P. Griffith
- Test Assessment Matrix and Results
 - D. Bestion
 - P. Griffith

TRACE 5.0 Peer Review

- **Activity Summary**

- Contract Award Aug., 2007
- Kick-off meeting Aug. 28-29, 2007
 - Office of Research presentations
 - Discussions/questions by peer reviewers
- Reviewers draft reports to NRC Jan., 2008
- Working meeting Feb. 27-28, 2008
 - Discuss draft reports and findings with Office of Research staff
- Reviewers final reports to NRC May, 2008
- Presentation to ACRS T/H Subcommittee July 7, 2008
- Presentation to ACRS Committee Sept. 4, 2008
- Final Report In preparation

TRACE 5.0 Peer Review

- The following slides summarize the opinion statements which were requested by the ACRS T/H Subcommittee and independently developed by the peer reviewers.
- The speakers following me will present the NRC response to the opinion statements.

Summary Statement of the Review Panel

- *“The summary opinions of the Panel regarding the adequacy of TRACE should be viewed in light of*
 - *the evident time and resource limitations that precluded a full and detailed review of the models,*
 - *the absence of full information regarding the developmental validation of the models used, and*
 - *the limitations of the code validation work.”*

Summary Statement of the Review Panel

- *“A very large number of models and correlations have been carefully assembled to produce a code that can cover the phenomena of interest.”*
 - *The manual describes the models and correlations clearly and in sufficient detail.*
 - *It was not possible within the limits of this review and in the absence of full information to verify the adequacy and implementation of all the models.”*
- *“The TRACE documentation lists the physical phenomena that are important in large-break and small-break loss-of-coolant accident analyses.”*
 - *Phenomena identified as important on the basis of phenomena identification and ranking tables (PIRTs) appear in the Assessment Manual.*
 - *A cross-reference table should be provided showing how the code capability was assessed for each phenomenon considered.”*
- *“The manuals indicate that some important changes will be implemented in the future.”*
 - *Some of these may make critical remarks made by the reviewers obsolete.*
 - *However, this review was limited to the TRACE 5.0 version of the code.”*

Summary Statement of the Review Panel

- 1. *“No major deficiency was evident in the physical models, nor revealed by the assessed test cases, that would preclude the use of TRACE for confirmatory thermal-hydraulic calculations of LBLOCAs and SBLOCAs of PWRs and BWRs.*
 - *However, additional assessments covering more systematically the entire range of conditions expected are recommended.”*
- 2. *“A few deficiencies were identified in the physical models, and some inaccurate predictions or erroneous predictions are found in assessment calculations.*
 - *Although it is recommended to correct these deficiencies, there is no clear indication that they could introduce significant errors in TRACE predictions.”*
- 3. *“Development of the code appears to have (partly at least) lacked a strategic approach to modeling.*
 - *Although much work has gone into the selection of the best available models and correlations, the top-level guiding lines and strategy employed in selecting flow regimes, phenomena, and situations to be simulated, and the selection of methods and models for these regimes are not clear.”*
- 4. *“There is no assurance that the closure laws used perform adequately over the entire range of applicability claimed.*
 - *A systematic evaluation of the set of correlations implemented in the code against the best available relevant range of basic data sets would have been necessary.”*

TRACE 5.0 Peer Review

- The following slides summarize the specific findings and recommendations for improvements found in the individual reviewers' reports.
- The speakers following me will present the NRC response to the specific findings and recommendations.

Specific Findings in Reviewers' Reports

- **Thermal-Hydraulic Closure Relations and Physical Models**
 - Improvements needed for some physical (equations or closure) models.
 - Some physical models require further review, analysis and improvement.
 - Include validation matrix for physical models and phenomena.
 - The interface tracking model is innovative and efficient; but user guidance should be provided.
- **Conservation Equations Application**
 - The $\nabla \nabla V$ momentum term is incorrect for side connections, and 3-D vessel flow direction changes.
 - Provide guidance for using the nonconservative form of the momentum equation.
 - Water packing is overly restrictive.
- **Numerical Solution Methods**
 - The SETS* numerical solution is innovative and allows Δt s to exceed the material Courant limit.

* Note, the SETS method was previously developed and implemented in TRAC.

Specific Findings in Reviewers' Reports

- **Test Assessment Matrix and Results**
 - Additional assessments or extensions are needed to fully address each physical model and all important phenomena.
 - Assessments should be referenced to the SET matrix and PIRT tables.
 - The Assessment Manual should provide information on how well TRACE predicts important licensing limits (e.g. PCT).
- **Nuclear System Components, Features and Physical Models Documentation**
 - A good deal of work is needed to make the Users Manual easy to use.
 - The Users Manual should be rewritten to provide recommended modeling and guidelines for system components.
 - Better input modeling guidelines, with references to assessment modeling, are needed.
 - Include code uncertainties relative to PWR and BWR transients.

TRACE 5.0 Peer Review Summary

- **Recommended Modifications/Improvements:**
 - Items which should be addressed as soon as possible
 - Rewrite the Users Manual.
 - Correct $\nabla \nabla V$ momentum term.
 - Review indicated closure relations and physical models, and include a validation matrix.
 - Continue to expand the code assessments.
 - Longer term items
 - Add a liquid droplet field.
 - Modify TRACE to solve the conservative form of the momentum equation.



Backup Slides

Summary Statement of
the Peer Review Panel

Summary Statement of the Review Panel

Objective

The objective of the work of the peer review panel was to review the TRACE manuals, including the Theory Manual, the Assessment Manual, and the User's Guide, and to produce a report that summarizes the strengths and deficiencies of the code as documented and provides recommendations for code changes and improvements. In particular the Panel was asked to:

- Identify major deficiencies that preclude the use of TRACE for confirmatory thermal-hydraulic calculations
- Identify deficiencies that introduce significant errors in TRACE predictions
- Provide recommendation for substantive improvements.

The recommendations for improvements can be found in the reviewers' reports that follow. The summary comments of the next section address the other two top-level issues listed above.

Summary Opinion of the Panel

The following summary opinion of the Panel regarding the adequacy of TRACE should be viewed in light of the evident time and resource limitations that precluded a full and detailed review of the models, the absence of full information regarding the developmental validation of the models used, and the limitations of the code validation work that followed. More specifically:

A very large number of models and correlations have been carefully assembled to produce a code that can cover the phenomena of interest. The manual describes the models and correlations clearly and in sufficient detail and often includes the reasons or the history that led to their selection and the relevant references. In spite of this, it was not possible within the limits of this review and in the absence of full information on the developmental validation carried out to verify in detail the adequacy of all the models used and the ways they were implemented or coded.

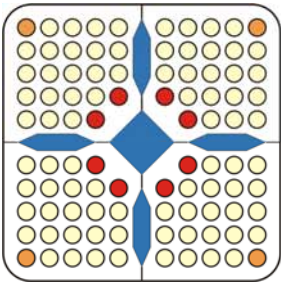
The TRACE documentation lists the physical phenomena that are important in large-break (LB) and small-break (SB) loss-of-coolant accident (LOCA) analyses. Phenomena identified as important on the basis of phenomena identification and ranking tables (PIRTs) appear in the Assessment Manual that also summarizes the pressurized-water reactor (PWR) and boiling-water reactor (BWR) modeling requirements. To arrive at some certainty regarding the completeness of the code validation work, it would have been necessary to provide information such as a cross-reference table showing how the capability of the code was assessed for each phenomenon considered and where this information can be found.

Finally, the manual indicates that some important changes will be implemented in the future. Some of these may make critical remarks made by the reviewers obsolete. However, this review had to be limited to the TRACE 5.0 version of the code.

Keeping in mind the above limitations of the review process:

1. No major deficiency was evident in the physical models described in the Theory Manual, nor revealed by the cases reported in the Assessment Manual, that would preclude the use of TRACE for confirmatory thermal-hydraulic calculations of LBLOCAs and SBLOCAs of PWRs and BWRs. However, additional assessment covering more systematically the entire range of conditions expected would be required to fully demonstrate that all phenomena identified in the PIRT tables are correctly addressed (such as oscillatory reflooding, condensation at ECCS injection....).
2. A few deficiencies were identified in the physical models described in the Theory Manual and some inaccurate predictions or erroneous predictions are found in assessment calculations. Although it is recommended to correct these

3. Development of the code appears to have (partly at least) lacked a strategic approach to modeling. Although much work has gone into the selection of the best available models and correlations, the top-level guiding lines and strategy employed in selecting flow regimes, phenomena, and situations to be simulated and the selection of methods and models for these regimes are not clear. For example, a three- (or if necessary four-) field model should have been implemented before the modeling work was undertaken. The flow regimes should have been selected based on the physical situations and then applied to both hydraulics and heat transfer; this is apparently only partly the case now.
4. There is no assurance that the closure laws used perform adequately over the entire range of applicability claimed. A systematic evaluation of the set of correlations implemented in the code against the best available relevant range of basic data sets would have been necessary.



TRACE

STAFF PLANS TO ADDRESS PEER REVIEW & LONG TERM DEVELOPMENT

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Chris L. Hoxie, Ph.D.

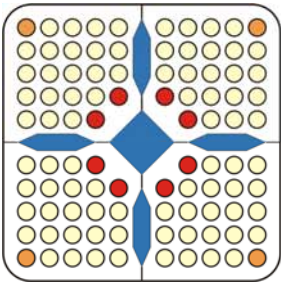
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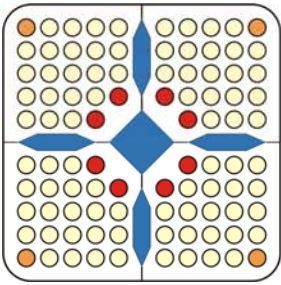
**Presentation to the
Advisory Committee on Reactor Safeguards
September 4, 2008**



TRACE

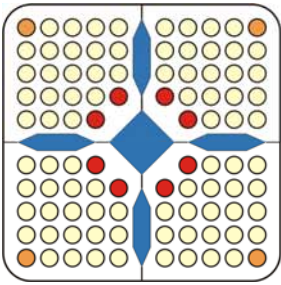
Purpose & Mission of TRACE Version 5.0

- TRACE is the NRC's consolidated thermal-hydraulics code for LBLOCA, SBLOCA, and transients. TRACE replaces TRAC-P, TRAC-B, RAMONA, and RELAP.
- Applicability is intended to include:
 - Conventional PWRs and BWRs
 - Advanced LWRs , with additional development to address new features and phenomena introduced by those unique designs.
- TRACE Version 5.0 is an audit tool and is intended to have capability and accuracy similar to vendor codes (RELAP, TRAC, WCOBRA/TRAC, etc.)



TRACE Review Comment Characterization

- PEER REVIEW REPORTS HAVE BEEN EXAMINED & 262 SEPARATE COMMENTS / ISSUES IDENTIFIED.
- GENERAL CHARACTERIZATION:
 - ➔ 21% FIELD EQUATIONS / CLOSURE MODEL ISSUES
 - ➔ 32% THEORY MANUAL; CLARIFICATION & JUSTIFICATION
 - ➔ 14% MODELING APPROACH
 - ➔ 7% ASSESSMENT RELATED
 - ➔ 26% ASSESSMENT REPORT DISCUSSION & DOCUMENTATION
- HIGHEST PRIORITY: ITEMS / ISSUES THAT ENHANCE THE READINESS OF TRACE FOR REGULATORY USE.
- SEVERAL CODE ERRORS IDENTIFIED - *ALL ERRORS HAVE BEEN CORRECTED IN THE MOST RECENT CODE VERSION MADE AVAILABLE TO STAFF ANALYSTS.*



TRACE

Review Comment Resolution

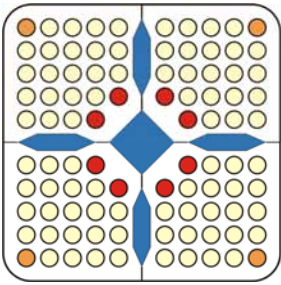
■ WE WILL DISCUSS PLANS TO ADDRESS PEER REVIEW COMMENTS & FINDINGS FOR:

- DOCUMENTATION
- VALIDATION & ASSESSMENT
- MODELS & CORRELATIONS
- LONG TERM DEVELOPMENT

Near Term



Long Term

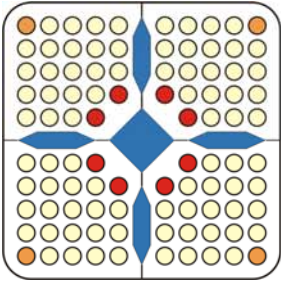


TRACE

ISSUE: Documentation

- BACKGROUND: CURRENT DOCUMENTATION WAS ISSUED AS A SET (Aug. 2007) AND CONSISTS OF:
 - THEORY MANUAL
 - ASSESSMENT REPORT
 - USER MANUAL (VOLUMES 1 and 2)

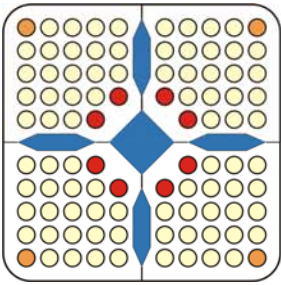
- EACH OF THE PEER REVIEWERS HAD DIFFICULTIES WITH THE DOCUMENTATION. OF PARTICULAR NOTE WERE:
 - LACK OF SPECIFIC USER GUIDANCE FOR PLANT INPUT DECK DEVELOPMENT
 - DIFFICULTY IN IDENTIFYING THE SPECIFIC MODEL(S) ACTUALLY USED BY TRACE



TRACE RESOLUTION: Documentation

- **VOLUMES 2 OF THE USER GUIDE IS BEING SIGNIFICANTLY REVISED AND UPDATED. NEW CONTENT WILL BE ADDED WITH SPECIFIC PLANT MODELING RECOMMENDATIONS.**
 - Each region (core, UP, HL, SG, PZR, etc.) of the plant will have specific guidelines on which Components, nodalization, parameter settings, and identify the basis for the recommendations.
 - To minimize the “User Effect” in plant calculations.
 - A Technical Editor has been obtained to facilitate revision of the User Manual.

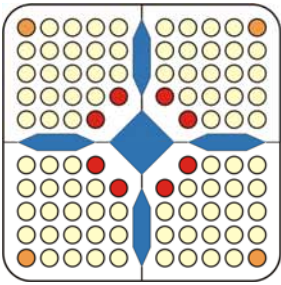
- **THE THEORY MANUAL WILL BE RESTRUCTURED TO IMPROVE CLARITY & MAKE IT EASIER TO USE.**
 - MORE CONCISE DESCRIPTION OF MODELS & CORRELATIONS.
 - “LINKS” TO PROVIDE DETAILS ON TECHNICAL DEVELOPMENT.



TRACE RESOLUTION: Documentation

- MOST SUGGESTIONS WILL BE INCORPORATED INTO REVISIONS OF THE THEORY MANUAL TO MAKE IT MORE READABLE:
 - ➔ ADD CONTENT TO OUTLINE MODELING STRATEGY
 - ➔ ADD CONTENT TO DEFINE FLOW AND HEAT TRANSFER REGIMES
 - ➔ USE MODERN TECHNOLOGY TO PROVIDE LINKS BETWEEN RELATED MODELS AND DIFFICULT TO OBTAIN REFERENCES
 - ➔ PROVIDE DETAILS TO ADDRESS SPECIFIC COMMENTS

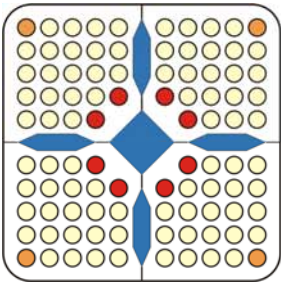
- ASSESSMENT REPORT WILL BE REVISED TO:
 - ➔ RELATE EACH ASSESSMENT TO A PART AND PROVIDE A BETTER CROSS REFERENCE BETWEEN MODELS AND SETs.
 - ➔ IDENTIFY RANGE OVER WHICH MODELS ARE ASSESSED.
 - ➔ MOVE “MODEL DEVELOPMENT TESTS” FROM THEORY MANUAL TO ASSESSMENT REPORT.



TRACE

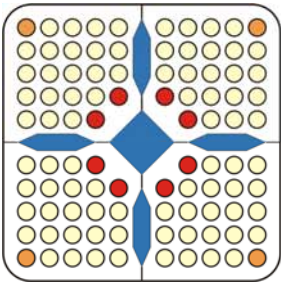
ISSUE: Assessment

- Background: TRACE ASSESSMENT IS CURRENTLY ACCOMPLISHED BY APPROXIMATELY 550 TEST CASES COVERING A BROAD RANGE OF FACILITIES AND T/H CONDITIONS. ADDITIONAL ASSESSMENT AND REPORTS ARE PRODUCED FOR NEW & ADVANCED LWRs.
- Peer Review Panel Comment: Additional assessments are needed to fully address each physical model and all important phenomena. Specific phenomena pointed out were:
 - **Direct Contact Condensation**
 - **Upper Plenum Entrainment / De-entrainment**
 - **SBLOCA Loop Seal Clearance**
 - **CCFL**
 - **Blowdown Film Boiling**
 - **Downcomer Hot Wall (i.e. Downcomer Boiling)**
 - **Non-LOCA Integral Tests**



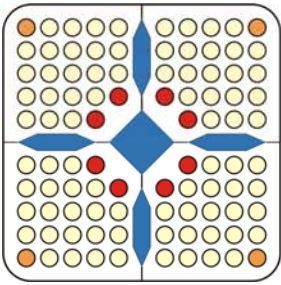
TRACE RESOLUTION: Assessment

- WHILE THE TRACE ASSESSMENT BASE IS LARGE & WE FEEL IS SUFFICIENT TO CHARACTERIZE PERFORMANCE, ADDITIONAL ASSESSMENT IS PLANNED.
- ASSESSMENT IS A CONTINUAL PROCESS - ADDITIONAL CASES AND NEW TESTS TO BE SIMULATED WILL DEPEND ON RESOURCES, IDENTIFIED CODE PROBLEMS, AND REGULATORY NEEDS.
- ADDITIONAL ASSESSMENT AVAILABLE IN:
 - **ESBWR CODE APPLICABILITY REPORT**
 - **EPR CODE APPLICABILITY REPORT**
 - **APWR CODE APPLICABILITY REPORT**
 - **AP1000 CODE APPLICABILITY REPORT**
- ADDITIONAL “GENERIC” ASSESSMENT PLANNED IS LISTED ON THE FOLLOWING SLIDE. (Highlighted Phenomena denotes consistency with a Peer Review comment.



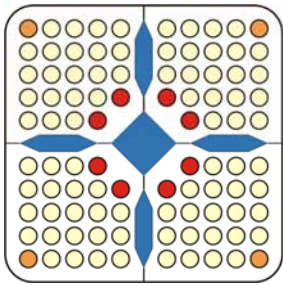
TRACE RESOLUTION: Assessment

TEST	PHENOMENA
COSI or <u>W</u> /EPRI 1/3 MIXING	Direct Contact Condensation
NRU	Fuel Rod Models
CCTF 72, 76 and UPTF 10	UP De-entrainment
Achilles (ISP 25)	Nitrogen discharge / Oscillations
FLECHT Top-Skewed Power	Reflood (Power Shape Sens.)
UPTF and/or IVO Loop Seal	SBLOCA Loop Seal Clearance
Inlet Elbow Flooding (various)	CCFL
MIST	IET (B&W plants)
PKL	IET for LBLOCA
to be determined	Blowdown Film Boiling
UPTF	Downcomer Hot Wall
09/10/2008 Stephen.Bajorek@nrc.gov various	Non-LOCA Tests



ISSUE: Physical Models and Conservation Equations

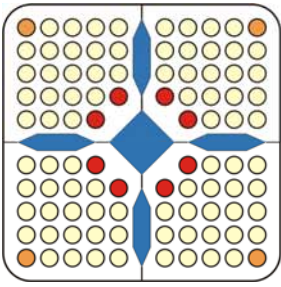
- PEER REVIEW COMMENTS FELL INTO ONE OF THREE CATEGORIES:
 - ERRORS – Areas where the code is incorrect. Examples:
 - **Incorrect treatment of the $V \text{ grad} V$ term for side connections**
 - **Gas mixture properties (viscosity and thermal conductivity) are not calculated using an appropriate mixing rule.**
 - IMPROVEMENTS - Areas where the model may be inadequate, alternate choices may simplify the code, or may improve agreement between predictions & experimental results. Examples:
 - **A stratified-mist flow regime should be added for large pipes.**
 - **Model for nucleate boiling is overly complex and ad hoc**
 - CLARIFICATION - Areas where the model is probably acceptable, but documentation or assessment does not make it clear.



RESOLUTION: Physical Models and Conservation Equations

TRACE

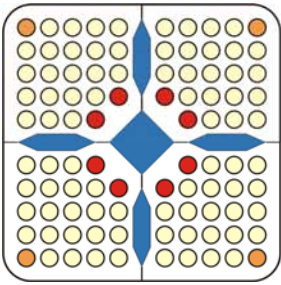
- ERROR CORRECTIONS HAVE HIGHEST PRIORITY
 - ALL CLOSURE MODEL ERRORS HAVE BEEN RESOLVED, AND A CODE VERSION IS AVAILABLE FOR STAFF ANALYSTS. (Effects on results appear to be small.)
 - MOMENTUM EQUATION ISSUE IS NEARING RESOLUTION. ERROR IN V_{gradV} TERM CORRECTED. TEST CASES (in progress) ARE SHOWING DEFICIENCIES IN MOMENTUM EQUATION TO BE SMALL.
- IMPROVEMENTS TO PHYSICAL MODELS WILL BE PART CONTINUING AND LONG TERM CODE DEVELOPMENT
 - Overly complex models to be replaced when found to be inaccurate or cause of numerical instabilities.
- CLARIFICATION TO BE INCORPORATED INTO THEORY MANUAL REVISIONS.



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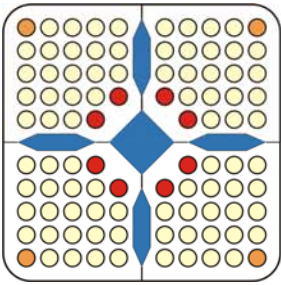
ISSUE: Long Term Development Recommendations

- Peer Review Panel comments included some recommendations for long term development:
 - Add a liquid droplet field.
 - Modify TRACE to solve the conservative form of the momentum equation.



RESOLUTION: Long Term *TRACE* Development Recommendations

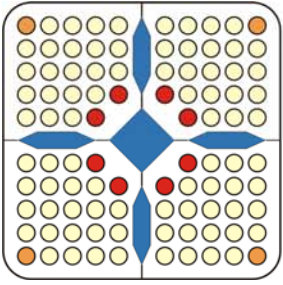
- ONLY LIMITED EFFORTS HAVE BEEN PLACED ON LONG-TERM DEVELOPMENT PENDING THE IMMEDIATE NEED TO MAKE TRACE MORE ROBUST & DEVELOP PLANT INPUT DECKS.
- PLANS FOR “TRACE VERSION 6.0” INCLUDE:
 - ACTIVATION OF 3RD FIELD FOR DROPLETS
 - SPACER GRID MODELS FOR
 - ➔ LOCAL CONVECTIVE HEAT TRANSFER ENHANCEMENT
 - ➔ DROPLET BREAK UP
 - ➔ GRID REWET
 - IMPROVEMENT OF T/H MODELS (INCLUDING PEER REVIEW COMMENTS)
 - INCORPORATION OF AN UNCERTAINITY METHODOLOGY
 - (POSSIBLE) FULLY CONSERVATIVE MOMENTUM EQUATION
 - (POSSIBLE) ACTIVATION OF 4TH FIELD FOR BUBBLY/SLUG FLOWS AND INTERFACIAL AREA TRANSPORT



TRACE

Summary & Conclusions

- THE PEER REVIEW WAS VALUABLE & THE COMMENTS WILL HELP THE STAFF TO IMPROVE THE CODE AND ITS APPLICATIONS.
- NO MAJOR DEFICIENCIES FOUND THAT INTRODUCE SIGNIFICANT ERRORS OR PRECLUDE USE OF TRACE FOR T/H CALCULATIONS.
- HIGH PRIORITY ITEMS TO BE ADDRESSED INCLUDE:
 - **CORRECTION OF IDENTIFIED ERRORS and RESOLUTION OF THE MOMENTUM EQUATION ISSUE**
 - **DEVELOPMENT OF USER GUIDELINES AND REVISION OF THE USER MANUAL**
 - **CONTINUATION OF ASSESSMENT WITH EMPHASIS ON THOSE AREA NOT WELL COVERED IN WORK TO DATE**
- LONG TERM EFFORTS WILL FOCUS ON MODEL & CORRELATION IMPROVEMENTS, IMPROVING & QUANTIFYING CODE ACCURACY and PRODUCTION OF ADDITIONAL PLANT MODELS.



TRACE

Summary & Conclusions

TRACE IS NOW READY TO BE
FULLY INCORPORATED INTO THE NRC'S
REGULATORY FRAMEWORK