Status of NRC Risk-Informed Activities and Associated Issues

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Purpose of Meeting

- Status of staff's (NRR, NRO, RES) risk-informed activities and associated issues
- Understand stakeholders' concerns and their efforts regarding risk-informed activities

Agenda

8:30 am	to	8:45 am	Introduction, NRC
8:45 am	to	10:15 am	RES, NRR, NRO presentation
10:15 am	to	10:30 am	BREAK
10:30 am	to	11:00 am	RES, NRR, NRO presentation cont'd
11:00 am	to	11:40 am	EPRI presentation
11:40 am	to	12:20 pm	BWR and PWR Owner Groups Presentations
12:20 pm	to	12:40 pm	BREAK
12:40 pm	to	1:00 pm	NEI presentation
1:00 pm	to	1:40 pm	ASME and ANS Presentations
1:40 pm	to	2:00 pm	Wrap-up, NRC
2:00 pm			Adjourn

RES Presentation

- Phased approach plan
- Standards and review guidance
- Technical programs
- Risk-informed activity needs

Phased Approach Plan to PRA Quality

- The plan provided a process for achieving PRA quality while allowing risk-informed decisions to be made until the necessary guidance documents defining quality were developed and implemented
- The plan involved a three-phased approach:
  - Phase 1 occurred when there were no NRC-endorsed standards and the staff review of the base PRA supporting the activity was performed on a case-by-case basis
  - Phase 2 occurred when there were some NRC-endorsed standards and the licensee's submittal was expected to be in conformance with those relevant to the specific application
  - Phase 3 occurred when there were NRC-endorsed standards to support current and anticipated applications
- Where are we?

Phased Approach Plan (cont'd)

- Publication of Revision 2 to Regulatory Guide (RG) 1.200 achieved Phase 3
- Achieving Phase 3 did not include:
  - Addressing technical issues
  - Update/upgrade to the NRC-endorsed standards
  - Development/update of peer review guidance
  - Standards and related guidance for new and non-LWRs
- Activities associated with PRA quality still ongoing

Standards

- ASME/ANS PRA Standard (RA-Sa-2009) as endorsed in Revision 2 to RG 1.200
  - Proposed changes to Standard in Addendum B not sufficiently substantive to warrant a revision to RG 1.200
    - Staff exploring interim options to provide staff position on Addendum B if necessary, and clarifications to staff position on PRA technical acceptability for operating and new reactors
  - Future revision and endorsement should address
    - Remaining concerns (e.g., internal fire, seismic)
    - LPSD, New reactors PRA, Level 2
    - Current "clarifications" (e.g., Addendum B not thorough in the clarifications)
  - Standard needs to be able to address modular reactor designs

Peer Review Guidance

- NEI peer review guidance as-endorsed in Revision 2 of RG 1.200
  - NEI 00-02 for Level 1/LERF for internal events and internal flood (at-power conditions)
  - NEI-05-04 for PRA Updates/Upgrades
    - No requirements for Standard updates
  - Concerns with Revision 1 to NEI 07-12, internal fire
  - Guidance needed for seismic, new reactors PRAs, LPSD

Technical Programs Status

- Uncertainties
- Internal Fires
- Human Reliability Analysis
- Digital I&C

Treatment of Uncertainties

- NUREG-1855 currently under revision
  - Guidance expanded to clarify stakeholder responsibility versus staff responsibility
  - Sources of model uncertainty expanded to include internal fire, seismic, Level 2, and low power shutdown
  - Revision 1 anticipated to be issued for public review and comment in early 2011
- Work being performed in collaboration with EPRI
  - EPRI expanding their effort consistently with NRC effort

Internal Fire

- Fire infrastructure adequate to support risk-informed activities
- Methodological development advances:
  - Continue to improve existing methods to further enhance realism
  - A few technical issues of potential significance not addressed in methodology
- NFPA 805 FAQ process provides interim resolutions to most questions
- Programs at NRC and EPRI continue to advance state of art, where needed

Internal Fire Peer Review

- NEI 07-12, Revision 1, NEI states in letter to NRC that "NEI does not believe that NRC endorsement of NEI 07-12, Revision 1 is necessary."
  - Changes to document are substantive
  - Does not address the major staff issues from RG 1.200
  - Relaxes some of requirements from earlier version
  - Does not ask for the peer review to address the FAQs
  - Allows review of an SR against CCI without an accompanying Finding

Human Reliability Analysis

- Commission inquiry regarding HRA model differences
  - Variability in HRA results due to differences in methods, and differences in how analyst apply the methods
  - Program in place that is developing a consensus approach
  - Collaborative effort with EPRI
  - Tentative date of late 2011 for a draft for comment

Human Reliability Analysis (cont'd)

- HRA Fire
  - Current methods generally provide a context of human performance for internal events
    - Internal fire may create conditions not presently covered by the internal events factors
  - Developing guidance regarding incorporation of human performance under fire conditions into current methods
  - Collaborative effort with EPRI (NUREG-1921, EPRI 1019196)
    - Supports joint EPRI/NRC-RES guidance for fire PRA (NUREG/CR-6850/EPRI 1011989)
  - Final report expected to be published in winter 2011 (draft published for public comment in December 2009)

Digital I&C

- No consensus methods currently exist for quantifying the reliability of digital I&C systems
- Previous and current RES projects have identified a set of desirable characteristics for reliability models of digital systems and have applied various probabilistic reliability modeling methods to an example digital system (documented in several NUREG/CR reports)
- Comparison of these studies to the set of desirable characteristics has revealed areas where additional research can improve the current methods

Digital I&C (cont'd)

- Principal focus at present is the quantification of software reliability (work being performed by Brookhaven National Laboratory [BNL])
  - Held expert workshop in May 2009 on philosophical basis for modeling software failures in a reliability model (documented in a BNL technical report)
  - Reviewed existing quantitative software reliability methods (documented in a BNL technical report)
  - Currently in the process of evaluating, selecting, and, if necessary, enhancing, one or more approaches to modeling and quantifying software failures in terms of failure probabilities, and plan to apply the approach(es) to an example software-based protection system in a proof-of-concept study (or studies)

Risk-Informed Activity Needs

- Effort commencing to examine the various risk-informed activities to determine/identify
  - What PRA scope is needed
  - What are the significant technical issues
  - What are the significant areas of uncertainty
  - What technical guidance is needed
- Purpose of document is to help in identifying resources and prioritizing activities
- Plan to work closely with stakeholders
- Anticipated draft in mid 2011

NRR Presentation

Major Risk-Informed Activities

- RITS Initiative 5B – Surveillance frequencies
- RITS Initiative 4B – Flexible allowed outage times
- 10 CFR §50.48(c) – NFPA-805
- 10 CFR §50.69 – Special Treatment Requirements

RITS Initiative 5B Status

- TSTF-425 available
- Current Status:
  - Issued SEs for pilots: Limerick, Diablo Canyon (4 units)
  - Issued SEs for non-pilots: STP, Peach Bottom (4 units)
  - SEs nearing issuance: 7 sites (11 units)
  - Submittals in review: 10 sites (19 units)
- Expected Submittals (based on past expectations):
  - FY 2011 - 15
  - FY 2012 - 9
  - FY 2013 - 5

RITS Initiative 4B Status

- TSTF-505 is under review:
  - RAIs have been issued and draft responses received
  - Model SE being developed based on NEI 06-09 SE, pending resolution of issue on TS structure
  - Model SE expected to be completed by January 2011
- Pilots:
  - Issued original pilot for STP (July 2007)
  - Received Vogtle pilot letter of intent and fee waiver request
- Expected Submittals (based on past expectations):
  - FY 2011 - 5 (second half of FY)
  - FY 2012 - 17
  - FY 2013 - 15

10 CFR §50.48(c) Status

- Guidance (RG 1.205) is available for NFPA-805 Applications
  - LAR and SE templates continue development
- Current Status:
  - Issued SE for Harris pilot
  - Review on-going for Oconee pilot
- Expected Submittals:
  - FY 2011 - 27 (39 units)
  - FY 2012 - 3 (6 units)
- Fire PRA Peer Reviews and Guidance
- Fire PRA Methods

10 CFR §50.69 Status

- Current Status:
  - Categorization Guidance Available (RG 1.201)
  - Inspection guidance continues development
    - Completion Schedule: Summer 2011
- Expected Submittals:
  - FY 2011 - Pilot ????

NRO Presentation

PRA Technical Adequacy

- Per §52.47 and §52.79, new reactors required to have Level 1 and Level 2 PRA for DC and COL, respectively
- **Per §50.71(h)(1), the PRA must cover those initiating events and modes for which NRC-endorsed consensus standards on PRA exist one year prior to the scheduled date for initial loading of fuel**
- Per §50.71(h) (2), the PRA must be maintained and upgraded per the NRC-endorsed consensus standards on PRA in effect one year prior to each required upgrade
  - The PRA must be upgraded every four years until the permanent cessation of operations.

PRA Technical Adequacy (cont'd)

- Expectations for new reactors same as for operating reactors:
  - Obviate the need for an in-depth staff review of the base PRA
  - Allow staff to focus on key assumptions and areas identified by peer reviewers as being of concern
  - Provide for a more focused and consistent review process by the staff
- Standards required for PRA
  - Design and construction stage
  - At initial fuel loading
  - Early operational stage (after fuel loading)
- Standards need to be of sufficient specificity to support the above goals
  - Remove ambiguity with regard to the technical requirements for a PRA in design/construction and early operational stages
  - **Parameters for acceptable assumptions for information not available for a PRA in design/construction and early operational stages**

PRA Standards and Guidance for New Reactors

- New light water reactors standard
  - In progress
- Advanced (non-light water) reactors standard
  - In progress
- Advanced (light water) reactors
  - Covered by ?? standard
- Peer review guidance for seismic PRA
  - Under consideration??

Risk-Informed Activities for New Reactors

- Risk-informed regulatory guidance
- Screening criteria
- RITS Initiative 4B – Flexible allowed outage times
- Advanced reactors
- RITS Initiative 5B – Surveillance frequencies (COL amendment)
- 10 CFR §50.69 – Special Treatment Requirements (COL amendment)

Risk-Informed Regulatory Guidance

- Commission briefing October 14, 2010
- Options:
  - Option 1: Status quo
  - Option 2: Revise guidance, as necessary
  - Option 3: Establish new, lower metrics
- Awaiting Commission decision

Screening Criteria Issues

- External hazards
  - Is link between deterministic and probabilistic criteria appropriate?
- 10 CFR §50.46(a)
  - Is new rule applicable to new reactors?
- Protection against low-trajectory turbine missiles (RG 1.115)
  - Is hazard rate of less than 10^{-7} acceptable for new reactors?

Screening Criteria Issues (cont.)

- 10 CFR §52, Appendices, VIII.B.5 (i.e., 10 CFR §50.59 "like" process)
  - Subpart b – What constitutes a "minimal increase"?
  - Subpart c (resolution of an ex-vessel severe accident) – What constitutes a "substantial increase"?

RITS Initiative 4B Implementation Issues

- COL issuance
  - Risk-informed regulatory guidance
  - "Methodology"
    - Site-specific, as-built PRA
    - PRA peer review
    - Plant operating experience
  - Public meeting 11/3/10 to discuss challenges and options

RITS Initiative 4B Implementation Issues (cont.)

- Post COL issuance
  - Considering options to address similar "methodology" issues (i.e., if amendment is submitted soon after COL issuance)

Advanced Reactors Issues

- Licensing may be under 10 CFR §50 or 10 CFR §52
- Risk-informed licensing strategy
  - Staff Requirements Memorandum
  - Public meetings
- Multi-unit sites
- Mechanistic source term

STAKEHOLDER PRESENTATIONS

WRAP-UP

In Conclusion . . . .

- Should keep moving forward and develop the necessary "guidance" to facilitate applications
- Continue to work closely with stakeholders
  - Public meetings
  - Collaborative efforts (where appropriate)
  - Pilot studies