October 25, 2011

MEMORANDUM TO: Charles E. Ader, Director
Division of Safety Systems and Risk Assessment
Office of New Reactors

FROM: Donald A. Dube, Senior Technical Advisor ***/RA/***
Division of Safety Systems and Risk Assessment
Office of New Reactors

SUBJECT: SUMMARY OF PUBLIC MEETING TO PERFORM TABLETOP EXERCISES TO COMPLETE LICENSING ISSUES AND TO DISCUSS THE REACTOR OVERSIGHT PROCESS FOR NEW REACTORS HELD ON OCTOBER 5, 2011

On October 5, 2011, a public meeting was held at One White Flint North, Room 3B4, to conduct tabletop exercises to discuss risk-informed licensing issues (e.g., Regulatory Guide 1.174) that were not covered during the previous tabletops that were held, and the reactor oversight process (ROP) for new reactors. The workshop was held to address the Commission's Staff Requirements Memorandum (SRM) of March 2, 2011, on SECY-10-0121. The workshop agenda is provided as Enclosure 1. A list of attendees is provided as Enclosure 2. Handouts prepared by the staff are included as Enclosures 3 through 5.

The workshop was the sixth in a series in response to the Commission SRM to perform tabletop exercises that "test various realistic performance deficiencies, events, modifications, and licensing bases changes against current U. S. Nuclear Regulatory Commission policy, regulations, guidance and all other requirements (e.g., Technical Specifications, license conditions, code requirements) that are or will be relevant to the licensing bases of new reactors."

During the morning session on licensing issues, staff discussed the status of revisions to RG 1.174 on risk-informed changes to the licensing basis. The five principles of risk-informed decisionmaking were highlighted, including the defense-in-depth philosophy and the change in risk acceptance guidelines. To test the application of RG 1.174, eight cases representing actual or hypothetical changes were presented, and the assessment process for determining the acceptability of the change was discussed. Staff noted that since it was highly unlikely that a combined license (COL) holder would propose a license amendment request to completely remove a Tier 1 system, the most likely changes would be regarding *how* the existing system is to be categorized, operated, and maintained.

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The following observations are noted:

- In many of the examples, the estimated change in core damage frequency (ΔCDF) was observed to be very low and well below Region II of the acceptance guideline per Figure 3 of RG 1.174. What the staff would be closely reviewing, then, is whether or not the proposed change might significantly change the risk profile by, for example, causing some sequences such as station blackout to become dominant.
- Degradation of the level of defense in depth would also be an area of close review by the staff. While a proposed change might have acceptably low ΔCDF or change in large early release frequency (ΔLERF), if the change adversely impacted equipment that provided defense-in-depth capability via redundancy and diversity, this could cause the staff to reject the proposed change.
- Changing a plant feature from highly passive to active, thus placing greater reliance on key operator actions, would be an area for close review by the staff.
- Proposed changes in or near the boundary of Region II would undergo close scrutiny by the staff, and there would need to be a compelling reason on the part of the license holder for the proposed change. Serious consideration of alternatives with lower risk impact would need to be assessed by the licensee.

Of the three options suggested by the staff regarding the possible treatment of new reactors in RG 1.174, most external stakeholders present at the workshop preferred Option 1, same treatment of new reactors as the currently operating fleet.

The second topic discussed during the workshop was regarding potential options for transitioning from large release frequency (LRF), and to a lesser extent on conditional containment failure probability (CCFP) as risk metrics used in new reactor design certifications, to LERF. The staff identified three possible options and discussed the advantages and disadvantages of each. While the staff reserved final judgment regarding which of three possible options it preferred, the industry representatives clearly preferred Option 3 in which the use of LRF would be terminated at or before initial fuel load, and LERF would be used going forward during plant commercial operation. However, external stakeholders questioned the value of performing a one-time LRF/LERF benchmark as the staff had proposed.

Finally, other risk-informed initiatives that have not been considered to any depth during the series of tabletops were briefly reviewed. These included:

- Risk-informed inservice testing of pumps and valves (RG 1.175)
- Integrated leak rate testing interval extension (NEI 94-01)
- Alternative source term (RG 1.183)
- 50.46a
- NFPA 806.

Participants in the workshop noted that for most of these activities there appeared to be very little short-term interest by future COL holders, and the staff's decision not to perform tabletops was reasonable. Staff noted that alternative source term has already been applied at most of the new reactor designs.

The staff opened the afternoon session by presenting a series of slides (see Enclosure 4) that summarized the objectives and approach for the ROP-related tabletops, provided a background discussion on the objectives of the ROP, and reviewed the ROP-related guidance for the risk-informed aspects of the significance determination process (SDP), Management Directive (MD)

8.3, and the mitigating systems performance index (MSPI). The objective of these tabletops was to test various realistic scenarios that are or will be relevant to the licensing basis for new reactors, and confirm the adequacy of the risk-informed aspects of the ROP for regulatory decision-making or identify areas for improvement. The staff presented a broad cross-section of well-vetted cases, developed from actual greater-than-green SDP findings, MSPI data and MD 8.3 applications from the current fleet of reactors. For each case study, the staff applied similar situations to the new reactor designs, filling in any gaps with realistic hypothetical situations and reasonable assumptions, and then compared the risk values and results from the new reactor scenarios to those derived from the current fleet. These case studies were compiled, made publicly available, and distributed to participants prior to the meeting (see ML112710033). Updated results presented on October 5 are provided in Enclosure 5.

The participants noted the following observations as a result of the SDP discussions:

- The SDP case studies seemed to reasonably represent situations applicable to new reactors.
- Although less likely (and less frequently), the case studies demonstrated that greater-than-green risk-thresholds for inspection findings can be surpassed, but it would likely take common cause failures that affect multiple systems and/or long-term exposures of risk-significant components.
- Regardless of SDP color, all performance deficiencies (including green) are entered into the licensee's corrective action program.
- The SDP analyses for new reactor designs may need to be more deterministic and augmented with additional qualitative considerations. The analyses for the current fleet are influenced by uncertainties and/or sensitivities, and this is expected to continue to be true for future reactors.

The following observations were noted as a result of the MD 8.3 event response discussions:

- The MD 8.3 case studies seemed to reasonably represent situations applicable to new reactors.
- Although less likely (and less frequently), the case studies demonstrated that the numeric thresholds for invoking reactive inspections, including AITs, can be met.
- In addition to the risk-informed criteria, deterministic criteria already play an important role in determining the appropriate regulatory response to events, and this is expected to continue to be true for future reactors.

The participants noted the following observations following the MSPI discussions:

- The MSPI case studies seemed to reasonably represent situations applicable to new reactors with active safety systems.
- The cases were limited to active designs; passive designs are too different to evaluate at this time and a meaningful MSPI may not be possible for passive systems.
- The cases indicated that it would be rare and unlikely to cross greater-than-green thresholds for active new reactor designs.
- Given the anticipated low utility of this indicator for new reactor designs, it may be impractical for licensees to create an MSPI basis document and track and report MSPI data.

- Potential considerations for addressing the MSPI for new reactors could include:
    - The performance limit (backstop) would play a more significant role and could be emphasized for the new reactor MSPI.
    - Alternate mitigating system PIs could be developed.
    - Additional inspection could be used to supplement/offset insights currently gained through MSPI.

The following general observations were also noted by the meeting participants

- The best available data were used in performing the analysis for the tabletop exercises. The Standardized Plant Analysis Risk (SPAR) models and new reactor vendors' risk models used for these case studies are still being refined and reviewed for quality and accuracy, and any future changes could potentially affect the risk numbers. In addition, adding external events to the risk models for new reactors could increase the risk numbers.
- The risk importance of passive systems and components was not available and/or considered for these case studies. Potential passive design issues may need to be taken into account for the new reactor designs in the future and could affect the risk numbers.
- Existing processes could be used to evaluate and potentially adjust the ROP for new reactors in the future as a result of the ROP self-assessment process, operating experience, and lessons learned.
- Deviations from the ROP Action Matrix could also be used to adjust the staff's actions to provide for an appropriate regulatory response, if deemed necessary, and then each deviation would be evaluated for potential program improvements.
- External stakeholders should be involved in the development of potential revisions to the ROP for new reactors.

The attendees also briefly discussed a vessel head degradation scenario but a case study with risk numbers had not been prepared in advance of the meeting. The participants noted that a follow-up meeting on October 26, 2011, may be necessary to discuss this case study and to summarize the observations and path forward in developing the staff's recommendations as a result of the ROP tabletop exercises. A meeting has since been scheduled for the afternoon of October 26, 2011 (reference meeting notice ML112860189).

Enclosures:
As stated

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Distribution: See next page

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U.S. Nuclear Regulatory Commission
Rockville, MD 20852
Public Workshop #5 on SRM to SECY-10-0121
Wrap-up of Licensing Issues and the ROP
for New Reactors October 5, 2011

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