March 31, 2004

MEMORANDUM TO: Ledyard B. Marsh, Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Michael E. Mayfield, Director***/RA/Chokshi for***
Division of Engineering Technology
Office of Nuclear Regulatory Research

SUBJECT: RES RECOMMENDATIONS FOR CHANGES TO 10 CFR PART 50, APPENDIX H

The Materials Engineering Branch (MEB) received a user need request from the Office of Nuclear Reactor Regulation (NRR), dated April 5, 2002, regarding reactor pressure vessel (RPV) integrity issues. Task 5 requested an evaluation of the need to revise Appendices G and H based on technical developments which have occurred relative to 10 CFR 50.61 and other technological developments. This memorandum addresses only the evaluation of Appendix H.

Appendix H to 10 CFR Part 50 establishes the NRC's requirements for light water RPV material programs. The purpose of these programs is to monitor changes in fracture toughness properties of ferritic materials in the reactor vessel beltline region, which result from the exposure of these materials to neutron irradiation and the thermal environment. Under the surveillance programs, fracture toughness data are obtained from material specimens exposed in surveillance capsules, which are withdrawn periodically from the reactor vessel. The data are used as described in Section IV of Appendix G to 10 CFR Part 50.

Presently, Appendix H endorses only the use of editions of American Society for Testing Materials (ASTM) Standard Practice E 185, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels," through the 1982 edition. Significant changes have occurred since 1982 regarding consensus "best practices" related to RPV material surveillance programs. Several of these changes have been incorporated into more recent editions of Standard Practice E 185, specifically ASTM E 185-93 and the subsequent update ASTM E 185-98. Some changes were made, but the practice is nominally the same as the earlier version, in that it includes guidelines for designing a minimum surveillance program, selecting materials, and evaluating test results. Additional changes are being currently evaluated by ASTM for a future revision of Standard Practice E185. More recently, the provisions of ASTM E 185-98 were separated into three new standard practices:

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1) ASTM E 185-02, “Standard Practice for Design of Surveillance Programs for Light-Water Moderated Nuclear Power Reactor Vessels,” and
2) ASTM E 2215-02, “Standard Practice for Evaluation of Surveillance Capsules from Light-Water Moderated Nuclear Power Reactor Vessels,” and
3) a standard practice, still under review, on supplemental surveillance intended to address the needs for surveillance programs during the license renewal period.

Although relatively minor in nature, the following changes to Appendix H, are recommended:

1) In Section I, ASTM E 185-73, -79, and -82 are currently referenced. These should be updated as appropriate to include the new standard practices ASTM E 185-93, -98, -02 and ASTM E 2215-02.
2) In Sections I and IV.B, Appendix H refers to fracture toughness with respect to Charpy impact testing. The wording should be revised to reflect the optional use of fracture toughness specimens that determine a K_{Jc} value as discussed in ASTM E 185-02 and E 2215-02.
3) In Section I, specific direction should be inserted regarding the design of surveillance programs in accordance with ASTM E 185-02.
4) In Section I, the address of ASTM should be changed to: ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.
5) In Section III.B.1, update the reference, as in the first recommendation for Section I above, to the more recent versions of ASTM E 185 for current and new plants.

Counterparts in the Materials and Chemical Engineering Branch (EMCB) of NRR have been informed of these recommendations. As mentioned earlier, ASTM Committee E-10 is in the process of developing a new standard practice to address supplemental surveillance needs for existing reactors that are approved for license renewal. The schedule for completion and publication of this practice has not been explicitly established. Once completed however, it should be evaluated for possible future inclusion in Appendix H.

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