UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 7, 2016

MEMORANDUM TO: Marissa G. Bailey, Acting Director
Division of Engineering
Office of Nuclear Reactor Regulation

FROM: Brian E. Thomas, Director ***/RA/***
Division of Engineering
Office of Nuclear Regulatory Research

SUBJECT: IMPENDING PUBLICATION OF TECHNICAL LETTER REPORT, ORNL/TM-2015/59531/REV-01, ENTITLED "THE EFFECT OF SHALLOW INSIDE-SURFACE-BREAKING FLAWS ON THE PROBABILITY OF BRITTLE FRACTURE OF REACTORS SUBJECTED TO POSTULATED AND ACTUAL OPERATIONAL COOL- DOWN TRANSIENTS: A STATUS REPORT"

The Office of Nuclear Regulatory Research (RES) has completed ORNL/TM-2015/59531/Rev-01, *"The Effect of Shallow Inside-Surface-Breaking Flaws on the Probability of Brittle Fracture of Reactors Subjected to Postulated and Actual Operational Cool-Down Transients: A Status Report,"* (ADAMS Accession ML16043A170). This report documents work performed under Task 2.1 of User Need Request NRR-2014-007, "Reactor Pressure Vessel Integrity Issues." Task 2.1 supports the development of the technical basis for a potential risk-informed revision of Appendix G to 10 CFR Part 50.

The structural integrity of a nuclear reactor pressure vessel (RPV) under loading depends in part on the size and location of flaws that either exist, or are postulated to exist, in the structure. One class of flaws that cannot be ruled out (see, for example, NUREG-1806 and NUREG-1874, which provide the technical basis for the alternative PTS Rule, 10 CFR 50.61a) are shallow surface breaking flaws on the inner diameter of the vessel. The surface flaws depths being considered just penetrate through the cladding layer and into the underlying ferritic steel. These flaws, if they exist, are subject to additional stresses that arise due to the mismatch in the coefficient of thermal expansion between the austenitic stainless steel cladding and the underlying ferritic steel base material.

This TLR is a status report summarizing progress of an on-going investigation conducted by ORNL for the NRC to investigate such flaws and their impact on the RPV structural integrity. Within the context of the mathematical models used in this report to represent the physical situation of such flaws in RPVs, the report concludes that these flaws may have an impact on

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vessel integrity. However, some aspects of these current models, while representing the best practice and knowledge currently available, fail to fully represent the physical situation. For this reason, on-going investigations are planned (subject to the availability of adequate funding) to develop improved models that better represents physical reality. The results of these investigations are expected to inform the need for future revisions, or not, of Appendix G to 10 CFR Part 50on the part of the NRC.

Staff from the Divisions of Engineering in NRR and NRO reviewed a draft of this TLR; the enclosed final TLR reflects the resolution of their comments. Nonetheless, please feel free to notify the responsible RES contact if you have any questions concerning the impending public release of this TLR.

If additional information is required, please contact Mark Kirk of my staff at 301-251-7631 or mtk@nrc.gov.

Enclosure:
As stated

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