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MEMORANDUM FOR: Bernard C. Ruscha, Director
Office of Nuclear Reactor Regulation

FROM: Saul Levine, Acting Director
Office of Nuclear Regulatory Research

SUBJECT: SRI 6: DRAFT REPORT: "A CRITIQUE OF THE BOARD-HALL
MODEL FOR THERMAL DETONATIONS IN THE UO₂-NA SYSTEM"

Reference: Memorandum of August 19, 1976 from C. H. Kalber to
L. Rubenstein entitled "Purdue Research Foundation
Proposal for Continuation of the Work Initiated
Under Contract No. AT(49-24)-018."

Enclosed for your information is a draft copy of the subject report prepared as part of the effort of the Office of Nuclear Regulatory Research to determine research needs in this area. The author is Dr. David C. Williams of Sandia Laboratories, and the paper will be presented at the ANS-ENS "International Meeting of Fast Reactor Safety and Related Physics" at Chicago in October. This evaluation is relevant to the DPM-supported experiments at Purdue University on the validity of the Board-Hall model, and is the RES generated evaluation of this model referred to in the reference memorandum.

The Williams report concludes that the Board-Hall model for propagation of a detonation-like thermal explosion in a postulated pre-mixed UO₂ sodium system is not valid for LMFBR accident conditions because of the very high magnitude of the shock pressure required for triggering, because of deficiencies in the fragmentation model, and because of neglect of the dispersive characteristics of the pre-mixed UO₂-sodium system. The report does say, however, that the possibility of the occurrence and propagation of a detonation-like thermal explosion in a pre-mixed UO₂-sodium system by some mechanism other than the Board-Hall fragmentation model cannot at present be ruled out completely.

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Edward C. Busche

We hope that this report will prove useful to you and your staff in evaluating the Board-Hall model in particular, and also the value of the experimental research proposed by Purdue to EPM. Further discussions on the technical aspects of this problem should be conducted with R. W. Wright of my staff.

Original Signed by
Saul Levine
Saul Levine, Acting Director
Office of Nuclear Regulatory Research

Enclosure:
As stated

- cc: R. F. Fraley, ACRS (5)
- T. S. McClellan, ACRS
- S. Manauer, IA
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- L. Rubenstein, DPM
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