RES 3-14

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L. Rogers, Director
Directorate of Regulatory Standards

SRI-3 ORNL V-7 INTERMEDIATE VESSEL TEST RESULT

This is the third in a series of memos to transmit safety research information (SRI) to you for assistance it may provide in regulatory use.

The information transmitted in the enclosed letter from ORNL titled "Preliminary Test Results for Heavy Section Steel Technology Intermediate Test Vessel V-7," is of high value because it demonstrates additional experimental evidence that a "safe" failure mode for reactor vessels may exist, namely "leak-before-break." You will recall that earlier this year the PSST program showed leak behavior rather than fracture from a flaw in a nozzle corner in another vessel.

The present test result is of additional importance because the flaw was 18-inches long and five inches deep in the six inch thick pressure vessel wall. Despite the enormity of this flaw, the vessel still was able to sustain twice the design load prior to penetration of the flaw through the remaining thin ligament of vessel material. It is not likely that such a flaw could be undetected in a reactor vessel, but even if it were, this test shows that the reactor would require an overpressure of more than 100% of its design operating pressure before leakage would occur. Pretest predictions made of the failure pressure for this vessel and test conditions proved to be quite accurate even though linear elastic fracture mechanics were no longer strictly applicable to the material and testing conditions. The results of this test are under continuing analysis to further generalize the results for application to operational reactors.

Sincerely,

Signed, H. J. C. Kouts

Herbert J. C. Kouts, Director
Division of Reactor Safety Research

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Enclosure:
ORNL test result of
V-7 intermediate vessel

cc: see next page

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