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MEMORANDUM FOR: Edson G. Case, Acting Director
Office of Nuclear Reactor Regulation

FROM: Saul Levine, Director
Office of Nuclear Regulatory Research

SUBJECT: RESEARCH INFORMATION LETTER #18 ON THE FRANTIC COMPUTER CODE

This memorandum transmits the results of completed research on the development of the FRANTIC computer code to calculate system unavailabilities. The work was performed internally by the Probabilistic Analysis Branch. Attached please find a copy of the FRANTIC user's manual (NUREG-0193) and a paper (printer's copy) describing the FRANTIC code which is to be published in the October issue of the IEEE Transactions on Reliability.

The FRANTIC code calculates the instantaneous, time dependent unavailability of any system model (such as a fault tree or block diagram). The testing models in FRANTIC are more detailed and more realistic than in other evaluation codes: test downtimes, test inefficiencies, and test-caused failures are incorporated to allow comprehensive surveillance testing evaluations to be performed. The calculations can be of either an absolute or relative nature. Standard quantitative evaluations can also be performed with FRANTIC where only designs and component hardware are evaluated. Extensive plots can be produced for reporting purposes.

EVALUATION AND APPLICATION

The enclosed FRANTIC user's manual, which describes the methodology and code utilizations, has been reviewed by the Offices of Nuclear Reactor Regulation, Standards Development, and Inspection and Enforcement. The FRANTIC methodology has also had peer review before acceptance for publication in the IEEE Transactions on Reliability.

As an example application of FRANTIC, the IEEE article and user's manual describe an evaluation in which test intervals are optimized for the aux-feed system analyzed in WASH-1400. By testing the turbine pump every 60 days and by staggering this test between the diesel tests, the average system unavailability is decreased by a factor of 23 as compared to the non-staggered case in which the pump is tested every 30 days. Furthermore, the maximum instantaneous unavailability of the system is also reduced by a factor of 43. This

example shows the important effect of staggering tests not only within a subsystem (between diesels) but across subsystems in the same accident sequence (pump test between diesel tests). These results also indicate that less testing can be performed (60 day intervals versus 30 day intervals for the pump), if the testing schemes are optimized.

The FRANTIC code has potential significant application in evaluating technical specifications on testing and allowed downtimes. The evaluations can be of a generic nature or can be applied to specific plant systems if applicable data are available. Sensitivity analyses can also be performed to evaluate detailed test properties. FRANTIC also has potential use in assessing the system impact of component data collected through NPRDS. The development of system models and further analysis of data will allow wider applications to be evaluated and to be reviewed for practical utilization.

Original Signed by
Saul Levine

Saul Levine, Director
Office of Nuclear Regulatory Research

Enclosures:
1. FRANTIC NUREG-0193
2. Paper describing FRANTIC Code

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*Enclosure 1 will be coming to you at a later date from Publications. Enclosure 2 is attached.

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