ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue, Argonne, Illinois 60439 Telephone 312/972- 3338

April 19, 1984

Mr. Jack Guttmann
Reactor Systems Branch
Division of Systems Integration
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Completion of Ginna Steam Generator Tube Rupture RETRAN Calculations - FIN A2311

References: 1. Letter, T. Y. C. Wei to J. Guttmann, "FIN A2311 Task II: Ginna Steam Generator Tube Rupture Calculations," March 6, 1984.

2. INPO Draft Report, "Thermal-Hydraulic Analysis of Ginna Steam Generator Tube Rupture Event, September, 1983.

Dear Mr. Guttmann:

Reference 1 reported on the completion of subtasks II.B.1 (Secondary System Behavior) and II.B.2 (Stuck Open PORV) for the subject FIN. We have now completed the remainder of the required RETRAN calculations using input supplied by INPO and the Mod03 versions of the computer code.

Subtask II.B instructed us to re-calculate the Ginna tube rupture event using RETRAN02 at ANL and the input decks developed cooperatively by RG&E and INPO. This analysis was done to verify that the INPO model, when run at ANL reproduces their results, reported in Reference 2. The ANL calculations were made with the latest released version of the code, viz. RETRAN02/Mod03, whereas the INPO results were obtained using a pre-release version, Mod03A. This required that changes to the input decks be made in order that it run on Mod03; these changes were identified in the documentation accompanying the code distribution package. More important, from the standpoint of schedule and budget, coding deficiencies or errors caused significant delays and attendant losses in man and computer time. These difficulties were overcome, often through discussions with EI personnel who were most helpful in resolving

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the problems. In two instances, changes to the FORTRAN source decks were suggested and made. Thus, replicating the INPO calculations was not as simple and straightforward a task as originally thought and the models and/or solution techniques are not absolutely identical. It is to be expected, therefore, that there be some differences in calculated results and such is the case. However, observations made to date indicate the results are comparable to well within the range of uncertainties inherent in such calculations. Our current evaluation is that INPO's calculations and conclusions derived therefrom are confirmed insofar as is possible with a state-of-the-art computer code as RETRAN. We are presently continuing to examine the results, and in particular, are preparing comparative results in graphical form to illustrate the level of agreement in the two sets of calculations. Code errors discovered have been formally reported to EPRI, EI and EPSC for general resolution as required by their procedures, except for one problem wherein the request for submittal of input decks has been referred to RG&E for approval.

In subtask II.B.3 (Failure to Terminate HPI), we were requested to determine the consequences in the primary and secondary systems if HPI were not terminated as in the actual event. The operator secured the HPI pumps at one hour and twelve minutes after tube rupture in the Ginna event which interrupted the ongoing cooldown of the RCS and dramatically reduced the discharge of radioactive water to the environment; some release continued because the charging pumps remained on and their flow exceeded the letdown rate. INPO estimated that the faulted steam generator (SGB) safety relief valve (SRV) did not completely close until three hours and two minutes after the tube rupture. For the purposes of this subtask, INPO's modeling of operator control of the intact steam generator (feed and bleed) was unaltered; the only changes in the model were to inhibit tripping the HPI and to maintain a constant flow area for SGB SRV equal to that assumed when HPI was terminated in the actual event. The calculation was continued for eight minutes beyond actual HPI termination, and the response trends in the primary and secondary systems are as anticipated. Primary system (RCS) pressure remains above that of SGB by approximately 300 psi. This maintains the tube rupture flow into SGB and attendant release through its SRV at a rate of nearly 600 gpm which approximately equals the sum of safety injection and charging flow rates. Sustained injection of this relatively cold water into the RCS causes a moderate rate of cooldown to continue. For example, examination of the calculated fluid temperature in the reactor vessel downcomer gives an estimated rate of approximately -70°F/hour during the end period of the calculation; the results also indicate a slow reduction in cooldown rate as anticipated. Based upon a limiting rate of -100°F/hour, these results show that a certain thermal margin still exists even for continued operation of the HPI system.

The foregoing summarizes the salient results of the indicated RETRAN calculations. We are preparing a final report that will provide details on all RETRAN calculations made for this task.

Sincerely yours,

J. H. Tessier

J. H. Tessier
Light Water Reactor Systems Analysis
Reactor Analysis and Safety Division

T. Y. C. Wei
Light Water Reactor Systems Analysis
Reactor Analysis and Safety Division

TYCW:JHT:jkb

cc: R. Mattson, Director, Division of Systems Integration, NRC/NRR
B. Sheron, Chief, Reactor Systems Branch, NRC/NRR
R. W. Houston, Assistant Director for Reactor Safety, NRC/NRR
S. M. Boyd, NRC/NRR
J. Carter, NRC/NRR
B. L. Grenier, NRC/NRR
W. Jensen, NRC/NRR
N. Lauben, NRC/NRR
L. W. Deitrich, RAS
R. Avery, RAS
LWR Systems Analysis Section
RAS Files: 8M627, A15