OAK RIDGE NATIONAL LABORATORY
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NUCLEAR DIVISION

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OAK RIDGE, TENNESSEE 37830

December 21, 1978

Dr. R. ~ Schamberger, Chief
Experimental Gas Cooled Reactor
Safety Research Branch
Division of Reactor Safety Research
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Bob:

Subject: Response to DSS Request of November 21, 1978 for Assistance with Fort St. Vrain Reactor Licensing Review

This letter responds to a request[1] by DSS for ORNL to provide additional calculations of postulated DBDA and LOFC accidents for Fort St. Vrain (FSV). The intent of the request is to determine if initial conditions other than those specified in the FSAR could lead to worse conditions during a DBDA or LOFC accident. Specific conditions chosen are points along the power-to-flow ratio vs core thermal power curve (Fig. 3.1-2 from the FSV Technical Specifications), shown in Attachment 1. The 5 points marked on the curve were chosen as initial conditions for the analyses. A sixth point, with an initial power of 102% and an initial flow of 93.5%, is also included to represent compounded worst-case measurement uncertainties.

Since detailed calculated core input parameters and functions are not available for these analyses, the following assumptions are made based on the GA data[2] supplied for the FSV analyses done by ORNL last May:

1. Equilibrium core (EQSB3) peaking factors and associated refueling region outlet temperatures. In order to obtain a heat balance for the initial conditions, the assumed core inlet temperature has to be adjusted (Table 1);

2. Post DBDA and LOFC emergency cooling flows and core helium inlet temperatures and pressures are the same as those given in Ref. 2; and

3. Afterheat equations used are based on the updated estimates approved by NRC for LHTGR safety studies, which include substantial uncertainty factors.[3]

The results of the study are summarized in Table 2, which shows peak predicted temperatures of interest for both the DBDA and the LOFC + FWCD accident. It should be noted that the predicted values of maximum cover plate temperatures are based on poorly-understood models of the plume heat transfer phenomena. Even so, the data shows clearly that each of the new postulated cases results in maximum temperatures that are no greater than the FSAR-assumed worst case.

Please let me know if there are any questions about the analysis, or if more detail about any of the runs is needed.

Have a nice Holiday,

S. J. Ball/rmw

S. J. Ball

SJB:rmw
Attachments
cc: J. C. Cleveland
J. C. Conklin
R. Ireland DSS/NRC
P. R. Kasten
G. Kuzmycz, DPM/NRC
F. R. Mynatt
L. Phillips, DSS/NRC
Z. Rosztoczy, DSS/NRC
J. P. Sanders
B. Sheron, DSS/NRC
T. Spies DPM/NRC
R. S. Stone
P. M. Williams, DPM/NRC

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[1]Letter from Z. R. Rosztoczy to R. D. Schamberger, "ORNL On-call Assistance for Fort St. Vrain," Nov. 21, 1978.

[2]Letter from G. A. Bramblett (GA) to S. J. Ball on FSV accident cases submitted to NRC, May 1, 1978.

[3]R. E. Sund, "Afterheat Calculations for the HTGR," Gulf GA-A12499A (GA-LTR-4, Amend. A), July 1974.

Table 1. Initial Conditions for DBDA and LOFC Analyses, Equilibrium core (EQSB?) parameters.

Case	Power to Flow ratio	T core inlet °F	Power %	Power MWt	Flow %	Flow lb/min
Ref.	1.043	773.0	104.3	878.3	100	56,500
1	1.05	768.3	100	842.0	95.2	54,760
2	1.095	737.6	80	673.6	73.1	41,871
3	1.14	706.9	60	505.2	52.6	30,084
4	1.17	686.4	40	336.8	34.2	19,511
5	1.1	734.2	20	168.4	18.2	10,418
6	1.091	740.4	102	858.8	93.5	53,601

Table 2. Maximum Temperature Estimates for FSV DBDA and FWCD Accidents for Various Initial Conditions. Equilibrium (EQSB3) Core, LTR-4-A + 20/10 Afterheat.

	Ref Case	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Initial Power, %	104.3	100	80	60	40	20	102
DBDA							
Max. Fuel Temp., °F	2676	2617	2335	2094	1923	1826	2627
Max. Avg gas out, °F	1768	1751	1664	1580	1512	1476	1758
Max. Region gas out, °F	2351	2313	2106	1928	1923	1736	2322
2-hr LOFC + FWCD							
Max. Fuel Temp. @ t=2hrs, °F	2858	2808	2555	2317	2072	1840	2826
Max. Reverse Flow temp @ t=2hrs, °F	1950	1923	1762	1586	1417	1232	1929
Max. Cover Plate temp. @ t=2hrs, °F	1619	1598	1474	1338	1209	1078	1599
Max. Forward Flow temp. after FWCD, °F	2269	2235	2065	1926	1305	1757	2241
T-streak at time of max. Forward flow temp., °F	1924	1903	1829	1736	1646	1605	1913

Attachment 1

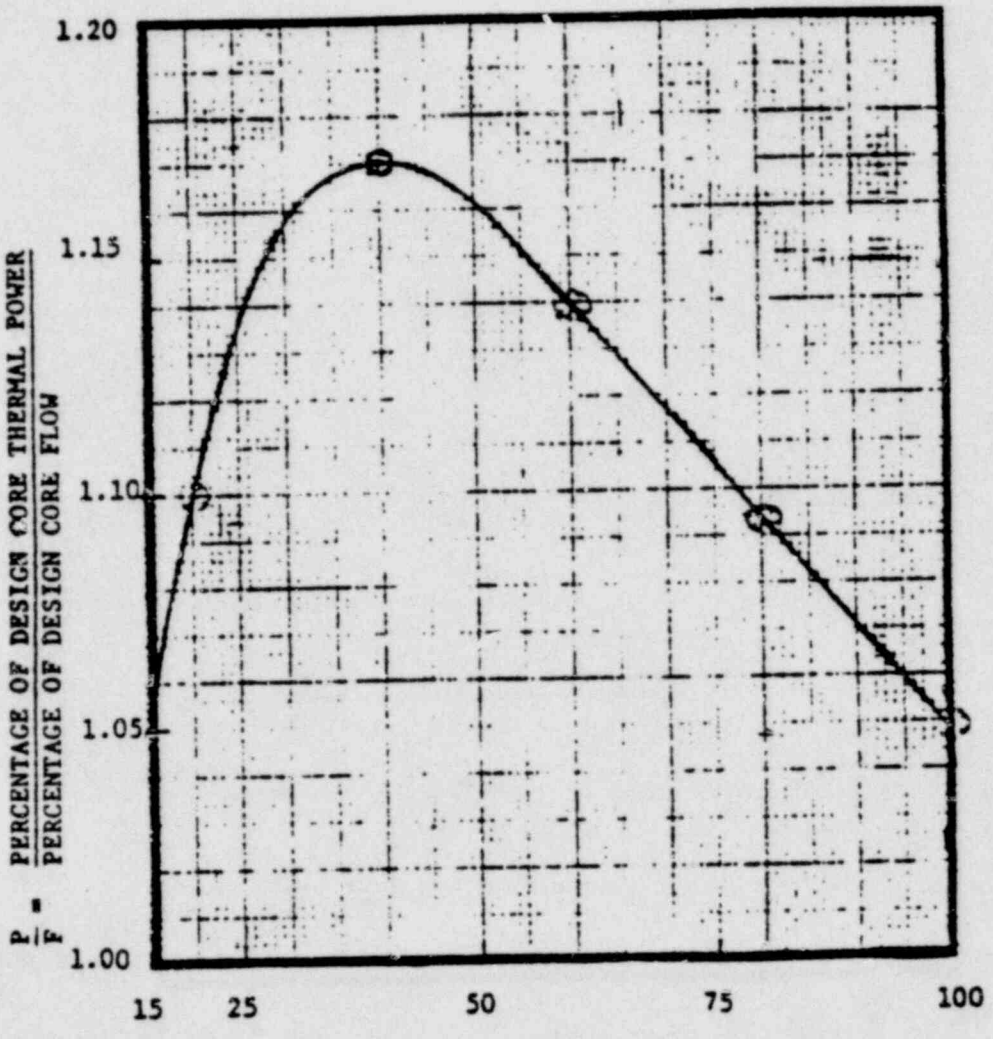

FIGURE 3.1-2