VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

W. L. STEWART
VICE PRESIDENT
NUCLEAR OPERATIONS

April 30, 1986

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
Attn: Mr. Lester S. Rubenstein, Director
PWR Project Directorate No. 2
Division of PWR Licensing-A
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Serial No. 86-250
NO/DJV/acm
Docket Nos. 50-338
50-339
License Nos. NPF-4
NPF-7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNIT NOS. 1 AND 2
REQUEST FOR ADDITIONAL INFORMATION
CORE UPRATING

Your letter dated April 14, 1986 requested additional information regarding the proposed core uprating for North Anna Units 1 and 2. Virginia Electric and Power Company's response to this request is provided in Attachment 1. If you have any further questions on this matter please contact us.

Very truly yours,

W. L. Stewart

Attachment

1. Response to NRC Request for Additional Information

A001
1/1

cc: Dr. J. Nelson Grace
Regional Administrator
NRC Region II

Mr. Larry King
NRC Resident Inspector
North Anna Power Station

Mr. Charles Price
Department of Health
109 Governor Street
Richmond, Virginia 23219

Mr. Leon B. Engle
NRC North Anna Project Manager
PWR Project Directorate No. 2
Division of PWR Licensing-A

ATTACHMENT 1

RESPONSE TO NRC REQUEST
FOR ADDITIONAL INFORMATION

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NRC REQUEST FOR ADDITIONAL INFORMATION

Page 24 of Attachment 1 to your letter of February 6, 1986 refers to a two-inch small break LOCA analysis for a plant similar to North Anna. Provide this analysis or an available reference and justify that this plant is similar.

RESPONSE

Results from the two-inch SBLOCA analysis for a plant similar to North Anna, referred to on page 24 of Attachment 1, is provided below along with justification for applicability to North Anna.

Objective of the Analysis

The objective of the reference analysis was to determine for a 3-loop Westinghouse plant how much time would elapse before the core would become uncovered for a two-inch equivalent diameter SBLOCA, in the event that accumulators and pumped SI were not available for injection into the RCS.

Methodology

The two-inch SBLOCA analysis was performed with the Westinghouse WFLASH SBLOCA Evaluation Model described in Reference 1.

Plant Characteristics

The analysis was performed for a 3-loop plant which is similar to North Anna Units 1 & 2. A comparison of the two plants is shown in Table 1. The minor differences between the two plants and their impact on the applicability of this analysis to North Anna are discussed in a later section.

Initial Conditions and Assumptions

The two-inch break transient was initiated from 102% full power conditions. The ECCS system (accumulators and pumped SI) was assumed to be inoperable and consequently was not modeled. The analysis was performed with all assumptions required by Appendix K of 10CFR50.46.

Analysis Results

The analysis results are summarized in Figures 1 through 4. As shown in Figure 1, the core uncovery began at 1327 seconds (22.12 minutes) after the initiation of the two-inch break.

Applicability of the Analysis to North Anna Units 1 & 2

Examination of Table 1 shows that the 3-loop reference plant used in the analysis described above is very similar to North Anna Units 1 & 2. The minor differences between the two plants and their impact on the applicability of these results of North Anna are discussed below.

The uprated North Anna Units have a full power rating which is 4.43% higher than the reference plant. This full power difference is insignificant when the results of this analysis are extrapolated to hot standby or hot shutdown initial conditions and their corresponding decay heat levels. For example, at the time of core uncovery the decay heat level of the reference plant full power analysis is approximately 65.86MWt (2.3% of full power), whereas when North Anna is in a hot standby or hot shutdown mode of operation the decay heat level is expected to be no more than 40.37MWt (1.36% of full power) or 35.25MWt (1.19% of full power), respectively. Consequently, the 22.12 minute time frame to core uncovery calculated for the full power case is a conservative minimum estimate for the time to core uncovery for SBLOCA's that may initiate from hot standby or hot shutdown initial conditions. Based on a comparison of power levels alone, it is expected that a more realistic time to core uncovery for hot standby or hot shutdown initial conditions would be greater than 36 minutes.

The two plants employ different model steam generators. The differences between the models is largely due to different secondary side feedwater and steam separator design features which have insignificant impact on the plant's response to a SBLOCA.

Both plants contain 17x17 fuel, however, the reference plant was analyzed with Optimized Fuel Assembly (OFA) fuel, whereas, North Anna has standard fuel. This fuel difference accounts for a small portion of the core volume difference between the two plants (the majority of the core volume difference is due to differences in barrel-baffle design). The differences in power density between the two fuel types has an insignificant impact on the thermal-hydraulic response of the RCS during a SBLOCA.

A comparison of the reactor vessels shows that the volume distribution is slightly different between the two plants, but that the total vessel volume differs by only 1.17%. The volume distribution difference between the two plants is primarily the result of different barrel-baffle and upper head design configurations. The differences in volume distribution below the top of the core will be insignificant prior to core uncovery. An examination of the volume above the core, i.e. the upper head and upper plenum volumes, shows that North Anna has approximately 8% more volume above the core. As a result, for the North Anna Units, 8% more water (as compared to the reference plant) must boil-off or be lost through the break before core uncovery will occur. Consequently, the elapsed time to core uncovery for North Anna would be longer than the 22.12 minutes calculated for the reference plant.

Summary and Conclusion

As a result of geometric and power level differences, the 3-loop plant modeled in the reference SBLOCA analysis provides a conservative representation of the North Anna Units response to a two-inch SBLOCA from hot standby or hot shutdown conditions. Therefore it is concluded that application of these results for the assessment of North Anna is conservative and justified.

References

1. Skwarek, R. J., Johnson, W. J., and Meyer, P.E., "Westinghouse Emergency Core Cooling System Small Break October 1975 Model", WCAP-8970 (Proprietary) and WCAP-8971 (Non-Proprietary), April 1977.

TABLE 1

PLANT COMPARISON

Parameter	Reference Plant	North Anna
Reactor Power (MWt)	2775	2898
No. of Loops	3	3
Steam Generator Type	Model F	Model 51
Pump Type	93A7000	93A7000
Fuel Type	17x17 OFA	17x17 Std.
Total Vessel Vol. (Ft**3)	3683.00	3726.22
Upper Head Vol. (Ft.**3)	611.82	439.22
Upper Plenum Vol. (Ft.**3)	816.90	1097.70
Core Volume (Ft.**3)	769.87	538.03
Lower Plenum Vol. (Ft.**3)	900.22	917.44
Downcomer Volume (Ft.**3)	584.19	733.33

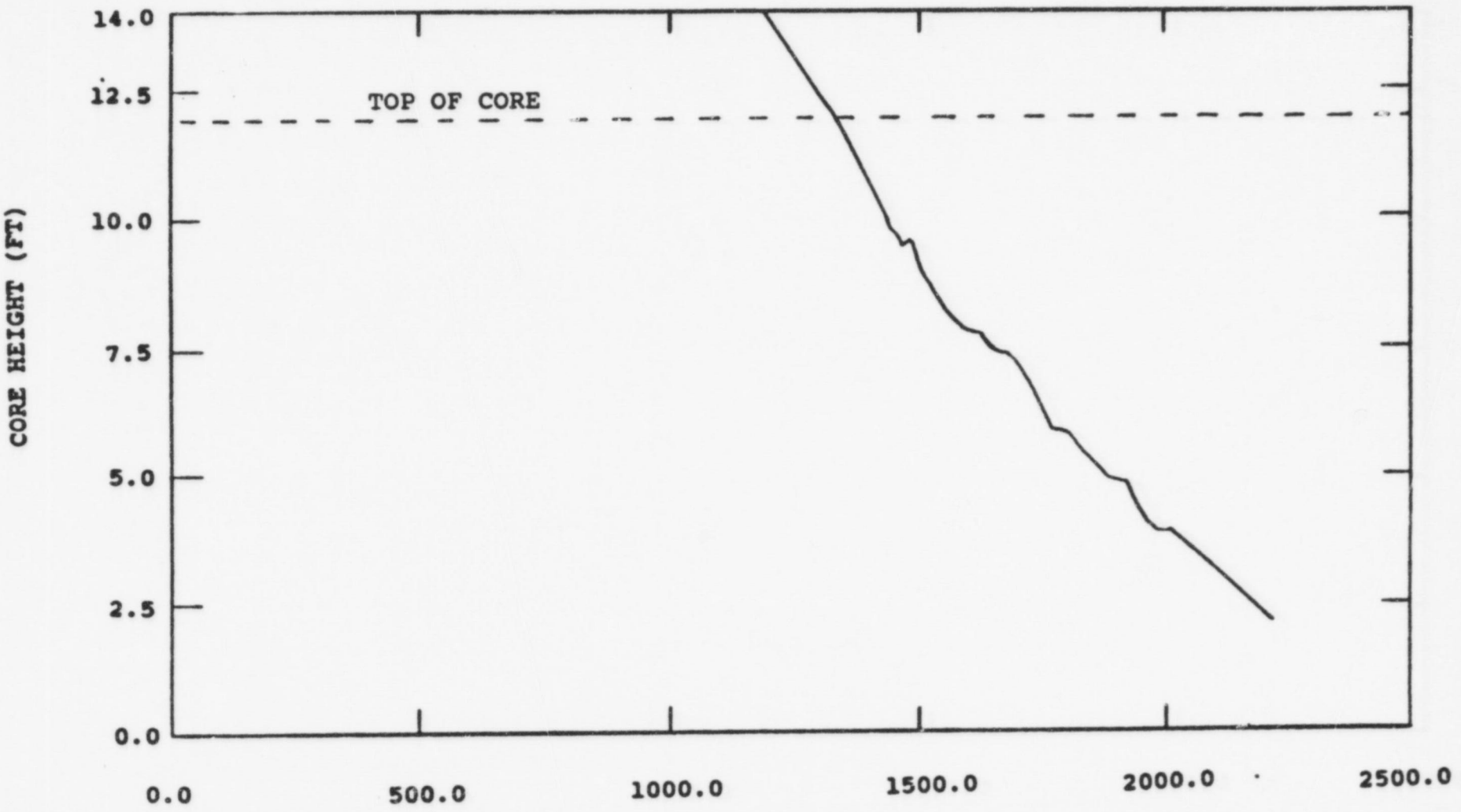

FIGURE 1. CORE MIXTURE LEVEL

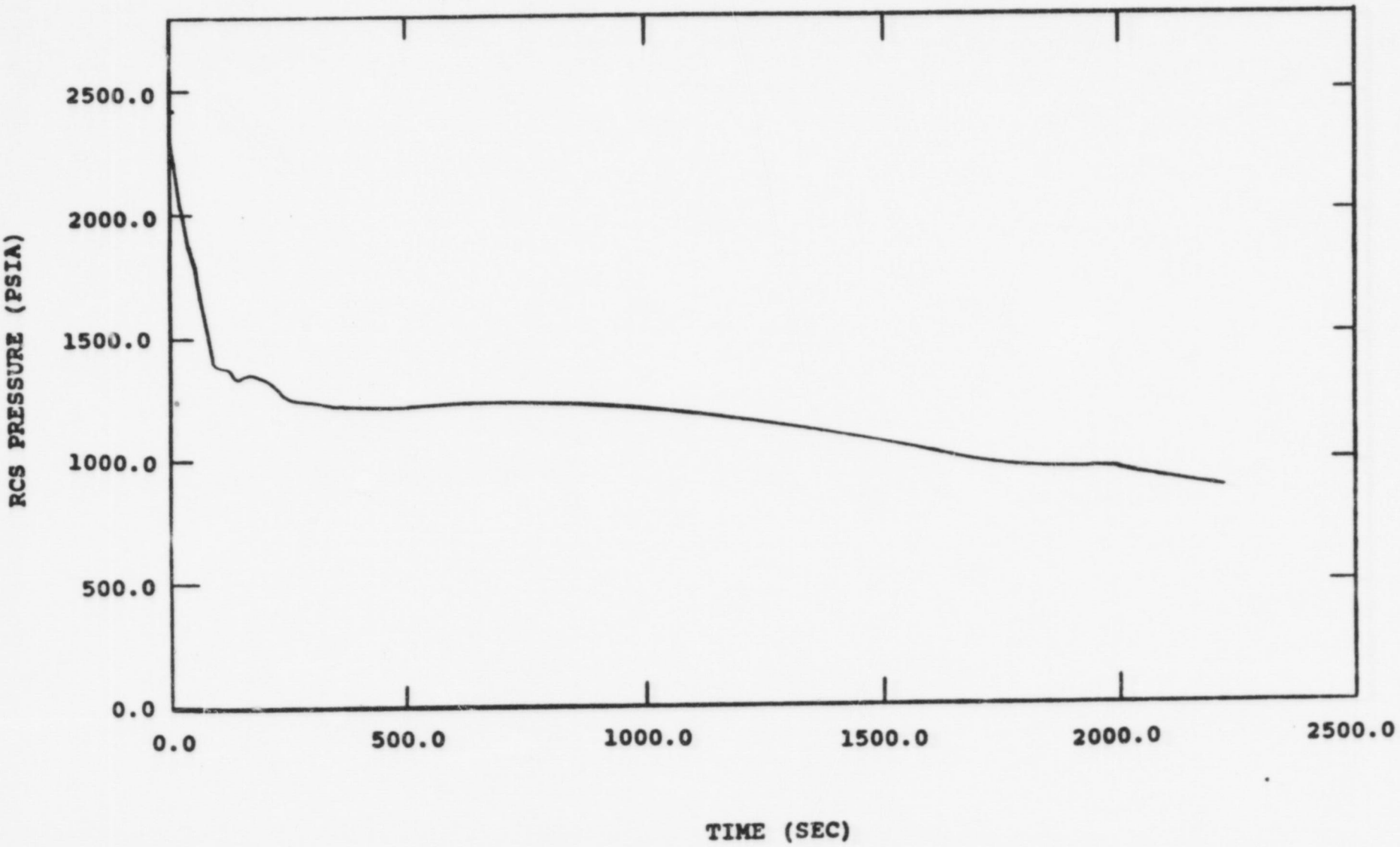

FIGURE 2. UPPER PLENUM PRESSURE

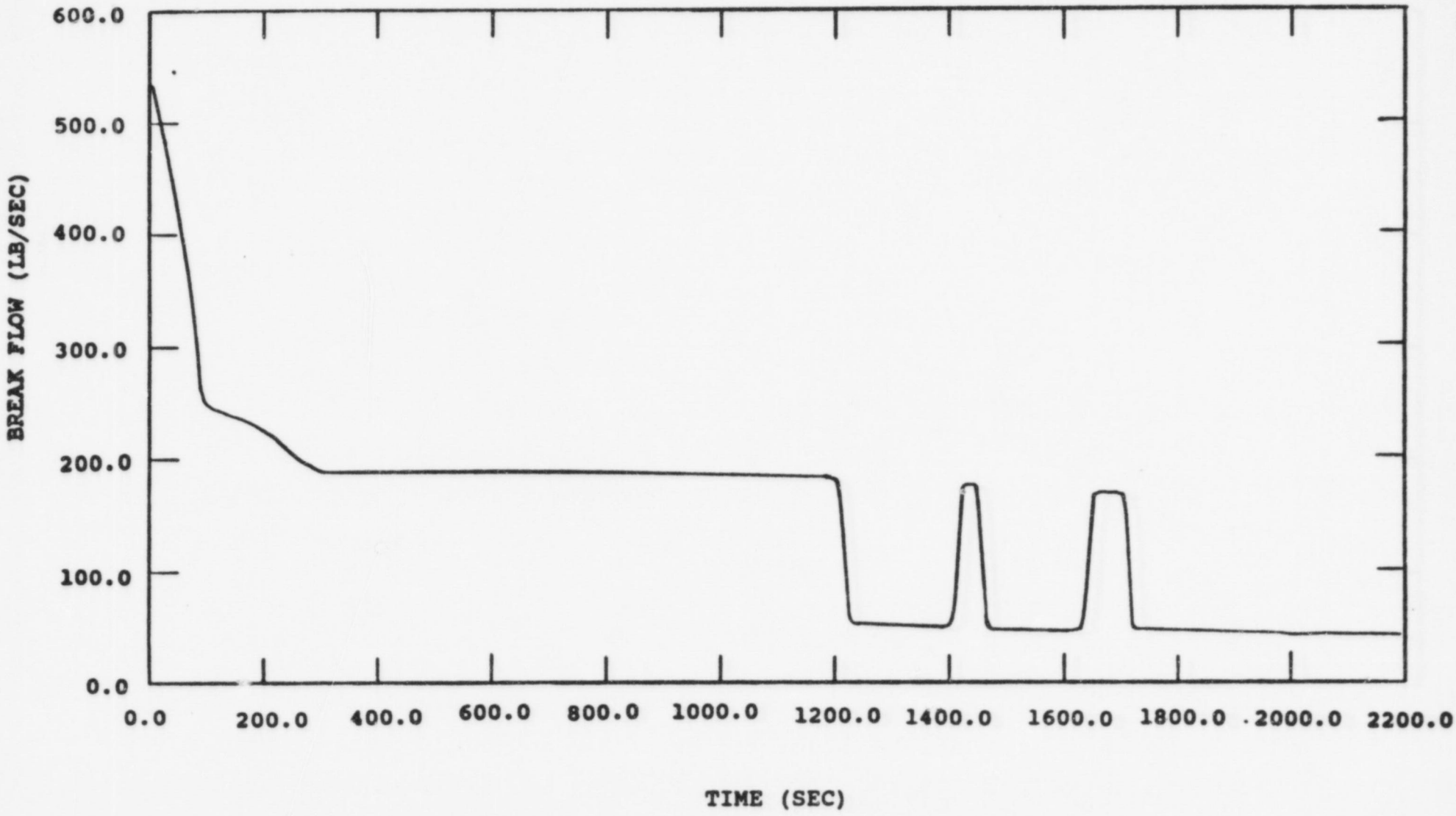

FIGURE 3. BREAK FLOW

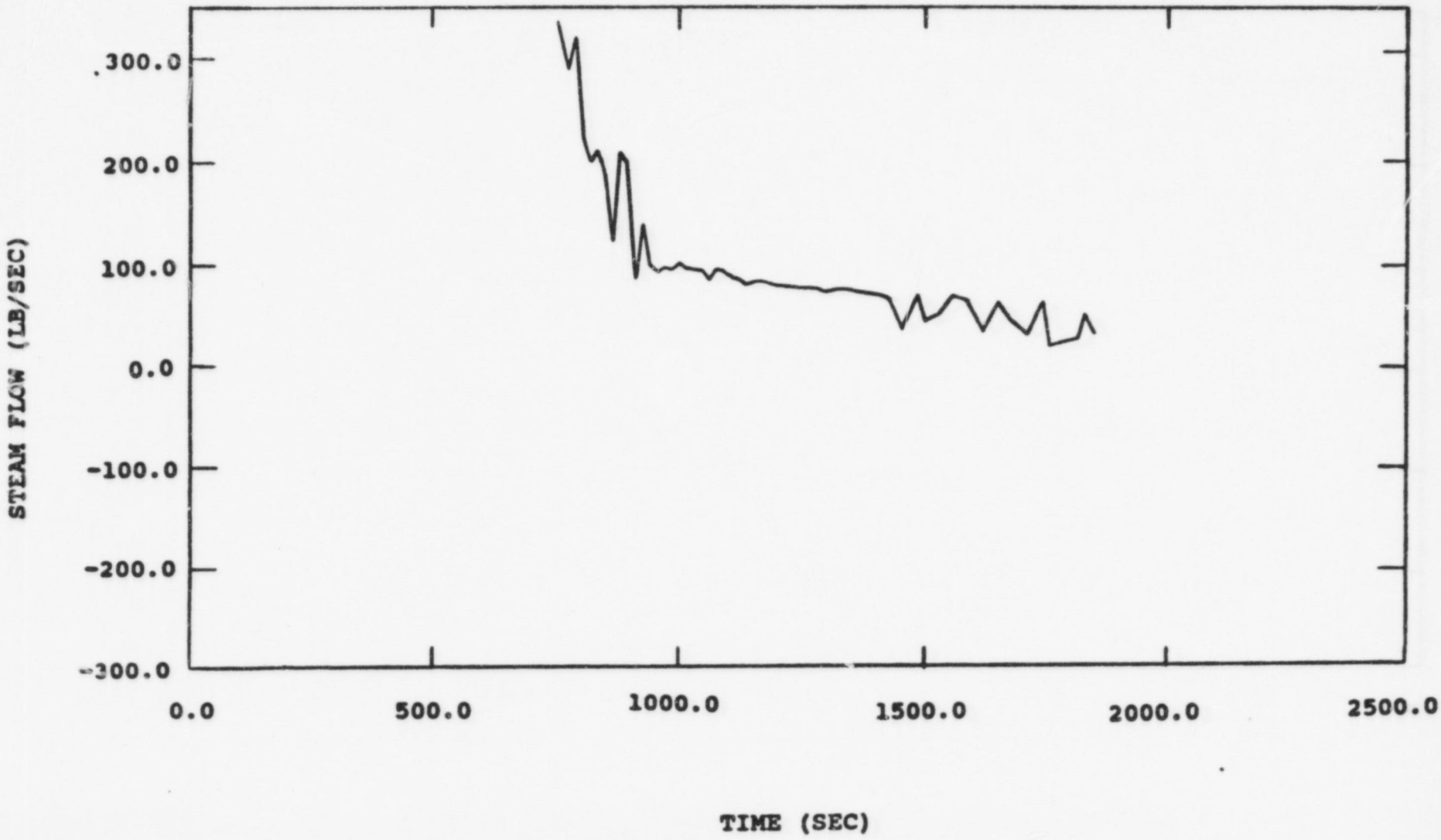

FIGURE 4. CORE STEAM FLOW