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January 9, 1986

Docket No. 50-213
B11943

Office of Nuclear Reactor Regulation
Attn: Mr. Christopher I. Grimes, Director
Integrated Safety Assessment Project Directorate
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Reference: (1) J. F. Opeka letter to C. I. Grimes, dated December 11, 1985, Proposed Revision to Technical Specifications, Cycle 14 Reload.

Gentlemen:

Haddam Neck Plant
Additional Information for Proposed
Revision to Technical Specifications
Cycle 14 Reload

The purpose of this letter is to provide the results of the LOCA calculations (Enclosure 1) for the Haddam Neck Plant, Cycle 14 reload in accordance with our commitment in the referenced letter. Additional information is also provided for the core bypass flow calculation methodology and for the engineering hot channel factor calculation methodology (Enclosures 2 and 3). Enclosure 2 contains information which is proprietary to Westinghouse Electric Corporation. Accordingly, Connecticut Yankee Atomic Power Company (CYAPCO) requests that this information be withheld from public disclosure.

In order not to delay this submittal of information, CYAPCO will comply with the requirements of 10CFR2.790 to provide proprietary and non-proprietary versions together with an affidavit as soon as the proprietary information contained in the submittal has been specifically identified and the proprietary and non-proprietary versions have been prepared. CYAPCO will submit the total required number of copies of the proprietary and non-proprietary versions of the information and the required affidavit at that time.

In the meantime, CYAPCO is providing this information for you to initiate your review. Mr. E. Shomaker, Esq., of the NRC Office of the Executive Legal Director, has advised Westinghouse Electric Corporation that he concurs with this procedure.

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We trust you find this information satisfactory and request review and approval of this information by March 1, 1986 in order to support the start of Cycle 14.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

J. F. Opeka
Senior Vice President

By: C. F. Sears
Vice President

Enclosures

Docket No. 50-213

Enclosure 1

Haddam Neck Plant
Cycle 14 Reload

Results of LOCA Calculations

January, 1986

Summary

A spectrum of large break LOCA cases (cold leg splits and guillotines) has been analyzed for the Haddam Neck Plant assuming a steam generator plugging level of 500 tubes per steam generator. The Interim Acceptance Criteria (IAC) evaluation model was employed together with a revised, upgraded input representation of the plant. The key results of this reanalysis are:

1) The maximum allowable Linear Heat Generation Rate (LHGR) that yields a Peak Cladding Temperature (PCT) of 2300°F has increased from the current allowable value of 13.85 kW/ft to 14.45 kW/ft at the beginning of core life (BOL).

2) The C_D = 1.0, Double-Ended Cold Leg Guillotine (DECLG) case replaces the C_D = 1.0, Double-Ended Cold Leg Split (DECLS) case as the limiting break.

Discussion

The improved ECCS performance predicted in this analysis for the Haddam Neck Plant is attributed to the upgraded input representation of the plant. This input representation includes the effects of the reduction of the reactor coolant system flow rate and steam generator heat transfer area due to the assumed plugging of 500 tubes in each steam generator.

As part of CYAPCO's on-going effort to upgrade the plant design basis, the reactor coolant system inputs to the original IAC evaluation model were also reviewed. The IAC evaluation model was originally developed in the early 1970s and has been used in subsequent large break LOCA evaluations (Reference 1-7). This input review identified that all systems inputs were consistent with current values except for the distribution of nodal volumes within the reactor pressure vessel. A comparison of the current and previous model volumes is shown in Table 1.

The impact of the change in the upper head and plenum volumes was assessed by comparing the results of the DECLS, C_D = 1.0 case with the current and previous values. The redistribution of liquid mass in the reactor pressure vessel shows that the current analysis is initialized with 7,560 pounds of additional liquid mass in the combined upper plenum and head. The flow down through the core to the cold leg break location shows marked improvement in the 7 to 11 second time interval during the blow-down phase. At 7 seconds in the current analysis, the total liquid mass in the vessel upper plenum and head is 14,262 pounds compared with 9,484 pounds in the previous analysis. The additional 4,800 pounds of liquid available above the core in the current analysis greatly enhances the negative core flow during blowdown, even with the assumed steam generator plugging level of 500 tubes per steam generator.

An additional benefit in the current analysis is due to the reduced lower plenum volume. The reduced lower plenum volume allows a shorter time for reactor pressure vessel refill and the associated core adiabatic heat-up.

The core flow benefit associated with the increased upper plenum and head volume should occur for any double-ended cold leg break. The magnitude of the improvement in the PCT however, will vary according to break size. Therefore,

a spectrum study was performed in order to identify/confirm the limiting break size for split and guillotine type breaks. This study was performed assuming 500 plugged tubes per steam generator. The results of this study are shown in Table 2 and identify the limiting break to be the C_D = 1.0, DECLG case. The results of this case are shown in Figures 1-4.

The resulting LHGR limits that yield a PCT of 2300°F are shown in Figure 5, and are 14.45, 14.75 and 17.0 kW/ft, at BOL, 3,000 hours and 6,000 hours respectively. In order to maintain margin relative to the 2300°F limit, the allowable LHGRs were conservatively reduced to 14.3, 14.5 and 15.5 kW/ft respectively, as described in Reference 8.

References

1. D. C. Switzer to P. A Morris, December 30, 1971.

2. D. C. Switzer to D. J. Skovolt, May 19, 1972.

3. D. C. Switzer to the Assistant Director for Operating Reactors, December 5, 1972.

4. D. C. Switzer to A. Schwencer, May 2, 1977.

5. D. C. Switzer to A. Schwencer, October 31, 1977.

6. W. G. Counsil to D. M. Crutchfield, December 14, 1982.

7. W. G. Counsil to D. M. Crutchfield, March 30, 1984.

8. J. F. Opeka to C. I. Grimes, December 11, 1985.

Table 1

NODAL VOLUME COMPARISON

NODE	CURRENT VOLUME, ft^3	PREVIOUS VOLUME, ft^3
Upper Plenum	969	840
Upper Head	599	552
Lower Plenum	780	851
Total Reactor Vessel	3,292	3,275

TABLE 2

RESULTS

BREAK	PCT, °F	END OF BLOWDOWN, Sec.	EOB, °F	B.O.C. RECOVERY, °F
DECLS, CD=1.0 14.40 KW/FT	2173.1	18.3	1480.7	2149.9
DECLS, CD=0.8 14.40 KW/FT	2228.9	20.0	1571.4	2209.2
DECLS, CD=0.6 14.40 KW/FT	2211.5	22.9	1584.8	2190.6
DECLG, CD=1.0 14.40 KW/FT	2295.3	18.6	1621.2	2279.6
DECLG, CD=0.8 14.40 KW/FT	2097.3	20.4	1426.3	2068.9

Figure 1
HADDAM NECK

DECLG $C_D = 1.0$

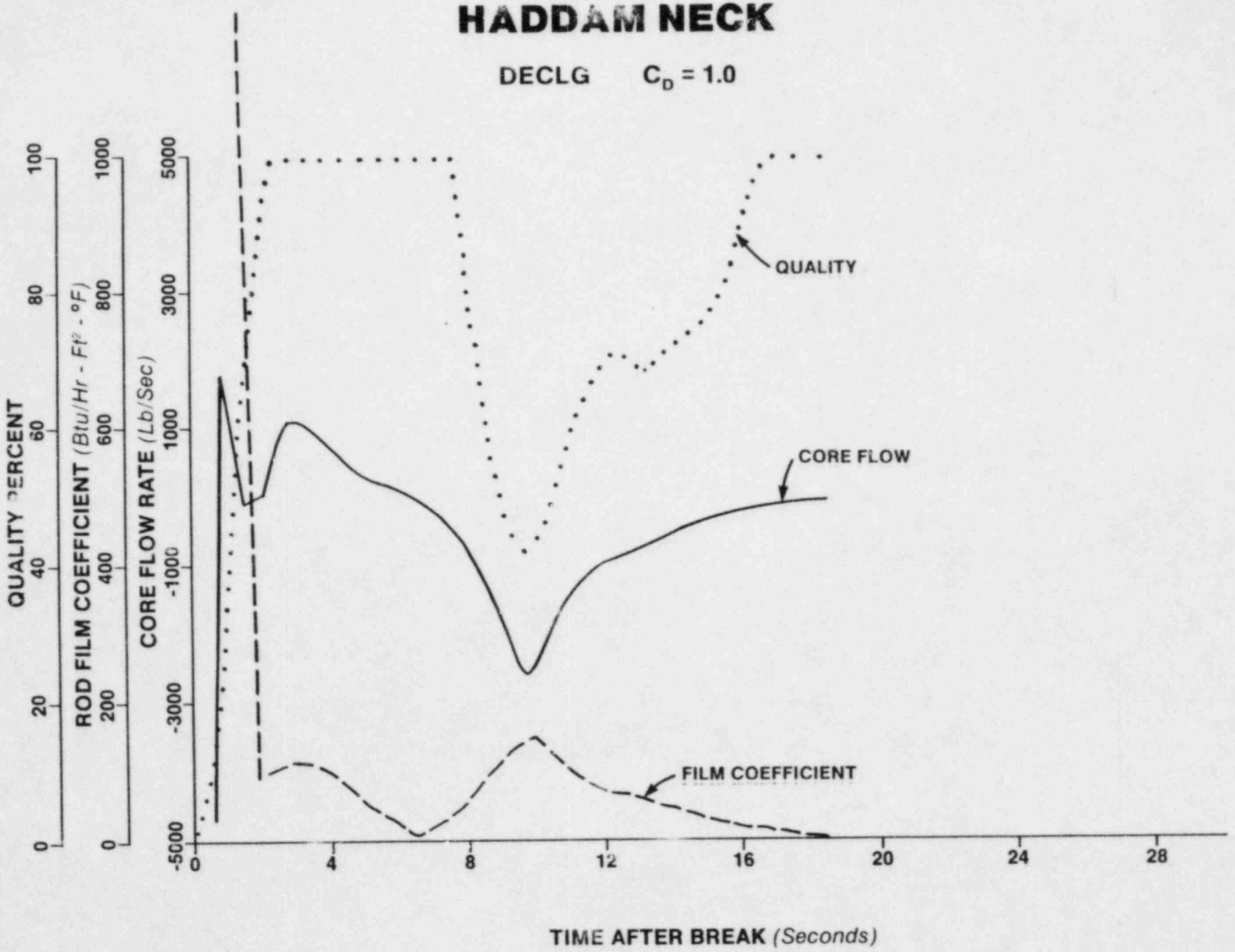


Figure 2
HADDAM NECK

DECLG $C_D = 1.0$

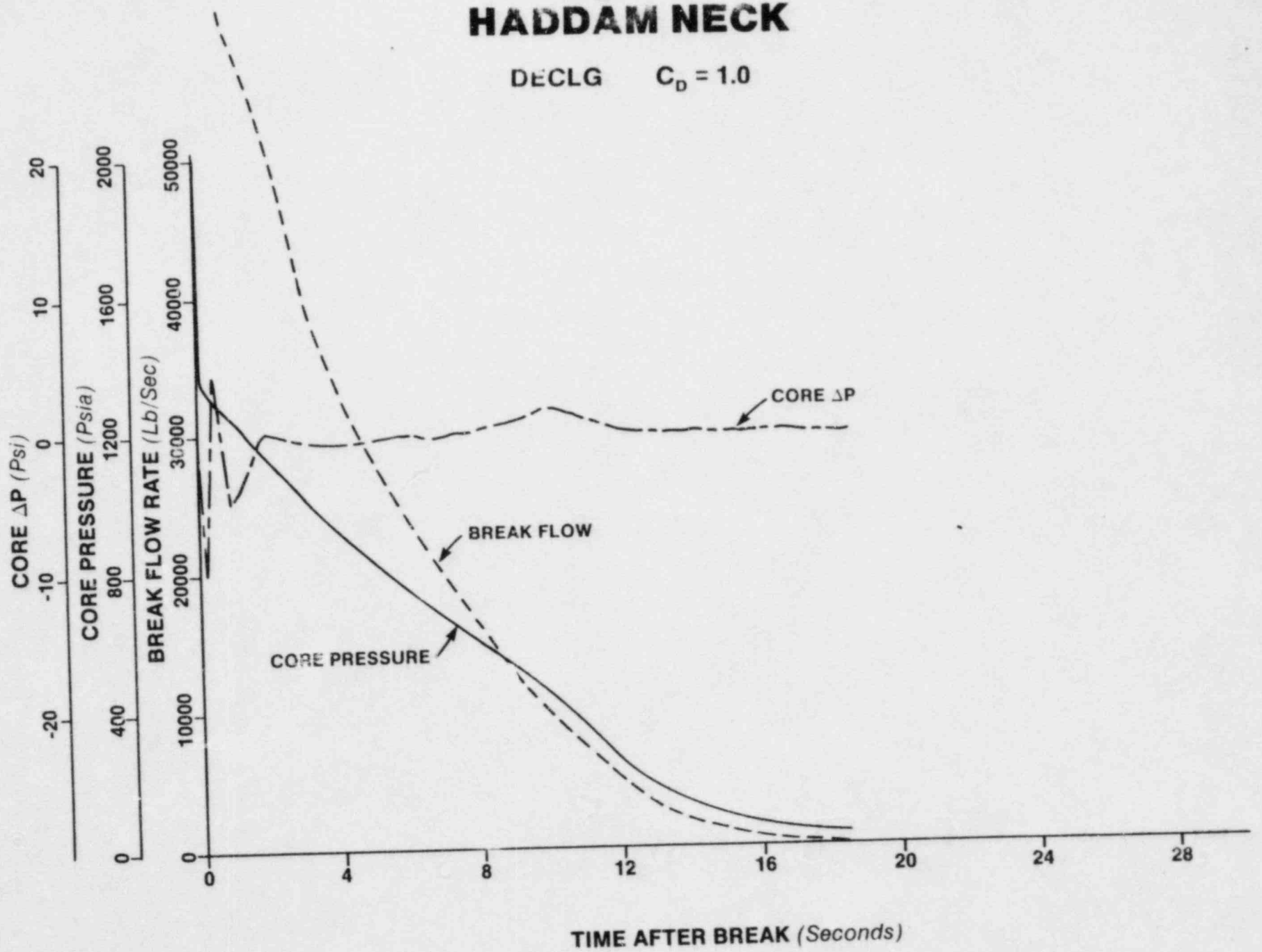


Figure 3
HADDAM NECK

DECLG $C_D = 1.0$

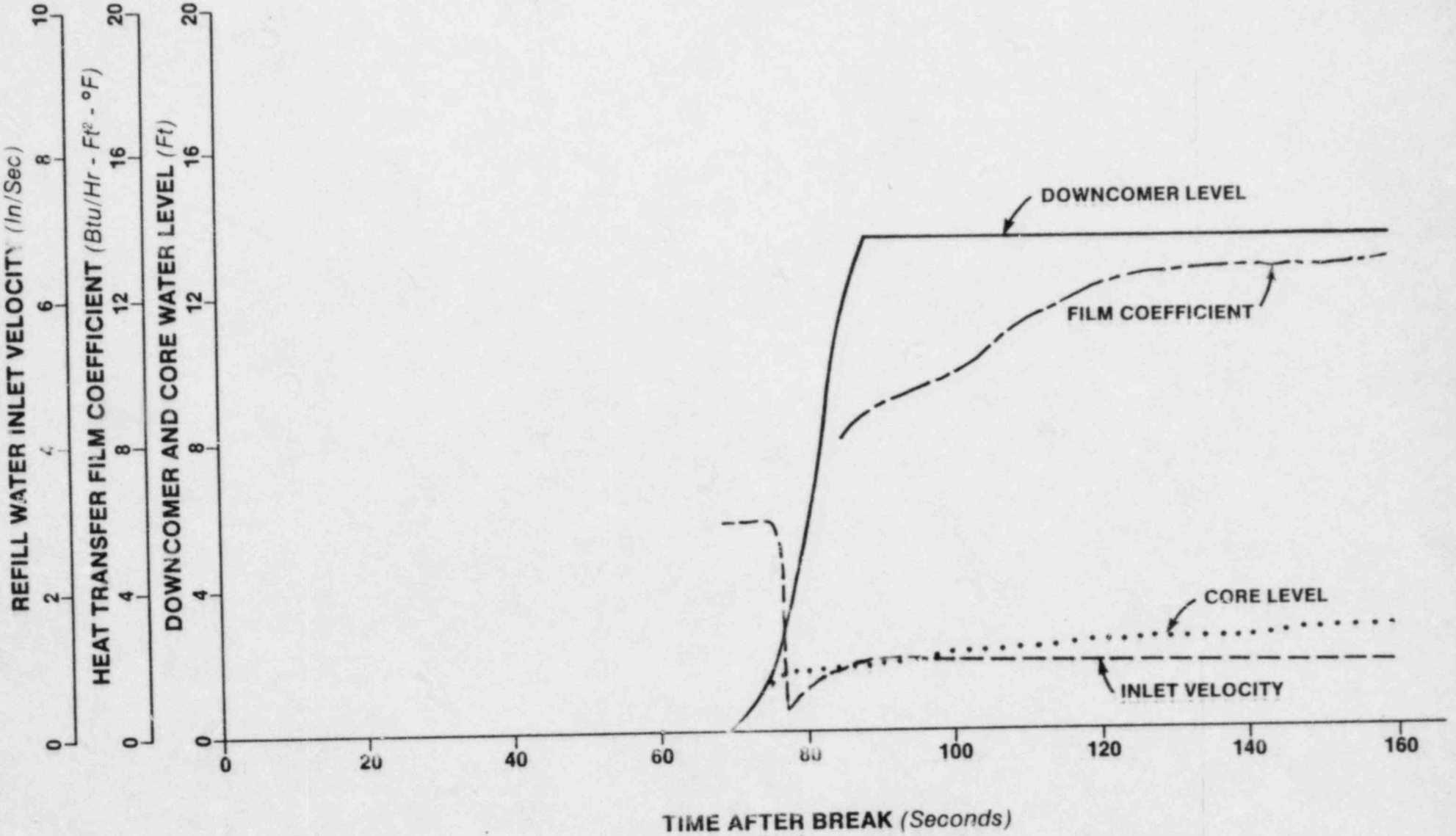


Figure 4
HADDAM NECK

DECLG $C_D = 1.0$

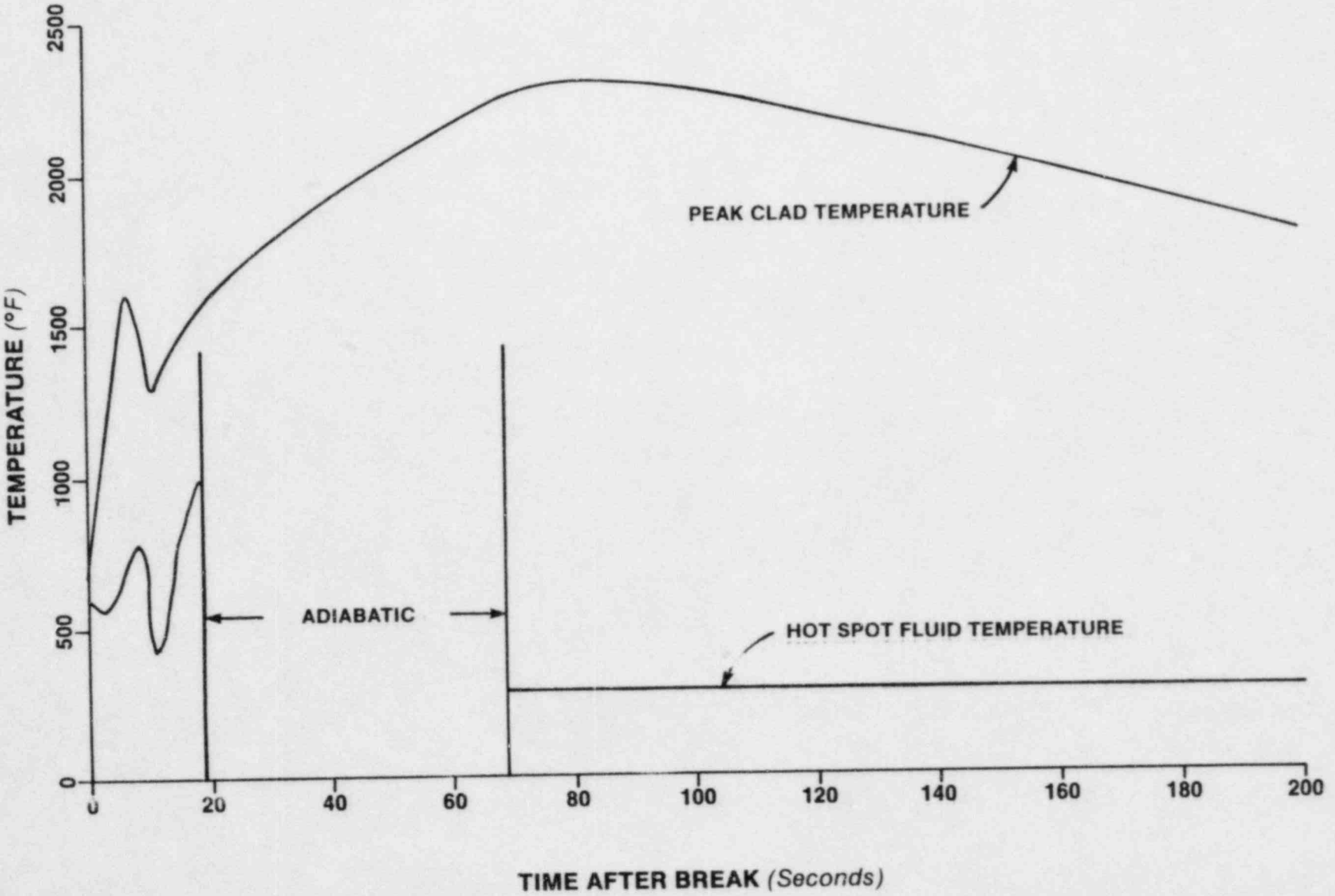
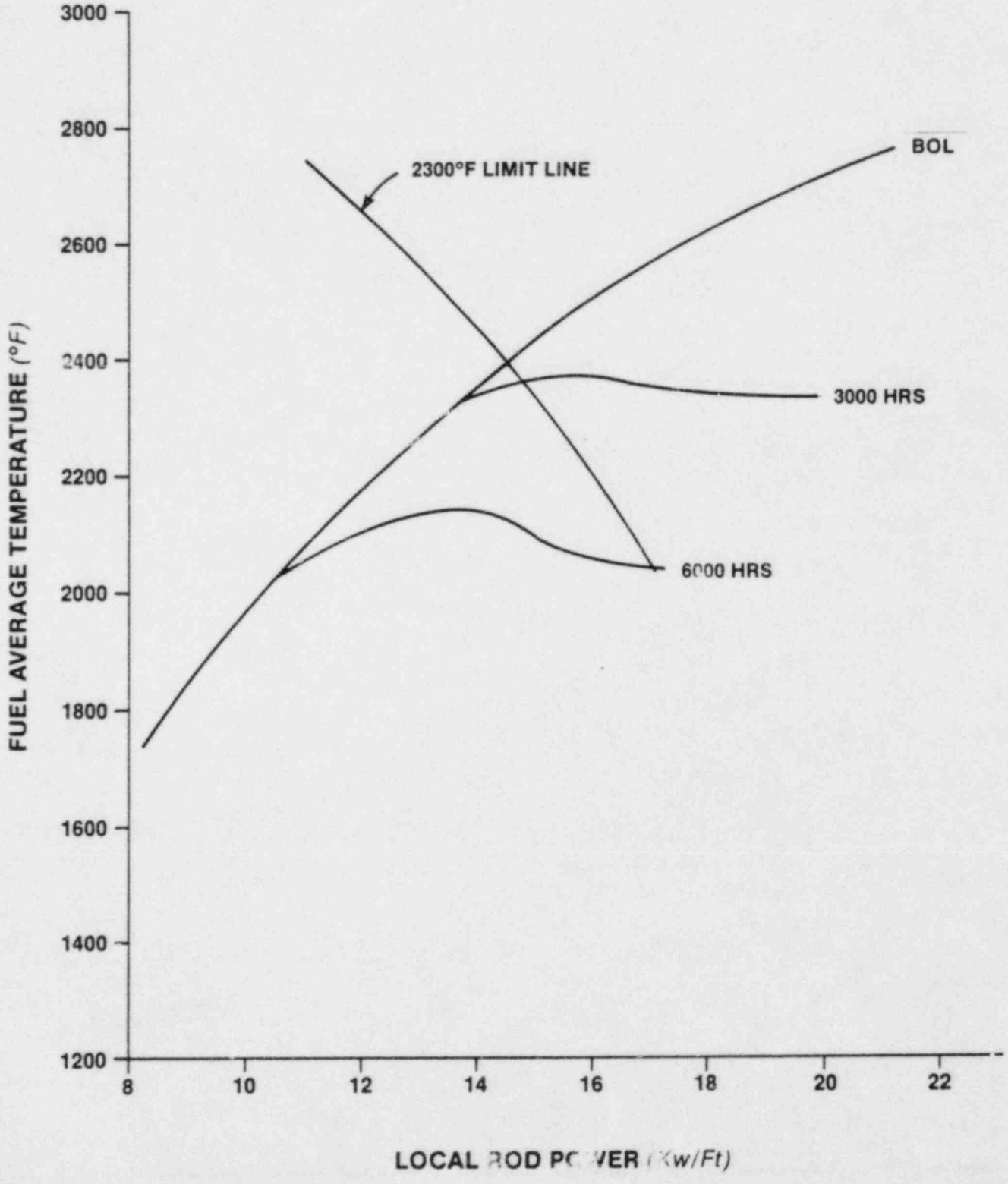


Figure 5
HADDAM NECK

FUEL AVERAGE TEMPERATURE



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Enclosure 2

Haddam Neck Plant

Cycle 14 Reload

Core Bypass Flow Calculation Methodology

January, 1986