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October 14, 1985
ST-HL-AE-1407
File No.: G9.17

Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Responses to DSER/FSAR Items;
LOCA Break Discharge Coefficient

Dear Mr. Knighton:

The attachments enclosed provide STP's response to Draft Safety Evaluation Report (DSER) or Final Safety Analysis Report (FSAR) items.

The item numbers listed below correspond to those assigned on STP's internal list of items for completion which includes open and confirmatory DSER items, STP FSAR open items and open NRC questions. This list was given to your Mr. N. Prasad Kadambi on October 8, 1985 by our Mr. M. E. Powell.

The attachments include mark-ups of FSAR pages which will be incorporated in a future FSAR amendment unless otherwise noted below.

The items which are attached to this letter are:

| Attachment | Item No.* | Subject |
|---|---|---|
| 1 | C 0.2-3 | LOCA Break Discharge Coefficient<br>Note: This item will not be incorporated in the FSAR. |

* Legend
D - DSER Open Item
F - FSAR Open Item
C - DSER Confirmatory Item
Q - FSAR Question Response Item

B001
1/1

L1/DSER/v

If you should have any questions concerning this matter, please contact Mr. Powell at (713) 993-1328.

Very truly yours,

M. R. Wisenburg
Manager, Nuclear Licensing

JSP/bl

Attachments: See above

L1/DSER/v

cc:

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Revised 9/25/85

L1/DSER/v

The question was in reference to the fact that the break discharge coefficient corresponding to the highest peak clad temperature (PCT) is different for the current analysis performed with the BART code (STP Amendment 51), which predicted a worst discharge coefficient (CD) of 0.6, than it was for the previous analysis performed with the Westinghouse 1978 Evaluation Model (STP Amendment 18), which predicted a worst CD of 1.0.

Attached are two figures which show the peak clad temperature (PCT) responses from the three CD's calculated for each analysis. As seen from the curves, the reflood phase of all of the transients in each analysis are very similar. The gravity-driven forces for reflooding the core are essentially the same for any case, and the variation in CD's has little effect on containment pressure and the relatively low flowrates associated with reflood. With similar reflooding behavior and the fact that adiabatic heating is assumed for the refill phase of the transient, the PCT attained will be determined based upon rod cladding temperature at the end of blowdown, which in turn is governed by the blowdown codes used.

During blowdown, water is discharged in both directions (around the loop and up the downcomer) from the core. At some point within or near the core a stagnation point will develop from which fluid is discharged in the two directions. This point is therefore characterized as a region of high quality and low flow rates. While this stagnation "point" does not generally remain in one place, and the high quality location in the core rapidly expands such that the stagnation is more of a regional effect, nonetheless the concept of a stagnation point is useful. The stagnation behavior in general is influenced by the resistance to, and nature of, flow in the two directions from the core to the break. The older Westinghouse 1978 Model predicted reactor coolant system behavior in which a CD = 1.0 for South Texas predicted a stagnation point near the center of the core, where the PCT's ultimately occur later in the transient. Other, smaller CD's would produce stagnation points at different positions in the core and the mid-core elevations would therefore experience longer and better blowdown cooling. This in turn resulted in lower temperatures at the end of the blowdown (EOB). Calculations for the blowdown portion of the current analysis were performed with the Westinghouse 1981 Model. The new features that were introduced in the 1981 Model, most notably the enhanced vertical drift flux model and provision for slip in horizontal piping, impacted the bi-directional resistance to flow of fluid through the system. Core flow for larger CD's achieves greater flowrates at lower qualities, and therefore relatively good initial cooling. For the smaller CD's the bi-directional resistance ratio changes less, the stagnation point moves back into the core and the 1981 Model benefit is less at EOB. The worst CD in terms of PCT attained is the one for which the stagnation point occurs at a position closest to the mid-core high-power elevations. For 4-loop plants this has repeatedly been found to be a smaller CD (0.6) with 1981 Model SATAN.

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The methodology followed in performing LOCA analyses for FSAR calculations is to perform calculations for a spectrum of three CD's which bounds the limiting CD by showing lower PCT's for both a larger and a smaller CD, which as described above indicates that the core stagnation point has moved to a less limiting location. In view of the influence of CD on core stagnation behavior there is every reason to suspect that the location would continue to move to less limiting locations for CD's both smaller and larger than those in the spectrum analyzed. Calculations have in fact been made to demonstrate this behavior (see Vogtle Electric Generating Plant, Amendment 11, Question 440.134, November 1984).

In conclusion, the fact that for South Texas the worst case CD has changed from one analysis to the next is a function of different codes being employed in the two analyses in question. The presently used Westinghouse 1981 Model SATAN-VI code is recognized as being an improvement over the 1978 Model, and the prediction of worse CD's near the smaller end of the spectrum is a credible consequence in view of the phenomena governing PCT.

Numerous conservatisms are accounted for in each of the blowdown, refill and reflood phases of a FSAR LOCA calculation. It is not of great consequence whether one particular break size or another results in the actual highest PCT. The PCT's from the spectrum performed for South Texas demonstrate that the limiting break has been identified.

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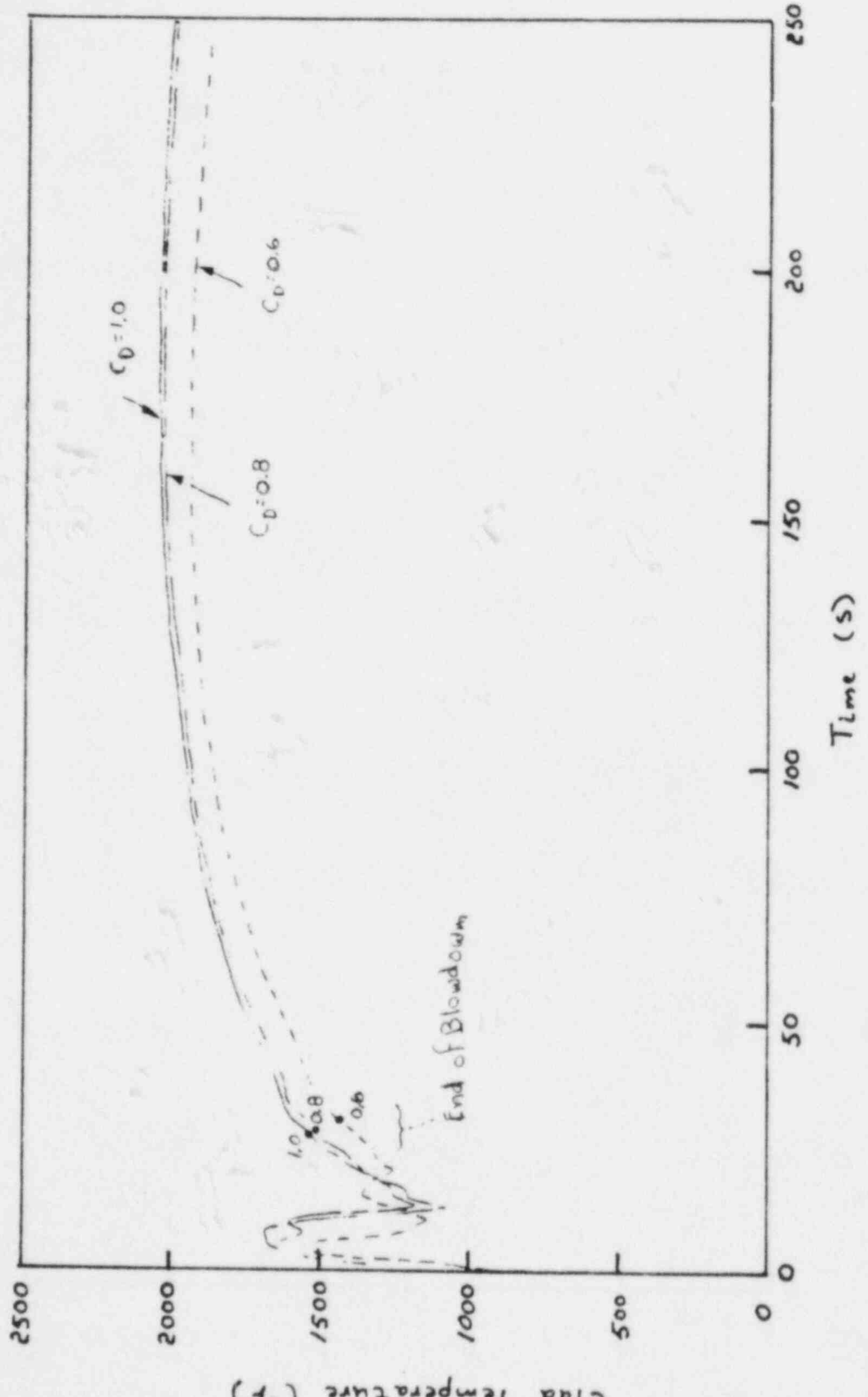


FIGURE 1. PEAK CLAD TEMPERATURES FROM 1978 MODEL ANALYSIS FOR TGX.

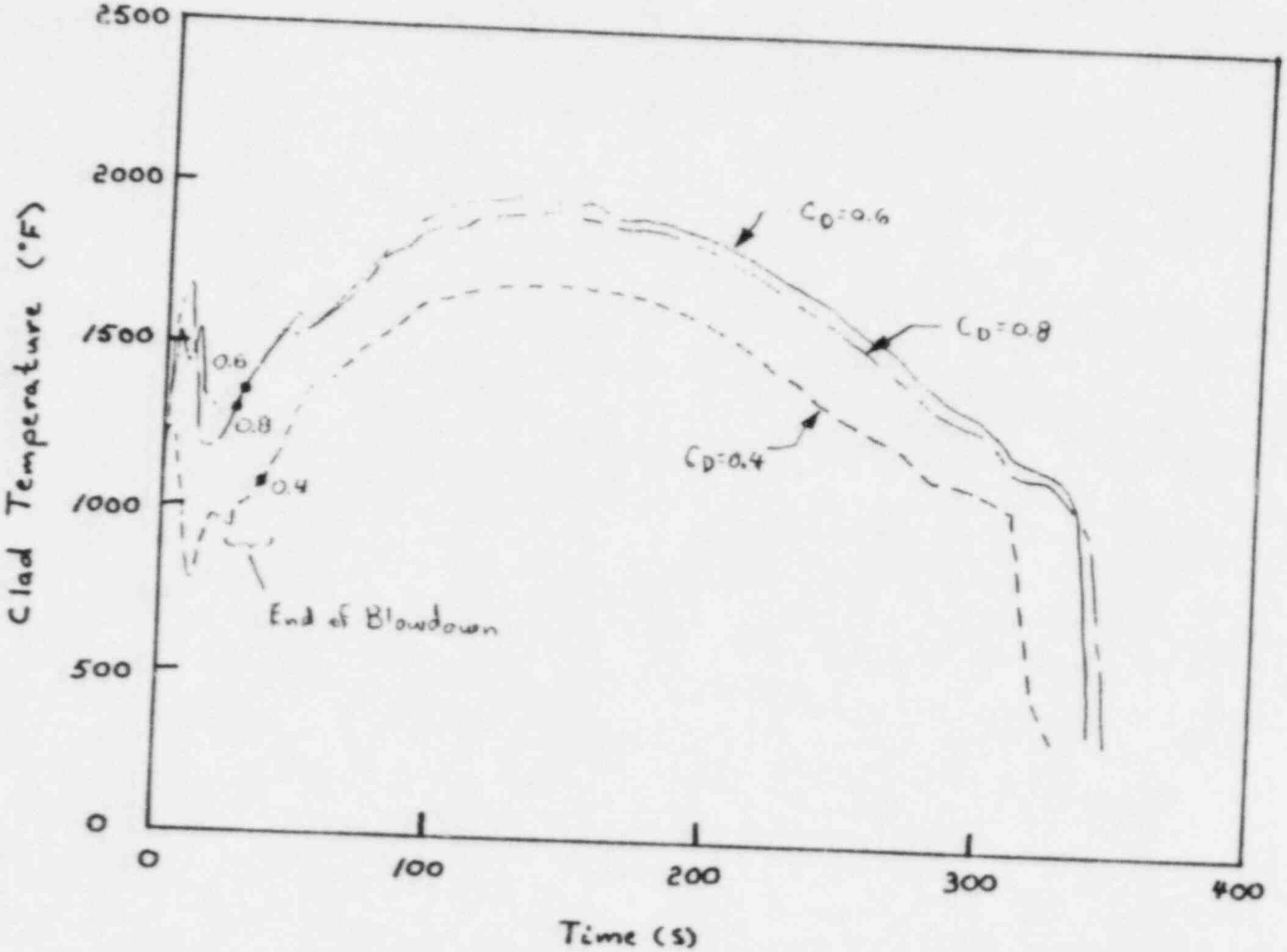


FIGURE 2. PEAK CLAD TEMPERATURES FROM 1981 MODEL ANALYSIS WITH BART FOR TGX.