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POWER SYSTEMS

June 10, 1981
LD-81-026

Mr. Richard H. Vollmer, Director
Division of Engineering
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: NUREG-0588 Qualification Time Margins

Dear Mr. Vollmer:

On May 18, 1981, Combustion Engineering (C-E) met with members of the staff to discuss our environmental qualification program for safety-related electrical equipment. At the request of the staff, we are formally transmitting the C-E position regarding the margin requirements applicable to qualification operability times. NUREG-0588 Section 3(4) requires that a one hour margin be applied to the required operability times for equipment that must operate for only a short time period into a design basis event. C-E believes that the one hour margin requirement is not appropriate in every case and thus the following technically justifiable method will be used to establish qualification times for safety-related equipment for which the one hour margin cannot be met.

Qualification times are obtained as a function of break area by evaluating each of the design basis events, steam line break, feedwater line break, CEA ejection, and LOCA, for a full spectrum of break areas. To assure that these times are bounding, the initial conditions and trip setpoints which are used in these evaluations are chosen to maximize the time the equipment would be needed. For example, minimum initial containment pressure is coupled with the upper limit on the High Containment Pressure trip setpoint and maximum initial steam generator pressure is coupled with the lower limit on the Low Steam Generator Pressure trip setpoint. Protective System trips whose setpoints might not be reached for certain plant operating conditions, will not be credited with limiting the bounding time to trip. Thus for each design basis event, this process yields a bounding time to trip as a function of break area for use in the qualification of most Protection System trips. Margins are incorporated by adding a percentage increment to the bounding time to trip versus break area using the method identified in Section 6.3.1.5 of IEEE Standard 323-1974.

The solid curve of Figure 1 is an example of the bounding time to trip as a function of break area. This curve shows the maximum time to occurrence of the High Containment Pressure trip for break areas below 3 ft.^{2} and the maximum time to occurrence of the Low Steam Generator Pressure trip for break areas above 3 ft.^{2}. In addition to the above two trips the following trips are to be qualified to operate for the entire envelope defined by the solid curve of Figure 1: Low Pressurizer Pressure trip, Low Steam Generator Level trip, and Low Steam Generator ΔP (low reactor coolant flow) trip.

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Certain Protective System trips are not required either for the full spectrum of break areas or for time intervals of greater than several minutes. For example, the Core Protection Calculator-Low DNBR trip, if required to provide protection against fuel failure, will encounter a trip condition within the first several minutes (maximum time for the plant to reach a new steady state in the event of a small break). Attached Figures 2 through 5 (Figures 15.1.3.2-2 through 5 from the CESSAR FSAR) illustrate the early occurrence of a new steady state in an increased steam flow transient, similar to a small steam line break. Core and primary system parameters stabilize at about 50 seconds. A maximum stabilization time of 100 seconds has been calculated. Therefore, protection against DNB provided by the Core Protection Calculator-Low DNBR trip is required for a maximum time into the transient of 100 seconds, as indicated in Figure 6. Consequently, the Core Protection Calculator-Low DNBR trip will be qualified for a time interval which bounds the maximum time to trip, but is more conservative than that obtained using IEEE 323-1974 (e.g., 10 minute qualification time to cover 2 minute requirement). Failure modes and effects analysis will demonstrate that subsequent failure of equipment will not prevent other equipment from performing its required function. Guidance provided to the operators will reflect the extent of qualification of equipment to help ensure that they are not mislead by false indications.

The method outlined above involves evaluation of the full set of design basis events and break areas to obtain bounding time to trip as a function of break area. Margins are incorporated by adding a percentage increment to these bounding times according to IEEE 323-1974. For certain Protective System functions, technical arguments can demonstrate that for small breaks a trip condition will occur within the first several minutes. For these cases additional margins more conservative than those obtained using IEEE 323-1974 will be applied as indicated in the example above. Clearly, for certain instrumentation, the results of our evaluation will be qualification times less than one hour. We are confident that the thoroughness of the method will provide ample assurance that the margins are conservative.

The above discussion is presented to formalize the C-E position regarding qualification operability time margins. We are proceeding with Revision 2 to CENPD-255, "Qualification of Class 1E Instrumentation", and this method will be incorporated into the text. If there are any questions concerning the above, please contact me or Ms. J. C. Ennaco of my staff at (203)688-1911, Ext. 2595.

Very truly yours,

COMBUSTION ENGINEERING, INC.

A. E. Scherer
Director
Nuclear Licensing

AES:dac

cc: Z. R. Rosztoczy

MODEL DATE

Figure 1. Maximum Time to Trip versus Steam Line Break Area for Indicated Trips

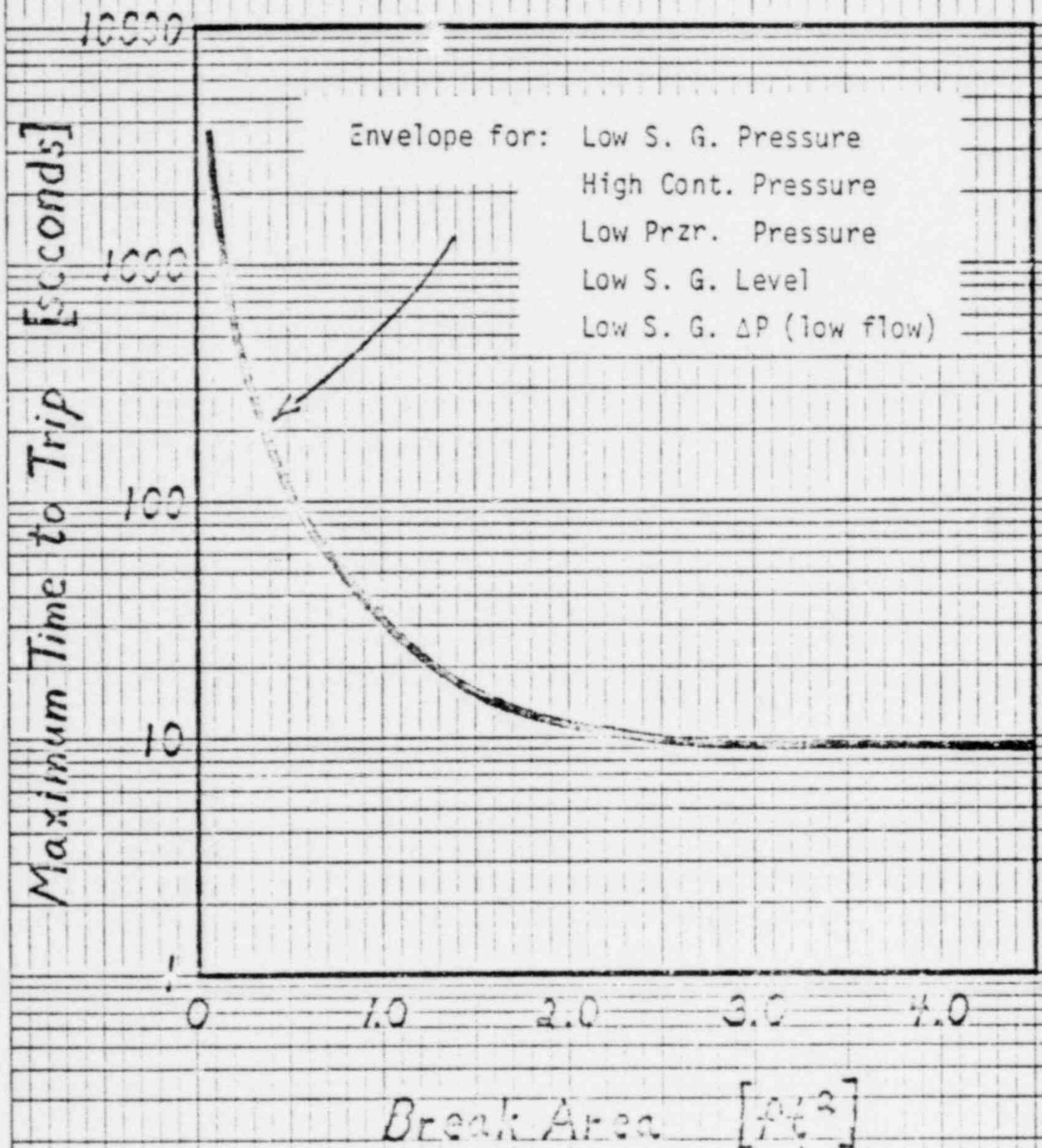
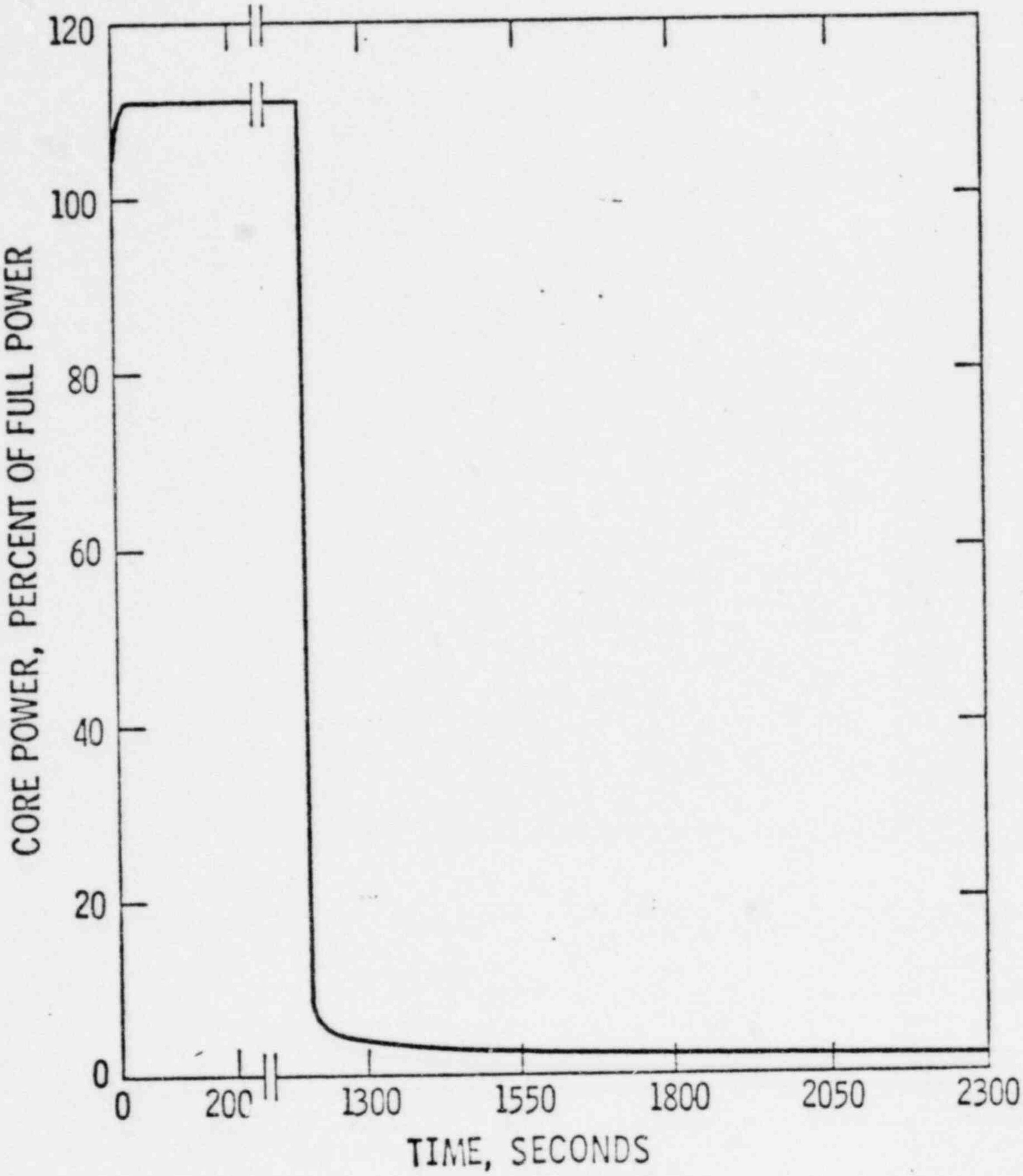
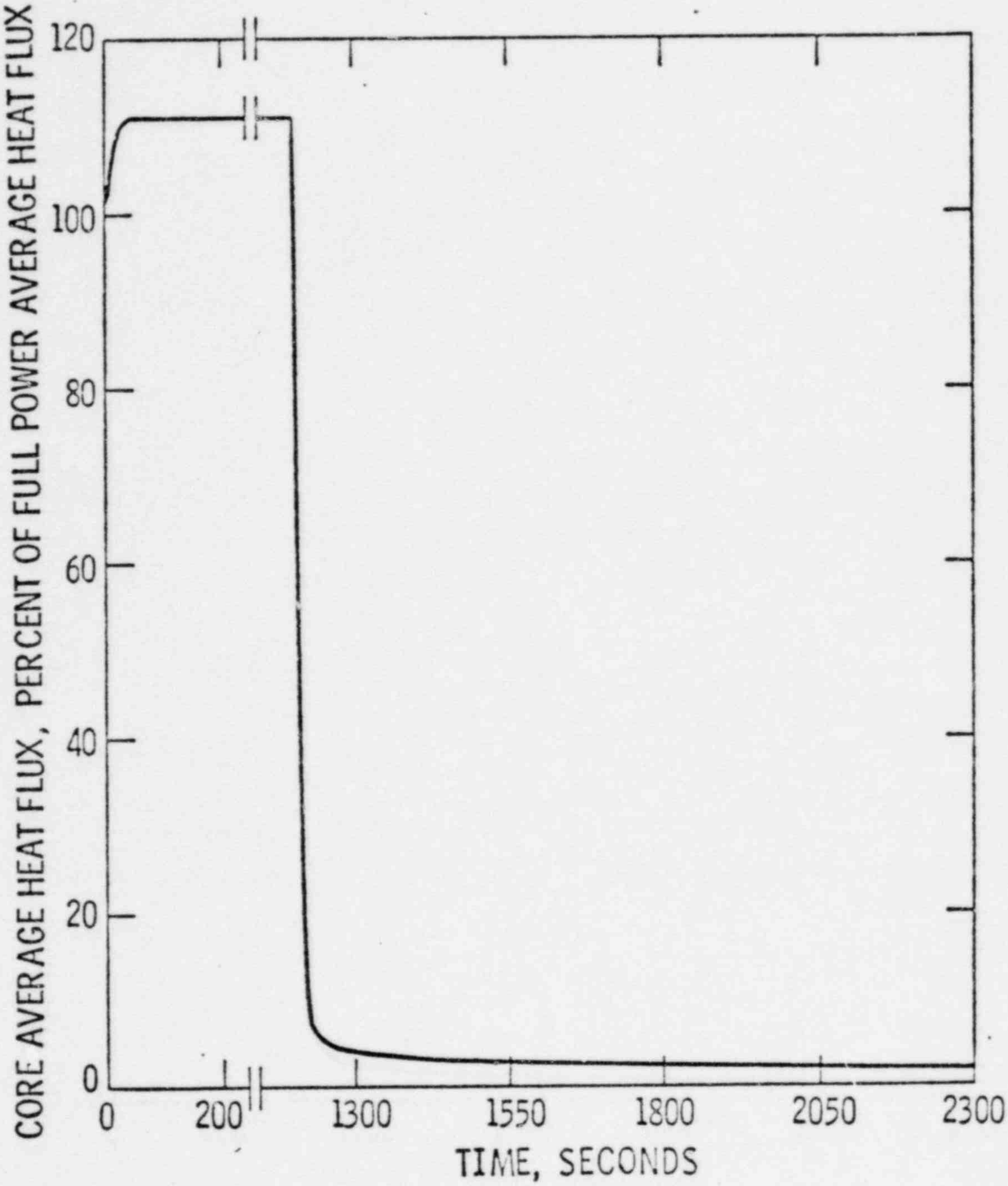


FIGURE 2



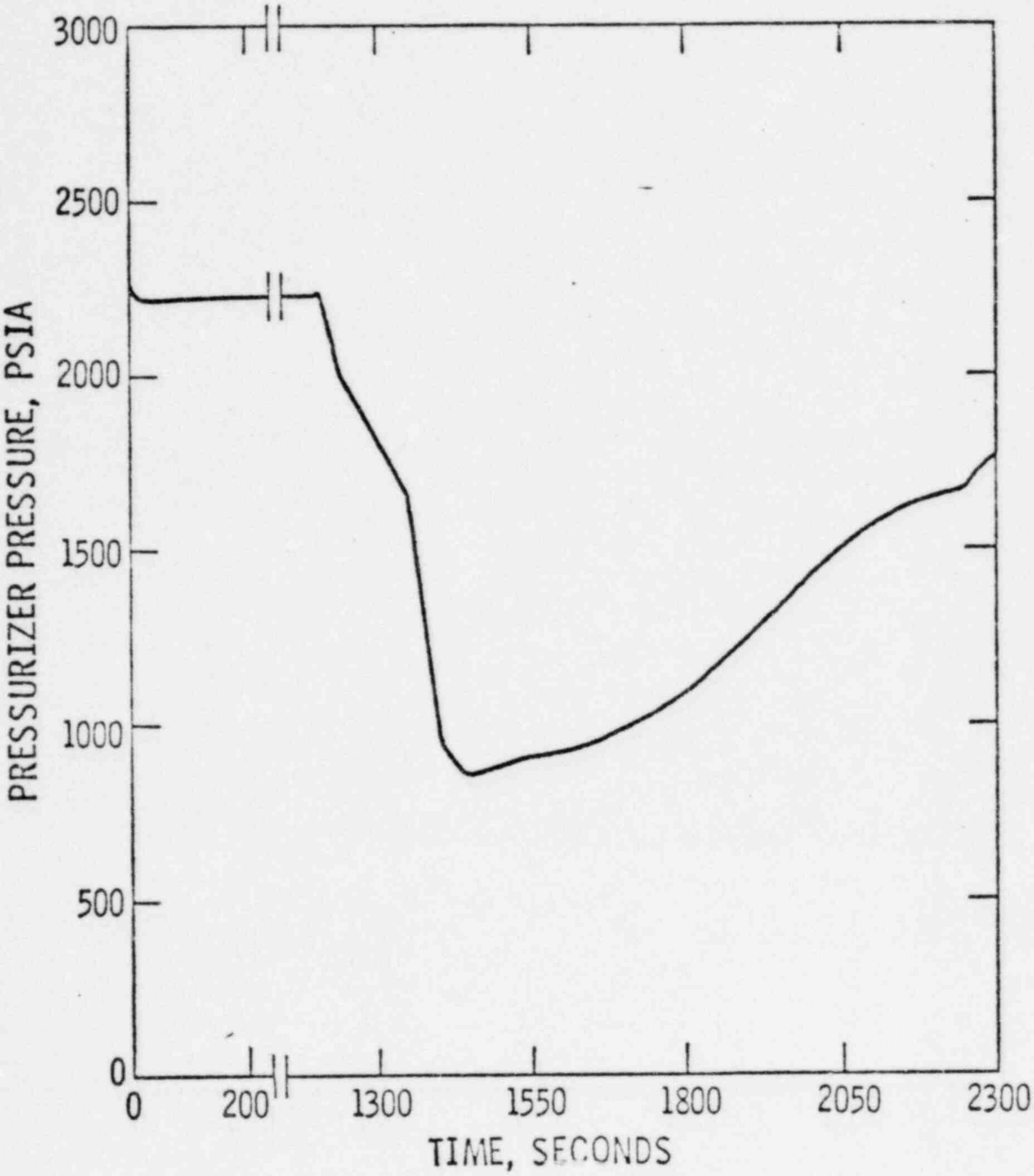
C - E SYSTEM 80	INCREASED MAIN STEAM FLOW THROUGH AN ATMOSPHERIC DUMP VALVE CORE POWER vs TIME	Figure 15.1.3 .2-2

FIGURE 3



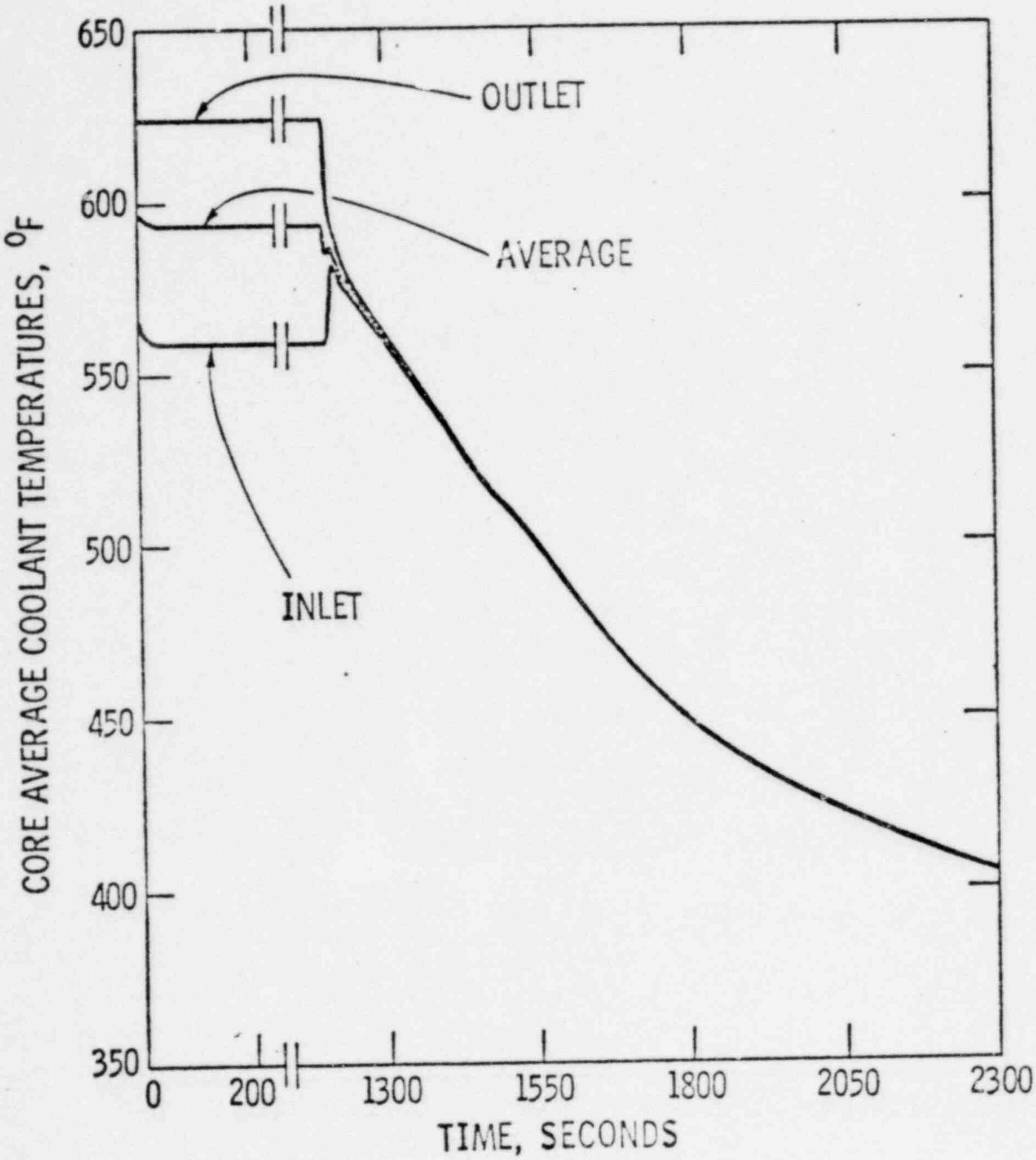
C - E SYSTEM 80	INCREASED MAIN STEAM FLOW THROUGH AN ATMOSPHERIC DUMP VALVE CORE AVERAGE HEAT FLUX vs TIME	Figure 15.1.3 .2-3

FIGURE 4



C - E SYSTEM 80	INCREASED MAIN STEAM FLOW THROUGH AN ATMOSPHERIC DUMP VALVE PRESSURIZER PRESSURE vs TIME	Figure 15.1.3 .2-4

FIGURE 5



C-E SYSTEM 80	INCREASED MAIN STEAM FLOW THROUGH AN ATMOSPHERIC DUMP VALVE CORE AVERAGE COOLANT TEMPERATURES vs TIME	Figure 15.1.3 .2-5

Figure 6. Maximum Time to Trip versus Steam Line Break Area for CPC Low DNBR Trip