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B&W EXHIBIT 542-F
3/14/82 N. A. RUDOLPH

July 22, 1977

MEB 770727 108

Combustion Engineering, Incorporated
1000 Prospect Hill Road
Windsor, Connecticut 06095

Answered by TD-CE-708

Attention: Mr. R. L. Lumpkin, Jr., 9460-400

Gentlemen:

PROPOSED YELLOW CREEK NUCLEAR PLANT
NUCLEAR STEAM SUPPLY SYSTEMS
CONTRACT 75K60-84840-2
LETTER NO. C-655

VERY SMALL BREAK LOCA - N802-NC

References: 1. CE letter TD-CE-161, September 18, 1975, "Small Break LOCA"
2. CE letter TD-CE-660, April 22, 1977, "Evaluation of CVCS Boration Capabilities" (MEB 770426 501)

We have been looking at the capability of the Proposed Yellow Creek Nuclear Plant (YCNP) to withstand a very small LOCA (equivalent to a break less than or equal to 0.1 $ft.^2$). We consider the event more probable than the classic large LOCA because there are several situations, including small pipe cracks or failures and seal failures, by which it can occur; smaller pipes (7/32 to 4-inch diameter) are also more susceptible to physical damage and vibration than are larger ones in general. (ANS classifies these events as Condition III.) We consider the probability high enough, all told, to require that the consequences be acceptable from the safety viewpoint with NRC conservative rules. (We are also concerned with steam generator tube ruptures, which are similar in many respects, but we will pursue these separately.)

In pursuit of our evaluation of very small LOCA's, we have looked through references, primarily TD-CE-161, and developed questions that need answers to assure our understanding of the transients. Some of these are unanswered items from previous correspondence and some are new. We feel confident that the answers are available to you as a result of your development of the RCS and ECCS design.

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Assumptions

We would like to know more about the assumptions on which you based your analysis:

1. What did you assume for the evolution, both quantity and speed, of noncondensibles?

2. Is the high-pressure safety injection (HPSI) throttling needed, and if so, how is this performed? (Note that CESSAR Section 6.3 and Section 8.2.3 of the SIS System Description seem to conflict with your letter TD-CE-660 on this point.)

3. How do you account for the operation of the chemical and volume control system (CVCS) pumps, auxiliary spray, and letdown during these transients?

4. Do you assume any additional losses due to increased leakage from reactor coolant pump seals?

Transient Analysis

In regard to the transient analyses that you gave us:

5. What is the mechanism and time frame of heat removal during the transition from natural circulation to boiling?

6. What are the hot and cold leg temperatures during this transition?

7. What are the effects if the reactor coolant pumps continue to operate during the initial phases of the transient?

8. What happens if the operator should isolate the break during the transition from natural circulation to boiling, or during the boiling mode of heat transfer?

9. What information (e.g., temperature, pressure, or level) is available to the plant operator to keep him informed of what is occurring and what actions he should or should not take during the transient?

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Recovery

In regard to recovery from the transient:

10. Please explain the mechanism and the time frame involved in going from the boiling mode to cold shutdown.

11. If this is done in part by restoring natural circulation,

    11a. What is the heat removal mechanism during the transition from boiling to natural circulation?

    11b. When is this transition to occur and when would it be complete?

    11c. How is refilling of the steam generator tubes to be accomplished?

12. If, on the other hand, the shutdown cooling system (SCS) is to be initiated directly from the boiling mode,

    12a. What is the earliest time frame that this can be done?

    12b. What instrumentation is available to operating personnel to know that they have adequate water in the reactor coolant system to protect the SCS pumps?

13. Assuming that the refueling water tank (RWT) is eventually dumped via the leak, and possibly via the containment spray system (CSS),

    13a. How is SCS established with water in sump instead of the RWT?

    13b. How is the high-pressure safety injection (HPSI) run after the recirculation actuation signal (RAS) isolates miniflow?

    13c. How is throttling accomplished to maintain the reactor coolant system sufficiently full while the system is being placed on and operated on SCS?

14. What steps must be taken to prevent dumping the safety injection tank (SIT) during the transition to SCS?

15. How long from the beginning of the transient is it before the SCS can be initiated in the worst case (remember the limits of emergency feedwater storage capacity)?

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General

Other general questions that we have regarding the very small LOCA event concern various modes of operator action and mechanical failures:

16. What are your recommended or prohibited operator actions during and following this event? Please send us, if available, procedures that you would have as typical for this event.

17. For a few scoping cases, please give us the time to actuation of the CSS.

18. Give us a time to the RAS for those cases with two trains of CSS and one or two trains of HPSI running.

19. Please give us any comments you have regarding the ability of the steam generator tubes to withstand possible mechanical stresses associated with the transition from natural circulation to boiling and back again.

20. Demonstrate (reference our letter C-578) that natural circulation can be reestablished if required to recover from the transient.

We have these preliminary concerns regarding this transient analysis. We request that our engineers and yours meet on this subject to discuss it in more depth and assure timely resolution. We would like to arrange a meeting in mid-August, if this is convenient with you so that you and we can come to a sufficient understanding of our mutual concerns before a great deal of effort is further expended. The above concerns would serve as the agenda for the meeting. If you need clarification regarding our concerns, please call us. Please notify us by August 5, 1977, regarding the date and desired place for the meeting.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

[illegible] by
[illegible]

D. R. Patterson, Chief
Mechanical Engineering Branch

In Quadruplicate
cc: Mr. M. J. Epprecht

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