Docket File

JUN 13 1973

T. Novak, Chief, Reactor Systems Branch, L

INDIAN POINT NO. 3 (DOCKET NO. 50-286) ECCS REVIEW STATUS AND SUPPLEMENTAL INFORMATION REQUIRED

I have completed a review of the Indian Point No. 3, ECC system. The following comments, recommendations and/or request(s) for additional information are provided for your review and action:

Valving/Piping - ECC System

The recommendations which follow are the result of reviewing Figure 6.2-1, Supplement 18, May 1973, of the IP-3 FSAR.

1) Valves 1810, 882, and 774 should be placed in the "locked open" (L.O.) position, and deenergized, to provide a more positive assurance that the high head and low head ECCS pumps can draw water from the refueling water storage tank. This should be included in "tech specs".

2) Valves 851A and 851B (isolation valves between high head pumps) can become manually operated valves provided they are L.O. when the reactor becomes critical.

3) Valves 842 and 843 (see Figure 6.2-1, FSAR) can be left as shown, normally operated in the open mode.

4) Valves 887A and 887B (see Figure 6.2-1, FSAR) can be left as shown, normally open.

5) A failure mode review of valves 638, 747, 899B, 640, 746 and 899A indicates that a "closed position" failure could occur. This coupled with a hypothesized cold leg, low pressure injection leg break which could result in only one leg available for low pressure pump delivery following accumulator discharge. This combination was acknowledged by Consolidated Edison and Westinghouse personnel in the May 31, 1973, meeting at Bethesda. A downstream (ref - valves 899A and 899B) cross coupling nullifies the above concern, but raises another question regarding a break in this coupling diverting all of the ECCS low head delivery to the the containment volume. A duplicate set of valves would alleviate the failure mode postulated. Con Ed is to review and propose a solution to this situation since locking open and deenergizing

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the above valves prevents utilizing these valves to effect switching from high head pump operation to recirculation pump operation for long term cooling.

Hydraulic Characteristics of ECC System(s)

For purposes of "independent audit", the hydraulic characteristics of the piping shown in Figure 6.2-1 should be reviewed and will require the additional information listed below:

1) The hydraulic loss characteristics of the piping, valving, orifices and components shown in Figure 6.2-1. Hydraulic loss factors (k-factors) for all flow paths from the pump discharge flange to delivery point at the reactor cold leg (or other delivery point) to provide a means to independently verify pump delivery flow as a function of system pressure. The above information should also include pipe lengths and water volumes within the respective lengths and/or components to provide a means for estimating the hydraulic inertia of the respective ECCS delivery paths.

2) A summary of "conservatisms" utilized by Westinghouse to arrive at pumped delivery versus system pressure for the high head and low head pumps (both RHR and RECIRC). Utilizing the data provided in Item 1), provide pumped delivery versus system pressure and verify that these delivery curves were utilized by the LOCA analysts.

3) Provide a comparison of pre-operational pump delivery tests run on Indian Point No. 2, with the predicted delivery curves. Include data at least at "miniflow", "run-out", and "partial flow" conditions.

As discussed in the May 31, 1973 meeting, the hydraulic characteristics information could be provided in an "informal manner" to expedite review.

LOCA Analyses

The following questions relate to inconsistencies noted in the identified figures of the FSAR, and in general relate to ECCS pump delivery:

1) Figure 14.2.5-8 (Steam Line Break Equivalent to 247 lbs/sec - "spurious opening") indicates that "20,000 ppm boron reaches loop at 125 seconds." This same figure indicates that the

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reactor coolant pressure is greater than 1500 psia up to about 265 seconds. On the other hand, Figure 14.2.5-3 indicates that cold leg safety injection flow will not commence until reactor system pressure drops below 1450 psia, and will not reach rated flow until system pressure approaches 0 psia. The dependence on injection of a high concentration of borated solution to maintain the reactivity transient shown in Figure 14.2.5-8 is therefore unanswered at this time. The May 31, 1973 meeting did not resolve this question (no LOCA analysts were present).

2) Figure 14.3.1-29 (flowrate versus time for the 0.5 ft^2 break) indicates that pumped injection commences at approximately 27 seconds with a flow rate of approximately 400 lb/sec. Figure 14.3.1-15 indicates that core pressure (at 25-30 seconds) is approximately 1200 psia and decays to about 800 psia at 125 seconds. Since the low head pumps (which can deliver 400 lb/sec) have a maximum delivery head of approximately 160 psia, the pumped injection rate is questionable. Furthermore, the high head pumps have a delivery rate on the order of 50 lb/sec per pump at zero system pressure. Therefore, the validity of the LOCA analysis presented for the 0.5 ft^2 break, and perhaps the 3.0 ft^2 break also, is suspect.

3) Small break analyses (pp 14.3.2-1 through 14.3.2-17) have been accepted in the past based on informational content of the type presented in this section. Dependence on injected flow (see Figure 14.3.2-3) is not clear, nor is it evident that the 3.5 inch break (see Figures 14.3.2-11 through 14.3.2-15) represents the worst case (compare Figures 14.3.2-7, 14.3.2-8, and 14.3.2-9, which display volume versus time and show proportion of core uncovered). This question of information adequacy should be tempered by the fact that the "worst case" (3.5 inch break) calculated clad temperature is only on the order of 1200°F. Therefore, I would recommend acceptance of the small break results at this time pending a generic review of small break analyses in suitable technical depth. Current activities related to Westinghouse's RESAR will review details of the SLAP code calculations more thoroughly.

4) Calculations related to breaks less than a 2 inch break and approaching a zero break area are lacking. The question of dependence on auxiliary feedwater pumps for makeup, and

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resulting answers provided at the May 31, 1973 meeting should be pursued further. I am assuming Westinghouse will supply an answer to this question consistent with the LOCA analyst's cooling water requirements, thereby requiring that the auxiliary feedwater system be designed to engineered safety systems criteria, or show that the charging pumps can adequately handle such a leak.

Fuel Densification Effects

The preliminary fuel densification report on IP-3, submitted under cover letter dated April 3, 1973, and utilizing the Zion No. 1, fuel densification report as technical backup appears adequate for the time being. Since the applicant stated he will submit a detailed report for IP-3, based on "license" power (rather than extended power), I will review that information when received. A point in question which should be referred to the applicant is whether DNB credit for L-grid design will be granted at time of submittal. The Zion fuel densification report requests credit for mixing vane grids; on the other hand, the Point Beach-2 densification report did not require credit for grid effects.

In summary, the preceding comments bring you up-to-date on my technical review of Indian Point No. 3's ECC systems and capabilities. Pending the receipt of information requested and/or answers to questions raised, I will defer further technical review.

Aleck W. Serkiz
Reactor Systems Branch
Directorate of Licensing

cc: H. Specter

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