Duke Power Company
Catawba Nuclear Generation Department
4800 Concord Road
York, SC 29745

D. L. Rehn
Vice President
(803)831-3205 Office
(803)831-3426 Fax

DUKE POWER

August 1, 1994

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington D.C. 20555-0001

ATTN: Mr. Robert E. Martin,
Senior Project Manager

RE: Catawba Nuclear Station, Units 1 & 2
LER 413 / 93-002
Transmittal of Preliminary Accident Sequence
Precursor Program Analysis for Peer Review

Dear Sir,

As requested, Duke Power has reviewed the subject precursor analysis presented in your letter of July 6, 1994 involving the low torque switch settings on three out of four Nuclear Service Water (RN) pump discharge valves. These settings essentially made three out of four RN pumps unavailable for the seven month period from August 1992 through February 1993.

We note that the preliminary conditional core damage probability of 1.4E-04 calculated by the NRC contractor is approximately the same value estimated by Duke; however, we have several comments on the factors influencing these results, including the accident sequence of interest. Our comments are presented as an attachment to this letter.

We appreciate the opportunity to review and comment on this preliminary analysis.

Very truly yours,

Mark E. Patrick for

D. L. Rehn, Vice President
Catawba Nuclear Station

IE22

xc: S.D. Ebneter
Regional Administrative, Region II

R.J. Freudenberger
Senior Resident Inspector

ATTACHMENT

Catawba Nuclear Station
LER No. 413/93-002
Comments on Preliminary Precursor Analysis

1) We disagree with the NRC contractor's selection of the event which would lead to the functional failure of the Nuclear Service Water (RN) System and / or the diesel generators (D/Gs). The preliminary analysis assumes that since the '2A' RN pump was always available during the seven month time frame of interest, the only area of concern is the case of a dual loss of off-site power (LOOP), when two RN pumps would be required. Such an assumption implies a two-pump success criteria. As the analysis progresses, there appears to be an inconsistency in that all four RN pump discharge valves are assumed to fail, thus implying a one-pump success criteria. With a two-pump success criteria, we would have expected to see a failure probability for only three valves since the valve downstream of RN pump '2A' was essentially functional [this would make the valve failure probability $(0.75)^3 = 0.422$, rather than $(0.75)^4 = 0.316$]. Furthermore, the operating pump discharge valve should remain open following the LOOP since the valve requires power to change position. Although some valve movement is expected when the power is regained (from the D/Gs), the time span between the initiation of valve closure (nominal valve closure time is approximately 55 sec.) and pump restart (i.e., valve begins to open again) is such that the pump would remain operable.

   In addition, subsequent testing with the valves about 20° closed showed that this position was adequate to assure opening of the valves by alleviating peak unseating loads. Thus, we conclude that the operating valve would have maintained its ability to open when required.

   Duke Power's analysis suggests a more appropriate approach in that we considered the actual time when RN could have been lost had the '2A' pump failed (and accordingly, no backup would have been available from the three remaining pumps). The loss of RN initiator fault tree was re-solved using a mission time of 1015 hrs (the actual number of hours during the seven month time frame when the '2A' RN pump was running). Given that this automatically assumes a failure of the other three pump discharge valves, recovery factors were assigned for manually opening one of the valves and for establishing RCP seal cooling from the SSF (see following comments). This resulted in a core damage probability of approximately <u>1.0E-04</u> for the seven month time frame.

   For completeness, we also reviewed the impact of a LOOP initiator and a loss of the 4160V bus initiator. Both of these accident sequences had significantly lower probabilities than the loss of RN initiator sequence.

2) The preliminary precursor analysis uses a recovery factor for opening an RN pump discharge valve of 0.34, which is based on generic assumption. Duke's value is based upon the Human Cognitive Reliability (HCR) Model. The time available to perform this action is based upon the amount of time it would take for the reactor coolant pump (RCP) seals to

fail. On a loss of all RN, there are an estimated 35 minutes until the injection pumps overheat and fail. The RCP seals are assumed to fail 15 minutes after losing injection flow. Thus, a total of 50 minutes are available to re-establish RN cooling. We estimate that the maximum amount of time needed to perform the necessary recovery actions is 20 minutes. Using the HCR Model, a non-response probability of 0.1 is obtained. This value takes into account the operators' knowledge of the plant and their ability to use this knowledge when faced with ambiguous or incomplete information.

3) The preliminary precursor analysis uses a factor for SSF actuation of 0.218. This value assumes a station blackout in which the operator has a 15 minute response time. For this valve problem, the time available is estimated to be approximately 50 minutes. Therefore, 0.06 would be the appropriate factor, as developed in Appendix A.18 of the Catawba PRA / IPE. This value includes SSF maintenance, human errors, and component failures. For the LOOP concern, the D/Gs are expected to run for several minutes and a longer time would have been available.