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BUTLER, W. R. Project Directorate I-2

SUBJECT: Forwards application for amend to License NPF-22, allowing extended operation w/one recirculation loop out of svc. Topical Repts XN-NF-86-146 & XN-NF-86-125 re analysis for single loop operation also encl. Fee paid.

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JUN 30 1987

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Director of Nuclear Reactor Regulation
Attention: Dr. W. R. Butler, Project Director
Project Directorate I-2
Division of Reactor Projects
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED AMENDMENT 52 TO LICENSE NO. NPF-22
PLA-2885 FILES R41-2, A17-2, A7-9

Dear Dr. Butler:

The purpose of this letter is to propose changes to the Susquehanna SES Unit 2 Technical Specifications in order to allow extended operation with one recirculation loop out of service. Marked-up revisions to affected Technical Specifications are provided as an attachment to this proposal.

Background

Via Amendment 26 to License No. NPF-22, the NRC approved Single Loop Operation (SLO) Technical Specifications for Susquehanna Unit 2 Cycle 1 operation. PP&L voluntarily withdrew this provision prior to Cycle 2 operation (i.e., the current cycle) due to incomplete analyses. Since that time, sufficient analyses has been completed and, in conjunction with previous analysis, forms the basis for this submittal.

Justification

This section documents the review of all analyses pertinent to SLO for SSES Unit 2 Cycle 2. Appropriate references are provided at the end of this section.

o Vessel Internal Vibration

During the Susquehanna SES Unit 2 first refueling and inspection outage, 10 to 15 mil gaps on the jet pump restrainer bracket were discovered. General Electric (GE) performed a jet pump vibration analysis assuming SLO with a 30 mil set screw restrainer gap (Reference 9). Based on this analysis, Unit 2 operation will be restricted to 80% recirculation pump speed during SLO.

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o Containment Analysis

An SLO containment analysis (Reference 1) was performed by GE. The peak wetwell pressure, peak drywell pressure, chugging loads, condensation oscillation and pool swell containment response are bounded by the rated power analysis.

o LOCA Analysis

The GE LOCA Analyses submitted in the Cycle 1 SLO submittal are applicable to Cycle 2 and future cycles containing GE fuel because the ANF and GE fuels are hydraulically compatible. Therefore, an SLO MAPLHGR multiplier of 0.81 continues to be required for GE fuel.

ANF has performed LOCA analyses (Reference 3) for their fuel which show that for the spectrum of breaks possible at Susquehanna SES, the SLO Peak Cladding Temperature (PCT) is lower than the two loop PCT at the same MAPLHGR. Therefore, the two loop MAPLHGR limits are applicable to SLO for the ANF fuel.

o Safety Limit MCPR

ANF has performed an analysis to determine the Safety Limit MCPR for SLO using the SLO core flow and power distribution uncertainties, which are larger than the two loop uncertainties. The SLO Safety Limit MCPR is 0.01 higher than the two loop value. The SLO Safety Limit MCPR is 1.07.

o Operating Limit MCPR

ANF has performed analyses of the Idle Loop Startup and Recirculation Pump Trip Transients from Single Loop conditions (i.e., 75.6% power/60.3% core flow). The largest ΔCPR for these events is 0.12 which is considerably less than the largest full power/full flow ΔCPR of 0.24 (i.e., from the Generator Load Rejection Without Bypass transient). As discussed in Reference 4, the Generator Load Rejection Without Bypass transient is less severe at the lower power SLO condition than at rated two loop conditions due to the reduced vessel pressurization that occurs as a result of the lower initial steam flow. This phenomenon also applies to the other pressurization events analyzed in the FSAR.

Another limiting transient which sets the MCPR limit at reduced power conditions for two loop operation, the Feedwater Controller Failure - Maximum Demand transient, is also less severe when initiated from Single Loop conditions. As discussed in Reference 4, the subcooling in the downcomer due to the high feedwater flow takes longer to transverse the core, due to the reduced recirculation flow in SLO, so that a high water level trip occurs before core power can rise as high as it does in the two loop case. Therefore, the two loop power dependent Operating Limit MCPR is modified by adding a 0.01 constant to account for the 0.01 increase in the Safety Limit MCPR to determine the SLO Operating Limit MCPR as a function of power.

A third limiting transient which sets the Operating Limit MCPR at reduced flow conditions for two loop operation, the Recirculation Flow Runout Event, is less severe when initiated from SLO conditions. As discussed in Reference 1, since the maximum core flow runout during SLO is only about 60.3% of rated, the current flow dependent MCPR limits, modified by adding a 0.01 constant to account for the 0.01 increase in the Safety Limit MCPR, which are generated based on the flow runout up to 105% of rated core flow, are also adequate to protect the flow runout event during single loop operation.

The last transient which could potentially be affected by operation with one recirculation loop out of service is the Rod Withdrawal Error (RWE) event. The RWE transient takes credit for the flow biased rod block and scram trip systems. For SLO the procedure established by GE to correct for the back flow through the inactive jet pumps is also applicable for a core with ANF fuel. This results in the correct total drive flow used in the rod block and scram trip systems. Consequently, the two-loop RWE analyses are conservative for SLO. All other events exhibit similar response for SLO as for the two loop operation at the same power and flow conditions.

ANF has also performed an analysis of the Recirculation Pump Seizure Accident initiated from SLO. The resulting CPR is 0.35 for the GE 8x8 fuel and 0.33 for the ANF 9x9 fuel. ANF determined the number of fuel rods which would experience boiling transition if the Operating Limit MCPR was not increased to account for this event (Reference 4); PP&L did not take credit for this calculation in our determination of the Operating Limit MCPR. Although margin to the Safety Limit MCPR is not required for events classified as accidents, the minimum Operating Limit MCPR has been increased to 1.42 for SLO.

Therefore, the Operating Limit MCPR for SLO is the largest of the following three values:

1) 1.42,

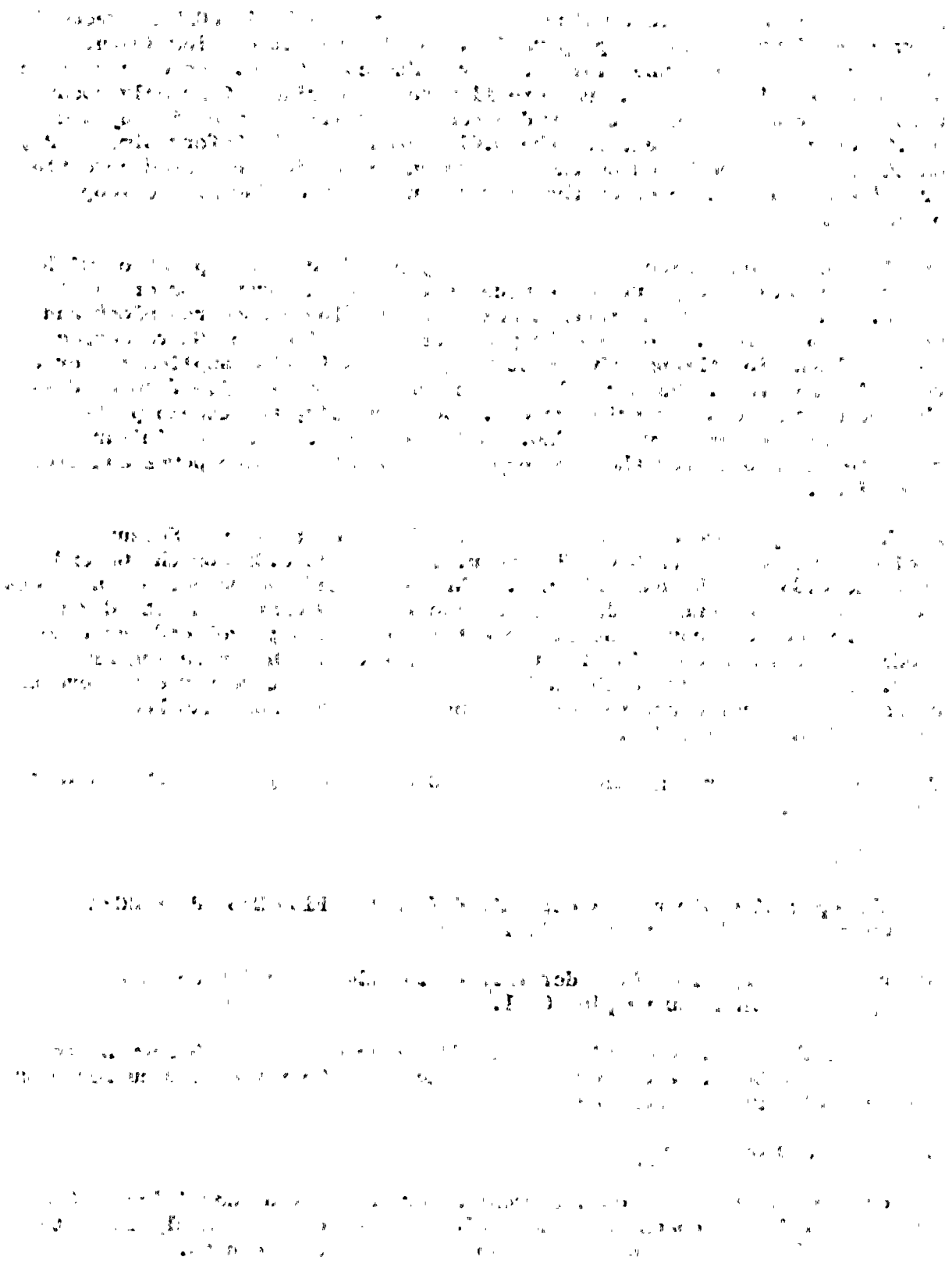
2) the Operating Limit MCPR determined from the Flow Dependent MCPR Operating Limit Curve plus 0.01, and

3) the Operating Limit MCPR determined from the Reduced Power MCPR Operating Limit Curve plus 0.01.

Operation above this Operating Limit MCPR assures that the Safety Limit MCPR will not be exceeded during any Anticipated Operational Occurrence or Recirculation Pump Seizure Accident.

o <u>Control Rod Drop Analysis</u>

The control rod drop accident is most severe at startup conditions. Since void reactivity feedback is conservatively ignored in the analysis of this accident, the core flow conditions do not affect the results.



o Stability

At the startup of Susquehanna SES Unit 2 Cycle 2, stability tests were performed under SLO conditions. The measured decay ratio was 0.30 (σ=0.064) at 55% power/44% flow. ANF performed an analysis of these tests with their COTRAN (Reference 6) and CONTRANSA2 (reference 7) computer codes and calculated decay ratios of 0.29 and 0.24, respectively. In addition, ANF has performed a CONTRANSA2 stability calculation for Susquehanna Unit 2 Cycle 2 SLO at 64% power/42% flow, which is the least stable point in the Single Loop Operating region. The calculated decay ratio is 0.51. COTRAN calculations at the same power and flow condition resulted in a decay ratio of 0.59. Susquehanna SES Unit 2 Technical Specifications contain a Stability Surveillance requirement which is in accordance with GE SIL 380, Revision 1 (Reference 8).

o References

1) PLA-2440, "Proposed Amendments 66 to NPF-14 and 19 to NPF-22," PP&L Letter to NRC, April 11, 1985; and Additional Information PLA-2520, August 15, 1985; PLA-2522, September 13, 1985; PLA-2554, November 4, 1985; PLA-2564, December 4, 1985; and PLA-2620, March 27, 1986.

2) Letter from E. G. Adensam (NRC) to H. W. Keiser (PP&L), "Amendment Nos. 56 and 26 to Facility Operating License Nos. NPF-14 and NPF-22 Susquehanna Steam Electric Station, Units 1 and 2," April 11, 1986.

3) XN-NF-86-125, "Susquehanna LOCA Analysis for Single Loop Operation," November, 1986, attached.

4) XN-NF-86-146, "Susquehanna Unit 2 Cycle 2 Single Loop Operation Analysis," November, 1986, attached.

5) XN-NF-86-90, Supplement 1, "Susquehanna Unit 2 Cycle 2 Stability Test Results," January, 1987.

6) XN-NF-80-19(A), Volume 1, and Supplements 1 and 2, "Exxon Nuclear Methodology for Boiling Water Reactors - Neutronics Methods for Design and Analysis," March, 1983; and XN-NF-691(A), as Supplemented, "Stability Evaluation of Boiling Water Reactor Cores," August, 1984.

7) XN-NF-84-67(P), as supplemented, "Stability Evaluation Methodology for BWR Cores," June, 1984.

8) General Electric Company SIL No. 380, Revision 1, "BWR Core Thermal Hydraulic Stability," February 10, 1984.

9) NEDE-30943(P), "Vibration Evaluation of Susquehanna 1 Jet Pump with Restrainer Gap, "April, 1985.

No Significant Hazards Considerations

The following three questions will be addressed for each of the proposed changes:

I. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

II. Does the proposed change creates the possibility of a new or different kind of accident from any accident previously evaluated?

III. Does the proposed change involve a significant reduction in a margin of safety?

o Table 3.3.6-2, Control Rod Block Instrumentation Setpoints

I. No. Footnote "##" is provided as a reference for the trip functions in this table which have revised trip setpoints and allowable values during SLO. This change applies this setpoint to the APRM Flow Biased Neutron Flux - Upscale trip. This change is administrative in nature since the revised setpoint and allowable value were previously approved as part of the original SLO Specification (reference Amendment 26 to License NPF-22), but footnote ## on the subject trip function was inadvertently omitted as part of the amendment.

II. No. See I above.

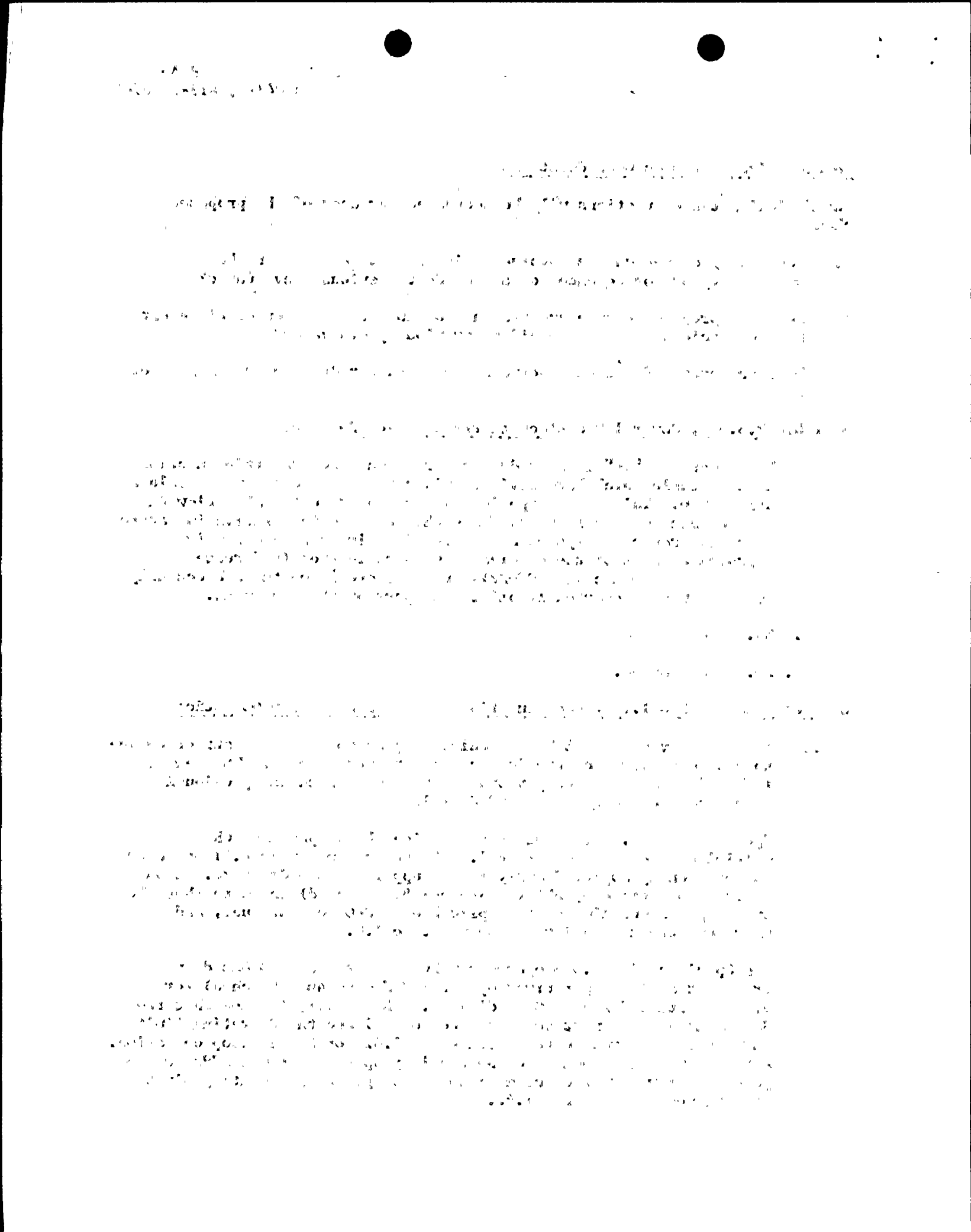
III. No. See I above.

o Specification 3.4.1.1.2, Recirculation Loops - Single Loop Operation

I. No. The revision to 80% recirculation pump speed is a restriction due to gaps discovered on the jet pump restrainer bracket. The new limit is based on a GE jet pump vibration analysis which was previously referenced for Susquehanna SES Unit 1.

Specification a.3 is revised to provide the proper MAPLHGR multipliers for GE and ANF fuel. The GE multiplier is 0.81 based on the previously approved analysis in support of Amendment 26. LOCA analyses performed by ANF (XN-NF-86-125, attached) indicate that the two loop MAPLHGR limits are applicable to SLO for ANF fuel, and therefore the multiplier has been set to 1.0.

New Specification a.5 proposes new MCPR limits for SLO based on transient analyses performed by ANF (XN-NF-86-146, attached) for events initiated from SLO conditions. These analysis show that the Safety Limit MCPR must be increased to 1.07 and the Operating Limit MCPR must be increased to a minimum of 1.42 for Single Loop Operation. A 0.01 constant is added to the two loop Operating Limit MCPR for low power and low core flow conditions for Single Loop Operating Limit MCPR values greater than 1.42.



Based on the addition of the new MCPR limits, the current Specification a.5 is revised to a.6. Under this listing of RBM/APRM Control Rod Block Setpoints, two lines of text are deleted. This change is editorial in that the text applies to setpoints that were deleted in approved Amendment 31 to License NPF-22, and therefore this information should have been deleted at that time.

Based on the above analyses of the non-editorial changes to Specification 3.4.1.1.2, appropriate limits have been proposed to assure that operation with one recirculation loop out of service will not result in a significant increase in the probability or consequences of any accident previously evaluated. The editorial changes have no impact on previous analyses.

II. No. The 80% pump speed restriction ensures that jet pump vibration greater than normally expected will not occur during SLO, thereby eliminating it as a contributor to any new accident scenario. The revised MAPLHGR and MCPR limits have been developed based on approved LOCA and transient analysis methods and therefore will not create any new accident. The deleted text is editorial as explained in I above.

III. No. The analyses for jet pump vibration, LOCA, and other anticipated operational occurrences ensure that no significant reduction in safety margin has occurred based on their inputs, applied conservatisms and calculation methodologies as documented in the previously referenced reports. The editorial changes have no safety impact.

Implementation

The analysis of SLO provided in this proposal is good for Cycle 2 operation, which is currently scheduled to end in early March, 1988. As you are aware, we have recently experienced several recirculation pump trips which were investigated and resolved within the allotted LCO time. Although we do not anticipate further problems, we encourage the NRC to give priority to reviewing this submittal in case further problems would occur in the future; we would like to have it available for as much of Cycle 2 as possible.

Any questions on this proposal should be directed to Mr. R. Sgarro at (215)770-7916. The appropriate application fee in accordance with 10CFR170 has been enclosed.

Very truly yours,

H. W. Keiser
Vice President-Nuclear Operations

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cc: NRC Document Control Disk (original)
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