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 Project Directorate I-2

SUBJECT: Application for amend to License NPF-14, extending operation during Cycle 4 w/one circulation loop out of svc.

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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, D.C. 20555

SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED AMENDMENT 114 TO LICENSE
NO. NPF-14: SINGLE LOOP OPERATION
PLA-3075 FILES A7-9,A17-2,R41-2

Docket No. 50-387

Dear Dr. Butler:

The purpose of this letter is to propose changes to the Susquehanna SES Unit 1 Technical Specifications in order to allow extended operation during Cycle 4 with one recirculation loop out of service. Marked-up revisions to affected Technical Specifications are provided as an attachment to this proposal.

JUSTIFICATION FOR CHANGES

o Background/Summary

The GE vessel internals vibration evaluation, containment analysis, and LOCA analyses for GE fuel (Reference 1) which supported Single Loop Operation (SLO) for Susquehanna SES Units 1 and 2 Cycle 1 are also applicable to Unit 1 Cycle 4. These analyses were reviewed and approved by the NRC in Reference 2.

Advanced Nuclear Fuels Corporation (ANF) previously performed SLO LOCA analyses for ANF fuel (Reference 3) and performed Cycle 4 specific analyses for the MCPR Safety Limit and the Recirculation Pump Seizure Accident considering SLO power/flow conditions and associated SLO uncertainties (Reference 5) which justify SLO for Cycle 4. The NRC previously reviewed and approved the SLO LOCA analyses performed by ANF (Reference 4). The results of the ANF LOCA analyses (Reference 3) show that the two loop MAPLHGR limits are applicable to SLO conditions for ANF fuel. The MCPR Safety Limit analysis for SLO results in an increase of 0.01 in the Safety Limit due to increased measurement uncertainties. The analysis of the Recirculation Pump Seizure Accident produced a limiting ΔCPR of 0.33. This value plus the SLO MCPR Safety Limit of 1.07 yields a MCPR Operating Limit of 1.40.

Previous analyses performed to support Susquehanna SES Unit 2 SLO (References 6, 7, and 8) concluded that other events which could be affected by SLO were non-limiting when analyzed under SLO conditions. For

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example, the SLO LOCA analyses presented in Reference 3 are bounded by the two loop LOCA event. These analyses have been reviewed and approved by the NRC (Reference 4).

Thermal hydraulic core stability has been demonstrated under SLO conditions via testing at Susquehanna SES Unit 2 (Reference 9) and ANF stability calculations.

o Specific Analyses

Vessel Internal Vibration

Based on the vessel internal vibration analysis performed by GE for SLO, the 80% recirculation pump speed restriction, contained in the SSES Unit 1 Technical Specifications, is maintained for Unit 1 Cycle 4 SLO.

Containment Analysis

A Susquehanna SES 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.

LOCA Analysis

The GE LOCA analyses submitted in the Unit 1 Cycle 1 submittal are applicable to Unit 1 Cycle 4, because the ANF and GE fuels are hydraulically compatible. Therefore, A SLO MAPLHGR multiplier of 0.81 continues to be required for GE fuel.

ANF has performed LOCA analyses (Reference 3) for ANF fuel (8x8 and 9x9) 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.

Safety Limit MCPR

ANF has performed an analysis to determine the Safety Limit MCPR for SLO. Applying SLO core flow and Traversing In-Core Probe measurement 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 therefore 1.07.

Operating Limit MCPR

To support SLO for Unit 1 Cycle 4, ANF analyzed the Recirculation Pump Seizure Accident considering SLO power/flow conditions (Reference 5). The pump seizure accident is more severe under SLO than under two loop operation (assuming seizure of the operating loop), and is the limiting event over most of the single loop power/flow operating domain. The limiting Δ CPR for the SLO Pump Seizure Accident was determined to be 0.33, yielding a MCPR operating limit of 1.40. When operating at some low power/flow conditions the two loop events remain limiting.

Previous analyses performed to support Susquehanna SES Unit 2 SLO (References 6, 7, and 8) concluded that other events which could be affected by SLO were bounded by the two loop analyses, when the events were analyzed under SLO conditions.

Based on the above, the Operating Limit MCPR for SLO is the largest of the following three values:

- 1) 1.40,
- 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 design basis Anticipated Operational Occurrence or Recirculation Pump Seizure Accident.

Control Rod Drop Analysis

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.

Stability

The Unit 1 Cycle 4 two loop core stability results, previously submitted to and approved by the NRC (References 10 and 11), also apply under SLO conditions. This is due to the fact that core stability is dependent upon core power/core flow conditions and is not affected by two loop operation versus SLO. In addition, one of the stability tests performed during the startup of Susquehanna SES Unit 2 Cycle 2, was performed under SLO conditions. The measured decay ratio was 0.30 ($\sigma = 0.064$) at 55% power/44% flow. ANF performed an analysis of these tests with their COTRAN computer code and calculated a decay ratio of 0.29. This data, the stability calculation results presented in Reference 10, and the Unit 1 Cycle 4 Technical Specification stability surveillance requirement support SLO during Unit 1 Cycle 4.

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 Letters 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 Stations Units 1 and 2," April 11, 1986.
3. XN-NF-86-125, "Susquehanna LOCA Analysis for Single Loop Operation," November, 1986.

4. Letter from W. R. Butler (NRC) to H.W. Keiser (PP&L), "Safety Evaluation for Thermal Hydraulic Stability and Single Loop Operation (TAC No. 75818)," April 22, 1988.
5. HGS:182:88 from H. G. Shaw (ANF) to D. E. Derr (PP&L), "Susquehanna Unit 1, Cycle 4 Pump Seizure Delta CPR Analysis for Single Loop Operation," June 7, 1988.
6. PLA-2885, "Proposed Amendment 52 to License No. NPF-22," PP&L Letter to NRC, June 30, 1987.
7. PLA-2935, "Additional Information on Proposed Amendment 52 to License No. NPF-22," October 30, 1987.
8. PLA-2952, "Response to NRC Request for Additional Information Regarding Unit 2 Cycle 2 SLO," December 25, 1987.
9. XN-NF-86-90, Supplement 1, "Susquehanna Unit 2 Cycle 2 Stability Test Results," January 1987.
10. PLA-2875, "Proposed Amendment 100 to License No. NPF-14," PP&L Letter to NRC, June 19, 1987.
11. Letter from W. R. Butler (NRC) to H. W. Keiser (PP&L), "Technical Specification Changes to Support Cycle 4 Reload (TAC No. 65636)," October 9, 1987.

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 create the possibility of a new or different kind of accident from any accident previously evaluated?
- III. Does the proposed change involve a significant reductions in a margin of safety?

o Specification 3.4.1.1.2, Recirculation Loops - Single Loop Operation

- I. No. Specification a.3 is revised to provide the proper MAPLHGR multiplier for ANF fuel. LOCA analyses performed by ANF (XN-NF-86-125) 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 the aforementioned transient analyses performed by ANF for events initiated from SLO conditions. These analyses show that the Safety Limit MCPR must be increased to a minimum of 1.40 for SLO. 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 1.40.

Editorial changes to remove unnecessary verbage and renumber these specifications have also been provided.

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 revised MAPLHGR and MCPR limits have been developed based on approved LOCA and transient analysis methods and therefore will not create the potential for any new event.
- III. No. The analyses for 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 this proposal. The editorial changes have no safety impact.

IMPLEMENTATION

The analysis of SLO provided in this proposal is good for Cycle 4 operation, which is currently scheduled to end in March, 1989. PP&L would like to have these Technical Specifications in place for as much of Cycle 4 as possible, but we are not requesting an expedited review.

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

Attachment

cc: NRC Document Control Desk (original)
NRC Region I
Mr. F. I. Young, NRC Resident Inspector-SSES
Mr. M. C. Thadani, NRC Project Manager-Rockville
Mr. T. M. Gerusky, Pa DER