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SUBJECT: Forwards evaluation of effect of revised safety limit on past operations at WNP-2,in response to unresolved items in insp rept 50-397/97-11.

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November 25, 1997
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Docket No. 50-397

U. S. Nuclear Regulatory Commission
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Gentlemen:

Subject: **WNP-2 OPERATING LICENSE NPF-21**
NRC INSPECTION 50-397/97-11
SUBMITTAL OF ADDITIONAL INFORMATION

Reference: NRC Inspection Report 50-397/97-11, November 6, 1997

Attached is an evaluation of the effect of a revised safety limit on past operations at WNP-2. This information is submitted in response to unresolved items 50-397/9711-02 and -03.

The evaluation concludes that the MCPR operating limits (OLMCPR) would have been exceeded on numerous occasions during each of the evaluated cycles if the revised additive constants and additive constant uncertainties had been used. More significantly, the study concluded that the revised safety limit (SLMCPR) was not exceeded during actual events, nor would it have been exceeded during limiting transients occurring under actual plant conditions.

Through conversations with the staff's Inspection Team Leader on November 21, 1997, we understand that resolution of unresolved issue 50-397/9711-01 will require an on-site inspection of our design process as it relates to the incorporation of vendor information. Additional information to support that evaluation will be provided during the inspection. Should you have any questions or desire additional information regarding this matter, please contact Mr. P.J. Inserra at (509) 377-4147.

Respectfully,

D. W. Coleman

D.W. Coleman (Mail Drop PE20)
Acting Manager, Regulatory Affairs

IE01 /1

Attachment

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NRC Inspection 50-397/97-11
Effect of Revised MCPR Limits

1.0 Summary

The NRC determined the number of test points and the range of conditions for critical heat flux experiments for Siemens Power Corporation (SPC) ATRIUM-9 fuel design and other 9x9 fuel designs with an internal water channel are insufficient to justify the values for the additive constants uncertainties used in the MCPR safety limit determination. The additive constants and additive constant uncertainties for these fuel designs are larger than previously estimated. The larger values affect not only previously monitored Critical Power Ratios, but also affect the safety limits for BWRs containing reload quantities of SPC 9x9 fuel designs with internal water channels.

Problems with the determination of the additive constant and additive constant uncertainties were reported to the Supply System by SPC in April 1997 while the unit was shutdown for refueling. To correct these problems, SPC revised its methodology and prepared a topical report for NRC review. Until the new methodology receives NRC approval, the Supply System is using a conservative interim adjustment to the SLMCPR for the SPC fuel (beginning with Cycle 13). Following NRC approval of the SPC revised methodology, the Supply System will be able to calculate the correct SLMCPR and to request, if necessary, the corresponding change to the Technical Specifications.

This report analyzes the effect of a revised safety limit on past operations to support the NRC's evaluation of unresolved items 50-397/9711-02 and -03. The study concludes that the MCPR operating limits (OLMCPR) would have been exceeded on numerous occasions during each of the evaluated cycles if the revised additive constants and additive constant uncertainties had been used. The largest departure from the OLMCPR occurred during Cycle 8 where it would have been exceeded by approximately 5 percent. However, more significantly, the study concluded that the revised safety limit (SLMCPR) was not exceeded during actual events, nor would it have been exceeded during design basis transients occurring under actual plant conditions.

2.0 Revised Safety Limits

Siemens Power Corporation (SPC) notified the Supply System (References 1 and 2) and other users of the ATRIUM-9 fuel design that a change was necessary in the previously approved method used by SPC to determine additive constants and their uncertainties. A revised methodology for treating the uncertainties has been submitted to the NRC for approval (Reference 3). Impacts of the ANFB additive constant errors on Cycles 7 through 12 are evaluated in this report. Cycles earlier than 7 did not use 9x9-9X fuel.

Based on the revised methodology of Reference 3, SPC recalculated the safety limits for Cycle 11 (Reference 4). The new limit for two loop operation is 1.10 based on the revised additive constant uncertainty of 0.0195. SPC also suggested (Reference 5) that a more conservative uncertainty of 0.029 should be used for interim correction of the SLMCPR until such time that the revised methodology of Reference 3 is approved by the NRC. However, for the evaluation of the impact of the revision on past operations, the value of 0.0195 is used.

The difference between the uncorrected and revised SLMCPR is 0.03 (from 1.07 to 1.10). This same difference is used for all previous six cycles in this evaluation since a SLMCPR of 1.07 was used for Cycles 7 through 12.

The revision of the additive constants associated with the SPC 9x9-9X fuel resulted in an impact on calculated MCPRs. This impact was evaluated for Cycle 11 and resulted in a penalty of about 0.02 in MCPR. There is also the effect on the calculated ΔCPR of about 0.01 (i.e., a multiplier of 1.10/1.07 applied to the ΔCPR) caused by using the incorrect SLMCPR. Thus, the total penalty of the ANFB additive constant revision is at most 0.03+0.02+0.01 = 0.06.

3.0 Operating Limits

A sort of the POWERPLEX CMSS data for Cycle 7 to 12 (Reference 7) indicated the following fraction of limits for each cycle before the error correction:

Cycle No.	7	8	9	10	11	12
FLCPR	0.982	0.997	0.990	0.985	0.979	0.969
Lowest OLMCPR*	1.23	1.25	1.25	1.24	1.24	1.28

* At full power, full flow

Based on the actual plant data for the past 6 cycles, the OLMCPR would have been exceeded some of the time during power operation if the revised additive constants were used and if a Safety Limit of 1.10 was used instead of 1.07. The largest difference occurred during Cycle 8 where the OLMCPR would have been exceeded at most by approximately 5% (0.06/1.25 = 4.8%). Given that the OLMCPR would have been exceeded during these cycles, two areas of investigation are needed to evaluate the effect of a 0.06 reduction in MCPR margin on the SLMCPR. First is a search of the operating data from past cycles to identify and evaluate operational transients that could potentially impact the safety limits. Second is to evaluate the impacts on thermal limits had there been a limiting transient during the last 6 cycles.

4.0 Actual Operating Events

A search of Monthly Operating Reports to the NRC from 1991 to 1997 identified five transients that could potentially challenge the SLMCPR. Four of these transients are pressurization transients and the other is a power oscillation due to core instability.

4.1 Feedwater Controller Failure (11/19/91)

On November 19, 1991, a reactor scram occurred due to a failure of feedwater level control system component. The failure caused an increase of the feedwater flow and subsequent turbine trip and scram (see Licensee Event Report 91-032). This transient is similar to the transient of Feedwater Controller Failure (FWCF) analyzed for licensing Cycle 7 reload. However, in the Cycle 7 analysis, the limiting transient at 100% power is Generator Load

Rejection without Bypass (LRNB). From Cycle 7 Plant Transient Analysis Report (Reference 6), the difference between FWCF and LRNB in Operating Limit MCPR (OLMCPR) is 0.05 (1.24 vs. 1.29). In addition, during the transient, the effect of the failure caused the summed feedwater flow signal input to the feedwater level control (FWLC) circuit to indicate zero feedwater flow. This resulted in a transfer of the reactor recirculation pumps from 60 Hz to 15 Hz after a 10 second time delay. In the licensing analysis, the recirculation flow was assumed to stay at 106% rated condition until L8 is reached making the analysis considerably more severe than this event. Additionally, POWERPLEX at the start of the transient (11/18/91 23:53, Reference 7) indicated a limiting FLCPR of 0.864 based on the uncorrected MCPR limits. Thus, considerable margin existed during this transient and consequently, the revised SLMCPR was not exceeded.

4.2 Core Instability (8/15/92)

On August 15, 1992, the reactor was manually scrammed due to indication of core instability (see LER 92-037). Reactor power was at 36.5% when one Flow Control Valve was closed to the minimum position in preparation for recirculation pump 1A shift from 15 Hz to 60 Hz. APRM signals started to oscillate at this time between 25% and 45% power. The oscillation was a result of the combined effect of high power, low flow, adversely skewed radial and axial power peaking and low MCPR.

A conservative post-event analysis by SPC (Reference 14) resulted in a ΔCPR of 0.37. At the initiation of the event, the MCPR was 1.94. Therefore, the lowest CPR reached during the event was 1.94-0.37 = 1.57, which maintains considerable margin to the revised SLMCPR of 1.10 even after corrections.

4.3 MSIV Closure (8/3/93)

On August 3, 1993, the reactor automatically scrammed from 100% power due to a full isolation of the Main Steam Isolation Valves (LER 93-027). This event was caused by the closure of a MSIV on main steam line B. As a result, steam flow through the other three main steam lines increased sufficiently to generate an MSIV isolation signal. Thus, the four main steam lines were not closed simultaneously. From POWERPLEX data, at the start of the transient (8/3/93 04:19, Reference 7), the limiting FLCPR at the plant based on the uncorrected MCPR limits was 0.860. Therefore, there was ample margin to the revised SLMCPR limits for this transient. In addition, based on licensing analysis for WNP-2 startup in 1984, the MSIVs were conservatively assumed to close simultaneously at the fastest time allowed by Technical Specifications (3.0 seconds). The ΔCPR calculated for the transient was less than 0.04 versus the most limiting transient of 0.09 for LRNB. Therefore, this transient provides more than 0.05 margin from the limiting transient which sets the operating limit.

4.4 Turbine Trip (2/18/95)

On February 18, 1995, with the plant at 78% power, the turbine reset lever was actuated instead of the test lever (LER 95-002) resulting in an unintended turbine trip after the trip pushbuttons were pressed. Based on an analysis performed for SPC fuel in Cycle 8 (Reference

9), it was determined that at a power level of 104%, the difference in ΔCPR for the feedwater controller failure (FWCF) with and without bypass is 0.12. In Cycle 10, the limiting transient at 100% power is turbine trip without bypass. At the time of this event, the bypass valves were operable. Therefore, there was an increased margin of 0.12 in OLMCPR. The use of the 0.12 margin from FWCF analysis for turbine trip transient is justified because the bypass function comes into play during the turbine trip phase of the FWCF, which is very similar to a turbine trip transient. In addition, from POWERPLEX data, at the start of the transient (2/18/95 12:29, Reference 7), the limiting FLCPR at the plant based on the uncorrected MCPR limits was 0.842. Therefore, there was ample margin to the revised SLMCPR limits for this transient.

4.5 Turbine Trip (4/4/95)

On April 5, 1995, near the end of Cycle 10, with WNP-2 at 100% power, a main turbine trip occurred. This transient, as the above three transients, was very mild as shown by the plant computer printout (see LER 95-006). The bypass system was operable. The maximum reading among the six APRM channels through the transient was 103.6%. The maximum heat flux was 101%. From the APRM time trace, there was no power excursion contrary to the predictions of the conservative licensing analysis. Therefore, during the transient, the fuel did not see any reduction in MCPR as compared to the MCPR at the beginning of the transient, which had a FLCPR of 0.952 based on the uncorrected MCPR limits (POWERPLEX 4/5/95 09:53, Reference 7). Therefore, there was an ample margin to the revised SLMCPR limits for this transient.

4.6 Summary

The five events discussed above demonstrate that the revised safety limits (SLMCPR) would not have been exceeded during the actual operating conditions experienced during Cycles 7 through 12. Accordingly, the fuel remained within the design basis at all times and therefore, plant safety was never compromised. There have been no fuel failures experienced during any of the cycles in question.

5.0 Evaluation of Limiting Transients Under Actual Conditions

As previously discussed, none of the actual transients that occurred during the past 6 cycles would have caused the corrected SLMCPR to be exceeded. To provide further assurance that the fuel was being protected, an evaluation of the corrected SLMCPR has been made by assuming the occurrence of the most limiting transients under actual plant conditions. The most limiting Anticipated Operational Occurrences (AOOs) for Cycles 7 through 12 are Load Rejection without Bypass (LRNB) and/or Turbine Trip without Bypass (TTNB) or Control Rod Withdrawal Error (CRWE) for rated conditions, and Feedwater Controller Failure (FWCF) for off-rated conditions. The following discussion provides justification for the conclusion that the SLMCPR was not exceeded assuming a limiting transient had occurred. The discussion is focused on the conservatism in the assumptions used in the analysis of the limiting transients in each cycle's reload report.

5.1 Fast Transients.

5.1.1 Turbine Bypass Availability.

For the limiting transient of LRNB or TTNB at rated conditions, it is assumed that the turbine bypass is out-of-service (OOS). However, a review of plant history indicates that through the past 6 cycles, the turbine bypass function was available at the rated conditions all of the time based on surveillances regularly performed for the turbine bypass. An exception at lower power (less than rated) was noted during Cycle 8 when the turbine bypass was not available between a power range of 25% to 35% (Reference 8). This condition does not impact the limiting transient at rated conditions. In addition, ample margin to SLMCPR exists when operating in this lower power range.

Based on an analysis performed for SPC fuel in Cycle 8 (Reference 9), the Supply System determined that at a power level of 104%, the loss of turbine bypass resulted in an increase of 0.12 in ΔCPR. Accordingly, an increased margin of 0.12 can be realized if the assumption of turbine bypass out-of-service is removed from the transient analysis based on actual plant conditions. This increased margin gained by having the bypass operable more than offsets the reduced margin of 0.06 due to the error in SLMCPR calculation. As a result, neither the LRNB or TTNB transients occurring under actual plant conditions (i.e., bypass operable at rated conditions) would have caused the revised SLMCPR to be exceeded.

5.1.2 Assumption of All-Rods-Out (ARO)

For the case of off-rated conditions, the limiting transient has been Feedwater Controller Failure (FWCF). In this event analysis, the bypass function was credited. However, the initial condition assumed the transient had an all-rods-out configuration. In order to evaluate the impact of this conservative assumption, an off-rated case of FWCF at 47% power (of 3323 MWt) and 106% rated flow was evaluated. Below 47% power, large thermal margins generally exist.

The sensitivity analysis performed by SPC (Reference 19) for Cycle 8 is summarized below. The quoted change in ΔCPR is the reduction in ΔCPR due to the use of realistic rod patterns instead of the licensing assumption of all-rods-out.

Burnup	RPT	Scram Time	Turbine Bypass	Change in ΔCPR
EOFP-1000 MWD/T	Yes	NSS	Yes	0.11
EOFP-1000 MWD/T	Yes	NSS	No	0.17

Note: RPT is Recirculation Pump Trip, NSS is Normal Scram Speed.

As seen in the above table, the reduction in ΔCPR is 0.11 or greater. This by itself is more than enough to cover the reduced margin of 0.06 due to errors in the SPC SLMCPR calculations.

5.1.3 Axial Power Shape

Conservative axial power shapes (based on conservative assumptions of fuel depletion at the initiation of transients) were used in the licensing transient analysis for Cycles 7 through 12. The analysis intentionally used a more top peaked axial power shape at end of cycle which results in a more severe ΔCPR. This is a conservative approach to ensure that actual operating power shapes are bounded by analytical assumptions. To investigate the effect of licensing axial power shape on the ΔCPR, a comparison was made between the licensing shape and the actual power shape at the end of each cycle for Cycles 7 through 12. From the comparison, an estimated change in ΔCPR is obtained (Reference 18). The results are shown in the following table.

Cycle #	Licensing AO, %	Actual EOC or EOFPL AO, %	Estimated Change in ΔCPR
7	3.3	-12.3	0.052
8	4.3	1.5	0.009
9	8.2	0.0	0.027
10	11.9	7.5	0.015
11	15.2	5.9	0.031
12	6.3	·2.2	0.014

Note: AO (Axial Offset) is defined as (Sum of power of top 12 nodes - Sum of bottom 12 nodes)/(Sum of power of top 12 nodes and bottom 12 nodes). In a 25-node model, power at mid-node (13) is not used.

From the above table, it can be seen that the reduction in ΔCPR for the actual power shape at EOC ranges from 0.009 to 0.052. For conditions prior to end of cycle, the power shapes were more favorable adding additional margin.

5.1.4 Turbine Control Valve Partial Arc Operation

For all previous cycles, with the exception of Cycles 10 and 11, the transient analysis for LRNB assumed that the turbine control valves (TCV) operated in full arc mode. However, the WNP-2 plant is operated in partial arc mode. Since the partial arc mode allows the last TCV to close in a full stroke time instead of a fraction of stroke time for full arc, the transient assuming full arc is more severe. A sensitivity analysis was performed to evaluate the effect of TCV closure time on ΔCPR (Reference 17). The RETRAN/VIPRE analysis for Cycle 8 gives a decrease of ΔCPR for 9x9-9X fuel of 0.01 when the closure time is increased by 0.03 seconds (from 0.07 sec to 0.10 sec). The partial arc closure time is 0.15 seconds, whereas the full arc closure time is 0.10 seconds. Therefore, the conservatism due to the assumption of full arc is equivalent to an increase of approximately 0.016 in ΔCPR.

5.1.5 Control Rod Modeling

The assumption that all control rods move at the same speed following a scram (as is the case in the WNP-2 transient model) is a conservative approach. Uniform speed for all control rods results in a slower initial negative reactivity insertion rate than that achieved by distributed control rod insertion speeds with the same average scram speed. All rods are assumed to travel at the analytically assumed speed despite the fact that the average rod speed is faster than assumed. Also, some rods are significantly faster than the average and exist in sufficient numbers to make the analysis conservative. This was supported indirectly by an analysis performed for an independent issue (degradation of scram pilot valve diaphragm in 1994, PER 294-0235). In that analysis, a group of 28 rods assumed available for scram (i.e., assuming the rest of the 185 rods failed to scram) with a configuration at the initiation of the limiting transient being 12 rods fully withdrawn, 16 rods at notch 36, resulted in a critical power performance equal to the base case (i.e., the case where all rods are out before the transient and available for scram). Even though this case is not a simulation of different scram speeds for all 185 rods, it gives an indication that only a few rods that are partially inserted can give the same effect as that of 185 rods that take longer to reach 20% of the core height where the rod worth effect is maximum.

This added conservatism of uniform scram speed increases assurance that the SLMCPR would not have been exceeded during postulated AOOs in the last six cycles considering that other conservatism as discussed above already provide more than the 0.06 increase due to the revision in SLMCPR for 9x9-9X fuel.

5.1.6 Control Rod Scram Times

Actual control rod scram times are considerably faster than assumed in the transient analyses. Surveillances are regularly performed to assure individual rod scram speeds remain within the normal scram time specifications. A review of historical data shows that core average scram times have remained relatively constant over the cycles in question. The table below compares the current average scram times to the normal values used in the transient analyses.

	Time to Notch 45	Time to Notch 39	Time to Notch 25	Time to Notch 05
Core Average Time 9/18/97	0.31 sec.	0.61 sec.	1.33 sec.	2.42 sec.
Normal Time Assumed	0.43 sec.	0.72 sec	1.60 sec.	2.95 sec.

Sensitivity studies have shown that the time to notch 39 and 25 have the most significant impact on ΔCPR. Based on the sensitivity study in Reference 16, the OLMCPRs for the ABB fuel based on rod insertion from an initial all-rod-out configuration were calculated as follows:

Time to Notch 39	Estimated OLMCPR
0.72*	1.292
0.87	1.321

* 0.72 sec was used in determining the OLMCPR for Cycles 9 through 12 under normal scram speed condition. For Cycle 7 and 8, it was 0.69 sec.

From the above sensitivity analysis, an estimated change in OLMCPR can be made based on the core average measured times. The actual time to Notch 39 is 0.11 seconds faster than assumed. From the above table this extrapolates to approximately 0.02 improvement in OLMCPR. The improvement is more significant if one considers that a significant number of rods have times faster than the average and will suppress the transient faster than modeled as explained in the previous section.

5.1.7 Actual Transients Compared to Analysis

Power Ascension Test (PAT) Number 027 "Load Rejection Test," demonstrated that there was no power excursion during the transient, similar to the turbine trip of 4/4/95 as discussed above. Analysis performed by SPC for Cycle 8 predicted a ΔCPR of 0.18 for the LRNB transient. Using the change of 0.12 (Reference 9) based on the FWCF transient with and without bypass, the adjusted ΔCPR for load rejection with bypass from Cycle 8 Licensing analysis is 0.06 (0.18-0.12). The use of 0.12 adjustment from FWCF for load rejection is justified because the bypass function in FWCF comes into play during the turbine trip phase of the transient, which is similar to the turbine trip in the load rejection transient. The actual transient showed no increase in heat flux. This indicates that overall analytical models are conservative by 0.06.

5.2 Slow Transients: CRWE

The assumptions made in the CRWE transient analysis are very conservative. The CRWE analysis assumes a control rod configuration that puts the most reactive rod fully in and the assemblies in a 6x6 array around this rod near limits. The analysis further assumes no xenon, the most reactive exposure in the cycle, and the most sensitive Rod Block Monitor (RBM) inoperable (a condition not permitted by Technical Specifications). Sensitivity studies described in References 10 and 11 evaluate the conservatism of these assumptions and serve as a basis in this assessment to adjust the analysis to fit actual plant conditions.

The conservatism of the rod pattern selected for licensing analysis was investigated in sensitivity studies described in Reference 10. A comparison of the conservative licensing basis rod pattern against more realistic (but still conservative) rod patterns that could be present under full power conditions showed that the licensing analysis was about 0.08 in ΔCPR more conservative.

The conservatism of the most sensitive RBM being inoperable was investigated in Reference 11. This sensitivity study indicates that the failure of one of the two RBMs results in a ΔCPR which is between 0.04 and 0.20 larger, dependent on the Local Power Range Monitor (LPRM) failures that have been assumed.

Even though the conservatism available from the control rod pattern sensitivity study shown in Reference 10 is by itself more than adequate to cover the loss of MCPR margin of 0.06, the Supply System decided to evaluate cases where the RBM was declared inoperable and the conservatism shown in Reference 11 was not fully available. To do this, a search was made of PERs associated with the RBM being inoperable for Cycle 7 through 12. Two cases were found and are discussed below.

PER 295-0890 shows that RBM A was declared inoperable from the evening of 7/26/95 to 7/28/95 (Cycle 11). The MFLCPR during this time period was 0.96 giving a margin of 1.24/0.96 - 1.24 = 0.05 CPR. Also, the control rod pattern during this time was not the Limiting Control Rod Pattern used in the Licensing Analysis making the 0.08 ΔCPR conservatism applicable. Furthermore, typically RBM B is the more sensitive RBM and it was operable. Thus even with RBM A being inoperable, there was more than adequate CPR margin to cover a CRWE.

PER 296-0811 shows that RBM A was declared inoperable on 11/25/96 and remained inoperable to 12/4/96 (Cycle 12). Going back 1/4 year (by Technical Specification Surveillance requirements) from the 11/25/96 date, one arrives at 8/25/96. Between 8/25/96 and 12/4/96 the MFLCPR never exceeded 0.96 giving a margin of 1.28/0.96 - 1.28 = 0.05 CPR. Also, none of the control rod patterns during this time were the Limiting Control Rod Pattern used in the Licensing Analysis making the 0.08 ΔCPR conservatism applicable. Furthermore, RBM B was operable over this time period and it is typically the more sensitive RBM. Thus even with RBM A being inoperable, there was more than adequate CPR margin to cover a CRWE.

From the above discussion, the Supply System concluded that given the actual plant operating conditions during the period from Cycle 7 to Cycle 12, the SPC 9x9-9X fuel in the core would not have decreased below the revised SLMCPR from a CRWE.

6.0 Conclusions

The transient and steady state models and assumptions used to establish the OLMCPR have conservatisms that provide additional margin to the SLMCPR during Anticipated Operational Occurrences. The Supply System included these conservatisms in the analysis to ensure that actual plant operation remains within its design bases under all anticipated conditions. The combination of assumptions that cover the extremes of the operating domain (e.g., EOC axial power shapes, limiting rod patterns, scram speeds, scram modeling, equipment operability, and other initial conditions) results in the establishment of OLMCPRs that protect the safety limit under nominal plant conditions with margin for error. As shown above, the OLMCPR was exceeded on several occasions during Cycles 7 to 12. On those occasions, the SLMCPR would not have been exceeded during Anticipated Operational Occurrences because of the conservatisms built into the analytical assumptions as compared to actual plant conditions.

7.0 References

1. Letter KVW:97:077 dated April 8, 1997, KV Walters (Siemens) to RA Vopalensky (Supply System), ANFB Additive Constant Uncertainties for the SPC 9x9-9X Fuel Design.

2. Letter KVW:97:078 dated April 9, 1997, KV Walters (Siemens) to RA Vopalensky (Supply System), ANFB Additive Constants for the SPC 9x9-9X Fuel Design.

3. ANFB Critical Power Correlation Uncertainty for Limited Data Sets, ANF-1125(P), Supplement 1, Appendix D, Siemens Power Corporation - Nuclear Division, Submitted on April 18, 1997.

4. Letter KVW:97:115 dated May 20, 1997, KV Walters (Siemens) to RA Vopalensky (Supply System), Revised MCPR Safety Limits for WNP-2 Cycle 11.

5. Letter KVW:97:033 dated April 18, 1997, HD Curet (Siemens) to US NRC Document Control Desk, Interim Use of Increased ANFB Additive Constant Uncertainty.

6. ANF-91-01, Rev.1, " WNP-2 Cycle 7 Plant Transient Analysis", Siemens Power Corp., April 1991

7. POWERPLEX CMSS Data provided by W.J. Burke, 5/23/97.

8. Licensee Event Report LER 93-012, 4/9/93

9. Problem Evaluation Request PER 293-272, Attachment: "Basis for Continued Operation".

10. Applications Topical Report for BWR Design and Analysis, WPPSS-FTS-131(A), Revision 1, March 1996.

11. Supply System Interoffice Memorandum on the subject of "Impact of Assuming Upscale LPRM Failures in the Cycle 13 Rod Withdrawal Error Analysis (PTL 134493)," SS2-RXFE-003, January 28, 1997.

12. Supply System Problem Evaluation Request (PER) 297-0283, "The safety limit CPR used for SPC Fuel could potentially increase."

13. Supply System Problem Evaluation Request (PER) 297-0285, "SPC Supplied Additive Constants for 9x9 Fuel were incorrectly determined."

14. Letter YUF:235:92 dated September 4, 1992, U. Fresk (Siemens) to RA Vopalensky (Supply System), ΔCPR Calculation for WNP-2 Instability Event.

15. Letter KVW:97:119 dated May 23, 1997, KV Walters (Siemens) to RA Vopalensky (Supply System), 10CFR21 Evaluation and Notification of ATRIUM-9 CHF Database (transmits letter HDC:97:046 dated May 22, 1997, HD Curet (Siemens) to NRC Document Control Desk, 10CFR21 Evaluation and Notification of Adequacy of ATRIUM-9 CHF Data Base)

16. Letter, WPPSS to ABB, "Revised Normal Scram Speed for Cycle 12", WPABB-96-017, 4/17/96

17. Supply System Internal Memo, SH Bian to DL Whitcomb, "Status Report on the Applications Topical", 10/28/92

18. Interoffice Memo, SS2-RXFE-97-028, TC Hoang to SH Bian, 11/24/97

19. Fax, J. Ingham (Siemens Power Corp.) to SH Bian (WPPSS), 11/24/97