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SUBJECT: Forwards suppl to 920305 response to second request for addl info re Topical Rept WPPSS FTS-129, "BWR Transient Analysis Model," consisting of addl clarifications requested by NRC contracted reviewer in 920825 telcon.

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September 11, 1992
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Docket No. 50-397

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: WNP-2, OPERATING LICENSE NPF-21
SUPPLEMENT TO RESPONSE TO SECOND REQUEST FOR ADDITIONAL INFORMATION REGARDING TOPICAL REPORT WPPSS FTS-129, "BWR TRANSIENT ANALYSIS MODEL" (TAC No. M77048)

Reference: Letter, GC Sorensen (SS) to NRC, dated March 5, 1992, "Response to Second Request for Additional Information Regarding Topical Report WPPSS-FTS-129, BWR Transient Analysis Model (TAC No. 77048)"

The Supply System transmitted our response to the second round of questions regarding the Topical Report WPPSS-FTS-129, "BWR Transient Analysis Model" in March 1992. Additional clarifications to the responses were requested by the NRC contracted reviewer in a telephone conference held on August 25, 1992. The purpose of this letter is to provide a supplement to the responses providing the clarifications. The supplement is attached.

Sincerely,

GC Sorensen

G. C. Sorensen, Manager
Regulatory Programs (Mail Drop 280)

SHB:shm

Attachment: Supplement to Response to Second Request for Additional Information on Topical Report WPPSS-FTS-129

cc: JB Martin - NRC RV
NS Reynolds - Winston & Strawn
RR Assa - NRC
DL Williams - BPA/399
NRC Site Inspector - 901A

A001

SUPPLEMENT TO RESPONSE TO SECOND REQUEST FOR ADDITIONAL INFORMATION ON TOPICAL REPORT WPPSS-FTS-129

REVISION OF SAMPLE PROBLEM 9 CALCULATION

The results presented in Table A-9 in the responses to the second round of questions (Reference 1) were revised. The new results are given in Table A-9 as attached. The initial calculation for the RETRAN Sample Problem 9 (Turbine Trip Without Bypass With Space-Time Kinetics) as presented in Reference 1 showed a large difference in total reactivity between Version MOD005.0 and MOD5UEM at the end of the simulation (-1.4%). Further investigation indicated that two different conditions in the transient were compared. The input deck requires a scram signal at 0.700 second as set up through the input. From the published results in Reference 2, the MOD005.0 output indicated that the scram signal occurred at 0.705 second which is one time step later than the input demands. The cause of this shift is most likely due to the numerical representation in the computer used (in this case, CDC Cyber at PCC). If the last simulation time before the scram setpoint is very close to the setpoint (e.g., 0.6999999 versus the setpoint of 0.7000000), the system will not generate a scram signal at that time step. Instead, it will generate a signal at the next time step which is 0.7049999. The shift of one time step leads to large differences in the scram worth. In order to compare the MOD5UEM results with the MOD005.0 results on an equal basis, the MOD5UEM case on the IBM R6000 workstation was rerun with the scram time set to 0.705 second. Table A-9 gives the revised results at the end of the transient (1.005 seconds). As can be seen, the results show considerable improvements in the reactivity comparisons. The difference in the total reactivity is 0.0097%. Even though the mixture level in Vol. 9 showed an increase in differences, the absolute difference is still small (0.11%).

CLARIFICATION OF RETRAN VERSION DIFFERENCES

In the responses given in Reference 1, it was stated that "part of the differences between MOD5UEM and MOD004 is caused by the RETRAN revision from MOD004 and MOD005.0" (p. A-10 of Reference 1). However, no details were given in support of this statement.

Several additional comparisons were made in this supplement to quantify the differences between the three versions (MOD004, MOD005.0 and MOD5UEM). Results from three different but similar transient calculations were used.

Table A-13 gives the comparisons of the WNP-2 Load Rejection Without Bypass (LRNB) transient with a 24-node core running on two different computers - PCC and R6000. The same code version (MOD5UEM) was used. The difference in peak power is 0.069%. The difference becomes larger at the end of transient (0.17%) for the similar reason as discussed above. In this case, the shift in the trip signal is on the safety relief valve (SRV) opening and closing. The SRVs open and close at different times for the two cases due to differences in the calculated system pressures. That is, small differences in system pressure calculation translates into large differences in trip initiation due to the discrete time step sizes. The first bank of SRVs open at about 1.46 seconds after the initiation of the LRNB transient. Therefore one expects increased differences in the calculated power after that time as is seen in the table. Even so, the differences are judged acceptable in that they will not impact the MCPR calculations for the limiting transients.

Table A-14 gives the comparison of the RETRAN Sample Problem 9 running on MOD005 at PCC and MOD5UEM on R6000. The difference in peak power is 0.0037%. Table A-15 gives the comparison of the same sample problem using the MOD004 and MOD005.0 versions. The results are quoted directly from the RETRAN User's Manuals (References 2 and 3). The MOD005.0 peak power underpredicts MOD004 by 0.26%. These comparisons lead one to believe that a larger part of the differences between MOD004 at PCC and MOD5UEM on R6000 is due to the transition from MOD004 to MOD005.0.

CODES USED BY SIEMENS FOR CALCULATION COMPARISONS IN THE TOPICAL

The system transient code used by Siemens Power Corporation is COTRANSA (Reference 4). The results of this code were compared to the RETRAN Licensing Basis Model in the Topical Report.

REFERENCE

1. Letter, GC Sorensen to NRC, "Response to Second Request for Additional Information Regarding Topical Report WPPSS-FTS-129, BWR Transient Analysis Model (TAC No. 77048)", dated March 5, 1992

2. C.E. Peterson, "RETRAN-02 - A Program for Transient Thermal-Hydraulic Analysis of Complex Fluid Flow Systems", NP-1850-CCM-A, Vol. 3, Rev. 4, Nov. 1988

3. C.E. Peterson, "RETRAN-02 - A Program for Transient Thermal-Hydraulic Analysis of Complex Fluid Flow Systems", NP-1850-CCM-A, Vol. 3, Rev. 3, June 1987

4. R.H. Kelley, "Exxon Nuclear Plant Transient Methodology for Boiling Water Reactors", XN-NF-79-71(P), Siemens Power Corp., Richland, Washington, Nov. 1981

Table A-9

Turbine Trip without Bypass with Space-Time Kinetics Comparison

Parameter	MOD5UEM	MOD005.0	Diff. (%)
Time (sec)	1.005	1.005	---
Number of time steps	223	223	---
Normalized core power	0.6005144	0.6005210	-1.1E-3
Vol. 10 pressure (psia)	1.10516E3	1.10516E3	0.0
Jct. 17 flow (lb/sec)	1.68810E3	1.68807E3	1.8E-3
Jct. 24 flow (lb/sec)	2.58969E3	2.58640E3	1.3E-1
Vol. 9 mixture level (ft)	4.69746	4.69237	1.1E-1
Total reactivity	-7.481584E-3	-7.480861E-3	9.7E-3
Rod reactivity	-1.127351E-2	-1.127351E-2	0.0

Table A-13

Power History Comparison for
WNP-2 Load Rejection Without Bypass

Time into Transient (sec)	Normalized Core Power		
	MOD5UEM (R6000)	MOD5UEM (PCC)	Diff. (%)
0.0	1.0	1.0	0.0
0.5	0.934090	0.934090	0.0
0.6	1.02295	1.02295	0.0
0.7	1.51282	1.51282	0.0
0.8	2.28564	2.28556	3.5E-3
0.9	3.02222	3.02134	2.9E-2
1.0	3.51064	3.50822	6.9E-2
1.1	2.39500	2.39328	7.2E-2
1.2	1.09113	1.09061	4.8E-2
1.3	0.719746	0.719425	4.5E-2
1.5	0.527126	0.526704	8.0E-2
2.0	0.435790	0.435038	1.7E-1

Table A-14

Power History Comparison for Sample Problem 9
Turbine Trip Without Bypass with Space-Time Kinetics

Time into Transient (sec)	Normalized Core Power		
	MOD5UEM (R6000)	MOD005 (PCC)	Diff. (%)
0.0	1.0	1.0	0.0
0.1	1.00219	1.00219	0.0
0.2	1.00331	1.00331	0.0
0.3	1.00877	1.00877	0.0
0.4	1.05714	1.05714	0.0
0.5	1.24762	1.24758	3.2E-3
0.6	1.88893	1.88879	7.4E-3
0.7	2.93263	2.93238	8.5E-3
0.8	3.24141	3.24129	3.7E-3
0.9	1.12465	1.12464	8.9E-4
1.0	0.61299	0.61299	0.0

Table A-15

Power History Comparison for Sample Problem 9
Turbine Trip Without Bypass with Space-Time Kinetics

Time into Transient (sec)	Normalized Core Power		
	MOD005*	MOD004**	Diff. (%)
0.0	1.0	1.0	0.0
0.1	1.00219	1.00216	3.0E-3
0.2	1.00331	1.00329	2.0E-3
0.3	1.00877	1.00876	9.9E-4
0.4	1.05714	1.05717	-2.8E-3
0.5	1.24758	1.24780	-1.8E-2
0.6	1.88879	1.89018	-7.4E-2
0.7	2.93238	2.93789	-1.9E-1
0.8	3.24129	3.24982	-2.6E-1
0.9	1.12464	1.12893	-3.8E-1
1.0	0.612985	0.614942	-3.2E-1

* RETRAN02 Manual, EPRI NP-1850-CCM-A, Vol. 3, Rev. 4
** RETRAN02 Manual, EPRI NP-1850-CCM-A, Vol. 3, Rev. 3

Table A-15

Power History Comparison for Sample Problem 9
Turbine Trip Without Bypass with Space-Time Kinetics

Time into Transient (sec)	Normalized Core Power		
	MOD005*	MOD004**	Diff. (%)
0.0	1.0	1.0	0.0
0.1	1.00219	1.00216	3.0E-3
0.2	1.00331	1.00329	2.0E-3
0.3	1.00877	1.00876	9.9E-4
0.4	1.05714	1.05717	-2.8E-3
0.5	1.24758	1.24780	-1.8E-2
0.6	1.88879	1.89018	-7.4E-2
0.7	2.93238	2.93789	-1.9E-1
0.8	3.24129	3.24982	-2.6E-1
0.9	1.12464	1.12893	-3.8E-1
1.0	0.612985	0.614942	-3.2E-1

* RETRAN02 Manual, EPRI NP-1850-CCM-A, Vol. 3, Rev. 4
** RETRAN02 Manual, EPRI NP-1850-CCM-A, Vol. 3, Rev. 3