MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
P. O. BOX 1640, JACKSON, MISSISSIPPI 39215-1640

NUCLEAR LICENSING & SAFETY DEPARTMENT

May 7, 1985

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

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
File: 0260/0650
Ref: AECM-85/0127, MAEC-85/0146
Response to NRC Request for
Additional Information on FSAR
Startup #25B-Full Reactor Isolation
AECM-85/0155

Please find attached Mississippi Power and Light's (MP&L) response to your letter dated May 3, 1985 requesting additional information regarding the GGNS Unit 1 FSAR Startup Test No.25B - Full Reactor Isolation. The attached information provides clarification and supplemental information to our previous submittal of April 23, 1985 (AECM-85/0127) on this matter.

In a teleconference on May 1, 1985, this response was discussed between members of your staff, NRC Region II, MP&L and General Electric. Where appropriate, MP&L has also provided comparisons of the results on the GGNS MSIV closure event at 75% power to other similar BWR-6 startup test results (as available) which were performed at approximately 100% power. Since a clearance to use test information from foreign utilities has not been obtained at this time, specific reference to test results by plant name cannot be provided.

The startup testing program at GGNS has progressed ahead of schedule and MP&L anticipates entry into Test Condition 6 by approximately May 10, 1985. In order to implement our revised schedule for startup testing on GGNS, MP&L respectfully requests your review and approval by May 13, 1985. Please contact me, if you require any additional information.

Yours truly,

L. F. Dale
Director

SAB/JGC:vog
Attachment

cc (See Next Page)

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cc: Mr. J. B. Richard (w/a)
Mr. O. D. Kingsley, Jr. (w/a)
Mr. R. B. McGehee (w/a)
Mr. N. S. Reynolds (w/a)
Mr. G. B. Taylor (w/o)
Mr. R. C. Butcher (w/a)

Mr. James M. Taylor, Director (w/a)
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dr. J. Nelson Grace, Regional Administrator (w/a)
U. S. Nuclear Regulatory Commission
Region II
101 Marietta St., N. W., Suite 2900
Atlanta, Georgia 30323

MP&L RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION
REGARDING GGNS UNIT 1 STARTUP TEST 25B
FULL REACTOR ISOLATION

Question #1

AECM-85/0127
Statement: These demonstrated results have been analytically extrapolated to the closure event from 100% power and are also bounded by the originally predicted results for this event.

NRC
Request:

a. Do all extrapolated results meet all of the test requirements for Startup Test No. 25B (Test 25B) with the exception of Level 2 ECCS actuations and safety relief valve (SRV) group 2 actuation?

b. What actions did the operators take during the main steam isolation valve (MSIV) event at 75% full power (FP) that would be in variance with those planned for Test 25B?

If operator actions were taken, how were these factored into the analysis and extrapolation of 100% FP?

MP&L
Response:

a. Based on a comparison of the GGNS 100% predictions (as extrapolated from the test data at 75% power) to other recent BWR-6 test results at full power, the test requirements were met during the MSIV closure event. The RPV water level 2 ECCS actuations and Group 2 SRV actuations are not specific requirements of the test that have to be accomplished to meet the acceptance criteria. If however, these setpoints are reached, the respective systems and components will be observed to perform their intended function. Group 2 SRVs were not opened during the full power MSIV closure testing at either of the other BWR-6 plants which have conducted this test.

b. No operator action was taken during the first three minutes that could have effected the results of the MSIV closure event. This was confirmed by post trip test data and analysis. The portion of the transient necessary for verifying the test objectives was completed after 3 minutes had elapsed.

Question #2

AECM-85/0127
Statement: These demonstrated results have been analytically extrapolated to the closure event from 100% power and are also bounded by the originally predicted results for this event.

NRC
Request: How do the extrapolated data compare with actual test results for the MSIV closure test on similar BWR's such as Kuo Sheng, Leibstadt, and WPPSS-2?

MP&L
Response: The extrapolated data for the MSIV closure event from 100% power compares very favorably with data taken from other BWR-6's. Comparing the extrapolated data with the data taken from two other BWR-6's, the shape of the dome pressure changes versus time is very similar with an initial dip of 15 psi in the transient due to the scram and a pressure rise to a maximum value of approximately 1100 psig in about 6 to 7 seconds into the transient. Group 2 SRVs were not actuated. During testing at one plant, RCIC and HPCS were initiated in the early part of the event (RPV level 2 setpoint was set high), and at the other plant, no level 2 actuations occurred. For plants like GGNS with turbine-driven feedwater pumps, eventual long-term water supply is expected to be provided by manual or automatic RCIC and/or HPCS initiation. No comparison to WPPSS-2 was performed since it is a BWR-5 and is not considered similar to GGNS.

Question #3

AECM-85/0127
Statement: As further assurance of acceptable plant response to this pressurization transient, the full power Turbine Trip and Generator Load Rejection Test (#27) causes a more rapid shutoff of main steam than the MSIV closure event. GGNS FSAR Figures 15.2-2 "Generator Load Rejection, Trip Scram, Bypass-On" and 15.2-6 "Three-Second Closure of All Main Steam Line Isolation Valve With Position Switch Scram Trip" depicts this conclusion.

NRC
Request: The GGNS Final Safety Analysis Report (FSAR) Figures 15.2-2 and 15.2-6 seem to support the conclusion in these two sentences. However, these figures were derived from a computer simulated, analytical model of a generic BWR. Paragraph FSAR 15.1.1.3.1 states that the computer model has been improved and verified through extensive comparison of predicted results with actual BWR test data.

a. What actual BWR test data were utilized to improve and verify the predicted results and your conclusions?

b. Is your conclusion that Startup Test No. 27-Turbine Trip and Generator Load Rejection Test (Test 27) is a more severe pressurization transient supported by a comparison of actual results of Startup Test Nos. 25B and 27 from similar BWR's such as Kuo Sheng, Leibstadt, and WPPSS-2?

MP&L
Response:

a. The ODYN computer program was used and verified with turbine trip data obtained from Peach Bottom. The ODYN program and its verification has been discussed with the NRC previously (Reference: NEDO 24154; Volumes 1, 2, 3). In addition, the analysis provided between this model and the 75% MSIV closure event also provides Grand Gulf unique model comparison.

b. The conclusion that test 27 is a more severe pressure transient for the entire transient period must be considered in terms of the steam shutoff rate and a plant's unique features such as bypass capacity and response of bypass valves.

In a generic sense, the load rejection from 100% power is a more severe transient than the MSIV closure from 100% power during the initial stages because of the rapid turbine valve closure (0.1 second) versus the significantly slower MSIV closure (3-5 seconds). Therefore, the initial pressurization rate and response of the core will be more severe for a load rejection versus an MSIV closure, especially when considered from high power which is well beyond the steam bypass capacity.

For GGNS with 35% bypass capacity and normal bypass response (measured during the 75% turbine trip test recently performed at GGNS), the load rejection will provide the most challenging initial pressure and power transient and will give peak vessel pressures which are as high or higher than an MSIV closure.

A direct comparison of startup tests 25B and 27 between Grand Gulf and the reference plants is not fully applicable because of plant unique differences. One plant has a full bypass capacity (100%) so that the load rejection is mild enough that scram is avoided, and the plant can be brought right back on line. The other plant does have the same bypass capacity as GGNS (35%), but it had been tuned up to be especially fast before the load rejection test so that the bypass valves began opening before control valve closure and the event was milder than expected. No comparison to WPPSS-2 was performed. See also the response to Question #8.

Question #4

AECM-85/0127
Statement:

All FSAR Level 1 acceptance criteria for the MSIV closure test are included in the Level 1 acceptance criteria for the Turbine Trip and Generator Load Rejection Test (#27). However, each of these criteria were met with sufficient margin during the actual 75% event; no significantly greater challenge is predicted at full power.

NRC
Request:

These sentences imply all Level 1 criteria will be reverified during performance of Startup Test No. 27. We agree with this conclusion if Test #27 is a more severe pressurization transient. However, if the level transient is more severe in Test 25B than Test 27, then Level 1 Acceptance Criterion No. 2, to demonstrate prevention of flooding of the steam lines, might not be satisfied.

a. Substantiation of feedwater (FW) response with no operator action for the MSIV event at 75% FP should be provided.

b. What actions, if any, did the operators take with regard to feedwater that may have modulated the FW response during the MSIV event at 75% FP?

MP&L
Response:

a. No operator action took place until about three minutes into the 75% power MSIV closure transient. The post trip logs and transient recorder plots confirm that the feedwater system was allowed to operate in the "automatic" mode with no operator intervention until the time when there was insufficient steam available to the feedwater pump turbines to supply the necessary discharge pressure to the reactor vessel.

The criteria concerning high level has also been reviewed. Since feedwater is eventually lost in the MSIV closure transient (loss of steam to the turbines), the main water level challenge is low level (protected by manual or automatic RCIC and/or HPCS as needed). The high level criteria is included in Test 25B for completeness, but a high level condition is not expected. Test 27, where feedwater remains available, will actually provide a better indication of high level control and protection.

b. The operators did not take any action with regard to feedwater that modulated the feedwater response from the MSIV closure event for 75% power.

Question #5

AECM-85/0127
Statement: The group 2 SRV actuation will be demonstrated during the generator load rejection.

NRC
Request: This sentence implies that Group 2 SRV will actuate during Test 27.

a. What will be the effect with regard to the test being satisfactory or unsatisfactory on Test 25B extrapolation if the pressure transient during Test 27 is insufficient to actuate Group 2 SRV?

b. FSAR Table 15.2.6 states that there will be two lifts and reseats of Group 2 SRV. What will be the effect on Test 25B extrapolation and Test 27 if you experience no lifts or only one lift of Group 2 SRV?

MP&L
Response:

a. The test objectives of Test 25B were met for the MSIV closure test at 100% power when the test was performed at 75% power. The opening of Group 2 SRV is not a requirement of the test but is predicted on the basis of conservative analyses. These same analyses predicted the opening of Group 2 valves for the MSIV closure event at 100% power. The plant proved to be less severe than predicted by the response conservative analyses.

b. The sequence of events for MSIV closure at 100% power delineated in FSAR Table 15.2-6 is based on a conservative end-of-cycle analysis. During initial fuel cycle testing, GGNS is not expected to respond with the severity predicted by the FSAR analysis. Other BWR-6 testing has shown similar results with no Group 2 valves opening. Group 2 valves may not open when test 27 is conducted depending on plant unique conditions (e.g. bypass response). The test objectives for Test 25-B were met on GGNS without opening the Group 2 SRVs and the test objective of Test 27 can also be met without opening the Group 2 SRVs.

Question #6

AECM-85/0127
Statement: Although GGNS has not experienced an on-line RCIC level 2 auto start, the RCIC system has been the subject of extensive startup and surveillance testing.

NRC
Request: The extensive testing of the RCIC level 2 auto start should be described. Does this testing include auto actuation via level 2 instrumentation with achievement of design flow?

MP&L
Response: The GGNS startup program has verified the ability of the RCIC system to auto start and supply the rated flow to the reactor vessel. The surveillance program periodically tests the level 2 actuation logic to the point of opening of the steam admission valve to the RCIC turbine.

Question #7

AECM-85/0127
Statement: Additionally, MSIV closure times are not expected to be significantly different at 75% power than at 100% power.

NRC
Request: The basis and substantiation for this conclusion should be provided.

MP&L
Response: Because the normal steam flow is in a direction from behind the main disk, any increase in pressure upstream of the valve tends to assist closure, especially during the latter stages of closure as the main disk is about to seat. The difference in pressure upstream of the valve for an MSIV closure event at 75% and 100% power was assessed to be about 25 psi with the higher pressure occurring at the 100% power. This 25 psi pressure increase is insignificant in affecting the MSIV closure time. This finding is consistent with field experience in which MSIV closure times tend to be affected more at closures from low reactor power and pressure versus closures from high reactor power where operating pressures are controlled at near 1000 psi.

Question #8

AECM-85/0127
Statement: Vibration measurements on the main steam piping were not conducted during the MSIV closure event. However, performing main steam piping vibration testing concurrently with Test No. 27 has been shown to be an acceptable alternative, since the generator load rejection from 100% power will represent a worse case plant transient for measuring vibration of the main steam line piping.

NRC
Request: The basis and substantiation for this conclusion should be provided.

MP&L
Response: The load rejection from 100% power is significantly more challenging to the main steam piping system than the MSIV closure from 100% power because the closure of the turbine valves is more than an order of magnitude faster than the MSIV closure (0.1 seconds versus 3 to 5 seconds). Experience on all BWRs indicate that the load rejection produces the most significant steam piping dynamic loads induced by a reactor transient. Test results from the larger BWR-6 reference plant shows that at 98% power, the piping vibration level for load rejection is at least 34% higher than the MSIV closure event from about the same power level, which is consistent with previous BWR testing experience.