MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

October 18, 1984

NUCLEAR LICENSING & SAFETY DEPARTMENT

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
Units 1 and 2
Docket Nos. 50-416 and 50-417
License No. NPF-13
File: 0260/L-403.0
References: AECM-82/171
AECM-82/454
AECM-82/536
Application of Single Failure Criterion and Evaluation of Environmental Effects in IE Information Notice 79-22 Response
AECM-84/0404

Mississippi Power & Light Company (MP&L) submitted reports on Control Systems Failures and IE Information Notice 79-22 by way of MP&L letters AECM-82/454, dated October 25, 1982, and AECM-82/171, dated April 26, 1982. These reports were submitted in response to the concerns raised in GGNS Unit 1 Safety Evaluation Report Supplement 1 Section 7.8C and Operating License Condition 2.C(25). During subsequent discussions between MP&L and the NRC Instrumentation and Control Systems Branch (ICSB) as discussed in AECM-82/536, dated November 9, 1982, Mr. M. J. Virgillio requested further clarification of MP&L's response regarding the nonapplication of the single failure criterion to nonsafety-related instrumentation and further information concerning environmental effects on balance of plant instrumentation. Both issues are addressed in detail below.

The single failure criterion was applied only to active components in systems needed to mitigate the consequences of a pipe break and bring the plant to a safe shutdown condition. The rationale for only applying the single failure criterion to these components is described below:

1. The pipe break being analyzed (whether it is safety or nonsafety related piping) was considered the initiating event.

2. All cascading or consequential failures relating to the initiating event due to pipe whip and jet impingement were analyzed. If a component is not qualified and is vulnerable to any of these effects, it was failed or rendered useless.

A021
1/1

MISSISSIPPI POWER & LIGHT COMPANY

3. All systems required to mitigate the consequences of the events in number 2 above and bring the plant to a safe shutdown condition were analyzed.

4. The single failure criterion was applied to active components identified in number 3 above, only. The single failure criterion was not applied to other systems not involved in the functions of number 3 above, since these components were not needed for accident mitigation and plant shutdown.

This approach for applying single failure criterion was discussed with the NRC ICSB and was determined to be consistent with the intent of IE Information Notice 79-22.

In order to address the NRC's concern about the environmental effects on control grade equipment, an evaluation of environmental effects was performed and is included as Attachment 1. The results of this evaluation show that control systems failures caused by environmental effects due to high energy line breaks are bounded by FSAR Chapter 15 analyses. Therefore, no plant hardware changes will be required to comply with Operating License Condition 2.C(25).

MP&L considers the issues of IE Information Notice 79-22 resolved with information contained within this and earlier submittals. If you have any questions, please advise.

Yours truly,

L. F. Dale
Director

WKH/GWS:lm
Attachments

cc: Mr. J. B. Richard (w/a)
Mr. R. B. McGehee (w/o)
Mr. N. S. Reynolds (w/o)
Mr. G. B. Taylor (w/o)

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

Mr. J. P. O'Reilly, Regional Administrator (w/a)
U.S. Nuclear Regulatory Commission
Region II
101 Marietta St., N.W., Suite 2900
Atlanta, Georgia 30323

Evaluation of
High Energy Line Breaks (Environmental Effects)
and Consequential Control Systems Failures
(IE Information Notice 79-22 Summary Report)

PURPOSE

This evaluation is to determine what, if any, design changes or operator actions are necessary to assure that the environmental effects of high energy line breaks will not cause nonsafety control systems failures to instigate reactor transients not bounded by GGNS FSAR Chapter 15 analyses.

APPROACH

1. Identify all areas within the turbine building with nonsafety grade control systems in common locations. (Turbine Building was determined to be the only area requiring additional evaluation as noted in AECM-82/171 Attachment 1.)

2. Perform a preliminary evaluation of all areas for possible exclusion from environmental review. Exclusion is based on meeting any one of the following criteria:

   a. High energy line breaks (HELB) are not possible within an area, and the area is isolated by reinforced concrete walls and floors from adjoining areas which could be subjected to a HELB;

   b. The area contains instrument sensing lines only; or

   c. The area does not contain instruments of more than one control system or control function. The control systems or functions which could affect reactor safety are listed in Attachment 3.

3. Identify all areas not excluded following the above evaluation. These areas require review due to environmental effects.

4. Review all affected devices (as identified in Attachment 2) within the nonexcluded area or areas. Specifically,

   a. Determine which devices have counterparts that have already been qualified in accordance with NUREG-0588. For each of these devices, make a comparison with its qualified counterpart to demonstrate that it is likely to function in a HELB environment.

   b. For devices which have no qualified counterparts, perform one or more of the following:

      (1) Evaluate vendor's published data on environmental specifications to determine if the device is designed to withstand a severe environment;

(2) Evaluate the function of the device. (What does it do? How long does it take?);

(3) Evaluate failure modes of the device under HELB conditions (Does it fail safe?).

5. If the device cannot withstand the HELB environment and does not fail safe, consult General Electric to determine if the multiple failure caused by the HELB is bounded by FSAR Chapter 15 analyses.

6. If the multiple failure is not bounded by FSAR Chapter 15 analyses, consider device replacement or reanalyses to resolve the issue.

RESULTS

1. All areas in the turbine building with nonsafety grade control systems in common locations were identified and are shown in Attachment 2 (Reference letter AECM-82/171).

2. a. Areas 4, 5, 7, 8, 9, 10, 11, 12, 16, 17, 19, 20, 22, 24, 25, and 28 were found to have no potential for a HELB within them. These areas were found to be isolated by reinforced concrete walls and floors from any other areas which have a potential for a HELB (Reference AECM-82/171, Attachment 6, Section 3).

b. Areas 1, 2, 13, 14, 26, and 27 were found to have devices for only one control function or system that could be affected by environmental hazards due to a HELB (Reference AECM-82/171, Attachment 6, Section 2).

NOTE: Area 14 was identified in the aforementioned letter as an area of concern. However, this was due to the postulated loss of sensing lines, which is not a concern for an environmental review.

c. Areas 3 and 23 were found to contain instrument sensing lines only, as noted in Attachment 2. Instrument sensing lines are not affected by the environmental aspects of a HELB; therefore, these areas require no further review.

3. Areas 6, 15, 18, and 21 were not excluded by any of the previous evaluations; therefore, further review was performed.

a. Areas 6, 18, and 21 were reviewed as a common area due to the lack of physical barriers between them. This review was based on the assumption of a break of a centrally located pipe which imposes a worst case environment on all subject areas. The environmental parameters assumed for this review were a maximum temperature of up to 540°F and a relative humidity of 100 percent.

(1) Valve Positioner N21-ZC-R097 (Bailey Model No. AP5), located in area 18, was found to have no NUREG-0588 qualified counterpart and cannot withstand a HELB environment. The environmental specifications of this device limit it to use in areas below 180°F. Due to this limitation, the failure mode in the assumed HELB environment cannot be determined. The function of this device is to control feedwater flow during startup (up to 20 percent power). Therefore, a loss of feedwater control, which could result in an increased or decreased feedwater flow, was assumed.

(2) Device number N23-LSLL-N081 (Mercoid Model No. 205WT-7810-C1-75), located in area 6, was found to have no NUREG-0588 qualified counterpart and cannot withstand a HELB environment above 400°F. The worst case failure of this device would result in a loss of a single trip signal for the heater drain pumps upon low-low tank level. Therefore, this device was assumed to fail because of its environmental limitations.

(3) Devices N23-LSH-N001A-C, N23-LSHH-N017A-C, N23-LSHH-N032A-C, and N23-LSHH-N045A-C (Mercoid Model No. 205WT-7810-C1-75), located in area 21, were found to have no NUREG-0588 qualified counterparts and cannot withstand a HELB environment above 400°F. The worst case failure of these devices results in a loss of feedwater heating. This failure mode was, therefore, assumed to occur.

b. Area 15 was reviewed assuming a HELB which imposes the worst case environmental conditions (up to 540°F and 100% relative humidity) on all devices within this area.

The following devices were found to have no NUREG-0588 qualified counterparts and cannot withstand the postulated HELB environment: MCC 13B12, MCC 14B21, N21-SV-F612A (RFPT 'A' trip solenoid), N21-SV-F612B (RFPT 'B' trip solenoid), RFPT 'A' Electric Automatic Positioner (EAP), and RFPT 'B' EAP. The worst case failure of these devices could result in a failure of the reactor feed pump turbine (RFPT) trip solenoid valve to trip the RFPT on a reactor level 8 condition, concurrent with failure of the EAP. The EAP failure was assumed to cause an increase in feedwater flow.

SUMMARY

In reviewing the function of all devices in areas 6, 18, and 21, it was found that feedwater control and low pressure feedwater heating could be affected at the same time only during startup (up to 20% power). However, since low pressure feedwater heating is not used or required during startup, the failure of these devices, during operation or startup, will not create any transients not bounded by GGNS FSAR Chapter 15 analyses.

The potential failure caused by a HELB in area 15 (simultaneous loss of level 8 RFPT trip and feedwater controller failure) constitutes a loss of two control functions, which was not analyzed in Chapter 15 of the FSAR. This

condition was reviewed by General Electric (GE) to determine if this combination of failures was bounded by Chapter 15 analyses. GE has concluded that the simultaneous loss of level 8 RFPT trip and feedwater controller failure condition is bounded by FSAR Chapter 15 analyses. This transient would be bounded by the feedwater controller failure maximum demand transient described in the FSAR.

CONCLUSION

The results of the analyses transmitted by AECM-82/171 demonstrated that the direct effects of a HELB, considering failures to nonsafety related control systems, are bounded by FSAR Chapter 15 analyses. This evaluation has shown that the indirect (environment) effects of a HELB on control systems are also bounded by FSAR Chapter 15 analyses. Therefore, there is no need to perform any plant modifications in order to comply with Operating License Condition 2.C(25).

Nonsafety Grade Control Systems

In Common Locations

Area	Elevation	Panel or MCC/LCC/BUS	Instrument	Associated System	Comments
1	93'0"	H22-P084	N23-LT-N059A	Feedwater Temperature	Tap in Area 14
		H22-P084	N23-LT-N059B	Feedwater Temperature	Tap in Area 14
		H22-P084	N23-LT-N079	Feedwater Temperature	Tap in Area 6
		H22-P084	N23-LT-N082	Feedwater Temperature	Tap in Area 6
2	166'-0"	H22-P186	N32-SV-F507B	Turbine Generator Trip	Electrical Solenoid Valve
3	93'-0"	NA	N23-LT-N079	Feedwater Temperature	Sensing Line, Instrument in Area 1
		NA	N23-LT-N082	Feedwater Temperature	Sensing Line, Instrument in Area 1
4	93'-0"	NA	N62-FT-N013A-D	Condenser Vacuum	Sensing Lines, Instruments in Area 12
5	113'-0"	LCC 14BE2	NA	Turbine Trip/Feedwater Temperature	
		LCC 13BD1	NA	Turbine Trip	
6	113'-0"	NA	N23-LSLL-N081	Feedwater Temperature	Tap in Same Area
		NA	N23-LT-N059A	Feedwater Temperature	Sensing Line, Instrument in Area 1
		NA	N23-LT-N059B	Feedwater Temperature	Sensing Line, Instrument in Area 1
		NA	N23-LT-N079	Feedwater Temperature	Tap, Instrument in Area 1
		NA	N23-LT-N082	Feedwater Temperature	Tap, Instrument in Area 1
7	113'-0"	MCC 14B22	NA	Turbine Trip	
		MCC 12B11	NA	Feedwater Temperature	
		MCC 12B12	NA	Feedwater Temperature	
		LCC 12BE1	NA	Feedwater Temperature	
		H22-P043	C34-FT-N002A	Feedwater Control	Tap in Area 23
		H22-P043	C34-FT-N002B	Feedwater Control	Tap in Area 23
		NA	N30-PT-N018A&C	Turbine Bypass Control	Taps in Area 18
		NA	N30-PT-N019A&C	Turbine Bypass Control	Taps in Area 18
8	113'-0"	BUS 12HE	NA	Turbine Trip/Condenser Vacuum/Feedwater Temperature	
		BUS 14AE	NA	Turbine Trip/Feedwater Temperature	

Nonsafety Grade Control Systems

In Common Locations

Area	Elevation	Panel or MCC/LCC/BUS	Instrument	Associated System	Comments
9	113'-0"	MCC 12B41	NA	Turbine Trip/Condenser Vacuum	
		LCC 12BE4	NA	Turbine Trip/Condenser Vacuum	
		MCC 13B21	NA	Turbine Trip/Condenser Vacuum	
		LCC 13B21	NA	Turbine Trip/Condenser Vacuum	
		NA	N62-SV-F501A&B	Condenser Vacuum	Air Supply to Valves, Valves in Areas 10 & 11
10	113'0"	N62-B001A	N62-SV-F501A	Condenser Vacuum	Tap in Same Area
		NA	N62-FT-N013A&C	Condenser Vacuum	Taps, Instruments in Area 12
11	113'-0"	N62-B001B	N62-SV-F501B	Condenser Vacuum	Tap in Same Area
		NA	N62-FT-N013B&D	Condenser Vacuum	Taps, Instruments in Area 12
12	113'-0"	H22-P081	N23-LT-N003A	Feedwater Temperature	Tap in Area 21
		H22-P081	N23-LT-N004A	Feedwater Temperature	Tap in Area 21
		H22-P081	N23-LT-N018A	Feedwater Temperature	Tap in Area 21
		H22-P081	N23-LT-N020A	Feedwater Temperature	Tap in Area 21
		H22-P081	N23-LT-N030A	Feedwater Temperature	Tap in Area 21
		H22-P081	N23-LT-N031A	Feedwater Temperature	Tap in Area 21
		H22-P081	N62-FT-N013C	Condenser Vacuum	Tap in Area 10
		H22-P081	N62-FT-N013D	Condenser Vacuum	Tap in Area 11
		H22-P082	N23-LT-N003B	Feedwater Temperature	Tap in Area 21
		H22-P082	N23-LT-N004B	Feedwater Temperature	Tap in Area 21
		H22-P082	N23-LT-N018B	Feedwater Temperature	Tap in Area 21
		H22-P082	N23-LT-N020B	Feedwater Temperature	Tap in Area 21
		H22-P082	N23-LT-N030B	Feedwater Temperature	Tap in Area 21
		H22-P082	N23-LT-N031B	Feedwater Temperature	Tap in Area 21
		H22-P083	N23-LT-N003C	Feedwater Temperature	Tap in Area 21
		H22-P083	N23-LT-N004C	Feedwater Temperature	Tap in Area 21
		H22-P083	N23-LT-N018C	Feedwater Temperature	Tap in Area 21
		H22-P083	N23-LT-N020C	Feedwater Temperature	Tap in Area 21
		H22-P083	N23-LT-N030C	Feedwater Temperature	Tap in Area 21

Nonsafety Grade Control Systems

In Common Locations

Area	Elevation	Panel or MCC/LCC/BUS	Instrument	Associated System	Comments
12 (Continued)	113'-0"	H22-P083	N23-LT-N031C	Feedwater Temperature	Tap in Area 21
		H22-P077	N62-LT-N013A	Condenser Vacuum	Tap in Area 10
		H22-P077	N62-LT-N013B	Condenser Vacuum	Tap in Area 11
		D17-J034	D17-RE-N002	Off-gas System Control	
13	133'-0"	NA	N23-LSHH-N062A	Feedwater Temperature	Tap in Same Area
		NA	N23-LSHH-N074A	Feedwater Temperature	Tap in Same Area
		N21-B005A	N36-SV-F523A	Feedwater Temperature	Tap in Same Area
		N21-B005A	N36-SV-F524A	Feedwater Temperature	Tap in Same Area
		N21-B006A	N36-SV-F520A	Feedwater Temperature	Tap in Same Area
		N21-B006A	N36-SV-F521A	Feedwater Temperature	Tap in Same Area
		NA	N36-SV-F525A	Feedwater Temperature	Tap, Valve in Area 17
14	133'-0"	NA	N23-LSHH-N062B	Feedwater Temperature	Tap in Same Area
		NA	N23-LSHH-N074B	Feedwater Temperature	Tap in Same Area
		N21-B005B	N36-SV-F523B	Feedwater Temperature	Tap in Same Area
		N21-B005B	N36-SV-F524B	Feedwater Temperature	Tap in Same Area
		N21-B006B	N36-SV-F520B	Feedwater Temperature	Tap in Same Area
		N21-B006B	N36-SV-F521B	Feedwater Temperature	Tap in Same Area
		NA	N23-LT-N059A&B	Feedwater Temperature	Taps, Instruments in Area 1
		NA	N36-SV-F525B	Feedwater Temperature	Tap, Valve in Area 17
		NA	N30-PT-N018B&D	Turbine Bypass Control	Sensing Lines, Instruments in Area 17
		NA	N30-PT-N019B&D	Turbine Bypass Control	Sensing Lines, Instruments in Area 17
15	133'-0"	MCC 13B12	NA	Turbine Trip	
		MCC 14B21	NA	Turbine Trip	
		NA	N21-SV-F612A	Turbine Trip	
		NA	N21-SV-F612B	Turbine Trip	
		NA	Elec. Automatic Positioner	Feedwater Control	

Nonsafety Grade Control Systems

In Common Locations

Area	Elevation	Panel or MCC/LCC/BUS	Instrument	Associated System	Comments
16	133'-0"	N34-A003	N34-PS-N013	Turbine Generator Trip	Tap in Same Area
		N34-A003	N34-PS-N014	Turbine Generator Trip	Tap in Same Area
		N34-A003	N34-PS-N040	Turbine DC Oil Pump Control	Tap in Same Area
		N34-A003	N34-PS-N041	Turbine DC Oil Pump Control	Tap in Same Area
17	133'-0"	NA	N30-PT-N018B&D	Turbine Bypass Control	Taps in Area 18
		NA	N30-PT-N019B&D	Turbine Bypass Control	Taps in Area 18
		NA	N36-SV-F525A&B	Feedwater Temperature	Taps in Areas 13 & 14
18	133'-0"	NA	N21-ZC-R097	Feedwater Control	
		NA	N30-PT-N018A-D	Turbine Bypass Control	Taps, Instruments in Areas 7 & 17
		NA	N30-PT-N019A-D	Turbine Bypass Control	Taps, Instruments in Areas 7 & 17
19	133'-0"	BUS 13AD	NA	Turbine Trip/Condenser Vacuum	
20	133'-0	N43-D001	N43-TE-N070	Turbine Generator Trip	
		N43-D001	N43-TE-N084	Turbine Generator Trip	
		N43-D002	N43-FT-N058	Turbine Generator Trip	Tap in Area 28
		N43-D002	N43-FT-N060	Turbine Generator Trip	Tap in Area 28
		N43-D002	N43-FT-N061	Turbine Generator Trip	Tap in Area 28
		N43-D002	N43-FT-N062	Turbine Generator Trip	Tap in Same Area
		N43-D002	N43-FT-N063	Turbine Generator Trip	Tap in Same Area
		N43-D002	N43-FT-N064	Turbine Generator Trip	Tap in Area 28
		N43-D002	N43-FT-N065	Turbine Generator Trip	Tap in Same Area
		N43-D002	N43-FT-N066	Turbine Generator Trip	Tap in Same Area
		N43-D002	N43-FT-N067	Turbine Generator Trip	Tap in Area 28
		N43-D002	N43-FT-N068	Turbine Generator Trip	Tap in Area 28
		N42-D001	N43-LT-N036	Turbine Generator Trip	Tap in Same Area
		N42-D001	N43-LT-N158	Turbine Generator Trip	Tap in Same Area
		H22-P148	N43-LT-N051	Turbine Generator Trip	Tap in Same Area
		H22-P148	N43-LT-N052	Turbine Generator Trip	Tap in Same Area

Nonsafety Grade Control Systems

In Common Locations

Area	Elevation	Panel or MCC/LCC/BUS	Instrument	Associated System	Comments
21	133'-0"	NA	N23-LSHH-N001A-C	Feedwater Temperature	Tap in Same Area
		NA	N23-LSHH-N017A-C	Feedwater Temperature	Tap in Same Area
		NA	N23-LSHH-N032A-C	Feedwater Temperature	Tap in Same Area
		NA	N23-LSHH-N045A-C	Feedwater Temperature	Tap in Same Area
22	133'-0"	NA	C34-FT-N002A&B	Feedwater Control	Sensing Lines, Instruments in Area 7
23	133'-0"	NA	C34-FT-N002A&B	Feedwater Control	Taps, Instruments in Area 7
24	166'-0"	H22-P189	N32-PS-N015	Pressure Controller	Tap in Same Area
		H22-P189	N32-PS-N016	Pressure Controller	Tap in Same Area
		H22-P185	N32-SV-F505A-C	Turbine Bypass Control	Electrical Solenoid Valves
		H22-P186	N32-SV-F507A	Turbine Generator Trip	Electrical Solenoid Valve
		H22-P187	N32-PS-N011	Turbine Generator Trip	Tap in Same Area
		H22-P187	N32-PS-N012	Turbine Generator Trip	Tap in Same Area
25	166'-0"	H22-P533	N30-PS-N003	Turbine Generator Trip	Tap in Same Area
		H22-P533	N30-PS-N004	Turbine Generator Trip	Tap in Same Area
26	166'-0"	NA	N35-LSH-N046B	Turbine Generator Trip	Tap in Same Area
		NA	N35-LSH-N047B	Turbine Generator Trip	Tap in Same Area
		NA	N35-LSH-N049B	Turbine Generator Trip	Tap in Same Area
		NA	N35-LSH-N050B	Turbine Generator Trip	Tap in Same Area
27	166'-0"	NA	N35-LSH-N046A	Turbine Generator Trip	Tap in Same Area
		NA	N35-LSH-N047A	Turbine Generator Trip	Tap in Same Area
		NA	N35-LSH-N049A	Turbine Generator Trip	Tap in Same Area
		NA	N35-LSH-N050A	Turbine Generator Trip	Tap in Same Area
28	166'-0"	Exciter	N43-YT-N077	Turbine Generator Trip	Tap in Same Area
		Exciter	N43-YT-N078	Turbine Generator Trip	Tap in Same Area
		Exciter	N43-YT-N079	Turbine Generator Trip	Tap in Same Area
		Exciter	N43-YT-N080	Turbine Generator Trip	Tap in Same Area
		NA	N43-FT-N058	Turbine Generator Trip	Tap, Instrument in Area 20

Nonsafety Grade Control Systems

In Common Locations

Area	Elevation	Panel or MCC/LCC/BUS	Instrument	Associated System	Comments
28 (Continued)	166'-0"	NA	N43-FT-N060	Turbine Generator Trip	Tap, Instrument in Area 20
		NA	N43-FT-N061	Turbine Generator Trip	Tap, Instrument in Area 20
		NA	N43-FT-N064	Turbine Generator Trip	Tap, Instrument in Area 20
		NA	N43-FT-N067	Turbine Generator Trip	Tap, Instrument in Area 20
		NA	N43-FT-N068	Turbine Generator Trip	Tap, Instrument in Area 20

CONTROL GRADE SYSTEMS WHICH MAY IMPACT REACTOR PRESSURE, WATER LEVEL, OR CPR

1. Reactor Feedwater System
2. Reactor Turbine Pressure Regulator System
3. Recirculation Flow Control System
4. Feedwater Heater System (Condensate and Extraction Steam)
5. Condenser Vacuum System
6. Reactor Water Level 8 Turbine Trip
7. Bypass System Operation
8. Rod Control and Information System (RC&IS)
9. Environmental Control System (Offgas Vent and Offgas Flow Control System)
10. Instrument Air System (Isolation Actuation)