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Helping Build Mississippi
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October 25, 1982

NUCLEAR PRODUCTION 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: 0260/0277/L-860.0/L-403.0
Ref: AECM-82/171
IE Notice 79-22 and Control Systems Failures; Operating License Conditions 2.C (25) & (26)
AECM-82/454

Mississippi Power & Light (MP&L) submitted reports on Control Systems Failures and IE Information Notice 79-22 by way of MP&L letters AECM-82/261, dated June 11, 1982, and AECM-82/171, dated April 26, 1982, respectively. Discussions held with members of Instrumentation and Control Systems Branch (ICSB) revealed some questions regarding the methods employed in the subject evaluations. These discussions between your D. McDonald and R. Kindle (ICSB) and our staff were held via telephone on July 14, 1982.

Responses to these concerns are provided as attachments to this letter. Attachment A addresses IEN 79-22 and Attachment B addresses Control Systems Failures. For information regarding the NRC Staff's review of these subjects refer to the Safety Evaluation Report (SER) on Grand Gulf, NUREG-0831, and its supplements, Section 7.8, Items C and D. If additional detail or clarification of our response is required please advise.

Yours truly,

L. F. Dale
Manager of Nuclear Services

DDW/SHH/JDR:rg

Attachments

cc: See next page

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Response to NRC ICSB Questions on IEN 79-22

Qualification of Control Systems

QUESTION

I. Attachment 1 to AECM-82/171, page 3 of 3

The conclusions contained on this page regarding system failures and FSAR Chapter 15 analyses are inconsistent. Are single control systems failures bounded by Chapter 15 analyses?

RESPONSE

Single control systems failures are bounded by Chapter 15 analyses as discussed below.

The most limiting transients analyzed in Grand Gulf FSAR Chapter 15, in terms of impact on the critical parameters of reactor water level, pressure, power, and critical power ratio, are the loss of feedwater flow (15.2.7), the feedwater controller failure - maximum demand (15.1.2), the generator load rejection with failure of bypass (15.2.2), and the loss of feedwater heating with reactor coolant recirculation in the manual flow control mode (15.1.1). Assumptions used in these analyses are worst case assumptions.

For example, in the loss of feedwater heating transient (15.1.1), a decrease of 100°F in feedwater heating is assumed. This assumption is more conservative than the 68°F assumption used in the analysis of the conservatively calculated worst case loss of feedwater heating due to a high energy line break. In each of the other referenced transients, 15.2.7, 15.1.2, and 15.2.2, the worst case failure in the worst direction has also been assumed.

A listing of control systems evaluated for the response to IEN 79-22 was provided as Attachment 3 to AECM-82/171. FSAR analyses 15.1.1, 15.1.2, 15.2.2, and 15.2.7 bound the failure of any single control system included in the subject evaluation.

QUESTION

II. Attachment 2 to AECM-82/171

A. Items 2, 3, and Note (bottom of page 2 of 2)

The selection of criteria for a high energy line break (200°F and 275 psig) is not consistent with the criteria of NRC MEB BTP 3-1. Justify the criteria used in the GGNS response; why are these criteria more realistic?

RESPONSE

For the review of pipe whip and jet impingement pertaining to IE Information Notice 79-22, only high energy piping with maximum operating conditions in excess of 275 psig and 200°F were considered. This criteria has been used only for the Turbine Building analyses.

The basis for using 275 psig and 200°F to designate high energy piping in the Turbine Building is:

> The NRC definition of high energy piping includes piping containing fluids either above 275 psig or 200°F. Although fluid temperature does affect thrust coefficients for frictionless flow, the thrust coefficient is reduced with increasing enthalpy.

For frictionless flow, cold water blowdown provides the highest thrust force. The thrust force for cold water blowdown with frictionless flow is equivalent to

$F_t = C_T P_o A_e$ where;

C_T (the thrust coefficient) is equal to 2.0 (NRC Standard Review Plan 3.6.2, ANSI 58.2, BN-TOP-2, Moody's "Fluid Reaction and Impingement Loads"). C_T is directly proportional to the friction head loss factor, fL/D.

P_o is the source pressure and

A_e is the break opening.

Based on the MP&L interpretation of guidance provided in BTP MEB 3-1, the NRC accepts the energy level when pressures are less than 275 psi and temperatures are at or below 200°F. Equivalent energy levels with lesser thrust coefficients should also be acceptable. As an example, if the thrust coefficient were reduced from 2.0 to 0.92, pressure could be increased from 275 psig to 600 psig and still provide equivalent forces [2.0/0.92 = 600 psig/275 psig].

From technical papers (ANSI 58.2, BN-TOP-2, Moody's "Fluid Reaction and Impingement Loads") on this subject, it is shown that when friction losses in the pipe are considered, the thrust coefficient is reduced. For example, with an equivalent fL/D of 2, the thrust coefficient is reduced from 2.0 to 0.92 for steady state saturated water blowdown. For subcooled or cold water blowdown, the associated coefficients are even less. Therefore, it is concluded that saturated, subcooled or cold fluid breaks with fL/D greater than 2 need not be classified as high energy, if source pressures are less than 600 psig. Since the Grand Gulf Turbine Building contains long runs of piping, the fL/D of all piping systems are assumed to be greater than 2.0. Additionally, where systems are pressurized by pumps, the steady state thrust coefficients are small because of pump run-out. Initial conditions are not considered due to their short duration. Therefore, piping pressurized by pumps, and other piping with pressures between 275 psig and 600 psig, with temperatures less than 200°F, were excluded from this review.

For Grand Gulf Unit 1, there exists only one pipe with a pressure greater than 600 psig and a temperature less than 200°F: 28" DBB-18 (pressure - 1260 psig, temperature - 150°F). This pipe is located in IEN 79-22 Areas 13, 14 and 18. The individual analyses for loss of all instrumentation located in these areas were provided previously (in AECM-82/171). These analyses indicate that HELB effects in these areas are bounded by Chapter 15 analyses.

QUESTION

B. Items 5, 17, and 20

Justify the exclusion of other environmental effects from consideration, e.g. humidity, pressure, temperature.

RESPONSE

MP&L examined the most significant effects in the vicinity of the pipe failure. Both jet impingement and pipe whip were considered significant enough to render an instrument inoperable. Other environmental effects such as humidity, pressure and temperature are assumed less signficant and unlikely to result in the failure of an instrument not in the immediate vicinity. Since it was not a design basis to consider the effects of pipe breaks on nonsafety related instruments, there is a lack of environmental qualification data. However, the instruments used in the balance of the plant are often identical to their IEEE-323 qualified counterparts, and all are designed to be reliable when exposed to extreme environments. This reliability is demonstrated by their past performance, both indoors and outdoors in various types of power plants and other industrial applications.

Conservatism was also introduced into the study by the worst case assumptions of system loss, such as a 68°F feedwater heater loss. Although some of the minor environmental effects could be postulated to migrate into other physical zones, the effects are minimal compared with the worst case combinations of this evaluation and the common power/sensor study (AECM-82/261, June 11, 1982). Furthermore, no credit has been taken for operator action which would occur as a normal response to most breaks providing other than normal indications to plant operators. This would include all but the most minor pipe cracks and small diameter pipe breaks.

QUESTION

C. Item 12

Justify the exclusion from consideration of control systems failures associated with decreased feedwater flow.

RESPONSE

Control systems associated with a decrease in feedwater flow need not be evaluated since reactor thermal power would be reduced due to the lower core inlet subcooling and increased voids. Control system failures which result in decreased feedwater flow would therefore make existing transient/accident analyses less severe if reanalyzed.

QUESTION

D. Item 13

The criteria cited in Item 13 for pipe breaks was 4" NPS and larger. Justify why this criteria is different from the standard use of lines 2" and larger. Justify exclusion of circumferential line breaks in piping less than or equal to one inch NPS.

RESPONSE

Circumferential breaks in piping greater than one inch NPS and longitudinal breaks in piping four inches NPS and larger is consistent with the SRP and BTP MEB 3-1.

Based on a cursory review by MP&L, we conclude that the industry does not typically postulate breaks in piping less than 1" NPS in any piping system, nor is this required/recommended by the NRC guidance in BTP MEB 3-1.

QUESTION

E. Item 19

Clarify whether or not the transmittal of erroneous information to the operator as a result of instrument/component failure has been considered.

RESPONSE

From Attachment 8 to AECM-82/171, Table II.E, "Nonsafety Grade Control Systems in Common Locations Which Provide Indication in the Control Room," was developed. Table II.E (Enclosure 1) is a complete list of the non-safety grade instruments reviewed which are located in a HELB area and includes the indicators, annunciators and/or computer points to which they input. From this table only C34-FT-N002 A&B provide indication directly to the operator (indicators C34-FI-R604 A&B, respectively). These two transmitters monitor feedwater flow. Other listed instrumentation provides input to annunciators and computer points, but not indicators.
Alarm response instructions dictate the actions of operators responding to annunciators. Computer point inputs are generally utilized as analog or analytical elements to assist operators in analysis of specific situations. Consequently, only planned actions should be taken in response to those nonsafety grade control systems problems which may affect safety related systems. Such planned actions are based on all inputs including an abundance of diverse redundant indications which allows the opportunity to compare instrument readings and to weed out bad information.

Loss of power to non-safety control systems and resultant operator actions is also the subject of IE Bulletin 79-27.

QUESTION

III. Attachment 4 to AECM-82/171

Clarify the scope of components/instruments addressed in the GGNS evaluation. Justify the exclusion of mechanical components, i.e., valves, etc.,

RESPONSE

The scope was originally defined in response to the effort regarding control systems failures due to power losses and common instrument taps (refer to AECM-82/261, dated 6/11/82). A number of systems were identified for review.

These systems are not safety grade but have the ability to affect the transient analyses. The control system including sensors, instrument tubing, instruments and indicators, but excluding cabling, has been included in the IEN 79-22 review. Piping, valves, pumps, motor and air operators, pump motors, etc. were not regarded as portions of control systems if they did not provide control or monitoring functions. Solenoid valves and position controllers which do provide a controlling function were considered in our evaluation.

QUESTION

IV. Attachment 5 to AECM-82/171

Clarify the definition of "targets"

RESPONSE

The term "target" refers to any of those instruments which were identified in Attachment 4 to AECM-82/171 as being located in the Turbine Building, excluding those associated with a decrease in feedwater flow.

Enclosure 1

TABLE II.E

NONSAFETY GRADE CONTROL SYSTEMS IN COMMON LOCATIONS

WHICH PROVIDE INDICATION IN THE CONTROL ROOM

AREA	INSTRUMENT	INDICATOR	ANNUNCIATOR	COMPUTER
1	N23-LT-N059A	None	None	N059A
	N23-LT-N059B	None	None	N059B
	N23-LT-N079	None	None	N079
	N23-LT-N082	None	None	N082
2	N32-SV-F507B	None	None	None
3	N23-LT-N079 N23-LT-N082	COVERED UNDER AREA 1		
4 5	NO HIGH ENERGY LINES			
6	N23-LSLL-N0881	None	LALL-L620	N081
	N23-LT-N059A N23-LT-N059B N23-LT-N079 N23-LT-N082	COVERED UNDER AREA 1		
7 8 9 10 11 12	NO HIGH ENERGY LINES			
13	N23-LSHH-N062A	None	LAHH-L614A	N062A
	N23-LSHH-N074A	None	LAHH-L617A	N074A
	N36-SV-F523A	None	None	None
	N36-SV-F524A	None	None	None
	N36-SV-F520A	None	None	None
	N36-SV-F521A	None	None	None
	N36-SV-F525A	None	None	None
14	N23-LSHH-N062B	None	LAHH-L614B	N062B
	N23-LSHH-N074B	None	LAHH-L617B	N074B
	N36-SV-F523B	None	None	None
	N36-SV-F524B	None	None	None
	N36-SV-F520B	None	None	None
	N36-SV-F521B	None	None	None
	N23-LT-N059A N23-LT-N059B	COVERED UNDER AREA 1		
	N36-SV-F52BB	None	None	None
	N30-PT-N018B	None	None	N018B
	N30-PT-N018D	None	None	N018D
	N30-PT-N019B	None	None	N019B
	N30-PT-N019D	None	None	N019D

AREA	INSTRUMENT	INDICATOR	ANNUNCIATOR	COMPUTER
15	MCC 13B12	N/A	N/A	N/A
16 17	NO HIGH ENERGY LINES			
18	N21-ZC-R097	None	None	None
	N30-PT-N018A	None	None	N018A
	N30-PT-N018B	COVERED UNDER AREA 14		
19 20	NO HIGH ENERGY LINES			
21	N23-LSHH-N001A	None	LAHH-L602A	N062A
	N23-LSHH-N001B	None	LAHH-L602B	N062B
	N23-LSHH-N001C	None	LAHH-L602C	N062C
	N23-LSHH-N017A	None	LAHH-L605A	N017A
	N23-LSHH-N017B	None	LAHH-L605B	N017B
	N23-LSHH-N017C	None	LAHH-L605C	N017C
	N23-LSHH-N032A	None	LAHH-L608A	N032A
	N23-LSHH-N032B	None	LAHH-L608B	N032B
	N23-LSHH-N032C	None	LAHH-L608C	N032C
	N23-LSHH-N045A	None	LAHH-L611A	N045A
	N23-LSHH-N045B	None	LAHH-L611B	N045B
	N23-LSHH-N045C	None	LAHH-L611C	N045C
22	NO HIGH ENERGY LINES			
23	C34-FT-N002A	C34-FI-R604A C34-FR-R607 (½ input) C34-FR-R616 Red Pen		
	C34-FT-N002B	C34-FI-R604B C34-FR-R607 (½ input) C34-FR-R616 Blue Pen		
24 25	NO HIGH ENERGY LINES			
26	N35-LSH-N046B	None	LAHH-L608B	N046B
	N35-LSH-N047B	None		
	N35-LSH-N049B	None	LAHH-L610B	N049B
	N35-LSH-N050B	None		
27	N35-LSH-N046A	None	LAHH-L608A	N046A
	N35-LSH-N047A	None		
	N35-LSH-N049A	None	LAHH-L610A	N049A
	N35-LSH-N050B	None		

Response to NRC ICSB Question on Control Systems Failures Analysis

QUESTION

In the study accomplished by MP&L on control systems failures, as reported in the MP&L letter AECM-82/161, dated June 11, 1982, were reference legs included in the sensor tap portion of that evaluation?

RESPONSE

As directed by the NRC in the letter to MP&L dated April 16, 1981, both loss of power and failure of common sensor lines were included in the MP&L evaluation of control system failures. The evaluation included both reference and variable legs in the common sensor evaluation. The results of this evaluation were provided in the above referenced MP&L letter.