REPORT ON INVESTIGATION PERFORMED TO DETERMINE UNIT 1 DEPENDENCE ON UNIT 2 SYSTEMS, STRUCTURES, AND COMPONENTS

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INTRODUCTION

This report describes the methodology and results of a combined Mississippi Power and Light (MP&L)/General Electric (GE)/Bechtel design review to identify Grand Gulf Nuclear Station (GGNS) Unit 1 functions which are dependent on Unit 2 systems, equipment, or structures. Since GGNS was designed as a two unit plant, some facilities were designed as independent systems and structures, while others were designed as common or "shared" items to be utilized by both units.

MP&L recently identified a substantial safety hazard condition requiring the use of nonoperational Unit 2 Standby Service Water (SSW) pumps to transfer water between the SSW basins under postulated accident conditions. The Final Safety Analysis Report (FSAR) considered the ability to use the SSW pumps (Q1P41C001A & B and Q2P41C001A & B) for transfer capabilities in the safety analysis. The pumps are divisionally separated in accordance with Regulatory Guide 1.75. However, the Unit 2 SSW pumps are not operational at this time and, when considering a LOCA coincident with a single active failure (loss of a division) and loss of offsite power, the ability to transfer water between the basins would be lost during Unit 1 only operation. The SSW basins were designed and constructed as a shared system, to be utilized by and service both units. The root cause of the condition in this interfacing system was that we failed to take into consideration single failure criteria with Unit 2 equipment not available.

Consequently, the Nuclear Regulatory Commission (NRC) questioned the readiness of the plant to support Unit 1 operations, and MP&L initiated an investigation to identify all interfaces between GGNS Units (shared systems and/or Unit 2 dependencies) that could effect the safe operation of GGNS Unit 1. The results of this review would then utilized to verify the functionality of all equipment required for Unit 1 operability.

MP&L, GE, and Bechtel have completed this review and concluded that all structures, systems, and equipment required for the safe operation of Unit 1 are complete and functional. The investigation included a review of all non-safety related facilities as well as all safety related structures and systems. The coordinated interdisciplinary review utilized qualified personnel from the Plant Staff, GE, Bechtel, and Nuclear Plant Engineering (NPE). The documentation reviewed includes the FSAR, "upper tier" design drawings such as P&IDs and one-line electrical diagrams, design change packages, and temporary alterations.

The detailed methodology and results are presented in subsequent sections and attachments, and figures.

DISCUSSION

On June 4, 1984, MP&L directed GE and Bechtel to initiate reviews to identify Unit 1/Unit 2 interface dependencies similar to the SSW problem which would require Unit 2 facilities to support the operation of Unit 1.

GE convened an interdisciplinary task force consisting of six senior and principal engineers and managers with expertise in projects, licensing, and mechanical and electrical engineering. The team was intimately familiar with GGNS systems as a result of the recent Technical Specification review effort and previous design efforts. The 200 man-hour review culminated in the development of a candidate list of 28 structures, systems, components, etc. that appeared to require Unit 2 equipment to support safety functions associated with Unit 1. Following detailed discussions with Bechtel, the list was narrowed to four items referred to Bechtel for resolution. The results of the GE review effort are documented in MPGE-84/2-100 (Attachment A).

A 350 man-hour Bechtel review was conducted by an interdisciplinary group of approximately twenty senior engineers, group leaders, and discipline engineers associated with the GGNS Unit 1 project. The review was conducted system-by-system or by structure by the Mechanical, Civil, and Electrical/Control disciplines. Additional review work was performed by the Licensing and Plant Facilities groups. Although discussions with GE focused attention to the list of candidate systems and equipment that appeared to exhibit significant Unit 2 interfaces, the Bechtel review was not limited to these areas. Bechtel reviewed 126 systems, 50 of which were determined to either interface with or to be shared with Unit 2 systems or equipment. Of these 50 systems, four were identified as relying on Unit 2 equipment as described in the summary of the Bechtel review, MPB-84/0256 (Attachment B).

Upon completion of the Bechtel and GE reviews, MP&L sent an engineering review team to both San Jose and Gaithersburg to assess the adequacy of the investigations. Each of the two teams consisted of a senior NPE engineer and a staff SRO. Both teams reported that the review efforts were conducted in an organized, thorough, and comprehensive manner. The team reports, including detailed descriptions of the review methodologies employed by GE and Bechtel, are presented in Attachments C and D. However, both the GE and Bechtel reviews were based on their most current in-house documentation which has not been completely updated to include numerous changes to the plant issued by MP&L. Subsequently, another review effort was initiated to address MP&L Design Change Packages (DCP's) and Temporary Alterations to determine if additional dependent interfaces with Unit 2 had been created. The overall review effort is diagrammed on Figure 1.

FOLLOWUP MP&L ACTIONS

Eight Bechtel engineers from the initial review group traveled to the plant site to conduct a review of DCP's associated with Unit 1 systems determined to interface with Unit 2. Several additional Balance of Plant (BOP) systems interfacing with Unit 2 were identified by MP&L. These systems and associated DCP's were reviewed by the Bechtel team. In the Bechtel followup review, DCP's associated with a Unit 2 interface involving a safety function were reviewed to identify any dependence on Unit 2 equipment. This review is documented in NPEI 84/1024 (Attachment E) included in Attachment E is an example review sheet.

Concurrently, MP&L/NPE engineers reviewed DCP's associated with Unit 1 systems without Unit 2 interfaces to confirm that no new interfaces had been created. The MP&L review is documented in NPEI 84/1025 (Attachment F) also included in Attachment F is an example review sheet. Similarly, Plant Staff conducted a review of all open Temporary Alterations as discussed in PMI 84/7151 (Attachment G) included this attachment is an example review sheet.

The review is diagrammed on Figure 2.

Due to questions raised by the MP&L Safety Review Committee on July 12, 1984, relative to the resolution of the Unit 1/Unit 2 interfaces identified by GE in MPGE-84/2-0100, MP&L directed Bechtel to document how each item was resolved along with its resolution. In addition, Bechtel was directed to provide the same information on the systems with the Unit 2 interface as previously identified by Bechtel. The method used by Bechtel to accomplish this effort along with the results are presented in Attachment H (MPB 84/0303).

RESULTS

GE has determined that the primary NSSS systems have no direct Unit 2 interdependencies. However, in the remainder of the plant, four significant areas (Items 1-4) were identified by Bechtel as relying on Unit 2 equipment along with Items 5 and 6.

1. Standby Service Water System (P41) - Unit 2 SSW pumps are required to transfer water from one SSW basin to the other in the event of a postulated LOCA in Unit 1. The associated ventilation system, Y47, is also required. With the completion of the SSW siphon work (DCP 84/5006), all equipment required to support these interfaces is functional.

2. Instrument Air System (P53) - The Unit 2 instrument air compressor has been made operable on Unit 1 BOP power as a backup to the Unit 1 compressor to improve reliability during normal plant conditions. The instrument air system is not safety related.

3. Safeguard Switchgear and Battery Room Ventilation System (Z77) - The Unit 2 equipment has been dedicated for use on and powered from Unit 1. It has undergone preoperational testing and has been turned over to MP&L for use.

4. SSW Pumphouse Ventilation System (Y47) - The Unit 2 ventilation system in SSW basin A is required during operation of the Unit 1 HPCS service water pump in the event Unit 1, Division I, power is unavailable. The Unit 2 equipment has undergone preoperational testing and has been turned over to MP&L for use. It is powered from Unit 1, Division II.

5. The DCP/Temporary Alternation review uncovered one additional dependence. Doors 2M110 and 2M111 and penetration 2SJ-8A in the SSW basin B are required by DCP 82/5026 to be sealed to protect Unit 1 equipment from flooding resulting from revised PMP studies.

6. 500 KV Switchgear (R27) - Original design for AC auxiliary power for 500 kv Switchgear constitutes three 100% capacity transformers fed from breakers 152-1610, 152-1905 and 152-2610. Breakers 152-1610 and 152-1905 are Unit 1 equipment and each capable of supplying full requirement. Therefore, without Unit 2 breaker 152-2610 the switchgear has two (2) redundant 100% capacity power sources. We are, however, transformed 100% capacity 13.8 KV - 480 v temporary station service power to a permanent installation so that switchgear operation will not require any revision.

CONCLUSIONS

In the design of the two-unit GGNS plant, shared systems have been designed and constructed as Unit 1 systems. Based on the results of the reviews discussed in this report, NPE concludes that the problem associated with the nonoperational Unit 2 SSW pumps was an isolated, unique situation and that Unit 1 can be safely operated, having corrected that problem.