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July 25, 1986

O. D. KINGSLEY, JR.
VICE PRESIDENT - NUCLEAR OPERATIONS

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
MP&L Responses to NRC Concerns Regarding Spent Fuel Decay Heat Capability and Associated Operating Procedures
AECM-86/0229

This letter documents a conference call held July 16, 1986 between representatives of Mississippi Power & Light Company (MP&L) and NRC NRR and Region II Staff. The call was arranged to discuss two NRC Staff concerns related to its review of the MP&L proposed license amendment to install high density spent fuel racks (AECM-85/0143, May 6, 1985).

Please find attached MP&L responses to the subject NRC concerns. As noted in the attached, certain station procedures related to this matter are currently under development and must be implemented prior to commencing refueling operations (Mode 5). These procedures will be made available to NRC Region II Staff when they are sufficiently complete to permit a meaningful review.

MP&L considers this information to be sufficient to resolve your Staff's remaining concerns and permit the completion of the subject licensing review. If your Staff requires additional information contact this office.

As discussed with NRC Project Manager for GGNS (Mr. L. L. Kintner) on July 24, 1986, use of the high density spent racks is required in August in order to accomplish certain preparatory steps supporting the upcoming refueling outage. This consists principally of moving the new reload fuel from new fuel vault into the spent fuel pool. This transfer is a necessary step in preparation for the eventual movement of the new fuel into containment. For this reason MP&L

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requests that the operating license amendment for the high density racks be granted on August 18 or soon as possible thereafter (i.e., the end date for the amendment's public notice period). Please advise this office of any support you may require to achieve this schedule.

Yours truly,

ODK:bms
Attachments

cc: Mr. T. H. Cloninger (w/a)
Mr. R. B. McGehee (w/a)
Mr. N. S. Reynolds (w/a)
Mr. H. L. Thomas (w/o)
Mr. R. C. Butcher (w/a)

Mr. James M. Taylor, Director (w/a)
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Dr. J. Nelson Grace, Regional Administrator (w/a)
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MP&L Response to NRC Request For Additional Information Regarding GGNS Spent Fuel Decay Heat Capability and Associated Operating Procedures

A. INTRODUCTION

A conference call was held between representatives of MP&L and the NRC Staff on July 16, 1986. The call was arranged to discuss two principal NRC concerns identified during its review of MP&L's proposed license amendment providing for high density spent racks for GGNS Unit 1. (Reference 1).

This attachment is intended to document the subject call and to provide MP&L's response to the NRC concerns.

B. NRC CONCERNS/MP&L RESPONSES

1. CONCERN

The NRC Staff based on its review of the GGNS design, including consideration of additional heat loads associated with the proposed high density spent fuel racks (HDSFR), considers the GGNS Fuel Pool Cooling & Cleanup (FPCC) system to have inadequate decay heat removal capability. MP&L has committed to present an engineering solution to the concern by startup following the third refueling outage (Reference 2). However, to support the NRC review of the HDSFR proposed license amendment, additional detail of that engineering solution is requested at this time.

RESPONSE

(1) The GGNS Residual Heat Removal (RHR) system is not only used for decay heat removal from the reactor vessel (shutdown cooling) but also supplemental cooling of the spent fuel pool (fuel pool assist mode). With RHR in the fuel pool assist mode, the return to power operations is prohibited. Therefore, to the extent that RHR is required to maintain the spent fuel pool temperature within limits, the reactor startup following a refueling outage will be constrained.

Based on discussions with the NRC Staff during the course of its review of the matter, it was agreed that a period of 35 days could be considered a "normal" or typical refueling outage duration and that reliance on RHR for spent fuel pool cooling over 35 days was considered "excessive."

(2) By analysis MP&L demonstrated that excessive reliance on RHR, as defined above, did not occur until after 13 refueling outages (Reference 2). Up through and including 13 such outages, one FPCC train was demonstrated to have sufficient

decay heat removal capacity to maintain the spent fuel pool temperature within limits without the supplemental use of RHR past 35 days (Reference 2).

While this issue does not pose a safety concern, MP&L recognized the undesirability of the situation since plant availability could be adversely affected. Therefore, MP&L committed to present an engineering solution to the concern regarding inadequate FPCC system capability by startup following the third refueling outage with implementation prior to startup from the fifth refueling outage.

(3) As discussed with the NRC Staff on July 16, the feasibility study of various decay heat removal enhancement measures for the FPCC system is expected to commence sometime in 1987. Obvious factors bearing on the evaluation of alternatives include space availability, the complexity of the modification, power supply capability, other support equipment capability, and ALARA considerations. In addition MP&L must factor in potential changes in the approach to spent fuel storage, e.g., compact fuel pin storage which MP&L recognizes as requiring separate, additional licensing action.

(4) Because of the uncertainty associated with the above described factors, it is difficult to provide at this time significant detail on the alternatives which will be evaluated. However, based on analyses performed to date and MP&L's understanding of the issues involved, two alternatives can be considered at this time to represent likely choices as a final solution. These alternatives are: (a) increased FPCC pumping capacity or (b) increased overall FPCC heat exchanger capacity by replacement or addition of heat exchangers. As noted to the NRC Staff on July 16, MP&L considers either alternative to represent, at this time, feasible engineering solutions to this issue.

2. <u>CONCERN</u>

Given that MP&L intends to perform design modifications during the first refueling outage which renders one RHR train inoperable (i.e., work on standby service water train A), MP&L should have contingencies in place and associated emergency procedures developed to address a degraded decay heat removal scenario including loss of offsite power coincident with the worst case single active failure. This concern, in fact, applies to all refueling outages where <u>either</u> RHR Train A or B <u>or</u> its associated standby service water is declared inoperable such that only one RHR train would be available to provide the decay heat removal function.

RESPONSE

(1) Technical Specification Requirements

With the reactor shutdown and in Mode 4, Technical Specification (TS) 3.4.9.2 requires that two (2) shutdown cooling trains of RHR be operable. Essentially the same requirement for RHR operability applies to actual refueling operations in Mode 5 if irradiated fuel is in the vessel and water level is abnormally low (TS 3.9.11.2).

For operations in Mode 5 with water level approximately 23' above the vessel flange and irradiated fuel in the vessel, TS 3.9.11.1 requires only one RHR shutdown cooling train to be operable. Should the operable RHR train fail in this situation, the GGNS TS require that an alternate method of decay heat removal be operable.

(2) Alternate Decay Heat Removal Procedures

As a matter of standard practice, GGNS plant staff develops and issues alternate method procedures on an outage specific basis. These procedures are not only developed as the means to implement the discussed TS requirement but also as a matter of good engineering and operating practice, i.e. to have contingencies ready should the remaining RHR shutdown cooling train become inoperable.

Such procedures are developed prior to planned major outages and are prepared considering the decay heat removal equipment availability during the outage. This process was executed for the GGNS fall outage in 1985. It is likely that many aspects of the same system lineups and associated procedures will be utilized in the upcoming refueling outage (RF01). Systems likely to be used for backup decay heat removal include the main condenser (and circulating water), as well as, reactor water cleanup.

The RF01 alternate method procedures are currently under development. These procedures will be developed, reviewed by the Plant Safety Review Committee, and issued prior to commencement of RF01 refueling operations (i.e., entering Mode 5).

As discussed with the NRC Staff on July 16, draft and final versions of these procedures will be made available to the NRC Region II Staff for inspection and review.

(3) Degraded Decay Heat Removal Scenario

The scenario suggested by the above described NRC concern does not require the initiation of backup cooling and inventory contingency measures for shutdown operations in Mode 4 and under certain conditions in Mode 5. Such measures are not necessary under these conditions since loss of an RHR or SSW train or emergency diesel generator would still leave one operable RHR train with shutdown cooling capability. (See discussion on TS in paragraph (1) above.)

Special contingency measures would be necessary should the single operable (required) RHR shutdown cooling train become unavailable coincident with the loss of offsite power. (Since the "alternate method" procedures depend in varying degrees on offsite power, loss of this power supply essentially negates their usefulness in this scenario.)

Key initial conditions assumed for this scenario are as follows:

(a) Reactor shutdown for at least 110 hours;

(b) Mode 5 with water level greater than approximately 23' over the vessel flange;

(c) Irradiated fuel is in the vessel with a portion of the fuel in some phase of transfer from the vessel to the upper containment pool (UCP) or to the spent fuel pool (SFP).

(d) Either RHR Train A or B is operable (along with its associated SSW train and emergency diesel generator; and

(e) UCP and SFP bulk pool temperatures are at their upper allowable limit of 140^{0}.

The key events that precipitate the need for contingency decay heat removal measures are as follows:

(a) Loss of offsite power and

(b) Worst case single failure which in this case is the coincident loss of the remaining emergency diesel generator (Division I or II).

(4) Contingency Measures and Associated Procedure

With the loss of onsite and offsite power with the above described initial conditions, the plant is essentially experiencing a "station blackout" in the refueling mode. The current station blackout procedure does not specifically address decay heat removal measures under refueling conditions and, therefore, is in the process of being modified to accommodate his scenario.

Based on system and equipment availability given the constraints of the above scenario, GGNS plant staff developed contingency measures under these degraded conditions to provide adequate decay heat removal such that pool boiling is prohibited for at least a four hour period. The lineup chosen involves the use of the station fire truck, fire hose, and the fire water storage tanks in concert with appropriate manual valve manipulations to provide a water supply to containment and spent fuel pools, as necessary, with discharge to the suppression pool using installed plant systems (RHR, FPCC, and low pressure core spray).

MP&L recognizes that the execution of these contingency measures may require the controlled opening of secondary containment. Access to the various pools with fire hose from the fire truck requires the opening of certain auxiliary and containment building doors and/or hatches. Even though the plant would be in Mode 5, Technical Specification 3.6.6.1 would require secondary containment integrity to be maintained while operations are underway with a potential for draining the reactor vessel. In that these measures call for discharge of the water from the affected pools, operations with the potential for draining the vessel cannot be avoided. It should be noted, however, that this scenario represents a significantly degraded situation since both onsite and offsite power is not available. Under these conditions, the standby gas treatment system would not be operable.

Since the overall goal here is prevent pool boiling under degraded situations, MP&L considers that the temporary breaching of secondary containment, while not in strict compliance with the plant's technical specifications, to be reasonable and appropriate actions. Steps will be included in the procedure implementing these contingency measures to provide for appropriate monitoring of fouled secondary containment doors along with necessary provisions to affect an expeditious closure should secondary containment need to be set in the judgement of control room management. Implementation of these measures will also include monitoring if pool water levels with provisions for securing evolutions associated with draining the reactor vessel if pool water level cannot be adequate controlled.

As noted above, a revision to the appropriate station procedure incorporating these contingency measures is now under development. Draft and final versions of the procedure will be made available to the NRC Region II Staff for inspection and review, as discussed with the NRC Staff on July 16. The analytical basis demonstrating the adequacy of contingency measures is summarized in paragraph (5) below.

(5) <u>Analytical Basis For Contingency Measures In A Degraded Heat Heat Removal Scenario</u>

To support development of the contingency measures, several spent fuel distribution scenarios were evaluated to determine the limiting requirements for the supply flowrate to the pools such that bulk boiling in the pools would be prevented.

Key assumptions made in these analyses include the following:

(a) The reactor had been shutdown at least for 110 hours;

(b) Initial pool bulk temperatures are at 140^{0} (UCP and SFP);

(c) Decay heat terms were calculated per NRC Branch Technical Position ASB 9-2, Revision 2 (Reference 3);

(d) For those calculations associated with spent fuel in either the vessel or UCP storage racks, only the water inventory in the vessel and the reactor cavity was utilized, i.e., no credit was taken for the additional inventory and heat capacity associated with the separator storage area, the UCP rack area, or the containment transfer pool;

(e) The SFP was assumed to contain previously offloaded batches of spent fuel from 12 refueling outages;

(f) No heat loss was assumed from evaporation or transfer through piping or walls; and

(g) The spent fuel transfer rate was assumed to be 6 assemblies per hour from one pool to the next.

The principal scenarios evaluated were: (a) full core transfer to the SFP, (b) full core transfer to UCP, and (c) no fuel transfer from the vessel. The loss of offsite power (LOSP)and loss of all RHR was assumed to occur in Cases (a) and (b) when the last bundle was transferred (approximately 243 hours after shutdown). LOSP and loss of RHR was assumed to occur at 110 hours after shutdown for Case (c). For this reason Case (c) was determined to require the highest supply flowrate from the fire protection system to prevent pool boiling (at standard atmospheric pressure).

Case (c) generated a makeup flow requirement of approximately 720 gpm, well within the station fire truck capacity of approximately 1000 gpm. The inventory requirement for Case (c) was determined to be well within the storage capacity of the fire water storage tanks. Each tank has a design capacity of 300,000 gallons with the minimum storage requirements maintained at over 70% of this value by technical specifications. The inventory requirement was based on not regaining either offsite or onsite power for 4 hours, i.e., remaining in a degraded decay heat removal situation for 4 hours.

Based on NRC guidance provided in NUREG-1109 (Reference 3), currently in draft form, GGNS must be capable of adequately removing decay heat from the core for a period of up to 4 hours. This determination is based on consideration of the GGNS emergency power configuration, environmental (severe weather) considerations, and emergency diesel generator reliability. This time period could increase to up to 8 hours should emergency diesel generator reliability decrease for some reason in the future. Based on the limiting makeup flow rate (720 gpm), the available inventory conservatively exceeds the required inventory associated with NUREG-1109 based 4 hour period, as well as the longer duration of 8 hours.

(6) <u>Summary</u>

Provisions in the GGNS TS for RHR shutdown cooling trains require that 2 such trains be operable for Mode 4 and certain conditions in Mode 5, thus narrowing the exposure of the plant to need degraded decay heat removal contingency measures.

Only 1 RHR shutdown cooling train is required in Mode 5 with normal refueling water level maintained. As a standard practice, station procedures are developed on an outage specific basis to provide an alternate method of coolant circulation and decay heat removal should the remaining RHR shutdown cooling train become inoperable. The method or methods generally involve non-safety related equipment but are available based on the schedule governing outage activities.

The scenario suggested by the NRC is essentially a station blackout in a refueling situation. Contingency measures have been developed and evaluated to address this concern. The measure involve use of fire protection equipment and manual manipulation of valves to achieve a "feed and bleed" decay heat removal capability. Flow rates achieved by the method are adequate to prevent containment or spent fuel pool bulk boiling for a period of time that should be sufficiently long to restore either a more preferable safety or non-safety related decay heat removal method.

The subject procedures are under development but will be issued prior to entering Mode 5. Draft and final versions of the procedures will be made available to the NRC Region II Staff for inspection and review.

C. REFERENCES

1. Application for operating license amendment (high density spent fuel racks), MP&L letter AECM-85/0143, May 6, 1985.

2. Additional information and proposed modifications to original application for operating license amendment, MP&L letter AECM-86/0176, June 5, 1986.

3. NRC Branch Technical Position ASB 9-2, Revision 2.

4. Regulatory Analysis For Resolution of Unresolved Safety Issue A-44, NUREG-1109, Draft Report, FR 9829, March 21, 1986.