UNITED STATES
NUCLEAR REGULATORY COMMISSION
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JAN 23 1984

MEMORANDUM FOR: R. Wayne Houston, Assistant Director
for Reactor Safety
Division of Systems Integration

FROM: Frank Schroeder, Assistant Director
for Generic Projects
Division of Safety Technology

SUBJECT: REVIEW OF GESSAR-II DESIGN IMPROVEMENTS

In response to your January 6th memo on the above subject, there are several items which I believe should be included in your discussion with GE on potential design improvements for the GESSAR-II design. These items relate to the recommendations being made by the staff to resolve several Unresolved Safety Issues, specifically USI A-1, Water Hammer; USI A-43, Containment Emergency Sump Performance; and USI A-44, Station Blackout. The specific recommendations, as they are currently proposed, are included in an attachment to this memo. The four guidelines for a formal response from GE, included in your January 6th memo, would be appropriate to cover these items.

Frank Schroeder, Assistant Director
for Generic Projects
Division of Safety Technology

Enclosure:
Potential Design Improvements

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Potential Design Improvements

USI A-1, Water Hammer

Safety Issue

USI A-1 deals with safety concerns related to water hammer occurrence in nuclear power plants. Industry experience has shown that the causes of water hammer are approximately 50% inadequate design related and 50% operator (or plant maintenance) related. In BWRs, line voiding has been a principal underlying cause which appears to have been corrected by installation of keep full (or jockey pump) systems. The technical findings relevant to this safety issue are contained in NUREG-0927, and these findings have resulted in revisions to SRP Sections 3.9.3, 3.9.4, 5.4.6, 5.4.7, 6.3, 9.2.1, 9.2.2, 10.3 and 10.4.7, which have been issued for public comment, and are currently in NRC management review prior to issuance in effective form.

Applicability to GESSAR-II

The GESSAR-II design should be evaluated to determine conformance to the SRP revisions noted above when issued, for those sections having applicability to BWRs. Use of void detection and venting features are a potential preventative feature. Finally, the potential for water hammer, with degraded piping, should be considered.

USI A-43 Containment Emergency Sump Performance

Safety Issue

USI A-43 deals with safety concerns related to providing an adequate recirculation water source to the long-term recirculation pumps. For BWRs, the RHR pump suction intakes are those water sources; the suction strainers are designed to prevent ingestion of debris. RG 1.82 has been revised

(i.e., the prior 50% screen blockage criterion has been deleted) to reflect 2-3 years of experimental and analytical study efforts related to this safety issue. RG 1.82, Rev. 1 (which has been subjected to public comment) is currently in NRR management review prior to issuance in effective form. The current staff position is that an assessment should be performed of intake suction hydraulics (i.e., potential for air ingestion), insulation debris generation and blockage potential, and the attendant impact on recirculation pump NPSH margins.

Applicability to GESSAR-II

The GESSAR-II design should be evaluated per RG 1.82, Rev. 1, when issued in effective form, and the RHR system design should be shown to provide for adequate long-term recirculation cooling.

USI A-44, Station Blackout (loss of offsite and emergency onsite AC power)

The proposed resolution of USI A-44, currently under NRR management review prior to issuance for public comment, includes guidance for nuclear power plants to be able to cope with and recover from a station blackout lasting 4, 8, or 16 hours. The duration depends on certain site- and plant-related characteristics such as the onsite power system configuration and reliability and the susceptibility to severe weather that can cause long-duration losses of offsite power. The following functions and design features might be needed to cope with a station blackout and should be considered in the GESSAR-II design.

° DC Batteries

Increase battery capacity to provide DC power in the event of a station blackout lasting 4, 8, or 16 hours.

° Condensate Storage Tank (CST)

Provide capability to insure CST capacity is sufficient to provide cooling in the event of a station blackout lasting 16 hours.

° Instrument Air

Provide sufficient instrument air to operate valves and necessary air-operated instrumentation and controls during a 4, 8, or 16 hour station blackout.

° HVAC

Provide sufficient ventillation so that essential equipment and controls needed to operate during a 4, 8, or 16 hour blackout will not be subject to environmental conditions that would impede its required function.

° Provide a means for removing decay heat during a station blackout via direct steam condensation to either the RHR heat exchanger or another heat sink other than the suppression pool.

° Consider other design factors, such as recirculation pump seal integrity, that are needed to mitigate the consequences of a long duration station blackout (up to 16 hours).