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February 29, 2000

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D.C. 20555

Subject: Grand Gulf Nuclear Station  
Unit 1  
Docket No. 50-416  
License No. NPF-29

GGNS Motor Operated Valve (MOV) Risk-Ranking Methodology

GNRO-2000/00014

Gentlemen:

On December 14, 1999, there was a conference call between Entergy Operations and NRC Staff discussing a draft request for additional information (RAI) associated with NRC Generic Letter 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves". A request was made for GGNS to provide more information on its MOV risk-ranking methodology and a list of risk-significant valves. The requested information is provided in the attachment.

This letter contains no new commitments. If you have any questions, please contact Rita R. Jackson at (601) 437-2149.

Yours truly,

A handwritten signature in black ink, appearing to read "J. Roberts", with a long horizontal flourish extending to the right.

JCR/RRJ

attachment: Discussion of MOV Risk Ranking  
cc: (See Next Page)

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## Discussion of MOV Risk Ranking

A discussion of the GGNS MOV risk ranking methodology and its application is provided below.

### Task 1: Review Plant PSA

This task primarily involved the identification of valves modeled in the GGNS Level 1 and Level 2 PSA. In order to properly identify the modeled valves, a working knowledge of the PSA assumptions, modeling techniques, and results was required. The task included the identification of MOVs that were explicitly modeled and those that were implicitly modeled (i.e., "masked" because its failure is imbedded in a initiating event).

### Task 2: Review MOVs not included in PSA

All MOVs included in the GL89-10 program which are not modeled in the PSA are identified in this task. Plant documents were reviewed to determine valve functions and lineups for these valves in order to develop a brief justification for their exclusion from the PSA and subsequent qualitative determination of risk contribution.

### Task 3: Determine the Importance Measures of Valves Explicitly Modeled in the GGNS PSA

In this task, the importance of MOVs modeled in the PSA are determined using the Fussel-Vesely (F-V) measure. The F-V importance measure is calculated using the following equation:

$$F - V \text{ Importance} = \frac{\text{Sum of all event frequencies involving a specific MOV}}{\text{Total CDF}}$$

The cutsets generated from the GGNS PSA model are utilized to generate the F-V importance measure for each modeled valve. This task results in an importance ranking of the MOVs modeled in the PSA.

### Task 4: Determine the Importance Measure of Valves Implicitly Modeled in the GGNS PSA

The importance of valves implicitly modeled in modules, common cause events and in initiating events are evaluated in this task. The importance of valves modeled in modules is determined directly from cutset result information. The common cause risk contribution is added to the risk contribution for each of the valves in the common cause group. The risk importance of valves associated with initiating events is based on the risk importance of the initiating event.

Task 5: Compile Ranking Results and Assign Valves to Ranking Categories

Results from previous tasks are compiled and initially assigned to one of three risk categories based on the following table.

Ranking Criteria for MOVs in the Generic Letter 89-10 Program		
RANK	CRITERIA	NOTES
HIGH	>1% CDF F-V > 1.0E-2	Additional MOVs can be added based on judgment, sensitivity analysis
MEDIUM	$0.1\% \leq \text{CDF} \leq 1.0\%$ $1.0\text{E-}3 \leq \text{F-V} \leq 1.0\text{E-}2$	Additional MOVs can be added based on judgment, sensitivity analysis
LOW	<0.1% CDF F-V < 1.0E-3	Adequate justification for valves in this category should exist.

These rankings were then reviewed by the expert panel, which made the final determination of the risk categories. The panel members represented system and design engineering, operations, MOV engineering and PSA. The expert panel compensated for any PSA modeling limitations and determined the risk category for valves not in the PSA model.

Additional Considerations

Since the original ranking, NEDC-32264-A has been finalized and approved by the NRC. One of the additions to the methodology was a composite list of "High Risk" ranked valves. A listing of these valves and the corresponding ranking of the equivalent GGNS valves is provided in Table 1. This table also includes the ranking of corresponding valves from BWR E, one of the pilot plants discussed in NEDC-32264-A, Revision 2. BWR E is a BWR/6 plant similar to GGNS. Table 2 provides a listing of additional valves that were ranked either high or medium for GGNS.

Table 1. Comparison of GGNS to BWR E for BWROG  
Composite List of "High Risk" Ranked Valves

BWROG Composite List of High Valves	Valve	GGNS	BWR E	COMMENTS
		Rank	Rank	
HPCI (HPCS) Injection Valve	E22F004	H	M	
HPCI Steam Inlet Valve	N/A	N/A	N/A	
HPCI (HPCS) Torus (Suppression Pool) Suction	E22F015	M	M	
HPCI Steam Line Isolation	N/A	N/A	N/A	
RCIC Injection	E51F013	M	M	
RCIC Steam Inlet	E51F045	M	M	
RCIC Torus (Suppression Pool) Suction	E51F031	L	M	
RCIC Lube Oil Cooling	E51F046	M	M	
RCIC Steam Line Isolation	E51F063, E51F064	L	L	
RHR Suppression Pool Suction	E12F004A/B	L	L	
RHR Containment Spray Valve	E12F028A/B	L	N/A	BWR E does not have Containment Spray
RHR Suppression Pool Cooling Return Valve	E12F024A/B	L	H	Containment heat removal is more important at BWR E because containment failure can lead to loss of injection. This failure mode is not as important to GGNS.
RHR C Test Return	E12F021	L	L	
RHR Heat Exchanger Service Water Supply	P41F014A/B	M	H	
RHR Shutdown Cooling Suction from Vessel	E12F006A/B	L	L	
Containment Isolation - Equipment Drains	P45F096,097 P45F273,274	L		
LPCS Injection	E21F005	L	L	
LPCI (RHR) Injection	E12F042A/B/C	H	L	
Service Water Pump Discharge	P41F001A/B	H	H	
Service Water Train Discharge (Return to Tower)	P41F005A/B P41F011	H		Corresponding valves could not be identified.
Service Water Non-essential Load Isolation (SSW to IA Compressor)	P41F154,155A/B	L	L	
Service Water - DG Jacket Cooler	P41F018A/B	M		Corresponding valves could not be identified.
RBCCW Drywell Supply/Return Isolation	P42F114 P42F116 P42F117	L	L	

Table 2. Additional GGNS  
Ranked Valves

Description	Valve	Rank
HPCS Minimum Flow to Suppression Pool	E22F012	H
Control Rod Drive Pressure Control	C11F003	H
RCIC Steam Bypass	E51F095	M
RCIC Minimum Flow to Suppression Pool	E51F019	M
RHR Heat Exchanger Bypass	E12F048A	M
Service Water Outlet from RHR Heat Exchanger	P41F068A	M