SNUPPS

Standardized Nuclear Unit
Power Plant System

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Executive Director

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SUBJ: Pump and Valve Operability FSAR Revision

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Docket Nos.: STN 50-482 and STN 50-483

References:
1. SLNRC 84-0045, dated March 16, 1984: Equipment Qualification
2. NUREG-0830, Safety Evaluation Report Related to the Operation of Callaway Plant Unit No.1, Supplement 3, dated May, 1984
3. SLNRC 83-0026, dated May 9, 1983: NRC Request for Information - Seismic Qualification of Equipment

Dear Mr. Denton:

Section III.B of Reference 1 states that active safety-related pumps and valves have been qualified in accordance with FSAR Sections 3.9(B)3.2.2 and 3.9(N)3.2. A review of equipment specifications and startup test procedures for active safety-related Balance of Plant (BOP) pumps has indicated the need to modify FSAR Section 3.9(B)3.2.2 as shown on the attached pages. The FSAR statement that seal leakage tests of pumps would be performed at 150% of the design pressure was incorrect and is being deleted. This testing was not required by specification on any active BOP pumps. There is no specific regulatory requirement, industry code or standard that requires seal leakage tests for demonstrating pump operability. Seal leakage tests at 150% of design pressure do not provide any additional assurance of pump operability.

In addition, it is noted that bearing temperatures were not measured for the essential service water and emergency fuel oil transfer pumps. The recording of bearing temperatures was not performed for these pumps because the pump bearings are immersed in the fluid being pumped. Under these conditions little, if any temperature rise in the bearings can be expected.

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Also, as indicated on the enclosed pages, a table of active safety-related BOP pumps and valves is being incorporated into the SNUPPS FSAR. This will fulfill a previous commitment in Section III.A of Reference 1. The emergency diesel fuel oil transfer pumps have been incorporated into this table. These pumps have been purchased and qualified as active pumps based on their intended function. Due to the fact that the pumps are operated while totally immersed in fuel oil, vibration measurements were not taken.

Section 3.10.2 of Reference 2, under Generic Findings, states that the FSAR should explain the criteria for determining which pump and valve accessory equipment are incorporated into the FSAR lists of active safety-related equipment. An example is cited in which a lube oil pump is considered to be an accessory to the auxiliary feedwater turbine and, therefore, is not separately listed as an active pump.

The criterion used to develop lists of active safety-related pumps and valves in the SNUPPS FSAR is that only the major equipment, not accessories, are listed. This is consistent with SNUPPS FSAR Section 3.2, "Classification of Structures, Components, and Systems", and NRC Standard Review Plan Sections 3.2 and 3.10. The concern expressed during the SNUPPS pump and valve operability review, and the specific example cited above, resulted from the additional detail (over and above the FSAR level of detail) provided in the Master Listing of safety-related equipment submitted by Reference 3 in response to a specific NRC request for detailed information. The additional detail of the Master Listing is not appropriate for the FSAR tables. Therefore, the Tables of active pumps and valves (existing Tables 3.9(N)-10 and 3.9(N)-11 and forthcoming Tables 3.9(B)-15 and 3.9(B)-16) will list only the major equipment, i.e., each pump and each valve.

The enclosed marked-up pages will be incorporated into the FSAR in Revision 15.

Very truly yours,

Nicholas A. Petrick for

MHF/nld10a16&17
Attachments

cc:	D. F. Schnell	UE	H. Bundy	USNRC/WC
	G. L. Koester	KGE	B. L. Forney	USNRC/RIII
	D. T. McPhee	KCPL	E. H. Johnson	USNRC/RIV
	J. Neisler/B. Little	USNRC/CAL		

The system or subsystem analysis used to establish or confirm loads specified for the design of components and supports was performed on an elastic basis. There are no deformation criteria associated with the design loading combinations, and plastic instability allowable limits given in ASME Section III are not used when dynamic analysis is performed. The limit analysis methods have the limits established by ASME Section III for the normal, upset, and emergency conditions. For these cases, the limits are sufficiently low to assure that the elastic system analysis is not invalidated. Stress limits for faulted loading conditions are discussed in Section 3.9(B).1.4. These faulted condition limits are established in such a manner that there is equivalence with the adopted elastic limits and consequently will not invalidate the elastic system analysis. Elastic stress analysis methods were also used in the design calculations to evaluate the effects of the loads on the components and supports.

Dynamic analysis, as described in Sections 3.9(B).1.2.1.1 and 3.9(B).1.2.1.2, is performed to verify that the stresses are within the limits specified by the applicable code requirements.

The recommendations of Regulatory Guide 1.48 applicable to the design limits and loading combinations for seismic Category I fluid system components are met as discussed in Table 3.9(B)-13.

3.9(B).3.2 Pump and Valve Operability Assurance

3.9(B).3.2.1 Active ASME Section III Class 1, 2, and 3 Pumps and Valves Furnished with the NSSS

Refer to Section 3.9(N).3.2.

3.9(B).3.2.2 Active ASME Section III Class 2 and 3 Pumps and Class 1, 2, and 3 Valves Not Furnished With the NSSS

3.9(B).3.2.2.1 Pumps

Active pumps not furnished with the NSSS are identified in Table 3.9(B)-15. These

~~The following pumps are "active" pumps:~~

~~Component cooling water pumps~~
~~Essential service water pumps~~
~~Auxiliary feedwater pumps~~
~~Containment spray pumps~~
~~Fuel pool cooling pumps~~

~~Safety-related active~~ pumps are subjected to stringent tests both prior to and after installation in the plant. The in-shop tests include (1) hydrostatic tests of pressure-retaining parts to 150 percent of the design pressure, ~~(2) seal leakage~~

~~tests at the same pressure used in the hydrostatic tests,~~ and (2) ~~(3)~~ performance tests which are conducted while the pump is operated with flow to determine total developed head, minimum and maximum head, net positive suction head (NPSH) requirements, and other pump/motor properties. Bearing temperatures and vibration levels are also monitored during these operating tests. After the pump is installed at the plant, it undergoes startup tests and required inservice inspection and operation.

In addition to these tests, the active pumps are qualified for operation during and after a faulted condition. That is, safety-related active pumps are qualified for operability during an SSE condition by assuring that (1) the pump will not be damaged during the seismic event and (2) the pump will continue operating despite the SSE loads.

The pump manufacturer is required to show by analysis, correlated by tests, prototype tests, or existing documented data, that the pump will perform its safety function when subjected to loads imposed by the maximum seismic accelerations and the maximum faulted nozzle loads. It is required that test or dynamic analysis be used to determine the lowest natural frequency of the pump. The pump, when having a natural frequency above 33 Hz, is considered essentially rigid. This frequency is considered sufficiently high to avoid problems with amplification between the component and structure for all seismic areas. A static shaft deflection analysis of the rotor is performed with the conservative SSE accelerations of 3.0g horizontal and 2.0g vertical, acting simultaneously. The deflections determined from the static shaft analysis are compared to the allowable rotor clearances.

In order to avoid damage to the pumps during the faulted plant condition, the stresses caused by the combination of normal operating loads, SSE, and dynamic system loads are limited to the limits specified in Tables 3.9(B)-8 and 3.9(B)-9. The maximum seismic nozzle loads are also considered in an analysis of the pump supports to assure that a system misalignment cannot occur.

If the lowest natural frequency is found to be below 33 Hertz, the equipment is considered flexible. If flexible, the equipment is analyzed using the response spectrum modal analysis technique. The frequencies and mode shapes are determined in the vertical and horizontal directions. The loads due to the excitation of each mode and the loads due to the accelerations in the three orthogonal directions are added, using the SRSS method. Coupling effects shall be included in the mathematical model. The stress limits stated in Tables 3.9(B)-8 and 3.9(B)-9 must be satisfied. Performance of these analyses, based upon conservative loads and restrictive stress limits, assures that the critical