

ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 8901170376 DOC. DATE: 89/01/05 NOTARIZED: NO DOCKET #
FACIL: 50-361 San Onofre Nuclear Station, Unit 2, Southern Californ 05000361
50-362 San Onofre Nuclear Station, Unit 3, Southern Californ 05000362
AUTH. NAME AUTHOR AFFILIATION
MEDFORD, M.O. Southern California Edison Co.
RECIP. NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Responds to NRC Bulletin 88-004, "Potential Safety-Related Pump Loss," re pump-to-pump interaction.

DISTRIBUTION CODE: IE11D COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 6
TITLE: Bulletin Response (50 DKT)

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR ENCL
	PD5 LA	1 0	PD5 PD	1 1
	HICKMAN, D	1 1		
INTERNAL:	AEOD/DOA	1 1	AEOD/DSP/TPAB	1 1
	NRR ALEXION, T	1 1	NRR/DEST/ADE 8H	1 1
	NRR/DEST/ADS 7E	1 1	NRR/DEST/MEB 9H	1 1
	NRR/DOEA/EAB 11	1 1	NRR/DOEA/GCB 11	1 1
	NRR/DREP/EPB 10	1 1	NRR/PMAS/ILRB12	1 1
	NUDOCS-ABSTRACT	1 1	REG FILE 02	1 1
	RES/DSIR/EIB	1 1	RGN5 FILE 01	1 1
EXTERNAL:	LPDR	1 1	NRC PDR	1 1
	NSIC	1 1		

NOTE TO ALL "RIDS" RECIPIENTS:

PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK,
ROOM P1-37 (EXT. 20079) TO ELIMINATE YOUR NAME FROM DISTRIBUTION
LISTS FOR DOCUMENTS YOU DON'T NEED!

TOTAL NUMBER OF COPIES REQUIRED: LTTR 20 ENCL 19

11/10/89

Southern California Edison Company

P. O. BOX 800
2244 WALNUT GROVE AVENUE
ROSEMEAD, CALIFORNIA 91770

M. O. MEDFORD
MANAGER OF
NUCLEAR REGULATORY AFFAIRS

January 5, 1989

TELEPHONE
(818) 302-1749

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

Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
San Onofre Nuclear Generating Station Units 2 and 3

- References: 1) July 26, 1988 letter from SCE (M. O. Medford) to NRC;
Subject: NRC Bulletin 88-04
- 2) Letter from NRC (Donald E. Hickman) to SCE (Kenneth P. Baskin) dated November 17, 1988

This letter provides the Southern California Edison response for San Onofre Units 2 and 3 to NRC Bulletin 88-04, "Potential Safety-Related Pump Loss." As requested in Action 1 of the Bulletin, a review was conducted of safety-related systems where pump-to-pump interaction could occur. This review was initiated for all safety-related pumps as a result of the Westinghouse notification letter (before the bulletin was issued). It has been confirmed that corrective actions to the existing plant design or procedures are not necessary.

In Reference 1, it was stated that SCE was evaluating the need to participate in a joint effort being formulated by the C-E Owners Group to address this issue. By Reference 2 the NRC requested that SCE provide the NRC with the results of the Owners Group effort as soon as possible. Due to the need for plant specific data, SCE decided not to pursue this joint effort. Therefore, SCE has completed the required evaluations and formal participation with the

8901170376 890105
PDR ADDCK 05000361
Q PNU

TEI
11

January 5, 1989

C-E Owners Group is not anticipated. This plant specific effort required more time than originally anticipated at the time of our original submittal but was required to ensure technical accuracy of the requested information.

Provided as an enclosure are the specific responses to the actions requested.

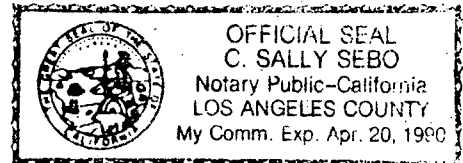
Respectfully submitted,

By:

M. O. Medford
M. O. Medford
Manager of Nuclear Regulatory
Affairs

Subscribed and sworn to before me this
5th day of January, 1989.

C. Sally Sebo
Notary Public in and for the County of
Los Angeles, State of California



Enclosure

cc: J. B. Martin, Regional Administrator, NRC Region V
F. R. Huey, NRC Senior Resident Inspector, San Onofre Units 1, 2 and 3

NUCLEAR GENERATION SITE
INDEPENDENT SAFETY ENGINEERING GROUP
EVALUATION OF POTENTIAL SAFETY-RELATED PUMP LOSS
IN RESPONSE TO NRC BULLETIN 88-04
UNITS 2 & 3

NRC Action 1:

"Promptly determine whether or not its facility has any safety-related system with a pump and piping system configuration that does not preclude pump-to-pump interaction during miniflow operation and could therefore result in dead-heading of one or more of the pumps."

SCE Response:

All safety-related systems were reviewed to identify those with two or more pumps operating in parallel. All pumps that did not use miniflow lines were eliminated from the evaluation as not being within the scope of NRC Bulletin 88-04.

The designs of the miniflow lines were then reviewed to determine if more than one pump shared miniflow lines. The pumps that did not share miniflow lines were eliminated from dead-heading concerns, but were evaluated for adequacy of miniflow capacity.

NRC Action 2:

"If the situation described in Item 1 exists, evaluate the system for flow division taking into consideration (a) the actual line and component resistances for the as-built configuration of the identified system; (b) the head versus flow characteristics of the installed pumps, including actual test data for "strong" and "weak" pump flows; (c) the effect of test instrument error and reading error; and (d) the worst case allowances for deviation of pump test parameters as allowed by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI, Paragraph IWP-3100."

SCE Response:

If multiple pumps share a miniflow line, the potential exists that interaction can cause one pump to run dead-head (zero flow) during miniflow conditions. This situation can occur when one pump provides more head to the discharge of the parallel pump. These conditions can occur at very low flow rates (mini-flow) if there is little resistance between the discharges of the two pumps and there is inequality in pump performance.

Pumps supplying a common discharge header are discharging at a common pressure, except for frictional losses. Pump developed head decreases as flow increases. Thus, when two or more pumps discharge to a common point, the higher performing pump reduces flow from the lower performing pump. At low

flows, when there is little margin in the head-flow curve, dead-heading of a pump can occur. At higher flows, the margin in the head-flow curve will only result in slightly reduced flow rates.

The design and operating modes of pumps with shared miniflow lines, including discharge headers were reviewed in detail, using P&IDs, System Descriptions, and Operating Procedures.

Safety-related pumps at San Onofre Units 2 and 3 that share miniflow lines or miniflow discharge headers have separate orifices for each pump's miniflow line. Reviews of the orifice designs confirmed that essentially the entire pressure drop for all miniflow lines occur at the orifices. Therefore, the resistive effects of the common lines are negligible with respect to those of the separate orifices and the systems behave as though they are separate miniflow lines discharging to a common tank. Interaction will not occur in such a design, because a single pump can not provide a significant pressure to the discharge of the parallel pump. An exception to this configuration is the component cooling water (CCW) system. This system utilizes a two train configuration with a "swing" or third pump which shares a miniflow discharge header with the pump in the train to which it is aligned. There are no orifices in these lines. These pumps only operate together when they are being swapped. The situation described in Action 1 above does not exist at San Onofre Units 2 and 3. There are no safety related systems with pump and piping configurations that could have pump-to-pump interaction during miniflow operation or that could result in "dead-heading" of one or more pumps.

NRC Action 3:

"Evaluate the adequacy of the minimum flow bypass lines for safety-related centrifugal pumps with respect to damage resulting from operation and testing in the minimum flow mode. This evaluation should include consideration of the effects of cumulative operation hours in the minimum flow mode over the lifetime of the plant and during the postulated accident scenario involving the largest time spent in this mode. The evaluation should be based on best current estimates of potential pump damage from operation of the specific pump models involved, derived from pertinent test data and field experience on pump damage. The evaluation should also include verification from the pump suppliers that current miniflow rates (or any proposed modifications to miniflow systems) are sufficient to ensure that there will be no pump damage from low flow operation. If the test data do not justify the existing capacity of the bypass lines (e.g., if the data do not come from flows comparable to the current capacity) or if the pump supplier does not verify the adequacy of the current miniflow capacity, the licensee should provide a plan to obtain additional test data and/or modify the miniflow capacity as needed."

SCE Response:

A potential for inadequate miniflow can exist, even if interactions between pumps do not occur. If the design were improper, inadequate miniflow could occur and can result in overloading of thrust bearings, overheating of pump

bearings, and excessive vibrations. Safety-related pumps are tested periodically, as part of the ASME Section XI Program, for bearing temperature rises and vibrations. During these tests, the pumps operate on miniflow for extended periods of time (approximately 30 minutes). However, the CCW pumps are tested at a reference flow of 12,000 gpm and do not go on to miniflow until system flow is below 3,000 gpm. This value is more conservative than the vendor's recommended 2,000 gpm. Pump test records were reviewed to determine if excessive vibration or temperature rises occurred during miniflow operation. The test records showed that vibrations and temperature rises were at acceptable levels during miniflow operation. The test records also showed that temperature and vibration levels were essentially constant during the test runs. This indicates that the pumps can be run on miniflow for durations even greater than those of the tests. Recent vibration and temperature rise results were compared with those of the earlier pump testing. The comparisons indicated no increase in vibration levels or temperature rise, further confirming the adequacy of the pump miniflow designs. A review of maintenance order histories showed no degrading trends. Miniflow designs were in accordance with vendor manuals.

NRC Action 4:

"Within 60 days of receipt of this bulletin, provide a written response that (a) summarizes the problems and the systems affected, (b) identifies the short-term and long-term modifications to plant operating procedures or hardware that have been or are being implemented to ensure safe plant operations, (c) identifies an appropriate schedule for long-term resolution of this and/or other significant problems that are identified as a result of this bulletin, and (d) provides justification for continued operation particularly with regard to General Design Criterion 35 of Appendix A to Title 10 of the Code of Federal Regulations (10 CFR 50), "Emergency Core Cooling" and 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling System for Light Water Nuclear Power Reactors."

SCE Response:

- a) Evaluation of the designs and operating modes of safety-related pumps with miniflow lines showed that there are no credible potentials for damage.
- b) No short term or long term modifications to plant operating procedures are planned.
- c) No schedule for long term resolution was required.
- d) No justification for continued operation was required.

NRC Action 5:

"Within 30 days of completion of the long-term resolution actions, provide a written response describing the actions taken."

SCE Response:

This letter provides the response to NRC Bulletin 88-04 with all resolution actions having been completed.

NRC Action 6:

"An evaluation of your actions in response to this bulletin should be documented and maintained at the plant site for a minimum of two (2) years. That evaluation should, as a minimum, address the piping system configuration in accordance with Item 1 above, each of the four factors discussed in Item 2, pertinent test data and field experience on minimum flow operation, and verification of the adequacy of current miniflow capacity by the pump manufacturer."

SCE Response:

The engineering evaluation for the actions taken have been documented and will be permanently maintained at Southern California Edison in the Corporate Document Management system.

CNO/skn:9905F