REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8103180268 DOC.DATE: 81/02/18 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
BASKIN,K.P. Southern California Edison Co.
RECIP.NAME RECIPIENT AFFILIATION
MIRAGLIA,F. Licensing Branch 3

SUBJECT: Forwards addl clarification to response to TMI Action Plan Item II-E-1.1 re auxiliary feedwater sys reliability evaluation.

DISTRIBUTION CODE: B001S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 20
TITLE: PSAR/FSAR AMDTS and Related Correspondence

NOTES:Send all FSAR & ER amends to L Chandler. 05000361
1 cy:J Hanchett (Region V),D Scaletti,1 cy of all envir info
Send all FSAR & ER amends to L Chandler. 05000362
1 cy:J Hanchett (Region V),D Scaletti,1 cy of all envir info

	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL
ACTION:	A/D LICENSNG		1	0	MIRAGLIA,F.		1	0
	LEE,J.		1	0	ROOD,H.	04	1	1
INTERNAL:	ACCID EVAL BR26		1	1	AUX SYS BR	07	1	1
	CHEM ENG BR	08	1	1	CONT SYS BR	09	1	1
	CORE PERF BR	10	1	1	EFF TR SYS BR12		1	1
	EMERG PREP	22	1	0	EQUIP QUAL BR13		3	3
	GEOSCIENCES	14	1	1	HUM FACT ENG BR		1	1
	HYD/GEO BR	15	2	2	I&C SYS BR	16	1	1
	I&E	06	3	3	LIC GUID BR		1	1
	LIC QUAL BR		1	1	MATL ENG BR	17	1	1
	MECH ENG BR	18	1	1	MPA		1	0
	NRC PDR	02	1	1	OELD		1	0
	OP LIC BR		1	1	POWER SYS BR	19	1	1
	PROC/TST REV	20	1	1	QA BR	21	1	1
	RAD ASSESS BR22		1	1	REAC SYS BR	23	1	1
	REG FILE	01	1	1	SIT ANAL BR	24	1	1
	STRUCT ENG BR25		1	1	SYS INTERAC BR		1	1
EXTERNAL:	ACRS	27	16	16	LPDR	03	1	1
	NSIC	05	1	1				

MAR 19 19[illegible]

MAR 19 1981

TOTAL NUMBER OF COPIES REQUIRED: LTTR 58 ENCL 52
51 51

MA 4

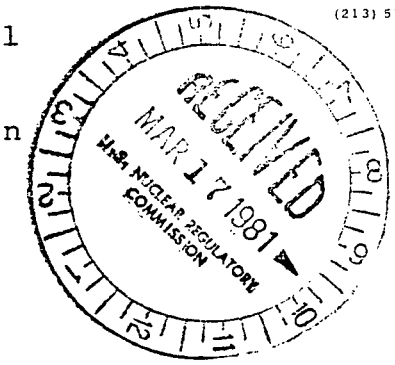
Southern California Edison Company

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

K. P. BASKIN
MANAGER OF NUCLEAR ENGINEERING, SAFETY, AND LICENSING

TELEPHONE
(213) 572-1401

February 18, 1981



Director, Office of Nuclear Reactor Regulation
Attention: Mr. Frank Miraglia, Branch Chief
Licensing Branch No. 3
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

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

SCE's letter of February 2, 1981 provided responses to the NRC requirements identified in NUREG-0737, Clarification of TMI Action Plan Requirements dated November, 1980. The February 2, 1981 submittal also included responses to NUREG-0660 items (NRC Action Plan Developed as a Result of the TMI-2 Accident, dated May, 1980) which were not addressed in NUREG-0737. Subsequently, SCE's letters of February 13, 1981 and February 16, 1981 provided clarification for several items addressed in the February 2, 1981 submittal in order to facilitate NRC review.

Enclosed please find seven copies of additional clarification relative to the response to Item II.E.1.1, Auxiliary Feedwater System Reliability Evaluation, which was addressed in the February 2, 1981 submittal.

If you have any questions or comments concerning this matter, please contact me.

Very truly yours,

K. P. Baskin

Boo 1 1

A 8103180268

ITEM II.E.1.1 Auxiliary Feedwater System (AFWS)
Reliability Evaluation

The Applicants met with the NRC staff Probability and Risk Assessment Branch (PRAB) reviewer, the Auxiliary Systems (ASB) reviewer and the NRC consultant from Sandia Labs on February 17, 1981 to discuss the AFW's Reliability Evaluation. As a result of the meeting the Applicants agreed to provide the following requested information in order to facilitate NRC staff's verification of the Reliability Evaluation previously submitted by the Applicant in December 1980.

1.	Responses to PRAB, ASB and RSB questions previously forwarded to the Applicants, some of which were discussed in the meeting.	Enclosed
2.	Calculational details of the AFW's Reliability Evaluation.	March 3, 1981

RESPONSES TO NRC QUESTIONS ON

AUXILIARY FEEDWATER EVALUATIONS

Question 1. Page 2

What is the source of air for the pneumatic-actuated valves in the steam supply lines? What function does the emergency dc power provide for these valves?

Response: The source of air for all pneumatic-actuated steam supply valves is the compressed air system. These valves are designed to fail open upon loss of air.

A Class IE power supply (emergency dc power) is provided since these valves received MSIS and AFAS signals.

Question 2. Page 4

How often are the locked open valves checked? How can you tell if one is open or shut? Is there an indicator in the Control Room to monitor the status of these valves?

Response: Manual valves are checked prior to plant startup, following system maintenance and at 30 day intervals in accordance with technical specifications. Valve position can be determined from mechanical indicators (e.g. valve stem position). There are no remote indicators in the Control Room, however status is monitored through administrative controls (e.g. tag procedures).

Question 3. Page 4 and 14

What is the procedure for placing the pumps in the automatic mode and aligning them with the Condensate Storage Tank? Are the valves on the discharge to the steam generators included in this operation? What is the probability of failure to place the auxiliary feedwater system in the automatic mode? How many switches are involved?

Response: Since the Emergency Feedwater Actuation Signal (EFAS) is part of the Engineered Safety Features Actuation System (ESFAS), individual components do not have to be placed in automatic. Individual components can be overridden in order to actuate the system manually.

Question 4. Page 4

Which valve or valves on the flow diagram are manually controlled during cooldown to regulate feedwater flow?

Response: During normal cooldown auxiliary feedwater flow to each steam generator is manually regulated by the remote-operated control valves (4705, 4706, 4712 & 4713) or locally operated bypass valves (4712 & 4713).

Question 5. Page 5

Are the primary and primary backup water sources used exclusively for the AFWS?

Response: The primary water source for the AFW System is the Seismic Category 1 condensate storage tank T-121. Its capacity of 150,000 gallons is used exclusively for the AFWS. The backup water source is the Seismic Category II condensate storage tank T-120. The capacity of this tank is 500,000 gallons of which a minimum of 200,000 gallons is reserved for the AFWS. The backup tank T-120 may also be used to supply condensate for additional plant functions (i.e. main condenser makeup, turbine plant cooling water tank, cross-connect between Units 1, 2, and 3).

Question 6. Page 8

What is RCPB? The report should include a glossary of terms.

Response: RCPB is abbreviation for Reactor Coolant Pressure Boundary.

Question 7. Page 12

Where are the recirculation flow lines connected into the AFWS?

Response: The recirculation flow lines are connected into the AFWS upstream of the pump cavitating venturies. These lines direct recirculation flow to the condensate storage tank T-121.

Question 8. Page 13

What and why are the chemical feed tanks connected to the AFWS?

Response: The AFW Chemical Addition System consists of:

1) One hydrazine feed tank
2) Two 1 to 10 gal/hr positive displacement hydrazine feed pumps
3) One ammonia feed tank
4) Two 1 to 10 gal/hr positive displacement ammonia feed pumps
5) One chemical feeder
6) Associated piping, valves, strainers, and instrumentation.

The pumps, tanks, chemical feeder, and associated equipment are located outdoors, next to the tank building.

The Chemical Addition System is designed to:

1) Supply hydrazine to the AFW in the amount required to scavenge oxygen and maintain the design residual at the steam generator.
2) Supply aqueous ammonia to the AFW to increase the pH of the auxiliary feedwater system in order to maintain the pH within the design range.

Question 9. Page 16

Where are the normally closed manual bypass valves for allowing both steam generators to be supplied from one motor driven pump shown on the system flow diagram (Appendix D)?

Response: The lines originating between the two locked open manual valves upstream of flow control valves 4713 and 4712 (Appendix D) are common to each other and provide a means of supplying both steam generators with AFW from either motor driven auxiliary feed pump.

Question 10. Page 25 Table 2.1

What are the numbers in parentheses after most events? What purpose does Table 2.1 serve in this report?

Response: The numbers in parentheses refer to FSAR sections. Table 2.1 serves as an illustrated reference for Section 2.1.5 pertaining to AFW flowrate.

Question 11. Page 27

Please explain note 1 in greater detail. It seems to be in conflict with the Table Heading.

Response: Note 1 pertains to those transients in which it is either conservative to neglect AFW flow when determining plant response to the particular event or conditions for automatic actuation of auxiliary feedwater were not achieved during the duration of the analyses.

Question 12 Page 28

Table III-3 of NUREG-0635 lists the Basic Data used for the purpose of conducting a comparative assessment of existing AFW designs and their potential reliabilities. Since NUREG-0635 used data to provide a basis for comparing the AFWSs of nuclear generating stations why weren't these data used to make the study for San Onofre? Fault trees are generally used for quantitative studies and comparisons. Please explain in more detail how fault trees can be useful in qualitative comparative study.

Reponse: Data from Table III-3 of NUREG 0635, along with additional failure data from Combustion Engineering's Reliability Data Base were used in the comparative assessment of the San Onofre AFWS with respect to the evaluation's reference plant. Because of the comparative nature of the study it is not felt that the absolute value of failure data or results are as significant as the relative increase in reliability. As in the case of NUREG 0635, numerical results have not been reported. The following results are provided for information only.

Conditional event	Failure to provide AFW to at least one steam generator	
	Reference Plant	San Onofre
LMFW	2.73×10^{-4}	2.73×10^{-5}
LOOP	3.68×10^{-4}	3.69×10^{-5}
LOAC	1.65×10^{-2}	1.64×10^{-2}

Question 13. Page 29

Why were check valves omitted from the fault trees? Check valve failure is (according to NUREG 0635) as significant as manual valve failure.

Response: Fault trees have been reviewed with the inclusion of check valves. No significant effect on the evaluation result was determined.

Question 14. Why is it necessary to have two manual isolation valves in the suction lines to the pumps?

Response: Two manual isolation valves are required to aide in ensuing isolation of particular components (pumps, tanks, etc.) when performing maintenance on the system. One valve is located at the tank discharge, the other at the pump suction.

Question 15. Page 31

The testing required by the technical specifications is quoted. Have these requirements been placed in the Test and Maintenance Procedure for San Onofre? If they have, the procedures should be reviewed for completeness and the unavailability resulting from the procedures should be included in the analysis. If procedures are available, be prepared to discuss them in the forthcoming meeting.

Response: Procedures are being prepared and reviewed in accordance with the overall plant operations and licensing schedule.

Question 16. Page 33

A reliability analysis using fault trees should produce a list of cutsets and provide a rank ordering of the events or combination of events which would produce failure. Has such an analysis been made to determine the dominant failure modes?

Response: As in the evaluation of NUREG 0635, results in terms of quantitative ranking of dominate cutsets were not reported. In general, the evaluation indicated that there were no single failure cutsets; the dominate multiple failure cutset was failure of the AFAS logic (based on the NUREG 0635 data for actuation logic). As reported in the evaluation, the remaining limiting cutsets required at least three separate failures .

Question 17. Page 33

It is stated that there are no potential single point failures. From the flow diagram there is only one source of AFW (the Condensate Storage Tank T-121). All backup sources flow into this tank. Although the failure probability is small, the failure of the tank would fail the entire system. Was that considered in your analysis? Please explain.

Response: Although the primary source of AFW (Condensate Storage Tank T-121) can be considered as a possible source for single point failure, the comparative analysis with the reference plant focuses directly on the presence of redundant flow suction paths to the AFW pumps and redundant flow paths from the backup source because no reasonable mechanistic

failure mode that results in loss of both of these flow paths was identified (see FSAR Section 9.2.5), it is felt that the evaluation assumption is justifiable.

Question 18. Page

Common mode occurrences were not discussed in the report. A more complete common mode analysis should be made to consider common manufacture, common location, temperature extremes, pressure extremes, etc.

Response: Common failure modes have been addressed in this report in terms of particular components, flow paths, or piping being of a common nature such that loss of these components will result in an increased probability of loss of flow to both of the steam generators. Common cause failures of independent components, taking into account manufacturer, temperature extremes, etc. were not quantitatively accounted for. The evaluation is a comparison with the reference plant analyzed in NUREG 0635, and was performed on an equivalent level to the analysis of NUREG 0635.

Question 19. Emergency procedures for the AFWS and their effect on reliability were not discussed in the report. Improper or incomplete procedures could result in operator errors which would defeat the system.

Response: Scheduled reviews will insure that there are no "improper" or "incomplete" emergency procedures. Section I.C.8

of the SONGS Response to NRC Action Plan NUREG 0737 states that "Plant emergency procedures will be completed and available for NRC review and audit 6 months prior to fuel loading. Any emergency procedure deficiencies identified during the NRC review and audit will be corrected and implemented prior to full power operation."

Question 20. Page

Are power sources adequate and are they properly separated to prevent common mode failure events? Please explain in detail.

Response: All safety related power sources, supplies, etc. meet the requirements for separation and redundancy in accordance with the design criteria, regulatory guides and IEEE standards outlined in Section F.1.4.3 of the SONGS FSAR.

Question 21. Page 41

What is the boil dry time for the steam generators under the conditions stated for Loss of Main Feedwater with a failure of the Turbine Steam Bypass System if the Auxiliary Feedwater System in inoperative?

Response: The boil dry time under these conditions is 17 minutes.

Question 22. Page 52

The recommendation contained in paragraph 5.1.1 seems to pertain to Recommendation GS-2 in NUREG 0635. Why doesn't an X appear in the GS-2 column in Table 5.1?

Response: An X will be added in the GS-2 column of Table 5.1 pertaining to verifying position of locked open valves in AFW suction piping.

Question 23. Page 52

Is the recommendation of paragraph 5.2.1 the same as Recommendation GS-4 in NUREG 0635?

Response: Yes, SONGS Emergency Operating Procedures will comply with Recommendation GS-4 of NUREG 0635. (See response to Question 19).

Question 24. Page 52

Is the recommendation of paragraph 5.1.2 the same as Recommendation GS-6 in NUREG 0635?

Response: Yes, SONGS Emergency Operating Procedures will comply with recommendation GS-6 of NUREG 0635. See response to Question 19.

Question 25. Page 52

Is the recommendation of paragraph 5.2.2 the same as Recommendation GS-6 in NUREG 0635?

Response: Yes, SONGS Emergency Operating Procedures will comply with recommendation GS-6 of NUREG 0635. See response to Question 19.

Question 26 Page 52, 53, and 54

In order to assure that San Onofre has complied with each of the recommendations of NUREG 0635 including short

term, additional short term, and long term, the licensee should provide an answer for each. If a recommendation doesn't apply, a reason should be given. Please provide these answers.

Response: Table 5.1 indicates compliance/non-compliance with the specific long term and short term recommendations outlined in NUREG 0635. Section 5.0 identifies specific items to be implemented to ensure compliance with Table 5.1. Section 5.0 will be revised to be compatible with the NUREG 0635 format and identify long term and short term requirements corresponding to each recommendation of Section 5.0. See response to Questions 22 through 25.

Question 27. Page 52

Why are there maintenance and/or test procedures which result in temporary degradation of the AFWS? Please give specific examples of those which do.

Response: This section refers specifically to maintenance procedures which cover items such as valve repair, repair of valve stem leakage, etc., which can be performed within the limitations imposed by the technical specifications for the AFWS (i.e. one AFW pump inoperable up to 72 hours while at power).

Question 28. Page 54 Table 5.1

What are the results of the Plant Specific Recommendations for SONGS 2 and 3?

Response: Plant specific recommendations are currently being evaluated by SCE.

Question 29. Page 56

Please explain the manual valve failure block in more detail. Which two valves are involved?

Response: This block refers to the manual locked open suction valves in each train. Failure of two valves implies a failure of one valve to be open in each of the two trains feeding a particular steam generator, effectively isolating all flow paths to that generator.

Question 30. Page 70

The diagram should be reviewed for completeness. For example, check valves. The meaning of L.O and L.C. are not shown in the legend.

Response: Check valve arrangement is as shown. The legend will be revised to identify symbols for check valve (N), locked open (L.O.), and locked closed (L.C.).

Question 31. Page 70

What are the normally closed valves in the piping around V4713 and V4712 used for?

Response: These lines are used during low flow requirements (i.e. startup) and serve as cross connect between motor driven AFW pump trains.

Question 32. Page 70

Are all valves in the lines from T-120 to T-121 locked closed? Why are any valves in those two lines closed? If it becomes necessary to use a backup source, how much time is required to accomplish alignment? Do emergency instructions exist to accomplish this?

Response: Valves between T-120 and T-121 are locked closed to provide isolation of the seismic category 1 portions from the non-seismic category 1 portions of the system. Procedures for timely alignment are being prepared in accordance with recommendation 5.2.1.

Question 33. Page

Will the pumps automatically shut down if there is no net positive suction head?

Response: There is no automatic pump shutoff on low NPSH.

Question 34. What purpose does the second L.O. valve serve in each of the individual suction lines to the three pumps?

Response: Additional isolation for maintenance/test purposes.

Question 35. What effect does the Primary Backup Source being connected to the Primary Source have upon the overall reliability of the AFWS? Why is not the PES connected to the system downstream from the PS?

Response: The position concerning the safety evaluation of the condensate storage tank is found in Section 9.2.6 of the SONGS FSAR. The effect of the present arrangement is considered minimal (see response to Question 17).

ASB Questions

Question — Page 4 - 3rd Paragraph - Clafify time periods. The implication is that both main and auxiliary feedwater pumps are operated simultaneously for same time period.

Response: The auxiliary feed pumps are started approximately 10 minutes after shutdown but remain in a standby recirculation mode until the main feed pumps are to be secured.

Question — 4th Paragraph - Clarify which are the locally operated bypass valves.

Response: The bypass valves referred to are the manual valves which bypass around control valves 4712 and 4713.

Question — Page 13 - Item 8 - Per FSAR Figure 10.4-3 the nonseismic chemical addition system is separated from the AFWS by one normally closed isolation valve. Discuss adequacy of this arrangement.

Response: Per ANSI N18.2a - 1975, Section 2.3.3.1, the chemical feed tank connects to a Class 3 piping system, with at least one normally closed isolation valve, and its failure will not degrade auxiliary feedwater system performance. A check valve is provided for additional isolation.

Question — Page 19 - Item (1) - For the combination of break LOCA "1" and the most severe single active failure, what is the required operator action and how much time is available for this action to be taken?

Response: For break location 1 with a single failure of motor pump P-504, all available AFW would be temporarily diverted to the break location. Required operator action would consist of shutting the turbine pump feedwater control valve (V4706) to the affected header thus ensuring AFW flow to the unaffected S/B AFW header. Motor pump P-141 would also be secured. Over 60 minutes is available for this action assuming the break is initiated with the auxiliary feedwater system in service and plant at hot standby.

Question — Page 24 - Figure 2.5 - Which valves can be modulated from the Control Room for AFW flow control?

Response: AFW pump control vavles V4712, V4705, V4706 and V4713 can be modulated from the Control Room for AFW flow control.

Question — Pages 32 and 33 - Fill in missing information.

Response: Technical Specifications are currently being submitted for review and approval.

Question — Page 54 - Table 5.1 - Discuss status of SONGS 2/3 generic recommendations GL-2 and the plant specific recommendations.

Response: All recommendations are being implemented.

Question — Page 5 - "Blackout Operation" - Will the steam generators high level flow cutoff be functional in loss of all a.c. power? If not, what operator actions would be required and within what time frame?

Response: With no operator action, the auxiliary feedwater actuation system will automatically initiate and secure auxiliary feed flow to the steam generators during a blackout using the AFAS logic which is based on S/G level.

RSB Questions

Question — Pages 25 and 42 - Table 2.1 indicates AFW initiates 55 seconds after a steam system piping failure. Item (B) of pages 42 and 43 (HSLB) states that the AFWS is not automatically actuated within "the 30 minutes prior to possible operator manual intervention." Clafity the apparent discrepancy.

Response: Table 2.1 indicates AFW is assumed at the steam generator 53 seconds after an AFW initiation signal. The AFW initiation signal may not be automatically actuated, however within the first 30 minutes.

Question — Page 41 and FSAR Page 15.2-20 - Per page 41 the design base event is loss of main feedwater and the basis for sizing is maximum decay heat at 5 minutes following reactor trip. FSAR Table 15.2-6 indicates minimum steam generator inventory at 82.8 seconds after reactor trip. Clarify this apparent discrepancy.

Response: The sizing calculation is based on the assumption of steam flow equal to feed flow and is essentially a steady state calculation. The analyses of Chapter 15 are transient analyses and hence may result in different response.

Question

Page 44 - RCS Pressure - The ASME Code specifies that the maximum stress in RCS components shall not exceed 120% of design value under level C services (emergency conditions). This is not necessarily equivalent to 120% of the design pressure since stress is the result of pressure, temperature, seismic loading, etc. Therfore, the statement should read "The maximum pressure of the system will not result in the stress exceeding 120% of the design valve."

Response:

This section will be revised as follows:

Level B - Upset Condition - the design loading combinations for ASME Code Class 1 components are given in Table 3.9-8 of the FSAR. The stress limits for Class 1 components (other than valves) are designated in subsections NB 3223 and NB 3654 of the ASME Code, Section III.

Level C - Emergency Condition - the design loading combinations for ASME Code Class I components are given in Table 3.9-8 of the FSAR. The stress limits for Class I components (other than valves) are designated in subsection NB 3224 and NB 3655 of the ASME Code, Section III.

These design criteria are reflected in the SONGS Technical Specifications (FSAR 16.2.1.2) which states that RCS pressure shall not exceed 2750 psia (110% of design pressure).