Docket No. 50-206

APR 30 1979

Mr. James H. Drake
Vice President
Southern California Edison Company
2244 Walnut Grove Avenue
Post Office Box 800
Rosemead, California 91770

Dear Mr. Drake:

RE: TOPIC IV-1.A - OPERATION WITH LESS THAN ALL LOOPS IN SERVICE

Enclosed is a copy of our redraft evaluation of Systematic Evaluation Program Topic IV-1.A. You are requested to examine the facts upon which the staff has based its evaluation and respond either by confirming that the facts are correct, or by identifying any errors. If in error, please supply corrected information for the docket. We encourage you to supply for the docket any other material related to this topic that might affect the staff's evaluation. This redraft supersedes the evaluation transmitted by our letter dated August 17, 1978.

In light of the conclusions stated in this evaluation, changes to the Technical Specifications are needed to restrict operation with less than all loops in service. The enclosed model technical specifications, when issued, would bound the staff position and resolve the SEP Topic IV-1.A as discussed in the attached evaluation. Accordingly, your comments and your proposal for license amendment to incorporate the model technical specifications or acceptable alternate provisions are requested within 30 days of the date you receive this letter.

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APR 30 1979

Since the SEP was not initiated by any licensing requirement, no license fees are being assessed for our SEP effort as such. However, license amendments resulting from SEP evaluations are subject to the provisions of 10 CFR Part 170. Therefore, your application should be accompanied by the appropriate fee, as required by Section 10 CFR 170.12(c).

Sincerely,

Original signed by
Dennis L. Ziemann

Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors

Enclosures:
1. Topic IV=1.A
2. Model Technical Specifications

cc w/enclosures:
See next page

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SYSTEMATIC EVALUATION PROGRAM

TOPIC IV-1.A: Operation with less than all loops in service
PLANT: SAN ONOFRE UNIT 1

DISCUSSION:

The majority of the presently operating BWR's and PWR's are designed to permit operation with less than full reactor coolant flow. That is, if a PWR reactor coolant pump or a BWR recirculation pump becomes inoperative, the flow provided by the remaining loop or loops is sufficient for steady state operation at some definable power level, usually less than full power.

Plants authorized for long term operation with one reactor coolant pump out of service have submitted, and the staff has approved, the necessary ECCS, steady state, and transient analyses. The remaining PWR and BWR licensees have Technical Specifications which require reactor shutdown within 24 hours if one of the operating loops becomes inoperable and cannot be returned to operation within the time period.

In a letter dated August 17, 1978 Southern California Edison (the licensee) was sent draft evaluations of eight essentially completed Systematic Evaluation Program (SEP) Topics. We requested that the licensee review and verify that the information was factual and that all documentation cited was current.

Topic IV-1.A, operation with less than all loops in service, was one of the eight essentially completed for San Onofre Unit 1. The assessment stated that San Onofre Unit 1 did not have authorization to operate in the N-1 loop mode.

EVALUATION

By letter dated October 3, 1978, the licensee responded to our August 17, 1978, request and provided comments concerning the correctness of our assessments. With regard to Topic IV-1.A, the licensee stated that our assessment was incorrect and cited two supportive references. Reference 1 (Technical Specification 3.1.2.D) permits operation up to 10 per cent of full reactor power with two of the three reactor coolant loops idle and up to 60 per cent of full reactor power with one loop inoperative. Reference 2 (Section 10.2 of the Final Engineering Report and Safety Analysis) was cited as the supporting basis for operation in the reduced reactor coolant flow modes.

We have reviewed the referenced material presented by the licensee and find, that although the Technical Specifications do permit operation in the N-1 and 2 loop modes, the justification on which this Technical Specification was based is inadequate in light of current licensing criteria. A review of reference 2 revealed that the analysis performed by the licensee described a complete and simulataneous loss of reactor coolant flow. The transient was analyzed assuming full reactor Power and full reactor flow (3 operating loops). The result of this analysis indicates that the Plant could sustain such a transient without violating fuel integrity limits [Departure from Nucleate Boiling Ratio (DNBR)]. However, this analysis does not envelope the effects that transients could have when operating in the reduced flow configuration. In addition to

reviewing the referenced material the accident and transient analyses presented in the Final Engineering Report and Safety Analysis and supplemented by Appendix A, Section 5, to cover cycle 2 and subsequent cycles were reviewed with respect to operation with less than all loops in service. Based on our review of this material we find that these analyses address accidents and transients initiated from full flow conditions but cannot be related to N-1 loop operation.

While the existing information on the docket does not provide an adequate basis for operation with less than all loops in service, a Technical Specification change for San Onofre Unit 1 would resolve this topic, pending staff approval of accident and transient analysis, addressing this mode of operation. Since San Onofre Unit 1 uses stainless steel clad fuel, the ECCS performance analysis may be performed under the guidelines of the ECCS Interim Acceptance Criteria for light water reactors.

On the basis of our review, as stated above, Technical Specification 3.1.2.D should be replaced with a Technical Specification which states that following a loss of a reactor coolant pump, thermal power shall be reduced (to some appropriate power level e.g. 10%) and appropriate actions implemented to return the inoperable pump to service or be in the hot standby (or below) condition within 24 hours. Continuous operation of the plant is only permitted with all pumps in service. In addition, startup of the plant (above hot standby) is not permitted with less than three operable pumps.

Based on the information presented in Final Engineering Report and Safety Analysis (Paragraph 10.2) we conclude that operation of the facility for a period less than 24 hours at 10 percent of power while in the N-1 and N-2 loop configuration does not present a significant safety issue. This is based also on the fact that the licensee has performed heat transfer analyses which show that natural circulation can remove reactor heat equivalent to 8 percent of full power; therefore, operating at an upper limit of 10 percent of full power with one or two pumps provides an adequate safety margin.

In addition, we conclude, on the same basis as that for operation with 1 or 2 pumps at 10 percent power, that low power physics testing (below 5 percent of full power) with 0, 1, 2 or 3 reactor coolant pumps operating is acceptable and does not present a significant safety issue.

This restriction, in lieu of an analysis supporting N-1 loop operation or until such an analysis is approved by the staff, will bound the staff position and resolve Topic IV-1.A for San Onofre Unit 1.

2.1 REACTOR CORE - Limiting Combination of Power, Pressure, and Temperature

Applicability: Applies to reactor power, system pressure, coolant temperature, and flow during operation of the plant.

Objective: To maintain the integrity of the reactor coolant system and to prevent the release of excessive amounts of fission product activity to the coolant.

Specification: Safety Limits

(1) The reactor coolant system pressure shall not exceed 2735 psig with fuel assemblies in the reactor.

(2) The combination of reactor system pressure and coolant temperature shall not exceed the locus of points established for the power level in Figure 2.1-1. If the actual pressure and temperature is above or to the left of the locus of points for the appropriate power level, the safety limit is exceeded.

Maximum Safety System Settings

The maximum safety system trip settings shall be as stated in Table 1.

TABLE 1

			TRIP SETTING
1.	Pressurizer High Level	≤	27.3 ft. above bottom of pressurizer
2.	Pressurizer Pressure: High	≤	2220 psig
**3.	Nuclear Overpower	≤	109% of indicated full power
*4.	Variable Low Pressure	≥	14.45 (1.313 T+T avg.) -7298.7
*5.	Coolant Flow	≥	85% of indicated full loop flow

* May be bypassed at power levels below 10% of full power.

** The nuclear overpower trip is based upon a symmetrical power distribution. If an asymmetric power distribution greater than 10% should occur, the nuclear overpower trip on all channels shall be reduced one percent for each percent above 10%.

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3.1.2 OPERATIONAL COMPONENTS

Applicability: Applies to the operating status of the reactor coolant system equipment and related equipment.

Objective: To identify those conditions of the reactor coolant system necessary to ensure safe reactor operation.

Specification:

A. At least one pressurizer safety valve shall be operable or open when the reactor head is on the vessel, except for hydrostatic tests.

B. The concentration of boron in the reactor coolant system shall not be reduced unless at least one reactor coolant pump or one residual heat removal pump is circulating reactor coolant.

C. The reactor shall not be made critical or maintained critical unless:

(1) Both pressurizer safety valves are operable.

(2) At least one steam generator is operable.

D. Whenever reactor power is greater than or equal to 10% of full power, three reactor coolant pumps shall be operating.

E. Whenever reactor power is less than 10% of full power, operation with one or two reactor coolant pumps operating shall be limited to less than 24 hours.

F. Operation may be conducted with 0, 1, 2 or 3 reactor coolant pumps operating during low power physics testing below 5% of full power.

Basis: One pressurizer safety valve is sufficient to prevent over-pressurizing when the reactor is subcritical, since its relieving capacity is greater than that required by the sum of the available heat sources, i.e., residual heat, pump energy and pressurizer heaters.

Prior to reducing boron concentration by dilution with make up water either a reactor coolant pump or a residual heat removal pump is specified to be in operation in order to provide effective mixing. During boron injection, the operation of a pump, although desirable, is not essential. The boron is injected in to an inlet leg of the reactor coolant loop. Thermal circulation which exists whenever there is residual heat in the core, will cause the boron to flow to the core.

Lack of further mixing cannot result in areas of reduced, boron concentration within the core. Prior to criticality the two pressurizer safety relief valves are specificed in service in order to conform to the system relief capabilities.(1)

Heat transfer analyses show that reactor heat equivalent to 8% of full power can be removed with natural circulation only; hence, for up to 24 hours the specified upper limit of 10% of full power with 1 or 2 reactor coolant pumps operating provides a substantial safety factor.

With three reactor coolant pumps in operation, the DNB ratio would not drop below 1.30 after a loss of flow with a reactor trip. (2) (3)

References: (1) Final Engineering Report and Safety Analysis, Sections 9 and 10.

(2) Final Engineering Report and Safety Analysis, Paragraph 10.2.

(3) Supplement No. 1 to Final Engineering Report and Safety Analysis, Section 3, Question 9.

TABLE 3.5.1

INSTRUMENT OPERATING CONDITIONS

	Functional Unit	COLUMN I Minimum Operational Channels	COLUMN II Minimum Redundancy* Required	COLUMN III Required Operating Action if Column I or Column II Cannot be Met
1.	Nuclear Power-Critical	3	For 3-Channel Operation --1 For 4 Channel Operation --2	Maintain hot shutdown conditions.
	-Subcritical	3	1	Maintain hot shutdown if at least one source and one intermediate channel are available; otherwise maintain 10% $\Delta k/k$ shutdown margin.
2.	Pressurizer Variable Low Pressure	2	1	Maintain load below 10% F. P.
3.	Pressurizer Fixed High Pressure	2	1	Maintain hot shutdown conditions.
4.	Pressurizer High Level	2	1	Maintain hot shutdonw conditions.
5.	Reactor Coolant Flow -- 3-Loop Operation	3	1**/2***	Maintain load below 10% F.P.
6.	Pressurizer Low Pressure (Safety Injection Function)	2	1	Maintain hot shutdown conditions.

* Redundancy is defined as N-M, where N is the number of channels in operation, and M is the number of channels in operation which, when tripped, will cause an automatic shutdown.

** For operation at $\leq$ 50% of full power

*** For operation at >50% of full power.