DISTRIBUTION
Docket
NRC PDR
Local PDR
ORB #2 Reading
NRR Reading
VStello
DGEisenhut
OELD
OI&E (3)
DLZiemann
ABurger
HSmith
BGrimes
TERA
JRBuchanan
ACRS (16)
DKDavis

Docket No. 50-206

JAN 0 5 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:

Enclosed are copies of our draft evaluation of two Systematic Evaluation Program topics. 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 error. If in error, please supply corrected information for the docket. We encourage you to supply for the docket any other material related to these topics that might affect the staff's evaluation.

It would be most helpful if your comments were received within 30 days of the date you receive this letter.

Sincerely,
Original signed by
T. V. Wambach for
Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors

Enclosures:
Topics III-4.B
V-10.A

cc w/enclosures:
See next page

7901240076

AMR4

P

OFFICE➤	DOR:ORB #2	DOR:ORB #2				
SURNAME➤	ABurger:ah	DLZiemann				
DATE➤	1/5/79	1/5/79				

NRC FORM 318 (9-76) NRCM 0240 ☆ U.S. GOVERNMENT PRINTING OFFICE: 1976 – 626-624

JAN 05 1979

cc w/enclosures:
Charles R. Kocher, Assistant
General Counsel
Southern California Edison Company
Post Office Box 800
Rosemead, California 91770

David R. Pigott
Samuel B. Casey
Chickering & Gregory
Three Embarcadero Center
Twenty-Third Floor
San Francisco, California 94111

David W. Gilman
Robert G. Lacy
San Diego Gas & Electric Company
P. O. Box 1831
San Diego, California 92112

Mission Viejo Branch Library
24851 Chrisanta Drive
Mission Viejo, California 92676

U. S. Nuclear Regulatory Commission
ATTN: Robert J. Pate
Post Office Box 4167
San Clemente, California 92672

SYSTEMATIC EVALUATION PROGRAM

SAN ONOFRE, UNIT 1

Topic III-4.B - Turbine Missiles

The safety objective of this review is to assure that all the structures, systems and components important to safety are adequately protected against potential turbine missiles.

The San Onofre unit 1 turbogenerator has peninsular orientation with respect to the containment and most of the safety-related systems. However, the following systems, or portions thereof, are within potential low trajectory missiles (LTM) strike zones:

a. DC Switchgear Room

b. Battery Rooms

c. Main and Auxiliary Feedwater Pumps

d. Circulating Water Pumps

e. Refueling Water Storage Tank

f. Primary Plant Makeup Water Storage Tank

g. Safety Injection Pumps

Systems (a), (b), (c) and (d) have redundant components, physically separated in the case of (c) and (d). For example, the main feedwater pumps are located on opposite sides of the turbogenerator. Therefore, the probability of a single missile incapacitating more than one train is considered very low. On the other hand, systems (a) and (b) are protected by the massive concrete turbine support pedestal. The sense of rotor spin (counterclockwise when facing north) is such that potential wheel fragments would be intercepted and either stopped or deflected by the turbine pedestal.

The probability of a turbine missile striking the remaining systems, e.g., (e), (f) and (g), has been calculated to be 2.5×10^{-3} on the basis of the solid angles subtended by them with respect to the total missile ejection solid angle and by adding the contributions from each low pressure wheel. The total probability of LTM's striking a safety-related system, P_{LTM}, is the product of 2.5×10^{-3} times the conservatively estimated turbine failure and missile ejection rate of 10^{-4} per year. The conservatisms associated with the 10^{-4} turbine failure rate stem from the use of a historically observed turbine failure data set. Some of the reported failures involved old turbine designs and fabrication techniques which have been improved in currently produced turbines (referenced 1 and 2). Thus, $P_{LTM} = 2.5 \times 10^{-7}$ per year.

Similiarly, the probability of high trajectory missiles (HTM's) striking the safety-related systems is obtained by multiplying the turbine failure and missile ejection rate, 10^{-4} per year, by the strike probability density per turbine failure 10^{-7} per ft^2, and by the horizontal area occupied by the systems. This area is estimated conservatively (i.e., it is assumed that every strike on area results in damaging the safety related equipment within) as follows:

Systems (a), (b), (e), (f)	2500 ft^2
Spent Fuel Pool	1200 ft^2
Cable Spreading Area	3200 ft^2
Reactor and Primary Coolant System Area	6400 ft^2
Miscellaneous Other Areas	10,000 ft^2
Total Area	23.300 ft^2

Therefore, $P_{HTM} = 2.5 \times 10^{-8}$ per year, and a conservative estimate of the total strike and damaoe probability from low and high trajectory missiles is about 3×10^{-7} per year.

The presence of the San Onofre Unit 2 and Unit 3 turbogenerators does not alter significantly the turbine missile risk for Unit 1. The turbogenerators for Units 2 and 3 are peninsular with respect to the Unit 1 site, so that LTM's are not a hazard. Although HTM's potentially could reach Unit 1 safety-related structures, systems and components, the strike probability per square foot of target area is several orders of magnitude less than 10^{-7}. This is due to the horizontal distances between Unit 1 site and the sites for Units 2 and 3. The HTM strike probability falls off rapidly with distance from a turbogenerator when the distance is more than about 300 feet, and the Unit 2 turbogenerator is no less than 700 feet from Unit 1 safety-related targets. Thus, the contribution of potential missiles from Unit 2 and 3 turbogenerators to the HTM strike probability for Unit 1 is negligible.

Therefore, we conclude that the overall probability of turbine missiles damaging the San Onofre Unit 1 plant and leading to consequences in excess of the 10 CFR Part 100 exposure guidelines is acceptably low as specified in the S.R.P. 3.5.1.3 and S.R.P. 2.2.3.

On the basis of these results, we consider the operation of the San Onofre Unit 1 Generating Station safe with regard to turbine missiles, and the risk presented by this postulated event similar to that of plants licensed under current criteria. This completes the evaluation for this SEP topic. Since the plant conforms to current licensing criteria, no additional review is required.

References

1. Bush, S. H., "Probability of Damage to Nuclear Components," Nuclear Safety, Vol. 14, No. 3, May - June, 1973.

2. Regulatory Guide 1.115, "Protection Against the Low-Trajectory Turbine Missiles," Revision 1, July 1977.

SYSTEMATIC EVALUATION PROGRAM

SAN ONOFRE, UNIT 1

Topic V-10.A Residual Heat Removal System Heat Exchanger Tube Failures

The safety objective of this review is to assure that impurities from the residual heat removal system are not introduced into the primary coolant in the event of residual heat removal system heat exchanger tube failure. This was expanded to assure that adequate monitoring exists to assure no leakage of radioactive material in the other direction - into the service water and thus to the environment.

Information for this assessment was gathered from plant personnel during the safe shutdown review site visit and related telephone conversations. Information was also taken from San Onofre, Unit 1 system drawings and the San Onofre, Unit 1 Technical Specifications.

The bases for the review of these cooling systems on today's plants include: (1) the NRC's Standard Review Plan (SRP) 9.2.1, which requires that the service water system include the capability for detection and control of radioactive leakage into and out of the system and prevention of accidental releases to the environment; (2) SRP 9.2.2 requires that auxiliary cooling water systems (such as the residual heat removal system) include provisions for detection, collection and control of system leakage and means to detect leakage of activity from one system to another and preclude its release to the environment; and (3) SRP 5.2.3, which discusses compatibility of materials with reactor coolant and requires monitoring and sampling of the primary coolant system. These Standard Review Plans were used only in the comparison of the San Onofre, Unit 1 plant against current criteria and were not used as absolute requirements which must be met, especially if the plant incorporates other equally viable means of accomplishing the stated goals.

The San Onofre, Unit 1 Residual Heat Removal (RHR) system pressure varies between 420 psig and 70 psig. The lower value occurs when only one RHR pump is running, but RHR has in the past been totally shut down when the entire core has been offloaded. Because the shell side of the RHR heat exchanger, which is the component coolant water (CCW) system, operates at 65-75 psig, there is an opportunity for CCW inleakage into the primary system. Because the Salt Water Cooling System operates at 30 psig in the CCW heat exchanger, where CCW is at 65-75 psig, there is little chance during normal operation for intrusion of chlorides and other detrimental impurities inthe salt water to enter the CCW system. The Salt Water Cooling System cools only the CCW system, and since it would be shutdown in case of a CCW system shutdown, there is also little chance of leakage of contaminants during CCW shutdown.

The San Onofre, Unit 1 CCW system incorporates a radiation monitor to alert the operators to leakage from the RHR heat exchanger (or any other heat exchanger or component carrying primary coolant). In addition, the CCW system includes high and low level alarms on the surge tank, which would alert the operators to leakage into or out of the system. As an added measure, the CCW system is sampled once every week during normal (power) operation as required by a plant procedure. This sample includes pH and chromate, a compound of which is added to the CCW system as a corrosion inhibitor. Chloride is included only when the operator suspects that a leak may exist.

Even though the CCW system does include engineered features to alert operators to leakage into or out of the CCW system, additional assurance of leak detection into the primary system is today typically provided by inclusion of limits and sampling frequencies in the plant Technical Specifications. Although Station Orders adequately cover primary system sampling, San Onofre, Unit 1 has no related technical specification.

The NRC staff's opinion is that such specifications for the primary system, during power operation and while shutdown, should be made a part of the license. Additionally, the procedure for sampling of the CCW system should be expanded to include sampling when shutdown and should also include chloride samples.

Another aspect of the San Onofre, Unit 1 systems which must be addressed here is the lack of a radiation monitor on the discharge of any salt water cooling system as it leaves the plant. As noted above, the salt water cooling system pressure is lower than both RHR and CCW system pressures. Although leakage to the environment would require simultaneous failures of (1) the CCW radiation monitor and (2) tubes in both the RHR and CCW heat exchangers or the failure of some other CCW-cooled component, we consider protection of the environment to be important enough to warrant consideration of a detector and alarm on the common discharge of the cooling systems. Alternatively, we may consider this requirement satisfied if calibration and test requirements for the CCW radiation detector were added to the San Onofre, Unit 1 Technical Specifications.

The final decision on the above recommendations will be made at the completion of the integrated plant Design Basis Event assessment. No action by the licensee is considered necessary at this time.