UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

FEB 22 1982

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MEMORANDUM FOR: Carlyle Michelson, Director
Office for Analysis and Evaluation
of Operational Data

THROUGH: Wayne D. Lanning
Office for Analysis and Evaluation
of Operational Data

FROM: Narinder K. Trehan
Office for Analysis and Evaluation
of Operational Data

SUBJECT: LOAD REDUCTION TRANSIENT ON JANUARY 14, 1982 AT SALEM UNIT 2

A meeting was held with the licensee at Salem on February 4, 1982, in order to evaluate the sequence of events of the load reduction transient, operator's actions, lessons learned, and future remedial actions to be taken for such an event. AEOD was represented by M. Chiramal and myself.

On January 14, 1982, a turbine load reduction was initiated at Salem Unit 2. This was in response to a steam generator feed pump low suction pressure which was apparently caused by a secondary system disturbance associated with the No. 2A feedwater heater and moisture separator reheater drain tank level control system. In conjunction with the manual initiated load reduction, the operator also bypassed the condensate polishing system. In order to reduce the RCS $T_{ave}$, the operator tried to insert the control rods in Bank D but failed to do so because of a failure of the firing circuit control card in the power cabinet. He then manually initiated the RCS boration.

As a result of the turbine load reduction, the condenser steam dump system had been armed in the load rejection mode of operation. There was a large mismatch between the reactor power (92%) and the turbine load (50%) and this power mismatch was being rejected to the condenser by the steam dump system. The operator increased the turbine load and the dump valves started to modulate closed and $T_{ave}$ was being held stable at 580°F.

The operator resetted the steam dump system load rejection signal causing the steam dump valves to close. This resulted in $T_{ave}$ to peak to 592°F causing pressurizer level to increase from 54% to 78% and pressure from 2200 psig to 2325 psig. The pressurizer pressure was reduced by the operation of both pressurizer spray valves.

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The rapid increase in RCS $T_{ave}$ was also reflected back into the secondary system, causing the steam generator pressure to rapidly increase resulting in lifting one of the steam generator safety valves. The safety valve failed to reseat fully due to the lifting disc associated with the manual lifting arm jamming the valve travel. The safety valve was still blowing out but had no effect on unit stability. The safety valve was reseated (four hours after it had opened) by removing the jammed lifting arm. The valve was repaired and the unit was maintained at 46% steady power.

Lessons Learned (by the Licensee)

1. Reactor coolant system $T_{ave}$ will be confined between the limits 541°F and 581°F. Outside this bound, the units will be tripped.

2. If there is a big mismatch between the reactor power and the turbine load, the unit will be tripped.

3. Initiate safety injection if cooldown rate limit is exceeded. The cooldown rate limit will be given at a later date.

IE is pursuing this matter with the licensee and we will follow it up.

N Trehan

Narinder K. Trehan
Office for Analysis and Evaluation
of Operational Data

Enclosures:
1. Inspector's review of operating events
2. Licensee's evaluation of sequence of events
3. List of attendees

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AEOD/E209

MAR 16 1982

MEMORANDUM FOR: Harold R. Denton, Director
Office of Nuclear Reactor Regulation

FROM: Carlyle Michelson, Director
Office for Analysis and Evaluation
of Operational Data

SUBJECT: POTENTIAL GENERATOR MISSILES -- GENERATOR ROTOR RETAINING RINGS

On April 13, 1979 an incident occurred at Sweden's Barseback-1 nuclear unit involving the failure of a generator rotor retaining ring. The unit was operating at 570 MW and 3,000 rpm when the failure occurred. Pieces of the retaining ring, rotor end windings and wedges were ejected from the machine causing considerable damage to the station. Concerned by that event, AEOD has conducted a review of the subject of generator rotor retaining ring failures. The enclosed memorandum presents our evaluation. Our review concludes that generator rotor retaining ring failures can develop missiles that inflict considerable damage and that such missiles can be ejected in an axial direction. The major cause of failure is attributed to brittle fracture at regions of stress concentration, and stress corrosion cracking induced by the environment.

Since there have only been 30 known failures of rotor retaining rings worldwide (13 in the United States), we do not consider the problem to be of immediate concern. However, since the potential for severe damage in a nuclear plant exists as a consequence of retaining ring failure, we believe that some effort should be expended in reviewing and evaluating the subject problem.

If you desire additional information or assistance, the AEOD contact is Matthew Chiramal.

Carlyle Michelson

Carlyle Michelson, Director
Office for Analysis and Evaluation
of Operational Data

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Enclosure:
As stated

cc w/enclosure:
RDeYoung, IE
RCHaynes, Region I
JPO'Reilly, Region II
JGKeppler, Region III
JTCollins, Region IV
RHEngelken, Region V

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