

LICENSEE EVENT REPORT

CONTROL BLOCK: [] [] [] [] [] [] [] [] [] (1)

(PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

01 | M | A | Y | K | R | 1 | 2 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 3 | 4 | 1 | 1 | 1 | 1 | 4 | [] [] [] (5)
7 8 9 LICENSEE CODE 14 15 LICENSE NUMBER 25 26 LICENSE TYPE 30 57 CAT 58

CONT

01 | L | 6 | 0 | 5 | 0 | 0 | 0 | 0 | 2 | 9 | 7 | 0 | 9 | 0 | 3 | 8 | 2 | 8 | 0 | 9 | 1 | 7 | 8 | 2 | 3
7 8 REPORT SOURCE 60 61 DOCKET NUMBER 68 69 EVENT DATE 74 75 REPORT DATE 80

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

02 | During Mode 1 coastdown operation, a condition was discovered which could
03 | have permitted reactor operation in a manner less conservative than assumed in the analysis (T.S. 6.9.4.a(8)). There was no adverse effect on the
04 | health and safety of the public.

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09 | Z | Z | (11) | X | (12) | X | (13) | Z | Z | Z | Z | Z | Z | (14) | Z | (15) | Z | (16)
7 8 SYSTEM CODE 9 10 CAUSE CODE 11 12 CAUSE SUBCODE 13 14 COMPONENT CODE 15 16 COMP. SUBCODE 17 18 VALVE SUBCODE 19 20
17 | LER/RD | 8 | 2 | (17) | [] | 0 | 2 | 8 | (22) | [] | (0 | 1) | (T) | (0) |
7 8 LER/RD REPORT NUMBER 21 22 EVENT YEAR 23 24 SEQUENTIAL REPORT NO. 25 26 OCCURRENCE CODE 27 28 REPORT TYPE 29 30 REVISION NO. 31 32
X | (18) | X | (19) | Z | (20) | Z | (21) | 0 | 0 | 0 | 0 | (22) | Y | (23) | N | (24) | Z | (25) | Z | 9 | 9 | 9 | (26)
7 8 ACTION TAKEN 33 34 FUTURE ACTION 35 36 EFFECT ON PLANT 37 38 SHUTDOWN METHOD 39 40 HOURS 41 42 ATTACHMENT SUBMITTED 43 44 NPRD-4 FORM SUB. 45 46 PRIME COMP. SUPPLIER 47 48 COMPONENT MANUFACTURER 49 50
CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

10 | A less than conservative assumption of moderator temperature defect was
11 | found in the analysis of the transient theoretically associated with rupture
12 | of a MSL at the time of a cooldown, with auto ECCS blocked and a control
13 | rod stuck. Administrative restrictions sufficient to guarantee adequate
14 | shutdown margin were immediately imposed on plant operations.

15 | E | (28) | 0 | 8 | 1 | (29) | NA | (30) | A | (31) | Personnel Observation (32)
7 8 FACILITY STATUS 9 10 % POWER 11 12 OTHER STATUS 13 14 METHOD OF DISCOVERY 15 16 DISCOVERY DESCRIPTION 17 18

16 | Z | (33) | Z | (34) | NA | (35) | NA | (36)
7 8 ACTIVITY CONTENT RELEASED OF RELEASE 9 10 AMOUNT OF ACTIVITY 11 12 LOCATION OF RELEASE 13 14

17 | 0 | 0 | 0 | (37) | Z | (38) | NA (39)
7 8 PERSONNEL EXPOSURES NUMBER 9 10 TYPE 11 12 DESCRIPTION 13 14

18 | 0 | 0 | 0 | (40) | NA (41)
7 8 PERSONNEL INJURIES NUMBER 9 10 DESCRIPTION 11 12

19 | Z | (42) | NA (43)
7 8 LOSS OF OR DAMAGE TO FACILITY TYPE 9 10 DESCRIPTION 11 12

20 | N | (44) | 8209280219 820917 (45) | NRC USE ONLY
7 8 ISSUED DESCRIPTION 9 10 PDR ADOCK 05000029 S PDR 68 69

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LER 82-28 ATTACHMENT

BACKGROUND

Shutdown margin requirements, as specified in Plant Technical Specifications for Operating Modes 1, 2 and 3 are based on results of analyses of a main steam line break. These shutdown margin requirements are specified to compensate for the reactivity effects of the most severe postulated cooldown at End-of-Cycle (EOC) when the moderator temperature coefficient is the most negative. For the Yankee plant, the licensing basis has been a double-ended rupture of a main steam line resulting in the blowdown of all four steam generators and a resultant final Primary System temperature of 212°F. The licensing basis is extremely conservative with respect to current plant configuration in that non-return valves (NRV's) on each main steam line would auto-close on low steam line pressure. This isolation feature results in limiting the blowdown to one steam generator, and in turn, limiting the Primary System cooldown.

The acceptance criteria used for the steam line break for the Yankee plant has been to demonstrate that the reactor remains subcritical for a cooldown to 212°F (blowdown of all four steam generators) under the conditions of the most reactive rod remaining out of the core at End-of-Cycle.

In Modes 1 and 2, the power operation and startup modes, the shutdown margin required to maintain subcriticality post-steam line break is provided by the available scram reactivity in control rods and by boron injected from the Safety Injection System.

In Mode 3, with rods inserted, the shutdown margin required is set forth in Technical Specification 3.1.1.1. This Technical Specification requires that the reactor be shutdown by 5.5%ΔK/K above 515°F and 4.72% ΔK/K below 485°F.

DESCRIPTION OF PROBLEM

During the analysis efforts for Core 16 (upcoming reload), it was determined that the most limiting moderator defect results from a condition of All Rods In (ARI) less stuck rod. In Core 15, the limiting condition was perceived to be the case with ARI. After re-examining the ARI and ARI less stuck rod moderator defects, we determined that the ARI less stuck rod defect was also more severe for Core 15, the present operating cycle.

Re-Analysis of the Core 15 steam line break with the appropriate worst case moderator defect (ARI less stuck rod) demonstrates that sufficient shutdown margin exists in control rods and safety injection in Modes 1 and 2 to maintain subcriticality following the licensing basis steam line break-blowdown of all steam generators with no credit for NRV operation. However, it was found that the shutdown margin as specified in Technical Specifications (5.5%ΔK/K), along with available rod worth, would not assure subcriticality following a licensing basis steam line break for certain plant conditions during Mode 3 operation.

The combination of conditions which result in inadequate shutdown margin are as follows:

- a. Operation at the upper end of the temperature range is Mode 3 (near 515°F)
- b. Most reactive rod is fully withdrawn from the core.
- c. Safety Injection System is blocked from auto initiation, in accordance with normal cooldown procedures, before Primary System pressure reaches 1800 psig.
- d. NRV auto isolation has been placed in bypass.
- e. Burnup is at EOC corresponding to the point in cycle operation that results in the most limiting moderator defect.
- f. No xenon condition.

Examination of plant operating records revealed that the plant has never operated in a Mode 3 under these conditions. Standard practice is to borate to cold shutdown conditions before blocking safety injection from auto-initiation and, thus, it is unlikely that the plant would have ever entered a condition of insufficient shutdown margin. Additionally, the NRV's would not be bypassed under normal circumstances. However, because this practice is not specified either through Technical Specifications or plant procedures, the potential has existed for operation under a condition less conservative than assumed in the safety analysis.

CORRECTIVE ACTIONS

Immediate corrective action to cover this unusual set of conditions included the specification of a 7% Δ K/K shutdown margin requirement for Mode 3 during the remainder of Core 15 to account for conditions of largest positive reactivity, i.e., safety injection blocked or no xenon conditions. In the long term, required shutdown margins will be derived through a combination of plant procedures and Technical Specification changes. Procedures will restrict certain operations in Mode 3 with a stuck rod and removal of safety injection from auto-initiation.