UPDATED REPORT-PREVIOUS REPORT DATED 5/7/85 POW 28-06-01

NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Surry Power Station, Unit I	0 5 0 0 0 2 8 0	1 OF 0 5

TITLE (4)
Quadrant Power Tilt

EVENT DATE (5) MONTH	DAY	YEAR	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	REPORT DATE (7) MONTH	DAY	YEAR	OTHER FACILITIES INVOLVED (8) FACILITY NAMES	DOCKET NUMBER(S)
0 6	2 0	8 4	8 4	0 1 7	0 2	0 1	2 1	8 6		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): N
POWER LEVEL (10): 0 2 9

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	X OTHER (Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE	
R. F. Saunders, Station Manager	8 0 4	3 5 7 - 3 1 8 4

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
X	I G	R I	W 1 2 0	Y					
X	A G	R G D	W 1 2 0	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) — X NO

EXPECTED SUBMISSION DATE (15): MONTH | DAY | YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

ABSTRACT

In June, 1984, during Unit I Cycle 7 operation, control rod B-6 became stuck at the 56 steps withdrawn location. As a result of the stuck rod, a quadrant power tilt of greater than 2.0% existed for greater than 24 hours. This was reported in LER 84-017-00 on July 17, 1984 in accordance with Section 3.12.B.7 of the Technical Specifications. At the time of the report, the cause of the stuck rod could not be determined. Virginia Electric and Power Company (the company) committed to determining the cause at the next refueling.

During the Cycle 7/8 refueling visual inspection of the affected fuel assembly and Rod Cluster Control Assembly (RCCA), it was discovered that one of the two holddown spring clamps had separated from the top of the assembly and had become lodged between two RCCA rodlets. The company and the fuel vendor have concluded that the spring clamp was the cause of the Cycle 7 stuck rod.

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U.S. GPO:1984-0-454-481/18759

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Power Quadrant Tilt

1. Description of the Event:

A reactor startup was in progress at 1125 on 6-14-84 following a reactor trip on 1-13-84 (See LER-84-015-00). While withdrawing Control Bank A, the first control bank of rods to be withdrawn, rod position indicator (RPI) B-6 stopped at 30 steps and was suspected to be malfunctioning. After the RPI was verified to be correct, the reactor trip breakers were opened and all rods dropped into the core except B-6. Rod B-6 was exercised using abnormal procedure AP-1.5. This action did result in some movement of B-6, however, when it was tripped from the fully withdrawn position, it became stuck at 56 steps and could not be moved in or out.

A Westinghouse representative was successful in freeing rod B-6 using a special control box that extends the time the lift coil is energized. Rod drop testing was satisfactorily completed on other rods to verify operability. In another unsuccessful attempt to free B-6, the unit was cooled down to 250°F and the Westinghouse control box was used. After a return to hot shutdown, rod drop testing was successfully completed on all rods except B-6.

The safety analyses required in T.S.-3.12.C.7 for continued operation with an inoperable rod were completed prior to station approval for a startup. During the performance of the safety analysis, it was revealed that the control rod insertion limit curve for one inoperable rod contained in Technical Specifications was not appropriate for this situation. A more restrictive insertion limit curve was generated for use. Also, before startup was approved, Special Test 163 was written. This test delineates the monitoring requirements to insure that the Unit 1's operation remains within the bounds of Surry's Technical Specifications during operation with B-6 partially withdrawn. At 0414 on 6-19-84, a reactor trip occurred from about 10% power (See LER 84-016-00).

At 1940 on 6-19-84, excore detector NI-43 failed due to a loss of detector voltage. The Instrument Technicians and Electricians determined that the problem with NI-43 was the detector or the detector cable inside containment. Additional monitoring requirements were initiated for operation with one inoperable excore detector per T.S.-3.12.D.1.

Following a startup on 6-20-84, reactor power was held at 29% for a flux map. The results of this map indicated that the hot channel factors were within Technical Specification limits, but a quadrant power tilt (QPT) of 5.52% existed.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

A flux map taken on 6-21-84 at 50% power indicated a QPT of 3.58%. *The results of all flux maps have indicated that the hot channel factors are within Technical Specification limits. Since the QPT exceeded 2.0% for greater than 24 hours, this event is reportable per T.S.-3.12.B.7.

2. Probable Consequences:

The company's Nuclear Engineering Staff has performed a safety analysis to verify that continued operations during cycle 7 with Rod B-6 stuck could be safely accomplished. The evaluation, in addition to addressing the ejected rod question, also considered the other UFSAR Chapter 14 accidents. This analysis included revision of insertion limits, re-evaluation of the potential ejected rod worth and transient power distribution peaking factors and included the effects on non-uniform fuel depletion in the area of the stuck rod.

The results of this analysis indicated that with the revised insertion limits, all applicable safety limits would continue to be met for cycle 7 with Rod B-6 stuck.

Re-analysis or re-evaluation of the accidents potentially affected has confirmed that the results of the current licensing analysis remain bounding. It was concluded that reactor operation with the stuck rod would continue to meet all applicable safety limits provided that a revised set of rod insertion limits be adopted for the remainder of cycle 7. The unit was subsequently restarted and operated to the end of cycle, with power administratively restricted to 80% of rated thermal power (The Technical Specification limits operation under this condition to 88%). This event does not constitute an unreviewed safety question and the health and safety of the public are not affected.

3. Cause.

Shortly after identifying the stuck rod, the company began planning for inspection of the affected fuel assembly and Rod Cluster Control Assembly (RCCA) during the cycle 7/8 refueling outage to determine the cause of the malfunction.

During visual inspection of the RCCA vanes and top of the fuel assembly, it was discovered that one of the two hold down spring clamps at the top of the assembly was missing. Further examination located the spring clamp lodged in the control (i.e. between the RCCA HUB and two rodlets). The clamp was

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*Another map taken on 6-22-84 at 80% power indicated delta QPT of 3.13%.

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retrieved and closer visual inspection was made. This inspection revealed that the heads of the two clamp hold down screws had separated from the screw shanks and the clamp had undergone severe mechanical distortion. The heads remained fixed in the clamp via spot welds. The loose clamp appears to have been the cause of the stuck rod. Unusual score marks on one rodlet at approximately 30 inches below the RCCA HUB (approximately 56 steps) support this conclusion. A review of pertinent manufacturing records was also performed. Subsequent inspection of NI-43 determined that the problem was in the detector.

4. Immediate Corrective Action:

Extensive efforts were made to free the stuck rod. A program was developed to monitor any flux tilt as long as the stuck rod existed. The NI-43 channel was placed in trip and the instrument technicians began to troubleshoot the problem.

5. Additional Corrective Action:

Efforts were made by Westinghouse personnel to analyze the problem with control rod B-6 and free it.

A review of the fuel manufacturer's and screw supplier's quality assurance practices and records provided no evidence that the screws had deviations (such as thinner than normal ligaments between the screw head socket and shoulder) which would lead to a higher failure susceptibility than those from other vendors or lots.

The company's Nuclear Engineering Staff performed a safety analysis to verify that continued operation with Rod B-6 stuck could be safety accomplished. During unlatching operations, the rod dropped into the core. The instrument Technicians and Electricians determined that the problem with NI-43 was in the detector. The detector was replaced during a short outage prior to refueling.

During the November, 1984 refueling outage, fuel assemblies in Unit 1 core were inspected for other possible loose hold down clamps and none were found.

6. Action Taken to Prevent Recurrence:

The fuel assembly with the missing clamp was removed from further fuel cycles.

The company, in cooperation with the fuel vendor, completed an investigation into the failure mechanism of the clamp hold down screws. The results of this investigation, reported in WCAP-10887, indicated that the failure mechanism was primary water stress corrosion of the screw. While failures of this component have been rare, the vendor has selected a replacement material for the screws in new fuel assemblies which will have greater resistance to stress corrosion.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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7. Generic Implications

A review of operating experience with spring clamp hold down screws was performed by the fuel vendor. The review showed that failure of clamp screws is a rare, but not a unique occurrence. Failures of this component in Westinghouse reactors have occurred in two other known instances: One in the USA and one European unit. In the case of the US failure, the screws were produced by the same manufacturer as the Surry screws, but were of a different design (cross slotted versus hexagonal sockets). The screws in the European unit had a different manufacturer and design. For screws of the specific manufacturer and design, the Surry event appears to be unique.

Vepco

VIRGINIA ELECTRIC AND POWER COMPANY
Surry Power Station
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January 21, 1986

U. S. Nuclear Regulatory Commission
Document Control Desk
016 Phillips Building
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Serial No: 84-029B
Docket No: 50-280
License No: DPR-32

Gentlemen:

Pursuant to Surry Power Station Technical Specifications, Virginia Electric and Power Company hereby submits the following Licensee Event Report for Surry Unit 1.

REPORT NUMBER

84-017-02

This report has been reviewed by the Station Nuclear Safety and Operating Committee and will be reviewed by Safety Evaluation and Control.

Very truly yours,

R F Saunders

R. F. Saunders
Station Manager

Enclosure

cc: Dr. J. Nelson Grace
Regional Administrator
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