UPDATE REPORT - PREVIOUS REPORT DATE - November 3, 1976 USRE-S2-76-15

# LICENSEE EVENT REPORT

CONTROL BLOCK: (1–6)

(PLEASE PRINT ALL REQUIRED INFORMATION)

| | LICENSEE NAME | LICENSE NUMBER | LICENSE TYPE | EVENT TYPE |
|---|---|---|---|---|
| 01 | VASPS2 (7–14) | 00-00000-00 (15–25) | 4 1 1 1 0 (26–30) | 0 3 (31–32) |

| | CATEGORY | REPORT TYPE | REPORT SOURCE | DOCKET NUMBER | EVENT DATE | REPORT DATE |
|---|---|---|---|---|---|---|
| 01 CON'T | M I (57–58) | L (59) | L (60) | 0 5 0 - 0 2 8 1 (61–68) | 1 0 0 6 7 6 (69–74) | 1 1 1 9 7 6 (75–80) |

EVENT DESCRIPTION

02 With Unit No. 2 at cold shutdown, leakage of water was observed from "A" Recirculation
03 spray heat exchanger piping. Further visual inspection and dye penetrant examinations
04 revealed indications of cracking in the heat affected zones of several welds. This
05 event is reportable per Technical Specification 6.6.2.b(4). (USRE-S2-76-15)
06

| | SYSTEM CODE | CAUSE CODE | COMPONENT CODE | PRIME COMPONENT SUPPLIER | COMPONENT MANUFACTURER | VIOLATION |
|---|---|---|---|---|---|---|
| 07 | S H (10) | E (11) | P 1 P E X X (12–17) | A (43) | Z 9 9 9 (44–47) | N (48) |

CAUSE DESCRIPTION

08 See attached cause description
09
10

| | FACILITY STATUS | % POWER | OTHER STATUS | METHOD OF DISCOVERY | DISCOVERY DESCRIPTION |
|---|---|---|---|---|---|
| 11 | G (9) | 0 0 0 (10–12) | N/A (13–44) | C (45) | N/A (46–80) |

| | FORM OF ACTIVITY RELEASED | CONTENT OF RELEASE | AMOUNT OF ACTIVITY | LOCATION OF RELEASE |
|---|---|---|---|---|
| 12 | Z (9) | Z (10) | N/A (11–44) | N/A (45–80) |

PERSONNEL EXPOSURES

| | NUMBER | TYPE | DESCRIPTION |
|---|---|---|---|
| 13 | 0 0 0 (9–11) | Z (12) | N/A (13–30) |

PERSONNEL INJURIES

| | NUMBER | DESCRIPTION |
|---|---|---|
| 14 | 0 0 0 (9–11) | N/A (12–80) |

OFFSITE CONSEQUENCES

15 N/A

LOSS OR DAMAGE TO FACILITY

| | TYPE | DESCRIPTION |
|---|---|---|
| 16 | Z (9) | N/A (10–80) |

PUBLICITY

17 N/A



ADDITIONAL FACTORS

18 The health and safety of the general public were not affected.
19

NAME: Tyndall L. Baucom PHONE: (804) 357-3184

GPO 881-667

UNUSUAL SAFETY RELATED EVENT

REPORT NO. USRE-S2-76-15

# STRESS CORROSION CRACKING OF RECIRCULATION SPRAY PIPING

November 19, 1976

DOCKET NOS. 50-280
50-281

LICENSE NOS. DPR-32
DPR-37

SURRY POWER STATION

VIRGINIA ELECTRIC AND POWER COMPANY

I. Introduction

This report is an update of the Unusual Safety Related Event USRE-S2-76-15.

The event described herein involved the piping in Surry Power Station, Unit Nos. 1 and 2, installed in the recirculation spray system.

II. Summary of Occurrence

During the Unit No. 2 cold shutdown on the above stated occurrence date, leakage of water was observed from "A" recirculation spray heat exchanger piping. Further visual inspection and dye penetrant examinations revealed indications of cracking near several welds.

A nondestructive test program was initiated to examine the recirculation spray system to determine the extent of pipe degradation. After the extent was determined an investigation was conducted to define the cause of degradation to the pipe.

Initially all the accessible welds in the recirculation spray system were visually inspected and dye penetrant inspected according to approved procedures in the VEPCO Nondestructive Test Manual.

The next step was to cut a section of pipe, approximately 12 inches long, in the most probable area that water could collect in each of the sections under investigation. Visual and dye penetrant examination of the inside surface area of the pipe were conducted to check for indications of a rejectable nature. If rejectable indications were identified in the remaining sections additional sections of pipe were cut out. This process continued until no rejectable indications were found. When a point was reached that showed no indications, a sample of the pipe with a weld joint was sent to an independent

testing laboratory for confirmatory analysis. This examination consisted of longitudinal splitting of pipe, interior visual inspection, descale and visual inspection, internal and external penetrant inspection. If after the independent laboratory examination, a section had no defect indications then it was concluded that the pipe beyond this point had not experienced degradation and was acceptable; therefore, it was left in the system. If the independent laboratory analysis revealed stress corrosion cracking, more sections of pipe were removed until a point was reached that showed no defects. A section from this point was sent to the independent laboratory to verify the field test.

III. Analysis of Occurrence

In order to determine the cause of the piping defects, metallographic examinations were conducted by an independent laboratory. The preliminary findings show that patches of intergranular cracking due to chloride stress corrosion was present near the heat affected zone of a weld in the sensitized pipe.

As a result of previous studies performed on stainless steel weldments at the Surry Power Station, a section of stainless steel piping was found which revealed grain boundary carbide precipitation. The specific origin of this section of piping was not known. A program of in-place metallographic examination of the engineering safeguards systems was initiated and performed at the site. Straight and bent lengths of pipe were examined. Metallographic examination indicated the presence of carbide precipitation only in piping which had been cold bent and stress relieved at 1,600°F. A report was completed on the sensitized stainless steel piping used in the safeguards systems and has been previously submitted to the NRC. The title of the report is "Sensitized Stainless Steel In Pressurized Water Reactor Applications", report number

SW-MER-1A. Some sensitized pipe is located in the recirculation spray systems. Further investigation is being performed to determine if the only pipe affected by the chloride stress corrosion cracking was in the sensitized piping.

There are two methods by which water containing chlorides could have been introduced into the recirculation spray systems. The recirculation spray systems are cooled by service water, which is brackish, circulating through heat exchangers. If the normally shut service water inlet valves (mark number MOV-SW-103A,B,C and D and MOV-SW-203A,B,C and D) leak through and a tube leak develops, brackish river water can accumulate in the heat exchanger and eventually come in contact with the recirculation spray piping. The other method by which water containing chlorides could have come in contact with the recirculation spray piping is by the testing of the spray pumps. Each month a Periodic Test is conducted on the recirculation spray pumps as required by the Technical Specifications. The inside spray pump test procedure requires that the pumps be tested dry; i.e. run for about one (1) minute without fluid. If chloride contaminated water is in the pump casement when the pump is tested, water containing chlorides can come in contact with the spray piping. Service water that is spilled on the containment floor during tube pluggings or other repairs to the recirculation spray heat exchanger eventually drain to the containment sump and into the recirculation spray pump casements.

The outside recirculation spray pumps have a mini flow line for periodic testing of the pumps. During a test the pumps are isolated from the system by suction and discharge isolation valves and primary grade water is used to fill the pump casement and test loop. The shutoff head of the pump during the test is compared against the pump head curve. The path that water containing chlorides could have been introduced into the outside containment spray pumps is via normally opened outside recirculation spray pump suction isolation valves from the containment sump. These valves are located between

the containment sump and the outside recirculation spray pumps.

IV. Corrective Action

As a result of the nondestructive test findings the following pipe will be replaced in Unit No. 2:

1. The pipe in the "A" recirculation spray system will be replaced from the pump to the heat exchanger and to the 22' 4" foot elevation between the "A" heat exchangers and the "A" spray header.

2. The pipe in the "B" inside recirculation spray systems will be replaced from the "B" pump to the "B" heat exchanger and to the 6'6" foot elevation between the "B" heat exchanger and the "B" spray header.

The pipe samples in Unit No. 2 outside recirculation spray system did not show any indications of chloride stress corrosion.

Initial investigations show that chloride stress corrosion has damaged pipe in the recirculation spray systems in Unit No. 1. Pipe will be replaced in parts of all four recirculation spray systems in Unit No. 1. The total amount of pipe has not been determined.

In order to prevent water containing chlorides from entering the spray piping several corrective actions are being implemented. They are as follows:

1. The recirculation spray heat exchangers are undergoing hydro tests to determine tube leaks. The tubes found to be leaking are being plugged.

2. The isolation valves between the containment sump and the outside recirculation spray pump suction in Unit No. 2 were replaced during the last refueling outage. The corresponding suction

valves in Unit No. 1 are being replaced during the present Unit No. 1 refueling outage.

3. Administrative controls will be implemented to assure that the inside recirculation spray pumps will not be tested if water is in the containment sump.

4. An Engineering Review is being conducted to determine the best method to use to monitor tube leaks in the recirculation spray heat exchangers. After the best method is determined a final design will be implemented at the next opportune unit shutdown commensurate with material deliveries.

5. Low point drain lines in the recirculation spray piping system will be left open during normal operation. These drains will preclude any water that may be inadvertly carried over to the piping systems from concentrating corrodents.

V. Analysis and Evaluation of Safety Implications.

The recirculation spray systems provide the necessary cooling and depressurization of the containment during a loss-of-coolant event. A complete description of the systems are contained in Section 6.3.1 of the Final Safety Analysis Report for the Surry Power Station, Unit Nos. 1 and 2.

The degradation of the affected piping systems did not have any direct safety implications because the need for the systems did not exist. Because of the redundancy of the systems, even with the degradation experienced, it is believed that the systems would have performed their intended function.

VI. Conclusions

1. From the preliminary data received from an independent testing laboratory it can be concluded that the degradation of the pipe

was caused by stress corrosion cracking.

2. The chlorides were introduced to the spray system piping by either a tube leak in the recirculation spray heat exchangers, by the inside recirculation spray pumps being tested with water containing chlorides in the pump casement, or by a leaking isolation valve between the containment sump and the suction to the outside spray recirculation spray pump.

3. The event described herein did not affect the safe operation of the station.

4. The event described herein did not affect the health or safety of the general public.

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

November 22, 1976

Mr. Norman C. Moseley, Director
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Region II - Suite 818
230 Peachtree Street, Northwest
Atlanta, Georgia 30303

IE FILE COPY

Serial No. 308A
PO&M/GRM:jlf

Docket No. 50-281
License No. DPR-37

Dear Mr. Moseley:

Pursuant to Surry Power Station Technical Specification 6.6.B.2, the Virginia Electric and Power Company hereby submits a copy of Licensee Event Report No. USRE-S2-76-15 update.

The substance of this report has been reviewed by the Station Nuclear Safety and Operating Committee and will be placed on the agenda for the next meeting of the System Nuclear Safety and Operating Committee.

Very truly yours,

C. M. Stallings
Vice President-Power Supply
and Production Operations

Enclosures

cc: Mr. Robert W. Reid, Chief (40 copies)
Operating Reactors Branch 4



11937

COPY SENT REGION II