

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

September 2, 1994

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Serial No. 94-521
NL&P/MAE: R0
Docket Nos. 50-280
50-281
50-338
50-339
License Nos. DPR-32
DPR-37
NPF-4
NPF-7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
NORTH ANNA POWER STATION UNIT 2
INITIAL NOTIFICATION OF DEFECT IN ACCORDANCE WITH 10 CFR 21

Virginia Electric and Power Company has identified a trend in the number of steam driven auxiliary feedwater pump overspeed trips during periodic tests. In accordance with 10 CFR 21.21, the following information is provided as initial notification of an existing defect. A written report will be provided by September 30, 1994.

1. Name and address of the individual or individuals informing the Commission.

Mr. R. F. Saunders
Vice President - Nuclear Operations
Virginia Electric and Power Company
5000 Dominion Boulevard
Glen Allen, Virginia 23260

2. Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States which fails to comply or contains a defect.

Surry Power Station Units 1 and 2
North Anna Power Station Unit 2
Steam Driven Auxiliary Feedwater Pump Governor Valve

3. Identification of the firm constructing the facility or supplying the basic component which fails to comply or contains a defect.

9409150039 940902
PDR ADCK 05000280
S PDR

JE 19
11

Dresser-Rand Steam Turbines, Motors and Generator Division
37 Coats Street
Wellsville, N.Y. 14895
Attn: Mr. R. M. Loughin
Manager Navy Nuclear Product Engineering
(716) 596-3343

4. Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply.

Virginia Electric and Power Company (Virginia Power) has implemented vendor recommended practices provided in the technical manual and the Dresser Industries general information letter dated March 24, 1993 (attached). This general information letter addressed corrosion related valve stem binding.

Although we have implemented the vendor recommended practices, Virginia Power has identified a trend in the number of steam driven auxiliary feedwater pump overspeed trips during periodic tests. Since the trend was identified, the governor valve stems and carbon spacers have been replaced due to indications of corrosion related valve stem binding. Surry Unit 1 replacements occurred in December 1993 and May 1994. Surry Unit 2 replacements occurred in January 1992, February 1994 and August 1994. North Anna Unit 2 replacements occurred in November 1993 and August 1994. North Anna Unit 1 has not recently replaced the governor valve stem and carbon spacers. Note that all of the Units with the exception of North Anna Unit 1 have experienced overspeed trips related to governor valve stem binding.

A Root Cause Evaluation is ongoing. Preliminary findings have identified the following:

- a. Corrosion and mineral deposits are accumulating faster than expected on the replacement governor valve stems. This accumulation may not allow the governor to move in the closed direction after the start of the turbine. The turbine would then overspeed and trip rendering the auxiliary feedwater pump inoperable.

Based on metallurgical analysis the corrosion products are formed due to galvanic corrosion, crevice corrosion, and pitting corrosion. It has been identified that the graphite (carbon) spacers received from the Dresser-Rand Steam Turbines, Motors and Generator Division have approximately 1.29% sulfur as a contaminant. It has not been determined what form the sulfur is in or if it has accelerated the corrosion process.

- b. Three differences have been identified between the original and replacement valve stem and carbon spacers:
 - Nitride thicknesses (original 12-14 mills, replacement 4-5 mills)

- Percent of contaminants in carbon spacers (original essentially pure carbon, replacement approximately 1.29%)
 - Flatness of the end of the stem that slides in the plug (original flat on bottom, replacement has a manufactured recess).
5. The date on which the information of such defect or failure to comply was obtained.

July 29, 1994

6. In the case of a basic component which contains a defect or fails to comply, the number and location of all such components in use at, supplied for, or being supplied for one or more facilities or activities subject to the regulation in this part.

There are three steam driven auxiliary feedwater pumps which are affected by this notification. At Surry, there is one in each of the Unit 1 and 2 Main Steam Valve Houses and at North Anna there is one located in the Unit 2 Steam Driven Auxiliary Feedwater Pump House.

7. The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action.

The corrective actions to ensure operability are based on the type of corrosion, observed corrosion rate and design of the steam supply piping. At North Anna and Surry Power Station pitting corrosion has been observed in the stem packing area. Surry is also experiencing corrosion build up near the gland seal leakoff area of the stem. In addition, the governor valve at Surry is the low point of the system, and the steam supply valves are approximately 4 feet from the governor valve. At North Anna the steam supply valve is greater than 100 feet from the governor valve. With the steam supply valve close to the governor valve, the ambient temperature of the governor valve is significantly warmer, which affects the corrosion rate.

Based on these factors, the corrective actions to ensure operability at each station are as follows:

Surry

- a. A maintenance procedure to stroke the governor valve stem is performed

weekly

 weekly.

- b. Monitoring of the corrosion build up in the gland seal leakoff area is performed weekly.

North Anna

- a. The periodic maintenance procedure to stroke the governor valve stem is performed monthly for North Anna Unit 2. This is followed by running the steam driven turbine.

Additional corrective actions, if necessary, will be based on the completion of the Root Cause Evaluation. This information will be transmitted to you in the required written report.

8. Any advice related to the defect or failure to comply about the facility, activity or basic component that has been, is being, or will be given to purchasers or licensees.

Virginia Power advises other licensees not to replace original equipment (stems, carbon rings, bushings and washers) until this issue is corrected. If these components have been replaced, the licensees should consider 1) increased monitoring of initial turbine startup parameters and 2) replacement of the 410 nitrided stainless steel valve stem with a chrome plated valve stem as discussed in the general information letter from Dresser Industries dated March 24, 1993 (attached).

Should you have any questions or require additional information, please contact Mr. M. L. Bowling, Manager Nuclear Licensing and Programs (804) 273-2699.

Very truly yours,



R. F. Saunders
Vice President - Nuclear Operations

Attachment

cc: **Regional Administrator
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, Georgia 30323**

**Mr. M. W. Branch
NRC Senior Resident Inspector
Surry Power Station**

**Mr. R. D. McWhorter
NRC Senior Resident Inspector
North Anna Power Station**

**Mr. R. M. Loughin
Manager Navy Nuclear Product Engineering
Dresser-Rand Steam Turbines, Motors and Generator Division
37 Coats Street
Wellsville, N. Y. 14895**

 --
 DISPLAY OF RECORD 0489

Record Last Revised: 05/12/93

 --

GENERAL INFORMATION

INITIAL REPORT DATE: 03/24/93 LATEST REPORT DATE: 03/24/93
 NRC ISSUE NUMBER: 0
 REPORTING COMPANY: DRESSER INDUSTRIES

ACTIVITY:

PRIMARY COMPONENT: VALVE
 SUB COMPONENTS: VALVE STEM

PRIMARY MANUF.: DRESSER INDUSTRIES
 SECONDARY MANUF.:

REFERENCES

AFFECTED MODEL NUMBERS

ZS GS NEQ904-5051-006

AFFECTED PLANTS/UTILITIES

UTILITIES:

ENTERGY OPERATIONS	DUQUESNE LIGHT CO.
TENNESSEE VALLEY AUTHORITY	CAROLINA POWER & LIGHT CO.
UNION ELECTRIC CO.	BALTIMORE GAS & ELECTRIC CO.
DUKE POWER CO.	ILLINOIS POWER CO.
TEXAS UTILITIES ELECTRIC CO.	NEBRASKA PUBLIC POWER DISTRICT
FLORIDA POWER CORPORATION	TOLEDO EDISON CO.
PACIFIC GAS & ELECTRIC CO.	AMERICAN ELECTRIC POWER SERVICE
IOWA ELECTRIC LIGHT & POWER CO.	GEORGIA POWER CO.
DETROIT EDISON CO.	CONNECTICUT YANKEE ATOMIC POWER CO.
PUBLIC SERVICE ELECTRIC & GAS CO.	CONSOLIDATED EDISON OF NEW YORK
NEW YORK POWER AUTHORITY	ALABAMA POWER COMPANY
WISCONSIN PUBLIC SERVICE CORP.	COMMONWEALTH EDISON COMPANY
PHILADELPHIA ELECTRIC CO.	MAINE YANKEE ATOMIC POWER CO.
NORTHEAST UTILITIES	NIAGARA MOHAWK POWER CORP.
VIRGINIA POWER	ARIZONA PUBLIC SERVICE CO.
CLEVELAND ELECTRIC ILLUMINATING CO.	BOSTON EDISON CO.

WISCONSIN ELECTRIC POWER CO.
 SACRAMENTO MUNICIPAL UTILITY DISTRICT
 SOUTHERN CALIFORNIA EDISON CO.
 LONG ISLAND LIGHTING CO.
 FLORIDA POWER & LIGHT CO.
 PORTLAND GENERAL ELECTRIC CO.
 SOUTH CAROLINA ELECTRIC & GAS

NORTHERN STATES POWER CO.
 GULF STATES UTILITIES
 NEW HAMPSHIRE YANKEE
 HOUSTON LIGHTING & POWER COMPANY
 PENNSYLVANIA POWER & LIGHT CO.
 VERMONT YANKEE NUCLEAR POWER CORP.

PLANTS:

ARKANSAS NUCLEAR ONE	BEAVER VALLEY	BROWNS FERRY
BRUNSWICK 1	CALLAWAY	CALVERT CLIFFS
CATAWBA 1	CLINTON	COMANCHE PEAK
COOPER	CRYSTAL RIVER	DAVIS-BESSE
DIABLO CANYON	COOK	ARNOLD
HATCH	FERMI 2	GRAND GULF
HADDAM NECK	HOPE CREEK	INDIAN POINT 2
FITZPATRICK	FARLEY	KEWAUNEE
LASALLE	LIMERICK	MAINE YANKEE
MCGUIRE	MILLSTONE	MONTICELLO
NINE MILE POINT	NORTH ANNA	PALO VERDE 1
PEACH BOTTOM	PERRY	PILGRIM
POINT BEACH	PRAIRIE ISLAND	QUAD CITIES
RANCHO SECO	RIVER BEND	SALEM
SAN ONOFRE	SEABROOK	SEQUOYAH
HARRIS	SHOREHAM	SOUTH TEXAS PROJECT
ST. LUCIE	SURRY	SUSQUEHANNA
TROJAN	TURKEY POINT	VERMONT YANKEE
SUMMER	VOGTLE	WATERFORD
WATTS BAR	WNP	ZION

REPORT TEXT DATED MARCH 24, 1993:

REFERENCE: TERRY TYPE GS AND ZS
 AUXILIARY FEED PUMP DRIVERS/RCIC
 GOVERNOR VALVE STEM

GENTLEMEN:

WE ATTACHED HERETO A COPY OF A LETTER DATED MARCH 18, 1993 WHICH WAS SENT TO THE PLANTS LISTED.

WE TRUST THAT THE ENCLOSED IS SELF EXPLANATORY; HOWEVER, IF WE CAN BE OF FURTHER ASSISTANCE, PLEASE DO NOT HESITATE TO CONTACT US.

BEST REGARDS,

CARLTON M. SLATER
 SERVICE ENGINEER

SEP 02 '94 14:12 NLD

GENTLEMEN:

ON ALL TERRY MODEL ZS AND GS TURBINES USING THE 2 1/2" VEEPORT AND 3" VENTURI GOVERNOR VALVES, THE VALVE STEMS ARE MADE OF NITRIDED 410 STAINLESS STEEL WITH CARBON RINGS FOR PACKING.

THERE HAS BEEN A FEW NUCLEAR PLANTS EXHIBITING CORROSION RELATED VALVE STEM BINDING. IT IS AGREED THAT VALVE STEMS OF THIS CONSTRUCTION ARE SUSCEPTIBLE TO CORROSIVE ATTACK DURING PROLONGED EXPOSURE TO AN ENVIRONMENT OF STAGNANT OXYGENATED WATER.

THE DESIGN SELECTION IS MADE WITH EXPECTATION (BACKED UP BY VERY EXTENSIVE EXPERIENCE) THAT THE RESIDUAL CORROSION RESISTANCE OF NITRIDED 410 IS ADEQUATE IN A TYPICAL STEAM TURBINE VALVE STEM ENVIRONMENT. THE FACT THERE ARE THOUSANDS OF STEAM TURBINES WITH NITRIDED 410 VALVE STEMS AROUND THE WORLD, INCLUDING MANY OF THEM IN STANDBY SERVICE PROVIDES A STRONG TESTIMONY TO THE EXPECTATION. ALSO, THERE ARE ONLY EIGHT OUT OF 140 NUCLEAR PLANTS ON OUR INSTALLATION LIST WHICH HAVE REPORTED PROBLEMS WITH CORROSION RELATED VALVE STEM BINDINGS. THEREFORE, THIS SUGGESTS STRONGLY THAT A REASONABLY NON-CORROSIVE VALVE STEM ENVIRONMENT IS BEING MAINTAINED BY THE OTHER PLANTS. THERE IS A SIMILARITY TO THESE TURBINES IN NUCLEAR PLANTS. THIS SIMILARITY IS, THEY ALL HAVE EXTENDED PERIODS OF IDLE STANDBY STATUS.

THE PLANTS THAT ARE HAVING THIS CORROSION ENVIRONMENT PROBLEM ARE NOT ADEQUATELY DRAINING THE UNIT AND/OR HAVE CORROSIVE WATER CHEMISTRY IN THE STEAM. THIS WATER IS STAGNATING IN THE VALVE STEM PACKING GLAND (L-GLAND). THE REAL SOLUTION IS TO HAVE ADEQUATE DRAINAGE AND ELIMINATE THE CORROSIVE ENVIRONMENT. HOWEVER, SOME OF THESE PLANTS HAVE CONCLUDED THAT THEY ARE UNABLE TO ASSURE A DRY AND NON-CORROSIVE CONTROL VALVE ENVIRONMENT.

ACCORDINGLY, THEY HAVE IDENTIFIED A NEED FOR A VALVE STEM WITH HIGHER CORROSION RESISTANCE - SPECIFICALLY A STEM WITH CHROME PLATING APPLIED OVER A LAYER OF ELECTROLESS NICKEL. ATTACHED IS A LIST OF THESE PLANTS AND THEIR EXPERIENCES. AFTER READING THIS LIST ONE CAN SEE THAT THERE IS NO SELECTION OF VALVE STEM MATERIALS WHICH, CAN BY ITSELF, PRELUDE THE POSSIBILITY OF SURFACE DETERIORATION OR ASSURE INDEFINITE FREEDOM FROM BINDING.

BECAUSE DRESSER-RAND HAS A HIGH REGARD FOR CUSTOMER SATISFACTION, THERE IS A WILLINGNESS TO SUPPLY NUCLEAR GRADE CHROME PLATED VALVE STEMS TO THE PLANTS THAT CAN NOT ASSURE A DRY AND CORROSIVE FREE ENVIRONMENT AND ARE EXPERIENCING A CORROSIVE RELATED BINDING PROBLEM. THAT MEANS NOT ALL PLANTS FIT THIS NEED AND FOR THEM, NO CHANGE IS REQUIRED.

GOVERNOR VALVE STEMS DO NOT HAVE A INFINITE LIFE SPAN. BASED ON DATA ON THE NUMBER OF THE 410 NITRATED VALVE STEMS USED, THE AVERAGE SERVICE LIFE

SEP 02 '94 14:13 NLD

IS 5 PLUS YEARS. THIS SUGGESTS THAT THESE VALVE STEMS ARE REPLACED ON A PREVENTATIVE BASIS AT NORMAL INSPECTION INTERVALS, NOT BECAUSE OF BINDING. ONLY VIGILANT ATTENTION TO GOOD OPERATING AND MAINTENANCE PRACTICES CAN ASSURE A FREE AND OPERATION READY CONTROL VALVE. THESE PRACTICES SHOULD INCLUDE BUT NOT BE LIMITED TO:

- 1) CRITICAL ATTENTION TO THE CONTROL VALVE ENVIRONMENT. THIS INCLUDES STEAM CHEMISTRY AND ANY OTHER POTENTIAL SOURCES OF CORROSIVES AS WELL AS SYSTEM ARRANGEMENTS AND PRACTICES THAT PROMOTE A WELL DRAINED CONTROL VALVE, I.E., DRY ENVIRONMENT FOR STEM AND PACKING ASSEMBLY, WHILE IN STANDBY STATUS.
- 2) PERIODIC INSPECTION OF THE VALVE STEM TO DETECT ANY SURFACE DETERIORATION THAT COULD LEAD TO BINDING AND/OR PERIODIC MONITORING OF THE FORCE REQUIRED TO MOVE THE VALVE THROUGHOUT ITS STROKE RANGE. THE STEM SHOULD BE REPLACED IF EITHER SURFACE DETERIORATION OR INCREASE IN REQUIRED STROKING FORCE ARE FOUND TO BE SIGNIFICANT.
- 3) CRITICAL ATTENTION TO ANY BINDING TENDENCIES THAT MAY BE EXHIBITED BY THE CONTROL VALVE DURING REGULAR SURVEILLANCE TESTING.

HOWEVER, IF YOUR PLANT IS ONE THAT CAN NOT ASSURE A DRY AND CORROSION FREE ENVIRONMENT, YOU CAN PURCHASE A NUCLEAR GRADE CHROME PLATED VALVE STEM (SPECIFICALLY 410 STAINLESS STEEL BASE MATERIAL WITH CHROME PLATING APPLIED OVER A LAYER OF ELECTROLESS NICKEL) TO ACCOMMODATE THE ADDITIONAL CORROSION RESISTANCE REQUIRED.

IF YOU HAVE ANY QUESTIONS REGARDING THE ABOVE OR WISH TO PURCHASE THE CHROME PLATED STEM, PLEASE CONTACT US. FOR QUESTIONS CALL ED GRANDUSKY: 716-596-3631, TO PURCHASE PARTS CALL MIKE LAUZZE: 716-596-3436.

BEST REGARDS,

CARLTON SLATER
SERVICE ENGINEER