

July 29, 1987

Docket Nos. 50-338  
and 50-339

Mr. W. L. Stewart  
Vice President - Nuclear Operations  
Virginia Electric and Power company  
Post Office Box 26666  
Richmond, Virginia 23261

Dear Mr. Stewart:

SUBJECT: QUESTIONNAIRE ON WATER CHEMISTRY ACTIONS

DISTRIBUTION

~~Docket File~~

NRC PDR

Local PDR

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(ACRS) 10

Gray File

As a result of the Surry pipe erosion/corrosion incident in December of 1986, the NRC is preparing a report that will reference existing research information available and describe the actions being taken by utilities regarding erosion/corrosion in feedwater pipes in nuclear power plants. Central to an understanding of erosion/corrosion in pipes is an accurate assessment of erosion/corrosion experience, piping design, feedwater and condensate chemistry and piping materials.

To ensure that both the NRC and the nuclear industry have available a comprehensive collection of data regarding erosion/corrosion in feedwater pipes, the NRC will assemble a summary of utility information related to ongoing water chemistry actions in pressurized water reactors. To accomplish this task we ask that you complete the enclosed questionnaire.

The information being requested is quite extensive and will require a diligent effort on your part and ours to assure accurate and timely completion. Also, we realize that parts of the information may already be available to the NRC, but not in a convenient format which is readily accessible. Therefore, we request that you assist us by returning for each unit a single completed copy of the enclosed questionnaire to the Project Manager, U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, within 60 days of receipt of this letter. We believe the questionnaire is self explanatory; however, if questions arise or clarification is required, please contact your NRC Project Manager.

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PDR ADOCK 05000338  
P PDR

Mr. W. L. Stewart

- 2 -

This request is covered by Office of Management and Budget Clearance Number 3150-0011 which expires December 31, 1989. Comments on burden and duplication may be directed to the Office of Management and Budget, Room 3208, New Executive Office Building, Washington, D. C. 20503.

Sincerely,

Leon Engle, Project Manager  
Project Directorate II-2  
Division of Reactor Projects-I/II

Enclosure:  
PWR Erosion-Corrosion  
Questionnaire

cc: See next page

LA:PDII-2  
DMU:er  
7/27/87

PM:PDII-2  
LEngle:bg  
7/27/87

D:PDII-2  
LRubenstein  
7/27/87

Mr. W. L. Stewart  
Virginia Electric & Power Company

North Anna Power Station  
Units 1 and 2

cc:

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Board Panel  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

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Louisa County  
P. O. Box 160  
Louisa, Virginia 23093

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Supreme Court Building  
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James B. Kenley, M.D., Commissioner  
Department of Health  
109 Governor Street  
Richmond, Virginia 23219

Resident Inspector/North Anna  
c/o U.S. NRC  
Senior Resident Inspector  
Route 2, Box 78  
Mineral, Virginia 23117



PWR EROSION-CORROSION QUESTIONNAIRE  
(Check or Circle All Applicable)

ENCLOSURE

Utility Company: Virginia Elec. & Power Co Unit Name: North Anna 1 MWe \_\_\_\_\_

Filled by: \_\_\_\_\_ Date: \_\_\_\_\_ Phone No. \_\_\_\_\_

In service: 19 .... Water Treatment: AVT with ammonia, morpholine, hydrazine.

Condensate polishers: none, cation, powdex, mixed bed; .....% of feedwater flow;  
installed 19 ....; operated in: H-OH, NH<sub>4</sub>-OH form.

Cooling water: fresh, salt, brackish, cooling tower.

Copper alloy condenser tubing: yes, no. Copper alloy FW heater tubes: LP, HP, none.

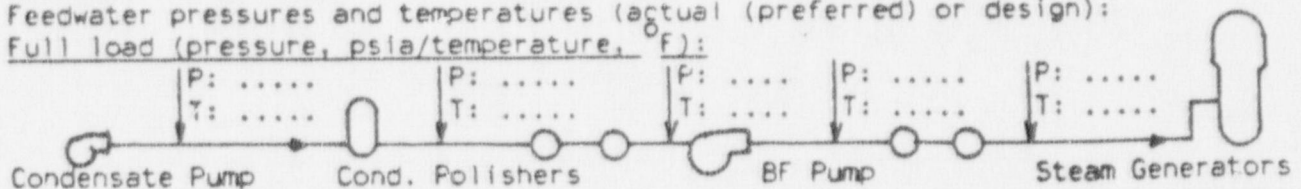
Boric acid used since: 19 ...; during: operation, layup, low load soaks, other.....

A. EROSION-CORROSION EXPERIENCE

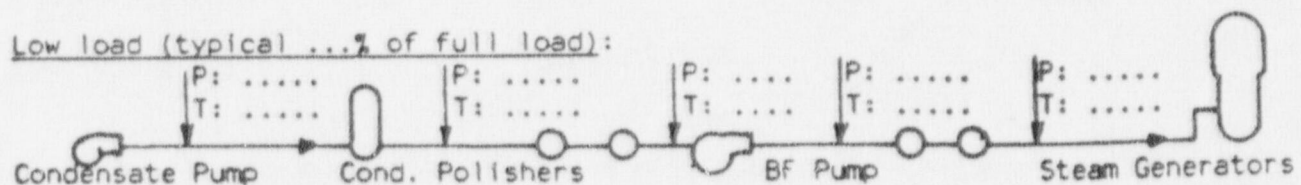
1. Erosion-Corrosion identified in wet steam piping: yes, no.
2. Erosion-Corrosion of MSR Chevrons or mesh: yes, no.  
Chevron material: stainless steel, carbon steel, other .....
3. Erosion-Corrosion of feedwater piping: yes, no. Date found .....  
Feedwater piping materials: .....
4. Erosion-Corrosion of: ..... elbows, ..... Ts, ..... diffusers, ..... reducers,  
.... valves, .... orifices, .... other components (specify).....
5. Erosion-Corrosion of J-Tubes: yes, no.
6. Erosion-Corrosion of feedwater distribution ring: yes, no.
7. Erosion-Corrosion of turbine: HP, LP; identify components: .....
8. Erosion-Corrosion of other cycle components (identify) .....
9. Feedwater temperature range where erosion-corrosion found: from .... to .....°F
10. Inspection frequency for feedwater piping ..... years. Steam lines ..... years.
11. Inspection methods used: ultrasonic thickness, radiography, visual, other.....

B. PIPING DESIGN

1. Maximum feedwater flow velocity ..... feet/second.
2. No. of feed pumps operating at 100% load ....., second pump On at .....% load.
3. Maximum flow velocity when only 1 pump is operating ..... feet/second.
4. No. of feedwater piping components: ..... elbows, ..... Ts, ..... diffusers,  
..... reducers, ..... valves, ..... orifices,  
..... other components (specify) .....
5. Maximum flow velocity in wet steam piping ..... feet/second.
6. Feedwater pressures and temperatures (actual (preferred) or design):  
Full load (pressure, psia/temperature, °F):



Low load (typical ...% of full load):



Please attach copies of the heat balance diagrams for your actual full load and typical low load.

### C. FEEDWATER AND CONDENSATE CHEMISTRY

1. Please complete the attached Table.
2. Feedwater chemistry history (average or typical values, final feedwater):

Year of oper.:	1st	1974	1976	1978	1980	1982	1983	1985	1986	1987
pH of FW maximum	.	.	.	.	.	.	.	.	.	.
minimum	.	.	.	.	.	.	.	.	.	.
average	.	.	.	.	.	.	.	.	.	.
pH of condensate maximum	.	.	.	.	.	.	.	.	.	.
minimum	.	.	.	.	.	.	.	.	.	.
average	.	.	.	.	.	.	.	.	.	.
DO, ppb maximum	.	.	.	.	.	.	.	.	.	.
minimum	.	.	.	.	.	.	.	.	.	.
average	.	.	.	.	.	.	.	.	.	.
Cat. Cond. uS/cm	.	.	.	.	.	.	.	.	.	.
Spec. Cond. uS/cm	.	.	.	.	.	.	.	.	.	.
NH <sub>3</sub> , ppb	.	.	.	.	.	.	.	.	.	.
N <sub>2</sub> H <sub>4</sub> , ppb	.	.	.	.	.	.	.	.	.	.
Boron, ppb	.	.	.	.	.	.	.	.	.	.
Air Inleakage, SCFM	.	.	.	.	.	.	.	.	.	.

Please send any water chemistry summary reports and data.

### 3. Chemical additions

- 3.1 Ammonia: typical concentration in feedwater .... ppb; added at .....
- 3.2 Hydrazine: typical concentration in feedwater .... ppb; added at .....
- 3.3 Boric acid: typical concentration in feedwater .... ppb as B;  
added at .....

### D. MATERIALS

1. Feedwater piping - list ASTM or other specification numbers .....
2. Wet steam piping: .....
3. Attach results of chemical analysis by you or pipe vendors.

PWR EROSION-CORROSION QUESTIONNAIRE  
(Check or Circle All Applicable)

Utility Company: Virginia Elec. & Power Co Unit Name: North Anna 2 MWe \_\_\_\_\_

Filled by: \_\_\_\_\_ Date: \_\_\_\_\_ Phone No. \_\_\_\_\_

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Condensate polishers: none, cation, powdex, mixed bed; .....% of feedwater flow;  
installed 19 ....; operated in: H-OH, NH<sub>4</sub>-OH form.

Cooling water: fresh, salt, brackish, cooling tower.

Copper alloy condenser tubing: yes, no. Copper alloy FW heater tubes: LP, HP, none.

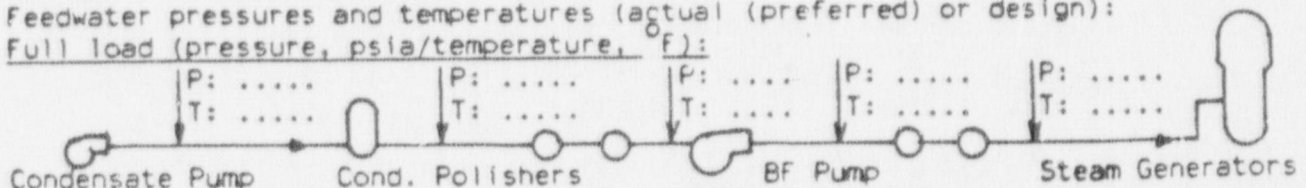
Boric acid used since: 19 ...; during: operation, layup, low load soaks, other.....

A. EROSION-CORROSION EXPERIENCE

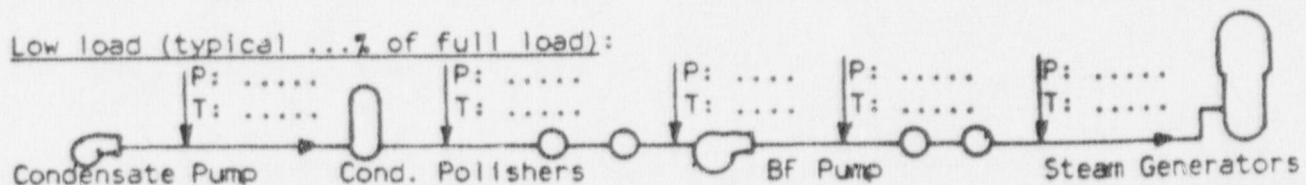
1. Erosion-Corrosion identified in wet steam piping: yes, no.
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3. Erosion-Corrosion of feedwater piping: yes, no. Date found .....
- Feedwater piping materials: .....
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..... valves, ... orifices, .... other components (specify).....
5. Erosion-Corrosion of J-Tubes: yes, no.
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..... reducers, ..... valves, ..... orifices,  
..... other components (specify) .....
5. Maximum flow velocity in wet steam piping ..... feet/second.
6. Feedwater pressures and temperatures (actual (preferred) or design):  
Full load (pressure, psia/temperature, °F):



Low load (typical ...% of full load):



Please attach copies of the heat balance diagrams for your actual full load and typical low load.



### C. FEEDWATER AND CONDENSATE CHEMISTRY

1. Please complete the attached Table.
2. Feedwater chemistry history (average or typical values, final feedwater):

Year of oper.:	1st	1974	1976	1978	1980	1982	1983	1985	1986	1987
pH of FW maximum	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
minimum	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
average	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
pH of condensate maximum	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
minimum	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
average	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
DO, ppb maximum	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
minimum	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
average	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Cat. Cond. uS/cm	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Spec. Cond. uS/cm	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
NH <sub>3</sub> , ppb	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
N <sub>2</sub> H <sub>4</sub> , ppb	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Boron, ppb	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Air Inleakage, SCFM	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Please send any water chemistry summary reports and data.

### 3. Chemical additions

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### D. MATERIALS

1. Feedwater piping - list ASTM or other specification numbers .....
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