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SUBJECT: Forwards completed questionnaire w/supporting responses to Section A, B. D & H re PWR secondary side water chemistry, per 870720 request.

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H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23
PWR SECONDARY SIDE WATER CHEMISTRY QUESTIONNAIRE

Gentlemen:

Per your letter of July 20, 1987, Carolina Power & Light Company hereby submits the completed questionnaire with supporting responses to Sections A, B, and D for H. B. Robinson, Unit No. 2.

If you have any questions regarding this matter, please call Mr. R. W. Prunty at (919) 836-7318.

Yours very truly,

S. R. Zimmerman
Manager
Nuclear Licensing Section

JSK/mss (5271JSK)

Enclosure

cc: Dr. J. Nelson Grace
Mr. K. Eccleston
Mr. H. Krug

411 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

A001
1/1

ENCLOSURE

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

Utility Company: Carolina Power & Light Unit Name: H.B. Robinson 2 MWe 750

Filled by: Dale Bates Date: 8/26/87 Phone No. (803) 383-1253

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

Condensate polishers: none, cation, powdex, (mixed bed); 100% of ~~feedwater~~ Condensate flow;
installed 19 84..; operated in: H-OH, NH4-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.....

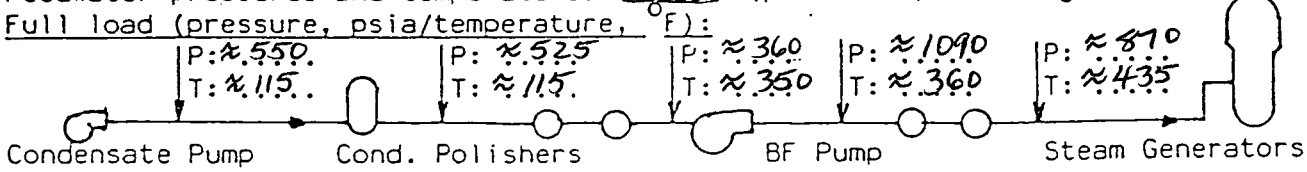
A. EROSION-CORROSION EXPERIENCE

1. Erosion-Corrosion identified in wet steam piping: (yes), no.
2. Erosion-Corrosion of MSR Chevrons or mesh: (yes), no. → mesh only - replaced with stainless chevrons in 1984.
   Chevron material: (stainless steel), carbon steel, other .....
3. Erosion-Corrosion of feedwater piping: yes, (no). Date found N/A.....
   Feedwater piping materials: A 106 Grade B.....
4. Erosion-Corrosion of: N/A elbows, N/A Ts, N/A diffusers, N/A reducers, N/A valves, N/A orifices, ... other components (specify)...N/A.....
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: H.P. Casing, LP Extraction Nozzles
8. Erosion-Corrosion of other cycle components (identify) #5 fwh Extraction lines, crossunder piping, FWP miniflow, FWH shell drains.....
9. Feedwater temperature range where erosion-corrosion found: from 150 to 360 °F (some less for others).
10. Inspection frequency for feedwater piping 3.. years. Steam lines 1..... years.
11. Inspection methods used: (ultrasonic thickness), radiography, (visual), other.....

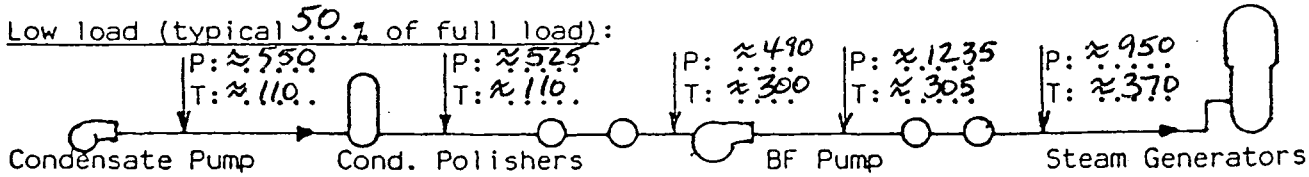
B. PIPING DESIGN

1. Maximum feedwater flow velocity ≈17.0..... feet/second.
2. No. of feed pumps operating at 100% load Two.., second pump On at ≈60..... % load.
3. Maximum flow velocity when only 1 pump is operating ..≈16.0..... feet/second.
4. No. of feedwater piping components: 65... elbows, 8... Ts, 7... diffusers, 3.. reducers, 20... valves, 0... orifices, 3.. other components (specify) flow nozzles.....
5. Maximum flow velocity in wet steam piping ≈158.4.... feet/second.
6. Feedwater pressures and temperatures (actual) (preferred) or design):

Full load (pressure, psia/temperature, °F):



Low load (typical 50 % of full load):



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

* 1970 - 1984 Phosphate Treatment
  1985 - Present AVT

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	*	*	9.4	9.6	9.7	9.6	9.7	9.6	9.6	9.4
minimum	*	*	8.4	8.2	8.3	8.0	8.4	8.6	8.5	8.8
average	*	*	9.0	9.0	9.2	9.0	9.0	9.0	9.0	9.0
pH of condensate										
maximum	*	*	9.3	9.6	9.8	9.6	9.7	9.8	10.0	9.3
minimum	*	*	8.4	8.3	8.3	7.8	8.6	8.6	6.9	8.5
average	*	*	9.0	9.0	9.2	9.1	9.2	9.1	9.1	9.1
DO, ppb maximum	*	*	N/A	N/A	25	12	5	26	26	6
minimum	*	*	N/A	N/A	5	ND	ND	ND	ND	ND
average	*	*	NA	N/A	ND	<1	<1	2	<1	<1
Cat. Cond. uS/cm	*	*	N/A	N/A	NA	N/A	NA	.06	.05	.05
Spec. Cond. uS/cm	*	*	N/A	N/A	N/A	5.0	7.5	3.5	3.3	3.2
NH_3, ppb	*	*	600	300	400	500	1000	400	400	300
N_2H_4, ppb	*	*	10	10	30	5	30	50	50	45
Boron, ppb	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Air Inleakage, SCFM	*	*	*	17	24	2	2.5	2	3	3

Please send any water chemistry summary reports and data.

3. Chemical additions

3.1 Ammonia: typical concentration in feedwater 350 ppb; added at Condensate Polisher Discharge
3.2 Hydrazine: typical concentration in feedwater 50 ppb; added at Condensate Polisher Discharge
3.3 Boric acid: typical concentration in feedwater N/A ppb as B; added at N/A

D. MATERIALS

1. Feedwater piping - list ASTM or other specification numbers A106 Grade B
2. Wet steam piping: A106 Grade B and A-155 Grade KC-55-1.
3. Attach results of chemical analysis by you or pipe vendors. Per ASTM Specs.

* Data for 1970-1974 is available but has not been verified due to retrievability & time constraints, however there would not be a significant difference from 1976-1983.

SUPPLEMENTARY INFORMATION

A1. Yes, HP crossunder to MSR inlet.

A5. No, did not have J-tubes until 1984 (S/G Replacement).

A6. No, replaced distribution ring in 1984.

A7. HP turbine casing, LP extraction nozzle (very little).

A8. HP turbine extraction piping to No. 5 feedwater heaters, HP exhaust piping to MSRs, feedwater pump mini-flow recirculation piping, feedwater heater shell side drain piping downstream of level control valves.

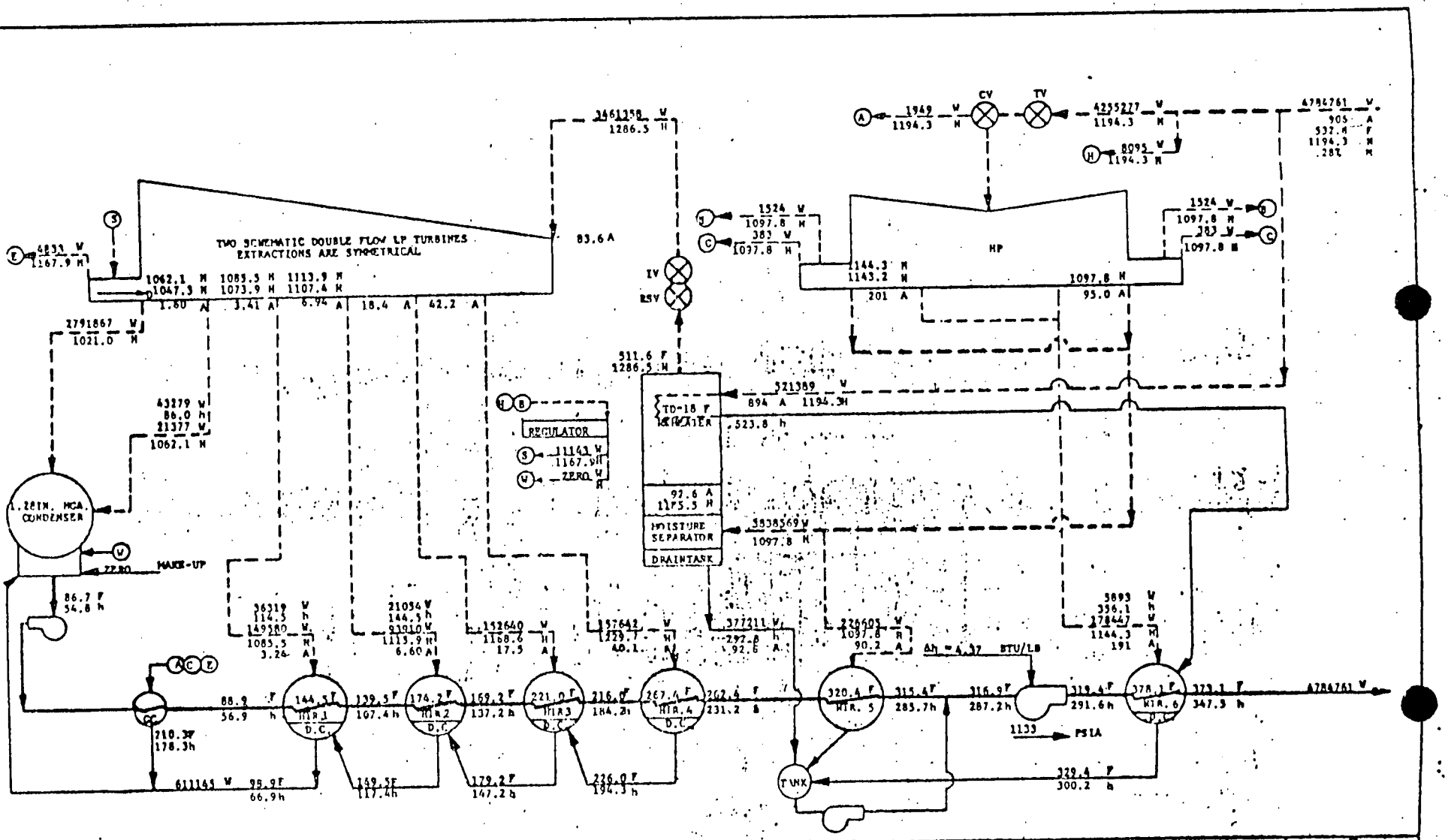
A10. FW piping currently to be inspected every other cycle. Steam lines inspected every cycle for some components and less frequently for others.

B4. The following is a list of components in the feedwater piping system downstream of the feedwater pumps. This list includes all piping in the main flow path to all three steam generators and from both main feedwater pumps:

65 elbows, 8 Ts, 7 diffusers
3 reducers, 20 valves, ∅ orifices
3 nozzles

D3. HBR ASME Class 3 and Class 2 Feedwater Piping is schedule 100 and no erosion in the main piping flow path has been observed. Pipe sizes are: 20-inch diameter at the discharge of the feedwater pumps and 16-inch diameter in the three steam generator feedwater lines.

(5271JSK/ppo)



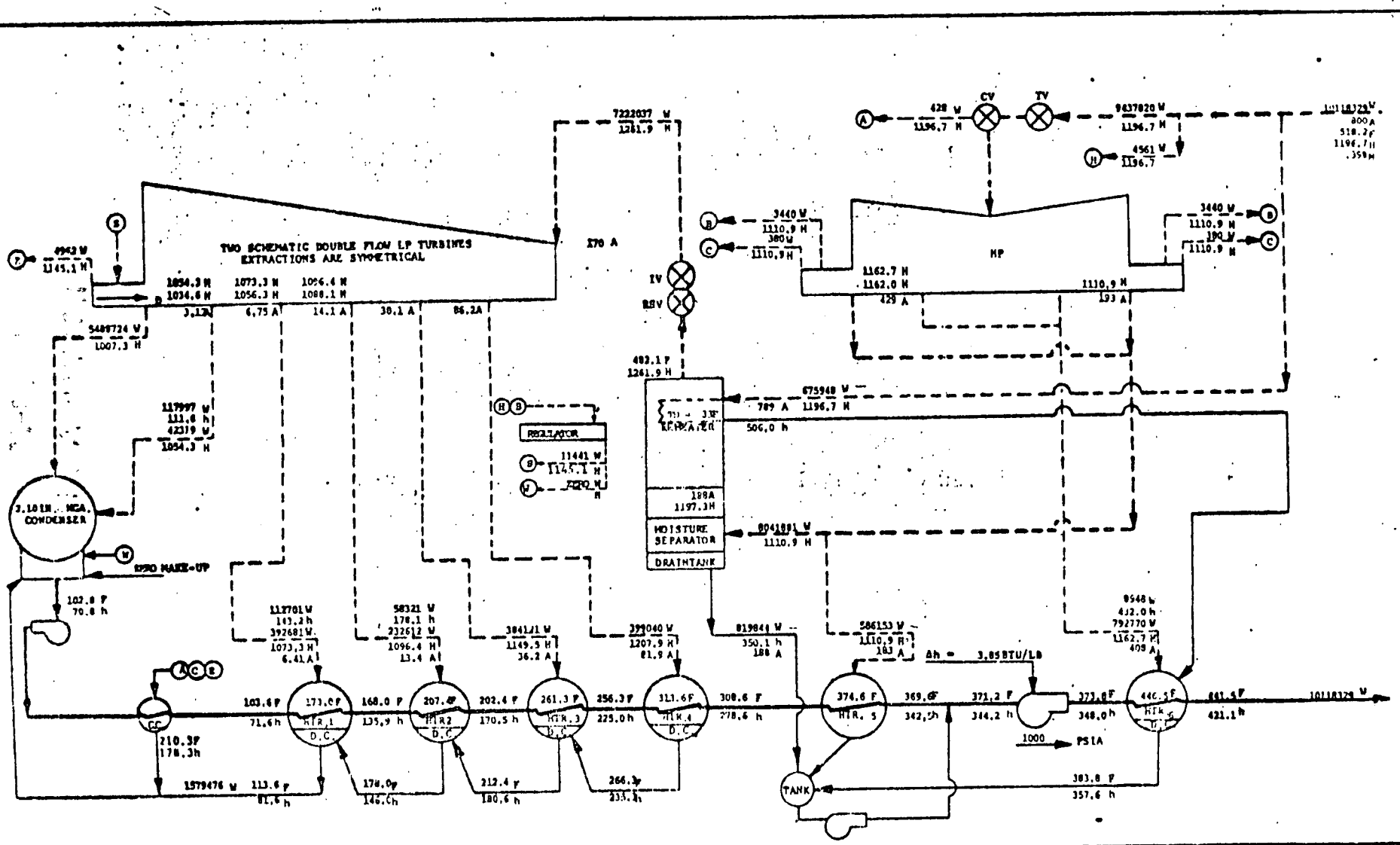
(1) CALCULATIONS ARE BASED ON NO RADIATION LOSSES TO HEATERS OR EXTRACTION PIPING LOCATED IN THE CONDENSER NECK.

(2) CALCULATIONS ARE BASED ON 1967 ASME STEAM TABLES.

(3) HEAT RATES ARE BASED ON THROTTLING LOSSES ACROSS CONTROL VALVES.

STEAM GENERATOR FLOWS ARE NOT GUARANTEED.

MAX. GUAR. STEAM GEN. FLOW= 9662140 LB/HR 2300 PSIT STEAM GEN. FLOW= 10118329 LB/HR



GROSS HEAT RATE = $\frac{10118329\ (1196.7 - 421.1)}{772529}$ = 10159 BTU/KWHR	TEP = 1007.2 BTU/LB EHEP = 995.7 BTU/LB MECH. LOSS = 2770 KW ELECT. LOSS = 10779 KW 0.9 PF MIN H_2 HFP POWER = 11426 KW	NAME PLATE RATING 743013 KW TURBINE-GENERATOR UNIT 808 PSIA 519.4 F 2.0 IN. HG A. 854090 KVA 0.9 PF 22000 VOLTS 75 # H_2
(1) CALCULATIONS ARE BASED ON NO RADIATION LOSSES TO HEATERS OR EXTRACTION PIPING LOCATED IN THE CONDENSER NECK. (2) CALCULATIONS ARE BASED ON 1967 ASME STEAM TABLES. (3) HEAT RATES ARE BASED ON THROTTLING LOSSES ACROSS CONTROL VALVES. STEAM GENERATOR FLOWS ARE NOT GUARANTEED. MAX. GUAR. STEAM GEN. FLOW= 9662160 LB/HR 2300 MWT STEAM GEN. FLOW= 10118329 LB/HR	TC4F-44	772529 KW GROSS LOAD HEAT BALANCE 2300 MWT - NOT GUARANTEED

LESTER, PENNA

ENGR. PHS/CP

DATE: 9/24/74

REV. A0:80-7063

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