

Title: D-3 STEAM GENERATOR
DOWNCOMER FLOW RATESCalculated by: A. ZARECHNOKDate: 1-6-83Checked by: L. BuckDate: 1-20-83Reviewed by: L. BuckDate: 1/28/83

Project: _____

Page 1 of _____PURPOSE:

The purpose of this calculation is to compare the flow rates measured in the downcomer of the D-3 steam generator at Ringhals to those calculated by the TRANFLO computer program.

SUMMARY OF RESULTS:

Agreement is reasonable between calculated and measured values for both total flow rate (and thus circulation ratio) and for flow split between hot leg and cold leg sides of downcomer.

Title: _____

Calculated by: A. Zarechka Date: 1-27-83Checked by: E. And Date: 1-28-83Reviewed by: W.B. Date: 1/28/83

Project: _____

Page 2 of _____

Both measured and calculated results indicate a circulation ratio slightly less than 2.0 at full power and somewhat greater than 2.0 near 86% power. Both measured and calculated results indicate significantly greater flow down the hot leg side of the downcomer than the cold leg side. The results are summarized in Table 1, below.

Titles: _____ Calculated by: A. Zorochuch Date: 1-15-83
 _____ Checked by: L. Reed Date: 1-20-83
 _____ Reviewed by: W.B. Date: 1/28/83

Projects: _____

TABLE 1
 SUMMARY OF RESULTS

	POWER	RINGHALS DATA	TRANFLO CALCULATION
CIRCULATION RATIO	~150?	1.82	1.75
CIRCULATION RATIO	~86?	2.17	2.08
<u>HOT LEG FLOW</u> COLD LEG FLOW	~150?	1.23	1.30
<u>HOT LEG FLOW</u> COLD LEG FLOW	~86?	1.19	1.19

Title: _____ Calculated by: A. Zarechnak Date: 1-27-83
Checked by: F. And Date: 1-28-83
Reviewed by: LB Date: 1/28/83

Projects: _____

CALCULATIONS

1. TRANFLO Calculations

Calculations of the flow rates throughout the 2-3 steam generator were performed with the calculational model documented in Appendix B of this report

The resulting steady state output is included at the end of this appendix and is summarized in Table 2, below.

Titles: _____ Calculated by: A. Zarechnak Date: 1-27-83
 _____ Checked by: E. Patel Date: 1-28-83
 _____ Reviewed by: W.B. Date: 1/28/83

Projects: _____ Page 5 of _____

TABLE 2
DOWNCOMER FLOW RATES (LB/SEC)
CALCULATED BY TRANFLO

	POWER	
	<u>1007.</u>	<u>867.</u>
HOT LEG**	470	555
COLD LEG**	361	467
TOTAL DOWNCOMER	831	1022
FEED FLOW	1105	950
CIRCULATION RATIO*	1.75	2.08

* CIRCULATION RATIO = $\frac{\text{DOWNCOMER} + \text{FEED FLOW}}{\text{FEED FLOW}}$

** Hot leg side of downcomer is connector 38 in attached computer output;
 Cold leg side is connector 39.

Titles: _____ Calculated by: A. Zaretski Date: 1-27-83
 _____ Checked by: E. Reed Date: 1-28-83
 _____ Reviewed by: LAB Date: 1/28/83

Project: _____

Page 6 of _____

2. Ringhals Measurements

Flow measurements obtained at Ringhals are summarized in Table 3, below. Summing stations 3 and 4 for the cold leg side and 5 and 6 for the hot leg side yields the following results:

DOWNCOMER FLOW RATES (LB/SEC)
MEASURED AT RINGHALS

	POWER	
	<u>100%</u>	<u>87%</u>
HOT LEG	503	604
COLD LEG	409	509
TOTAL DOWNCOMER	912	1113
FEED FLOW*	1105	950
CIRCULATION RATIO	1.82	2.17

*Specified boundary condition

Title: _____ Calculated by: A. Zarechmal Date: 1-20-83
 _____ Checked by: E. Lind Date: 1-24-83
 _____ Reviewed by: W.B. Date: 1/28/83

Projects: _____ Page 7 of _____

TABLE 3

RINGHALS DOWNCOMER FLOW TEST DATA*

POWER	DOWNCOMER FLOW (lb/hr x 10 ⁻⁵)			
	STATION** 3	STATION 4	STATION 5	STATION 6
99	6.30	8.42	8.75	9.37
87	8.23	10.08	10.62	11.14
80	8.54	10.26	11.36	11.61
50	10.28	13.34	13.34	14.15

* obtained in a telephone conversation with Mr. Hu (NTD) on 5-3-82

** Stations 3 and 4 are on cold leg side of downcomer; Stations 5 and 6 are on hot leg side of downcomer