CP&L

Carolina Power & Light Company

May 21, 1980

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Office of Nuclear Reactor Regulation
ATTENTION: Mr. T. A. Ippolito, Chief
Operating Reactors Branch No. 3
United States Nuclear Regulatory Commission
Washington, D.C. 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-324
LICENSE NO. DPR-62
CYCLE 4 RELOAD ANALYSIS AND EOC-RPT
DOCUMENTATION OF VERBAL RESPONSES

Dear Mr. Ippolito:

The purpose of this letter is to document Carolina Power & Light Company's (CP&L) responses to several NRC staff information requests which occurred during several telephone conference calls which discussed the End-of-Cycle Recirculation Pump Trip System (EOC-RPT) and the Cycle 4 reload analysis for Brunswick Steam Electric Plant (BSEP) Unit. No. 2.

Brunswick Unit 2 tested its EOC-RPT system as it was shutting down for refueling at the end of Cycle 3. The test was performed at 73% power and 97% core flow. The criteria to be met was for the EOC-RPT breaker response time to be less than or equal to 175 msec. and the recirculation pump flow coastdown curve was to fall within the coastdown curve predicted by General Electric (GE) for the BSEP-2 system. The indicated response time (175 msec.) was that assumed by GE in their EOC-RPT analysis. Refer to Attachment 1 for an outline of this assumption. The predicted flow coastdown curve was based on Brunswick-specific input data and the calculation of an inertial constant calculated from the pump/motor nameplate data, to which a 15% design factor for conservatism has been added. The measured response time was 105 msec., and, as can be seen from Attachment 2, the measured coastdown curve falls within the bounds of the predicted curve. A summary of the parameters measured for this test is presented in Attachment 3. The 105 msec. response was determined from two components: (1) 20 msec. from initial turbine stop valve movement to the 90% open position switch actuation, and (2) 85 msec. from the 90% open position switch actuation to load current arc suppression.

The predicted coastdown curve is conservative for Cycle 4 and future cycles because the curve was calculated with an additional 15% inertia included in the pump/motor inertia calculation which tends to increase the coastdown time. Since there is no known mechanism which would increase the pump/motor inertia, this predicted curve will be conservative.

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Since the EOC-RPT system was tested, a modification was installed on the recirculation pumps which required an increase in diameter of the pump shaft and associated parts. This change increased the pump/motor inertia by only 9.0 lb-ft^2. GE has evaluated this change, which was less than 0.1%, and has determined it to be insignificant with regard to the predicted coastdown curve.

The following question was asked again during the aforementioned conference calls. This is a restatement of the question based on meetings at NRR headquarters in April of 1979: What would be the effect of a single stop valve or control valve failing to close during a turbine trip without bypass (TT w/o Byp.) or a load reject without bypass (LR w/o Byp.) event, respectively? Although this question is outside the scope of the single failure criterion, CP&L provided a response to the question in its submittal of April 27, 1979, Serial Number GD-79-1143.

Another question that was addressed during the conference calls was that the NRC staff had found a statement in the BSEP FSAR which stated that the LR w/o Byp. was more severe than a TT w/o Byp. The NRC asked why the LR w/o Byp. had not been considered in the Unit 2 reload analysis. The LR w/o Byp. was the most severe, most limiting, core wide pressurization transient for the initial cycle; however, the most limiting pressurization transient can and does change for subsequent cycles. Item 9 of the supplemental reload licensing submittal only lists the most limiting of the core wide transient analyses results. Since the limiting core wide pressurization transient can be either a TT w/o Byp. or a LR w/o Byp., both events are analyzed for each reload with the most limiting results presented in Item 9. As can be seen in the BSEP Unit 2 reload license submittals, NEDO-24235 (with RPT) showed that TT w/o Byp. was the most limiting, while NEDO-24235 Revision 1 (without RPT) showed that LR w/o Byp. was the most limiting. For completeness, the results of the less limiting pressurization transients are presented in Attachment 4.

The following items which did not involve the EOC-RPT system were also discussed.

1. A 0.02 MCPR penalty was added to the analysis results to account for the uncertainty in the R factor for the misoriented and mislocated fuel assembly analyses. No other specific penalties have been applied to the BSEP-2 reload analysis.

2. Additional discussions were held regarding a MCPR penalty imposed by NRC to account for non-conservatisms in ODYN calculation results. This penalty and its imposition on BSEP analyses are presently being discussed between CP&L and GE. CP&L hopes to be able to address this penalty by May 23, 1980.

3. The Brunswick Plant will perform the startup physics tests discussed in our May 16, 1979 submittal to the NRC on BSEP-2 during startup from the present refueling outage.

This information documents our verbal responses to questions from your staff. If you should have further questions please contact my staff.

Yours very truly,

E. E. Utley
Executive Vice President
Power Supply
and
Engineering & Construction

DCS/jcb

Attachments

Attachment 1

Brunswick Unit No. 2

GE Assumptions

The following is a description of GE's assumptions with regard to the EOC-RPT response time used in their analyses.

Load Reject Event

Time (msec.)	Description	
0	Initial TCV* movement	
30	Trip signal generated @ EHC pressure switch	EOC-RPT Logic Train Functions
40	EOC-RPT breaker trip coil gets its signal	
175	Load current arc suppression	

Turbine Trip Event

Time (msec.)	Description
0	Initial TSV** movement
10	TSV reaches 90% open position switch
20	90% open position switch generates trip signal
30	EOC-RPT breaker trip coil gets its trip signal (For conservatism GE assumes this time to be 40 msec. as is the case in the load reject event)
175	Load current arc suppression

*TCV - Turbine Control Valve
**TSV - Turbine Stop Valve

Attachment 2

Brunswick Unit No. 2

Flow Coastdown Curves

Note: Curves plotted by circled data points are measured coastdown curves from BSEP-2 test data.

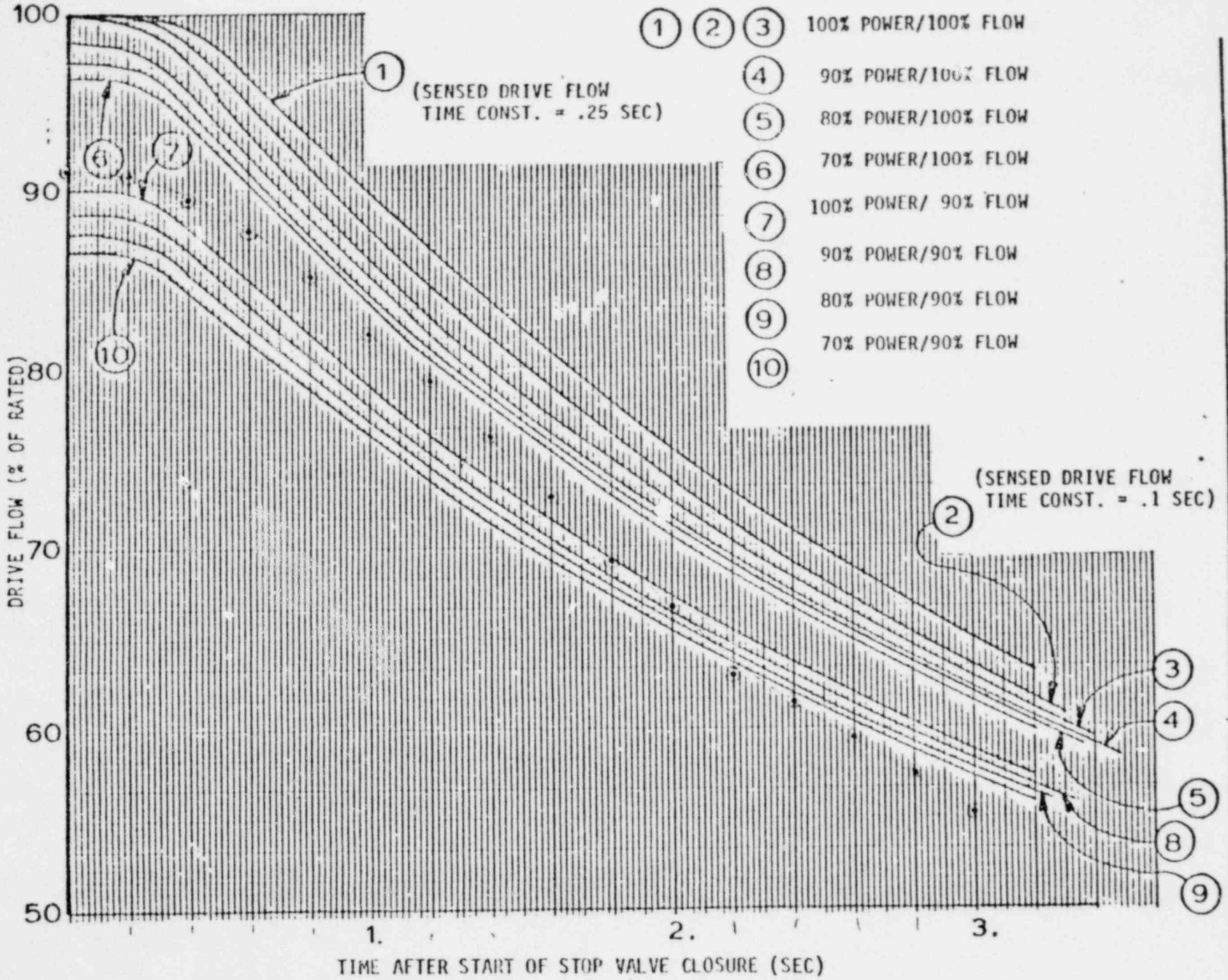

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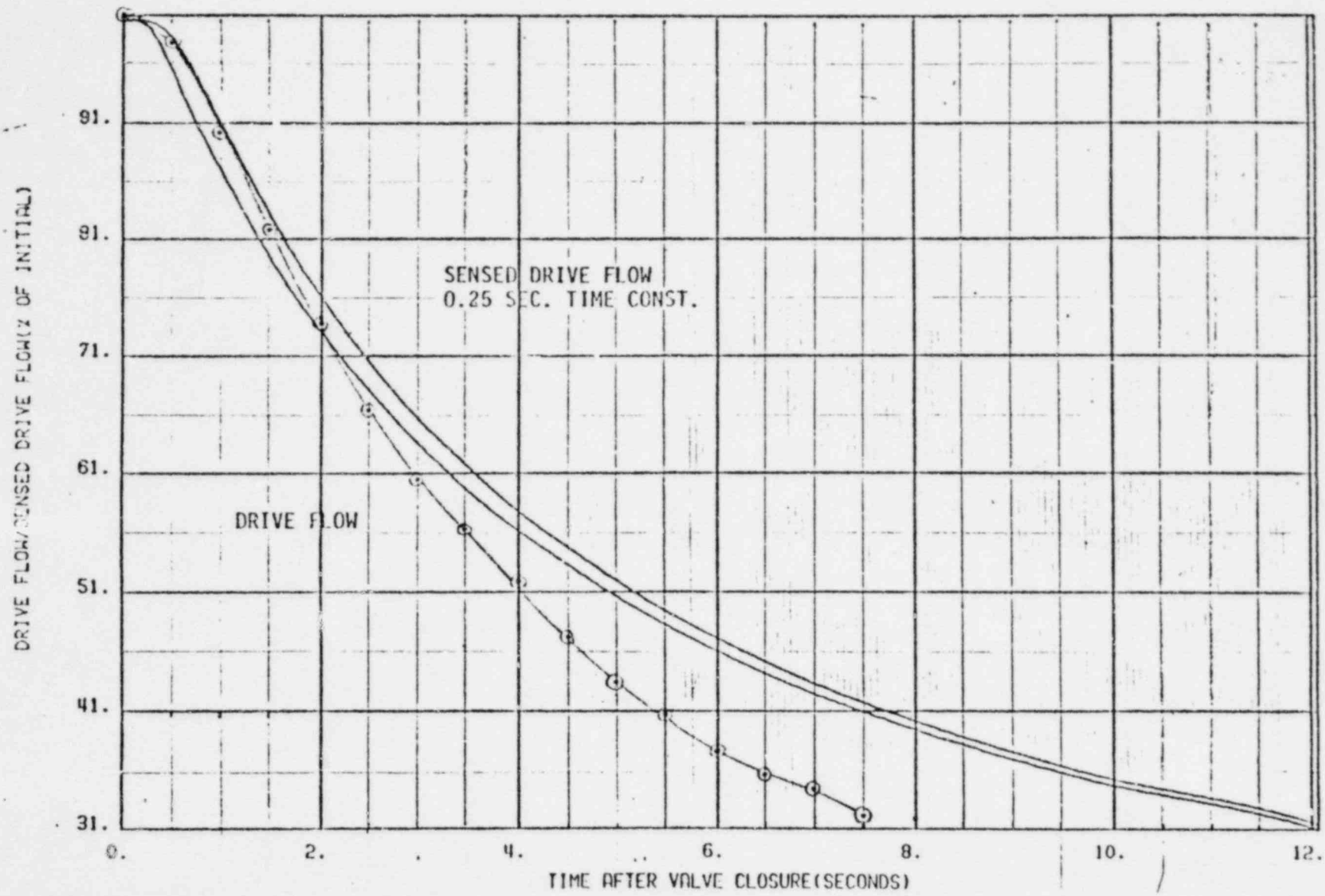
FIGURE 2 TURBINE/GENERATOR TRIP



BRUNSWICK 2. TURBINE TRIP RPT TEST CYCLE 3(70%P/100%F)

FIGURE 6

REV. 0

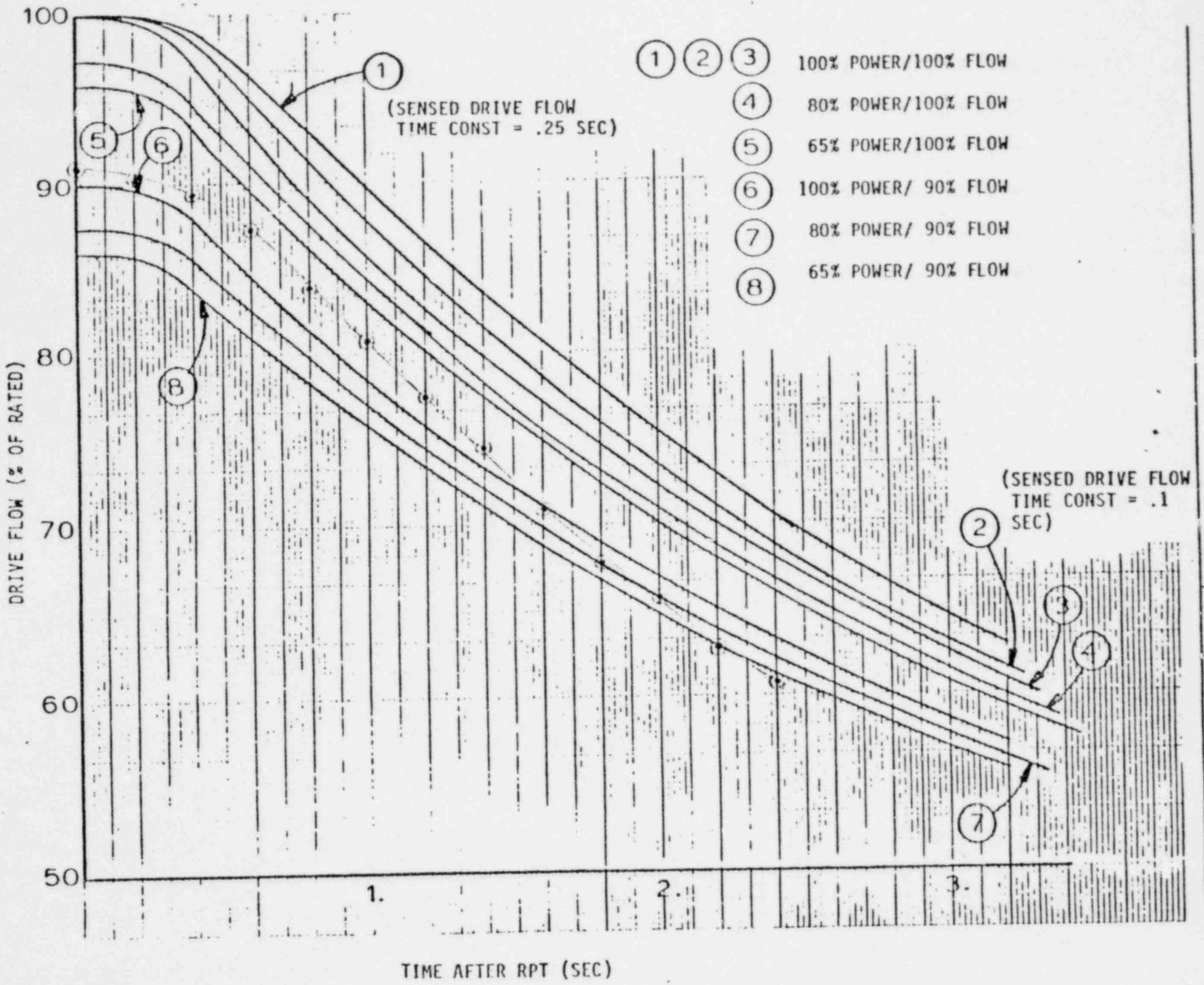


FIGURE 1 TWO PUMP TRIP

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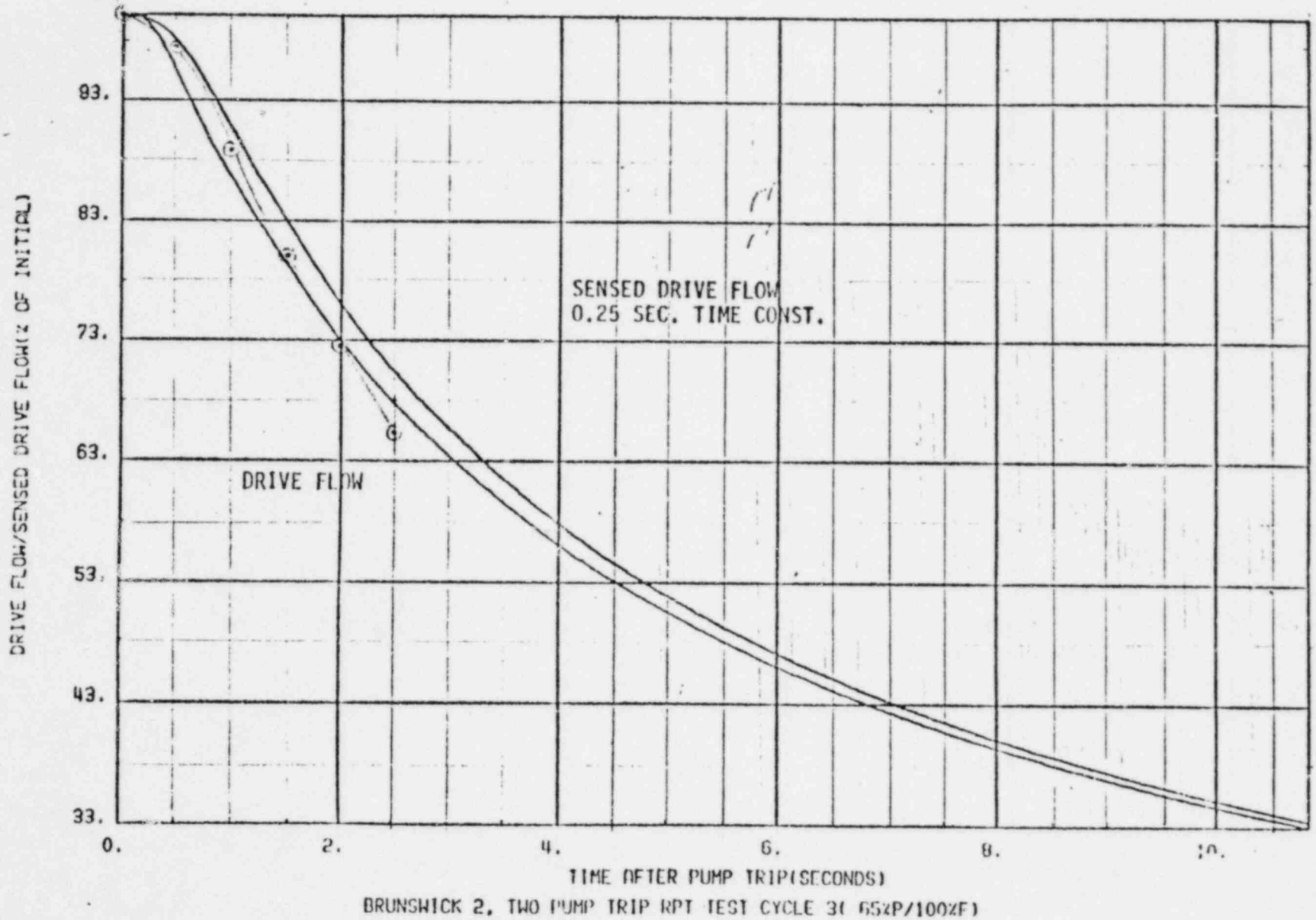
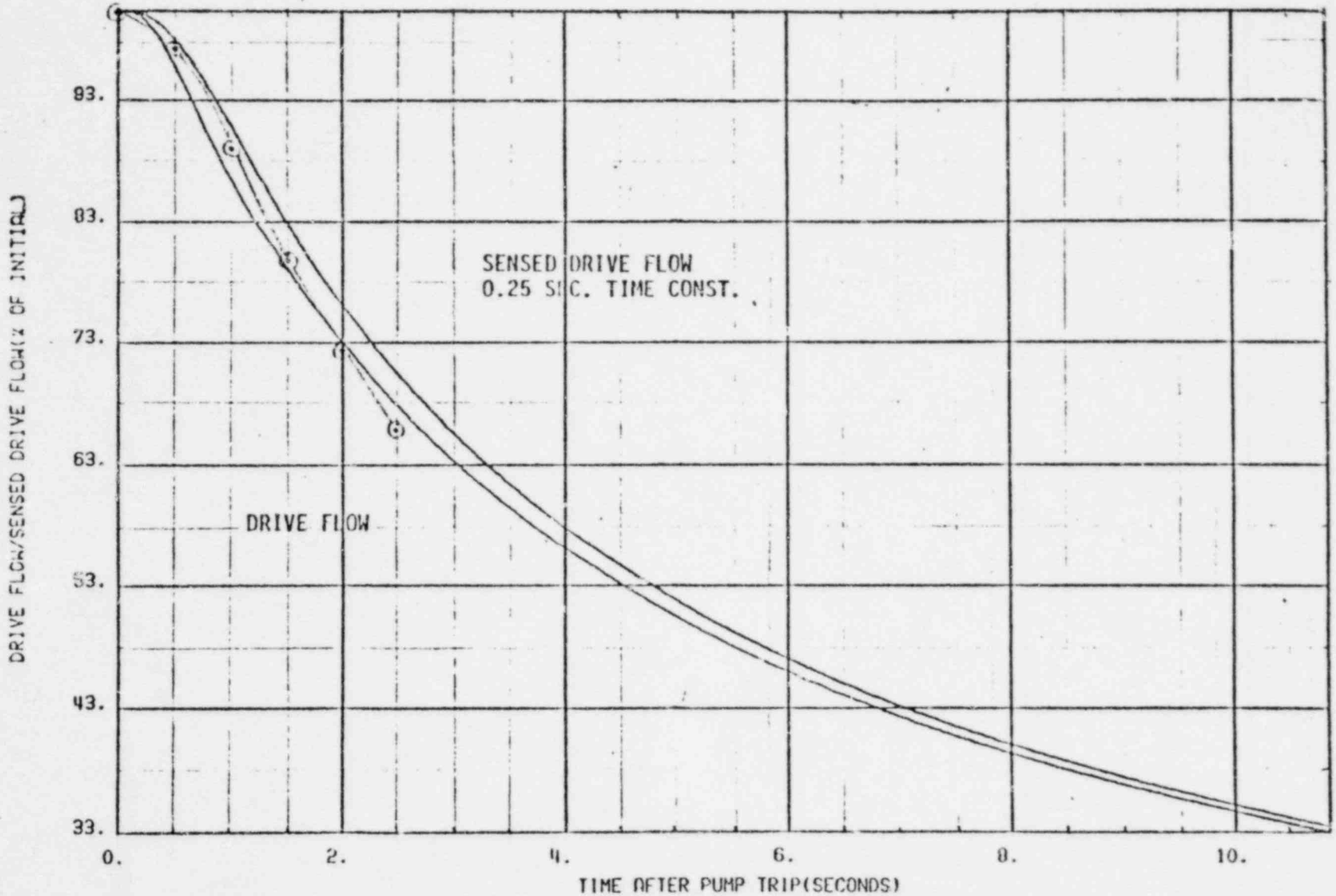


BRUNSWICK 2, TWO PUMP TRIP RPT TEST CYCLE 3(65%P/100%F)

FIGURE 14

REV. 0



BRUNSWICK 2, TWO PUMP TRIP RPT. TEST CYCLE 3(80%P/100%F)

FIGURE 13

REV. 0

Attachment 3

Brunswick Unit No. 2

RPT Test: Measured Parameters

1. TSV* #2 position
2. TSV #1 90% open limit switch
3. TSV #2 90% open limit switch
4. TSV #3 90% open limit switch relay coil
5. RPT Circuit Breaker 3A status lights
6. RPT Circuit Breaker 3B status lights
7. RPT Circuit Breaker 4A status lights
8. RPT Circuit Breaker 4B status lights

} Indicates trip coil voltage

9. Recirc. Pump A motor current
10. Recirc. Pump B motor current
11. Total Core Flow
12. Recirc. Loop A Drive Flow
13. Recirc. Loop B Drive Flow
14. Reactor Power (Computer Print-Out)
15. AC Current
16. Current Transducer Output

} Response of Current Transducer

17. Calibrated Pressure Ramp
18. Output of Barton Flow Transmitter

} Response Time of Flow Transmitter

*TSV - Turbine Stop Valve

Attachment 4

Brunswick Unit No. 2

Pressurization Transient Data

	Fuel Type	7x7	8x8	8x8R	P8x8R
With EOC-RPT LR w/o Byp.*	REDY ΔMCPR's	.07	.10	.10	.11
	ODYN ΔMCPR's	.08	.11	.12	.13
Non-RPT TT w/o Byp. **	ΔMCPR@ EOC-2000 MWD/t	.03	.06	.06	.07
	ΔMCPR@ EOC-1000 MWD/t	.12	.18	.17	.19
	ΔMCPR@ EOC	.19	.26	.25	.27

* Load Reject Without Bypass

** Turbine Trip Without Bypass