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June 13, 1962

HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

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TITLE

Reactor Statistics - Section III
April, 1961 - May 15, 1962

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AUTHOR

R. C. Burke

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June 13, 1962

REACTOR SIMULATION STUDY

The following discussion and attached summary report is sent to you to illustrate the type of information that is currently in data processing machine language and available to those who require it. During the progress meetings at which these reports were discussed, several persons indicated a desire to have a documented explanation of the report and a personal copy to scan. This is the answer to these requests.

The reports are comprised of three major sections. The first is a map indicating the number of recordings of data in the category defined by the function number code. The second is a summary of the data, in terms of hours, for each of the functions performed during an outage, except secondary function code number 21 which is the number of tubes associated with the basic function performed. The third is a summary of the secondary functions performed within a basic function class, the associated delay total, and the number of tubes involved for those functions where a delineation by tube count may be of interest.

The function code numbers relate directly to the definitions of the hours expended for charge-discharge, rupture removal, tube leak repair, tube replacement, and so forth. These definitive classes are taken from the distribution records supplied by the various reactor analysts and summarized by the Reports and Statistics group in the IPD Production Operation. The listing and record count map are an enlargement of the summary form designed in April of 1961. The codes are as follows:

	<u>Primary</u>	<u>Secondary</u>
***	1. Charge discharge - normal	1. Same as primary
Functions	2. Charge discharge - special	2. Same
	3. Charge discharge - problem	3. Same
	4. Rupture Removal	4. Same
	5. Water leak repair	5. Same
	6. Tube replacement	6. Same
	7. Tube replacement - abnormal	7. Same
	8. Mechanical Maintenance	8. Same
	9. Instrument Maintenance	9. Same
	10. Electrical Maintenance	10. Same

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	<u>Primary</u>	<u>Secondary</u>
	11. Standard Check	11. Same as Primary
	12. Production Test	12. Same
	13. Project Work	13. Same
	14. Miscellaneous - Other	14. Same
***	15. Cooling Time	15. Same
Delays	16. Startup Time	16. Same
	17. Equipment Breakdown	17. Same
	18. Delays - Man	18. Same
	19. Turco	19. Same
	20. Miscellaneous	20. Same
	21. Probologging	**21. Number of tubes involved
	22. Scrums	

One will notice immediately that the various time elements across any given function code row (primary function) do not necessarily have equal total values. The reason here is that some tasks are distributed according to the function governing or controlling the outage during different periods of the given outage. As an example, the records indicate that tube leak work was performed while normal charge-discharge was governing or the time controlling portion of a given outage. Therefore, one will find the tube leak repair hour requirements in row 1 under secondary function number 5 indicating the leak work was performed during the period when charge-discharge was the outage controlling function. The same distribution pattern will be especially noticeable with regard to associated maintenance time requirements. To determine the amount of time associated with a specific function one should look at the diagonal element for that particular function. For example, tube leak work during tube leak controlling periods will show up on the function row number 5 under secondary function column 5, and so forth.

The number of elements involved in this analysis versus the width of the paper on which to write the information required a slight modification. Therefore, it will be noted that each row is split with regard to the secondary functional relationship. The first fourteen functions are corrective in nature and the remaining are the unavoidable delays required to perform the necessary corrective work. Therefore, each row is broken at this logical point. The corrective first, followed by the associated delays ending with the corresponding tube count.

The third portion of each reactor report is a summary of the corrective time requirements, a summary of the associated delays, followed by the tube count for the period reported.

This report summarizes all the recorded data starting April 1, 1961 to May 15, 1962. This same analysis can be run for any reactor for any incremental period considering any one or combinations of causes for an outage during the above mentioned period. For example, one can get an analysis for B reactor, for the period July 1, 1961 through December 31, 1961 covering the outages for tube leaks and ruptures.

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The last page of the report is a summation of all the hours expended during the period for each of the recovery functions. This summary presents a reasonably good picture of the distribution of the total outage time to the various activities. One can, if he desires, calculate the percentage of time attributed to charge-discharge, rupture removal, mechanical maintenance and so forth. The averages, variance and standard deviation associated with tube count, in this case, are valueless.

Appendix A is an updated analysis which parallels the report HW-57166, but covers the period April 1, 1961 to May 16, 1962.

R. C. Burke

R. C. Burke
OPERATIONS RESEARCH & SYNTHESIS

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REACTOR 4 OUTAGE FUNCTION EXPECTATION REPORT

APRIL 1961 TO MAY 15 1962

THIS IS AN EXEMPLARY REPORT ILLUSTRATING
AVERAGE TIME REQUIREMENTS AND EXPECTED
VARIANCES FOR THE BASIC TASKS REQUIRED
TO RE-ESTABLISH ON-LINE PRODUCTION STATUS.

••ALL DATA IN HOURS-EXCEPT SECONDARY FUNCTION#21#TUBE COUNT.

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•• INCIDENT EXPERIENCE BY CAUSE FUNCTION ••

SECONDARY FUNCTION NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
FUNCTION 1	22	0	2	2	2	1	1	2	0	0	0	0	0	0	16	20	11	13	3	2	21
FUNCTION 2	7	10	0	0	0	0	0	0	0	0	1	0	0	0	10	11	2	3	3	0	14
FUNCTION 3	7	0	3	0	0	0	0	3	0	0	0	0	0	0	4	5	0	1	0	1	9
FUNCTION 4	15	0	0	9	1	0	0	4	0	0	0	0	0	1	13	19	1	3	0	0	20
FUNCTION 5	23	0	0	0	27	3	0	40	0	0	1	0	0	1	44	47	4	21	4	1	38
FUNCTION 6	9	0	0	0	0	10	0	12	1	0	1	2	0	0	14	14	3	5	3	1	16
FUNCTION 7	0	0	0	0	0	0	4	2	0	0	0	0	0	0	2	3	0	1	1	1	5
FUNCTION 8	6	0	0	0	0	0	0	49	21	1	0	0	0	0	31	33	2	13	3	1	0
FUNCTION 9	0	0	0	0	0	0	0	0	25	0	0	0	0	0	10	14	2	3	2	0	0
FUNCTION 10	0	0	0	0	0	0	0	0	0	8	0	0	0	0	2	4	0	0	1	0	0
FUNCTION 11	2	0	0	0	0	0	0	5	0	0	6	0	0	0	4	8	0	2	0	0	0
FUNCTION 12	3	1	0	0	0	0	0	1	0	0	1	5	0	0	6	7	2	3	1	0	1
FUNCTION 13	1	0	0	0	0	0	0	1	0	0	0	1	8	0	4	6	1	1	2	1	0
FUNCTION 14	4	0	1	0	0	0	0	2	2	0	0	1	4	14	3	3	0	1	0	0	0
FUNCTION 15	30	4	1	3	18	6	2	13	9	0	1	4	2	2	0	0	0	0	0	0	0
FUNCTION 16	28	4	1	5	18	6	3	13	10	0	3	5	2	2	0	0	0	0	0	0	0

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SECONDARY
FUNCTION NUMBER

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	15	16	17	18	19	20	21							
FUNCTION 1														
TGT.HOURS DOWN	259.4	0.	5.3	7.4	4.2	3.3	1.0	4.2	0.	0.	0.	0.	0.	0.
INCIDENTS	22	0	2	2	2	1	1	2	0	0	0	0	0	0
AVERAGE DOWN	11.8	0.	2.6	3.6	3.1	3.3	1.0	2.1	0.	0.	0.	0.	0.	0.
VARIANCE	133.7	-0.	5.4	21.6	8.6	0.	0.	1.0	-0.	-0.	-0.	-0.	-0.	-0.
STD.DEVIATION	11.4	-0.	2.3	4.7	3.0	0.	0.	1.0	-0.	-0.	-0.	-0.	-0.	-0.

FUNCTION 1														
TGT.HOURS DOWN	19.1	38.1	14.4	12.1	7.6	1.7	4145.							
INCIDENTS	18	20	11	13	3	2	21							
AVERAGE DOWN	0.8	1.9	1.3	0.9	2.4	0.8	198.							
VARIANCE	0.2	2.2	0.7	0.7	1.7	0.4	74194.							
STD.DEVIATION	0.5	1.5	0.8	0.8	1.3	0.6	272.							

FUNCTION 2														
TGT.HOURS DOWN	45.2	29.7	0.	0.	0.	0.	0.	0.	0.	0.	3.3	0.	0.	0.
INCIDENTS	7	10	0	0	0	0	0	0	0	0	1	0	0	0
AVERAGE DOWN	4.5	3.0	0.	0.	0.	0.	0.	0.	0.	0.	3.3	0.	0.	0.
VARIANCE	24.3	4.3	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	0.	-0.	-0.	-0.
STD.DEVIATION	4.9	2.1	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	0.	-0.	-0.	-0.

FUNCTION 2														
TGT.HOURS DOWN	5.3	8.2	3.4	5.3	0.6	0.	662.							
INCIDENTS	10	11	2	3	3	0	14							
AVERAGE DOWN	0.5	0.7	1.7	1.8	0.2	0.	41.							
VARIANCE	0.4	0.5	5.1	7.8	0.0	-0.	1639.							
STD.DEVIATION	0.6	0.7	2.3	2.8	0.1	-0.	40.							

FUNCTION 3														
TGT.HOURS DOWN	16.2	0.	4.3	0.	0.	0.	0.	22.7	0.	0.	0.	0.	0.	0.
INCIDENTS	7	0	3	0	0	0	0	5	0	0	0	0	0	0
AVERAGE DOWN	2.3	0.	2.1	0.	0.	0.	0.	4.5	0.	0.	0.	0.	0.	0.
VARIANCE	5.5	-0.	2.2	-0.	-0.	-0.	-0.	9.8	-0.	-0.	-0.	-0.	-0.	-0.
STD.DEVIATION	2.4	-0.	1.5	-0.	-0.	-0.	-0.	3.1	-0.	-0.	-0.	-0.	-0.	-0.

FUNCTION 3														
TGT.HOURS DOWN	2.3	4.4	0.	0.4	0.	0.5	23.							
INCIDENTS	4	5	0	1	0	1	9							
AVERAGE DOWN	0.6	0.9	0.	0.4	0.	0.5	3.							
VARIANCE	0.2	0.1	-0.	0.	-0.	0.	3.							

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AVERAGE CCNA	0.	0.	0.	0.
VARIANCE	-0.	-0.	-0.	-0.
STD.DEVIATION	-0.	-0.	-0.	-0.

FUNCTION TO	0.3	0.8	0.0	0.0	0.2	0.0	0.0
TCT.HOURS CWN	0.3	0.8	0.0	0.0	0.2	0.0	0.0
INCIDENTS	0.3	0.4	0.0	0.0	0.1	0.0	0.0
AVERAGE CWN	0.1	0.2	0.0	0.0	0.0	0.0	0.0
VARIANCE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STD.DEVIATION	0.1	0.2	0.0	0.0	0.0	0.0	0.0

FUNCTION	11
TCT.HOURS	2.6
INCIDENTS	3
AVERAGE DGM	1.4
VARIANCE	2.0
STD.DEVIATION	1.4

FUNCTION 11					
TCT.HOURS OWN	0.8	2.0	0.0	0.0	0.0
INCIDENTS	4	0			
AVERAGE OWN	0.4	0.2	0.0	0.0	0.0
VARIANCE	0.0	0.0	-0.0	-0.0	-0.0
STD.DEVIATION	0.0	0.0	-0.0	-0.0	-0.0

[illegible]

FUNCTION 12						
TCT-HOURS CWN	3.4	4.8	0.9	0.7	0.7	25.1
INCIDENTS	0.6	0.7	0.2	0.2	0.1	0.0
AVERAGE DCHN	0.2	0.3	0.0	0.0	0.0	25.0
VARIANCE	0.3	0.5	0.1	0.1	0.0	0.0
SIG-DEVIATION						

[illegible]

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FUNCTION 13
 TCT-HOURS CDM
 INCIDENTS
 AVERAGE DCMA
 VARIANCE
 STD-DEVIATION

1.1 4.1 1.0 0.4 1.2 0.3 0.0
 4 6 1 1 2 1 0
 0.3 0.7 1.0 0.4 0.4 0.3 0
 0.0 0.7 0 0.2 0.2 0.0 -0
 0.2 0.6 0 0.4 0.0 0.0 -0

FUNCTION 14
 TCT-HOURS CDM
 INCIDENTS
 AVERAGE DCMA
 VARIANCE
 STD-DEVIATION

14.4 0.0 0.3 0.0 0.0 0.0 0.0
 4 0 1 0 0 0 0
 4.2 0.3 0.3 0.0 0.0 0.0 0
 17.2 0 0.0 -0.0 -0.0 -0.0 -0
 4.1 -0.0 0.0 -0.0 -0.0 -0.0 -0

FUNCTION 14
 TCT-HOURS CDM
 INCIDENTS
 AVERAGE DCMA
 VARIANCE
 STD-DEVIATION

3.3 4.4 0.0 0.2 0.0 0.0 0.0
 3 3 0 1 0 0 0
 1.2 1.5 0.0 0.2 0.0 0.0 0
 0.6 1.6 0.0 -0.0 -0.0 -0.0 -0
 0.9 1.3 -0.0 -0.0 -0.0 -0.0 -0

FUNCTION 15
 TCT-HOURS CDM
 INCIDENTS
 AVERAGE DCMA
 VARIANCE
 STD-DEVIATION

75.4 1.0 0.4 1.9 23.4 4.8 0.9
 30 4 1 6 18 6 3
 2.5 0.2 0.4 0.6 1.1 1.1 0.4
 2.3 0.0 0.0 0.2 0.7 0.4 0.2
 1.3 0.2 0.0 0.4 0.0 0.4 0.2

FUNCTION 15
 TCT-HOURS CDM
 INCIDENTS
 AVERAGE DCMA
 VARIANCE
 STD-DEVIATION

0.0 0.0 0.0 0.0 0.0 0.0 0.0
 0 0 0 0 0 0 0
 0.0 0.0 0.0 0.0 0.0 0.0 0
 -0.0 -0.0 -0.0 -0.0 -0.0 -0.0 -0
 -0.0 -0.0 -0.0 -0.0 -0.0 -0.0 -0

FUNCTION 16
 TCT-HOURS CDM
 INCIDENTS
 AVERAGE DCMA
 VARIANCE
 STD-DEVIATION

121.7 1.9 1.2 17.3 46.0 21.7 3.3
 28 4 1 3 18 6 3
 4.3 0.5 1.2 3.5 2.6 3.6 1.1
 20.0 0.0 0 17.8 2.9 4.2 1.7
 4.5 0.2 0 4.2 1.7 2.0 1.3

FUNCTION 16

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3.9 2.9 3.2 2.9 3.2 2.9 3.9
 2 2 2 2 2 2 2
 1.9 1.4 1.4 1.4 1.4 1.4 1.9
 2.2 2.2 2.2 2.2 2.2 2.2 2.2
 1.5 1.5 1.5 1.5 1.5 1.5 1.5

INCIDENTS
 AVERAGE DCWA
 VARIANCE
 STD.DEVIATION

FUNCTION 17
 TGT-HOURS DWN
 INCIDENTS
 AVERAGE DCWA
 VARIANCE
 STD.DEVIATION

FUNCTION 17
 TGT-HOURS DWN
 INCIDENTS
 AVERAGE DCWA
 VARIANCE
 STD.DEVIATION

FUNCTION 18
 TGT-HOURS DWN
 INCIDENTS
 AVERAGE DCWA
 VARIANCE
 STD.DEVIATION

FUNCTION 18
 TGT-HOURS DWN
 INCIDENTS
 AVERAGE DCWA
 VARIANCE
 STD.DEVIATION

FUNCTION 19
 TGT-HOURS DWN
 INCIDENTS
 AVERAGE DCWA
 VARIANCE
 STD.DEVIATION

FUNCTION 19
 TGT-HOURS DWN
 INCIDENTS
 AVERAGE DCWA

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STD.DEVIATION

-0.

-0.

-0.

-0.

-0.

-0.

-0.

FUNCTION 20
TCT.HOURS DWN
INCIDENTS
AVERAGE DQWA
VARIANCE
STD.DEVIATION

2.4
1.2
0.0
0.1

0.0
0.0
-0.0
-0.0

0.5
0.5
0.0
0.0

0.0
0.0
-0.0
-0.0

0.4
0.4
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0.0

1.4
1.4
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1.4
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FUNCTION 20
TCT.HOURS DWN
INCIDENTS
AVERAGE DQWA
VARIANCE
STD.DEVIATION

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FUNCTION 21
TCT.HOURS DWN
INCIDENTS
AVERAGE DQWA
VARIANCE
STD.DEVIATION

15.0
3.3
10.0
4.3

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17.3
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10.0
3.2

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FUNCTION 21
TCT.HOURS DWN
INCIDENTS
AVERAGE DQWA
VARIANCE
STD.DEVIATION

0.0
0.0
0.0
0.0

2.0
0.7
0.4
0.4

0.0
0.0
-0.0
-0.0

0.1
0.1
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400
102
1213
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FUNCTION 22
TCT.HOURS DWN
INCIDENTS
AVERAGE DQWA
VARIANCE
STD.DEVIATION

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FUNCTION 22
TCT.HOURS DWN
INCIDENTS
AVERAGE DQWA
VARIANCE
STD.DEVIATION

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SLB TOTAL DELINEATION

FUNCTION 1		ASSOCIATED DELAY TOTALS		TOTAL TUBES
SUM#BASIS#SECONDARIES	287.2	SUM OF DELAYS	89.4	SUM 4165.
NUMBER OF INCIDENTS	23	INCIDENTS	23	CNT 23
AVERAGE HOURS REQD.	12.5	AVERAGE	3.9	AVG 181.
VARIANCE	323.3	VARIANCE	13.3	
STD. DEVIATION	18.0	STD. DEVIATION	3.6	

FUNCTION 2		ASSOCIATED DELAY TOTALS		TOTAL TUBES
SUM#BASIS#SECONDARIES	78.2	SUM OF DELAYS	22.8	SUM 662.
NUMBER OF INCIDENTS	17	INCIDENTS	17	CNT 17
AVERAGE HOURS REQD.	4.6	AVERAGE	1.3	AVG 39.
VARIANCE	39.2	VARIANCE	7.3	
STD. DEVIATION	4.3	STD. DEVIATION	2.7	

FUNCTION 3		ASSOCIATED DELAY TOTALS		TOTAL TUBES
SUM#BASIS#SECONDARIES	43.2	SUM OF DELAYS	7.6	SUM 23.
NUMBER OF INCIDENTS	10	INCIDENTS	10	CNT 10
AVERAGE HOURS REQD.	4.3	AVERAGE	0.8	AVG 2.
VARIANCE	46.2	VARIANCE	0.9	
STD. DEVIATION	4.8	STD. DEVIATION	1.0	

FUNCTION 4		ASSOCIATED DELAY TOTALS		TOTAL TUBES
SUM#BASIS#SECONDARIES	66.4	SUM OF DELAYS	49.8	SUM 20.
NUMBER OF INCIDENTS	22	INCIDENTS	22	CNT 22
AVERAGE HOURS REQD.	3.0	AVERAGE	2.3	AVG 1.
VARIANCE	13.2	VARIANCE	9.1	
STD. DEVIATION	3.9	STD. DEVIATION	3.0	

FUNCTION 5		ASSOCIATED DELAY TOTALS		TOTAL TUBES
SUM#BASIS#SECONDARIES	581.4	SUM OF DELAYS	243.2	SUM 73.
NUMBER OF INCIDENTS	47	INCIDENTS	47	CNT 47
AVERAGE HOURS REQD.	12.4	AVERAGE	5.2	AVG 2.
VARIANCE	182.7	VARIANCE	11.7	

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FUNCTION 4		ASSOCIATED DELAY TOTALS		TOTAL TUBES
SUM#BASICS#SECONDARIES	792.5	SUM OF DELAYS	101.1	SUM 713.
NUMBER OF INCIDENTS	18	INCIDENTS	18	CNT 18
AVERAGE HOURS REQD.	44.0	AVERAGE	5.6	AVG 40.
VARIANCE	8743.5	VARIANCE	40.8	
STD. DEVIATION	93.4	STD.DEVIATION	6.4	

FUNCTION 7		ASSOCIATED DELAY TOTALS		TOTAL TUBES
SUM#BASICS#SECONDARIES	28.2	SUM OF DELAYS	5.8	SUM 12.
NUMBER OF INCIDENTS	5	INCIDENTS	5	CNT 5
AVERAGE HOURS REQD.	5.6	AVERAGE	1.2	AVG 2.
VARIANCE	94.4	VARIANCE	3.4	
STD. DEVIATION	9.7	STD.DEVIATION	1.9	

FUNCTION 21		ASSOCIATED DELAY TOTALS		TOTAL TUBES
SUM#BASICS#SECONDARIES	33.8	SUM OF DELAYS	2.9	SUM 409.
NUMBER OF INCIDENTS	6	INCIDENTS	6	CNT 6
AVERAGE HOURS REQD.	5.6	AVERAGE	0.5	AVG 102.
VARIANCE	74.9	VARIANCE	0.5	
STD. DEVIATION	8.6	STD.DEVIATION	0.7	

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REACTOR 6 OUTAGE FUNCTION EXPECTATION REPORT

APRIL 1961 TO MAY 15 1962

THIS IS AN EXEMPLARY REPORT ILLUSTRATING
AVERAGE TIME REQUIREMENTS AND EXPECTED
VARIANCES FOR THE BASIC TASKS REQUIRED
TO RE-ESTABLISH ON-LINE PRODUCTION STATUS.

**ALL DATA IN HOURS-EXCEPT SECONDARY FUNCTION=21=TUBE COUNT.

** INCIDENT EXPERIENCE BY CAUSE FUNCTION **

SECONDARY FUNCTION NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
FUNCTION TOTAL	47	11	6	10	27	13	5	60	47	9	12	7	12	18	51	54	15	27	4	2	56

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SECONDARY FUNCTION GROUPS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
*****	15	16	17	18	19	20	21							
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
FUNCTION TOTAL	598.9	30.2	12.6	23.8	194.9	58.9	8.0	1212.3	87.1	8.4	33.7	49.8	33.6	13.8
TOT. HOURS RUN	47	11	6	10	27	13	5	60	47	9	12	7	12	18
INCIDENTS	12.7	2.7	2.1	2.4	7.2	4.3	1.6	20.2	1.9	0.9	2.8	7.1	2.8	0.8
AVERAGE DOWN	245.9	4.7	2.4	7.1	7.2	42.0	2.0	2024.8	3.5	0.7	10.3	22.5	34.6	0.7
VARIANCE	15.7	2.2	1.6	2.7	2.7	6.5	1.4	45.0	1.9	0.9	3.2	4.7	5.9	0.8
STD. DEVIATION														
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
FUNCTION TOTAL	161.4	316.5	28.7	72.0	25.5	5.9	6134.							
TOT. HOURS RUN	51	54	15	27	4	2	56							
INCIDENTS	3.2	5.9	1.9	2.7	6.4	2.9	110.							
AVERAGE DOWN	1.0	16.8	3.4	4.7	23.6	13.0	63208.							
VARIANCE	1.0	4.1	1.8	2.2	4.9	3.6	251.							
STD. DEVIATION														

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	TOTAL HOURS DOWN							
	REACTOR1	REACTOR2	REACTOR3	REACTOR4	REACTOR5	REACTOR6	REACTOR7	REACTOR8
CAUSE 1	0.	448.5	308.3	173.2	43.1	0.	431.8	643.1
CAUSE 2	516.4	978.0	584.2	742.7	373.3	642.8	334.0	243.3
CAUSE 3	805.1	192.1	538.8	794.8	699.4	1148.4	0.	0.
CAUSE 4	1681.8	526.7	1172.7	831.3	829.6	917.8	0.	33.4
CAUSE 5	4.1	10.2	50.6	173.8	133.3	127.7	663.6	334.1
CAUSE 6	31.1	72.4	146.4	35.3	1.8	4.7	0.	38.0
CAUSE 7	0.	56.0	5.4	0.	134.6	116.5	2.1	0.
CAUSE 8	0.	3.6	0.	0.	6.3	0.	0.	0.
CAUSE 9	72.6	0.5	121.5	274.1	41.8	0.	0.6	92.7
CAUSE10	0.	0.	0.	0.	0.	0.	0.	1.1
CAUSE11	0.1	0.	0.	0.	0.	0.	117.5	0.
CAUSE12	0.	200.6	0.	0.	0.	0.	0.	0.
CAUSE13	102.8	43.4	0.	0.	188.9	0.	0.	0.
CAUSE14	52.9	0.	0.5	89.2	27.1	0.5	0.	0.
CAUSE15	37.7	0.	0.	0.	0.	0.	0.	0.
CAUSE16	7.5	11.1	0.	3.1	0.	2.5	0.	0.

- Cause 1 = Scheduled Charge-Discharge
 2 = Rupture
 3 = Tube Replacement
 4 = Water Leaks
 5 = Control Trips (Fannellit, Beckman, etc.)
 6 = Front Face Leaks
 7 = Rear Face Leaks
 8 = Production Test
 9 = Electrical Power Failure
 10 = Oriface Failure
 11 = Control Rod Failure
 12 = Scheduled Overbore
 13 = Water Supply Failure
 14 = Ball Drop - Loss of Reactivity
 15 = Plugged Rear Nozzles
 16 = Faulty Thermocouples

APPENDIX

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	REACTOR1	REACTOR2	REACTOR3	REACTOR4	REACTOR5	REACTOR6	REACTOR7	REACTOR8
			TOTAL DOWN INCIDENTS					
CAUSE 1	0	4	3	2	1	0	6	9
CAUSE 2	9	14	13	18	9	21	8	6
CAUSE 3	2	1	2	2	4	6	0	0
CAUSE 4	29	11	22	14	15	25	0	1
CAUSE 5	4	16	10	12	5	24	21	19
CAUSE 6	1	2	4	1	1	3	0	1
CAUSE 7	0	3	2	0	4	4	2	0
CAUSE 8	0	1	0	0	1	0	0	0
CAUSE 9	2	1	5	2	1	0	1	1
CAUSE10	0	0	0	0	0	0	0	1
CAUSE11	1	0	0	0	0	0	2	0
CAUSE12	0	2	0	0	0	0	0	0
CAUSE13	2	1	0	0	3	0	0	0
CAUSE14	2	0	1	2	2	2	0	0
CAUSE15	2	0	0	0	0	0	0	0
CAUSE16	2	2	0	2	0	2	0	0

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	REACTOR1		REACTOR2		**DOWN INCIDENT AVERAGE AND STANDARD DEVIATION*		REACTOR3		REACTOR4		REACTOR5		REACTOR6		REACTOR7		REACTOR8	
CAUSE 1	0.	0.	112.1	38.3	102.8	18.4	86.6	68.5	43.1	0.	0.	0.	0.	72.0	9.7	71.5	9.6	
CAUSE 2	57.4	28.4	69.9	73.0	44.9	21.2	41.3	5.1	41.5	21.7	30.6	13.8	41.8	35.6	40.6	27.4		
CAUSE 3	402.5	27.6	192.1	0.	269.4	168.8	397.4	75.6	174.8	142.4	191.4	148.6	0.	0.	0.	0.		
CAUSE 4	58.0	36.5	47.9	30.3	53.3	16.2	59.4	24.9	55.3	17.0	36.7	25.4	0.	0.	33.4	0.		
CAUSE 5	1.0	1.2	0.6	0.5	5.1	12.6	14.5	20.9	26.7	26.5	5.3	10.5	31.6	25.9	17.6	16.6		
CAUSE 6	31.1	0.	36.2	0.5	36.6	29.3	35.3	0.	1.8	0.	1.6	0.6	0.	0.	38.0	0.		
CAUSE 7	0.	0.	18.7	30.7	2.7	3.1	0.	0.	33.6	37.3	29.1	57.7	1.1	0.1	0.	0.		
CAUSE 8	0.	0.	3.6	0.	0.	0.	0.	0.	6.3	0.	0.	0.	0.	0.	0.	0.		
CAUSE 9	36.3	8.5	0.5	0.	24.3	22.4	137.0	142.5	41.8	0.	0.	0.	0.6	0.	92.7	0.		
CAUSE 10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.1	0.		
CAUSE 11	0.1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	58.7	3.2	0.	0.		
CAUSE 12	0.	0.	100.3	84.1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
CAUSE 13	51.4	70.4	43.4	0.	0.	0.	0.	0.	63.0	25.4	0.	0.	0.	0.	0.	0.		
CAUSE 14	26.5	36.1	0.	0.	0.5	0.	44.6	23.9	13.5	5.5	0.2	0.0	0.	0.	0.	0.		
CAUSE 15	18.8	25.9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.		
CAUSE 16	3.8	3.1	5.6	7.6	0.	0.	1.5	1.6	0.	0.	1.3	0.6	0.	0.	0.	0.		

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****DOWN INCIDENT SUMMARY- TOTAL HOURS, PERCENTAGE OF TOTAL DEPARTMENT HOURS AND TIME OPERATING EFFICIENCY****

	REACTOR1	REACTOR2	REACTOR3	REACTOR4	REACTOR5	REACTOR6	REACTOR7	REACTOR8
TOTAL	3312.2	2543.2	2928.4	3117.4	2479.1	2961.0	1549.8	1385.7
PERCENT	16.335	12.542	14.442	15.374	12.226	14.603	7.643	6.834
EFFNCY	0.664	0.742	0.703	0.684	0.749	0.700	0.843	0.860

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DEPARTMENT SUMMARY

	TOTAL HOURS	TIMES DOWN	AVERAGE	STANDARD DEVIATION
CAUSE 1	2048.0	25.0	81.9	28.2
CAUSE 2	4414.8	98.0	45.0	34.7
CAUSE 3	4178.7	17.0	245.8	146.4
CAUSE 4	5993.4	117.0	51.2	27.5
CAUSE 5	1497.4	111.0	13.5	19.9
CAUSE 6	329.8	13.0	25.4	22.1
CAUSE 7	314.6	15.0	21.0	36.3
CAUSE 8	9.8	2.0	4.9	1.9
CAUSE 9	603.7	13.0	46.4	63.1
CAUSE10	1.1	1.0	1.1	0.
CAUSE11	117.6	3.0	39.2	33.9
CAUSE12	200.6	2.0	100.3	84.1
CAUSE13	335.1	6.0	55.8	36.3
CAUSE14	170.2	9.0	18.9	23.5
CAUSE15	37.7	2.0	18.8	25.9
CAUSE16	24.3	0.0	3.0	3.7

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INTERVAL BETWEEN LIKE OUTAGES BY CAUSE
CAUSE 1

REACTOR1	REACTOR2	REACTOR3	REACTOR4	REACTOR5	REACTOR6	REACTOR7	REACTOR8
	1040.3	749.9	486.6			977.6	857.7
	1147.4	6621.5				1069.4	747.8
	2299.6					760.5	1055.8
						826.8	1591.4
						1552.7	473.2
							412.3
							642.9
							917.2

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****
CAUSE 2

REACTOR1	REACTOR2	REACTOR3	REACTOR4	REACTOR5	REACTOR6	REACTOR7	REACTOR8
334.6	170.0	444.1	502.2	189.2	418.9	1.8	2864.7
138.2	834.2	2898.2	1965.7	136.1	2.4	186.8	594.2
3.3	34.7	36.2	395.5	1528.8	1274.2	538.6	2881.2
1067.0	2970.2	253.5	142.1	207.0	1165.6	395.0	16.1
4788.8	251.7	545.9	203.7	62.9	519.5	5722.4	1138.6
1136.8	1007.9	1085.8	41.3	2.0	26.6	1439.6	
193.3	360.6	978.1	93.7	900.2	74.9	96.4	
1491.5	224.7	494.8	74.2	12.7	660.8		
	375.9	395.8	28.1		1625.4		
	1415.7	1309.1	38.0		198.3		
	212.1	6.6	1120.8		129.8		
	402.9	105.0	270.4		45.6		
	27.9		1720.8		127.2		
			916.8		12.2		
			105.4		183.4		
			88.2		79.0		
			116.9		64.1		
					1083.4		
					337.1		
					901.9		

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****

REACTOR1	REACTOR2	REACTOR3	REACTOR4	CAUSE 3 REACTOR5	REACTOR6	REACTOR7	REACTOR8
1794.7		1515.0	1445.1	1934.1	1050.3		
				3004.4	2841.2		
				1419.6	1117.1		
					1675.2		
					1112.3		

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INTERVAL BETWEEN LIKE OUTAGES BY CAUSE
CAUSE 4

REACTOR1	REACTOR2	REACTOR3	REACTOR4	REACTOR5	REACTOR6	REACTOR7	REACTOR8
81.4	2.7	1402.1	61.3	6.6	2.9		
1472.5	666.8	506.1	425.8	2107.1	538.4		
430.9	69.0	335.7	103.0	16.2	453.2		
49.7	99.5	326.7	522.0	105.8	192.0		
111.1	184.4	174.3	162.5	577.0	580.9		
229.2	3507.2	776.9	529.8	399.6	203.4		
255.5	1255.8	31.2	69.1	278.4	584.7		
89.1	76.1	81.8	3096.1	1461.8	356.5		
12.0	1360.7	519.0	281.9	6.7	314.1		
99.5	300.8	195.8	1082.6	105.0	182.5		
109.2		132.5	458.2	352.5	92.5		
124.4		139.8	506.7	326.2	73.4		
156.2		43.1	1035.5	139.8	92.3		
2.3		385.6		959.0	448.3		
148.4		266.2			160.7		
49.4		119.0			70.7		
121.0		76.2			140.6		
75.6		145.6			113.6		
62.5		197.4			304.5		
347.6		270.0			136.8		
137.6		1989.8			1457.5		
903.5					69.2		
36.2					781.4		
152.3					365.5		
365.8							
150.1							
249.0							
161.1							

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****
CAUSE 5

REACTOR1	REACTOR2	REACTOR3	REACTOR4	REACTOR5	REACTOR6	REACTOR7	REACTOR8
631.1	1203.3	1393.1	2782.2	73.3	305.1	353.6	15.6
1645.3	3.3	2963.8	293.5	4878.6	308.2	323.1	574.4
2217.9	2368.3	529.6	622.6	210.8	205.6	628.3	322.8
	968.9	786.1	286.9	1453.6	357.5	1252.5	712.5
	36.1	358.8	326.6		1094.9	148.0	41.6
	136.6	1045.7	117.7		1.1	585.2	2462.0
	1183.7	0.1	69.6		1044.4	308.2	1008.4
	63.1	492.5	925.7		0.3	130.9	714.7
	1050.3	66.3	1139.2		1.4	558.4	51.5
	987.1		1881.9		0.6	226.4	330.9
	411.6		332.0		1407.1	792.9	0.2
	840.6				11.7	208.3	1.1
	1.3				3.3	357.8	0.7
	0.5				15.5	646.0	70.2
	0.4				5.3	483.7	457.1
					65.6	4.1	179.2
					110.9	1586.2	447.9
					0.9	1.4	928.0
					1063.7	19.1	
					742.6	317.3	
					702.6		
					0.6		
					975.2		

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****
CAUSE 6

REACTOR1

REACTOR2
6044.2

REACTOR3
1214.6
3074.2
1649.0

REACTOR4

REACTOR5

REACTOR6
657.6
660.1

REACTOR7

REACTOR8

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****

REACTOR1	REACTOR2	REACTOR3	REACTOR4	REACTOR5	REACTOR6	REACTOR7	REACTOR8
	4389.9	3551.9		529.7	704.3	1079.1	
	4147.9			753.4	1000.8		
				6536.2	2965.5		

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****
CAUSE 8

REACTOR1

REACTOR2

REACTOR3

REACTOR4

REACTOR5

REACTOR6

REACTOR7

REACTOR8

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****

REACTOR1	REACTOR2	REACTOR3	REACTOR4	CAUSE 9	REACTOR5	REACTOR6	REACTOR7	REACTOR8
5588.9		1373.5	6220.0					
		17.8						
		3146.1						
		1833.2						

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****
CAUSE10

REACTOR1

REACTOR2

REACTOR3

REACTOR4

REACTOR5

REACTOR6

REACTOR7

REACTOR8

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****

REACTOR1

REACTOR2

REACTOR3

REACTOR4

CAUSE11

REACTOR5

REACTOR6

REACTOR7
540.7

REACTOR8

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••INTERVAL BETWEEN LIKE OUTAGES BY CAUSE••
CAUSE12

REACTOR1

REACTOR2
3112.7

REACTOR3

REACTOR4

REACTOR5

REACTOR6

REACTOR7

REACTOR8

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****

REACTOR1
272.6

REACTOR2

REACTOR3

REACTOR4

CAUSE13

REACTOR5
517.8
28.6

REACTOR6

REACTOR7

REACTOR8

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••INTERVAL BETWEEN LIKE OUTAGES BY CAUSE••
CAUSE 14

REACTOR 1
312.5

REACTOR 2

REACTOR 3

REACTOR 4
115.3

REACTOR 5
10.1

REACTOR 6
1.1

REACTOR 7

REACTOR 8

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••INTERVAL BETWEEN LIKE OUTAGES BY CAUSE••
CAUSE15

REACTOR1
5512.3

REACTOR2

REACTOR3

REACTOR4

REACTOR5

REACTOR6

REACTOR7

REACTOR8

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****INTERVAL BETWEEN LIKE OUTAGES BY CAUSE****
CAUSE16

REACTOR1
3936.5

REACTOR2
3340.8

REACTOR3

REACTOR4
8137.4

REACTOR5

REACTOR6
0.7

REACTOR7

REACTOR8

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SUMMARY OF INTERVALS--AVERAGES AND STANDARD DEVIATIONS

	REACTOR1	REACTOR2	REACTOR3	REACTOR4	REACTOR5	REACTOR6	REACTOR7	REACTOR8
CAUSE 1	0.	0.	1495.8	698.2	3685.7	4151.8	486.6	0.
CAUSE 2	1144.2	1571.3	637.6	810.2	712.8	804.9	460.2	608.0
CAUSE 3	1794.7	0.	0.	0.	1515.0	0.	1445.1	0.
CAUSE 4	220.8	302.5	752.3	1088.3	386.4	480.9	641.1	806.9
CAUSE 5	1498.1	803.6	617.0	689.9	848.5	909.2	798.0	850.0
CAUSE 6	0.	0.	6044.2	0.	1979.3	972.8	0.	0.
CAUSE 7	0.	0.	4268.9	171.1	3551.9	0.	0.	0.
CAUSE 8	0.	0.	0.	0.	0.	0.	0.	0.
CAUSE 9	5588.9	0.	0.	0.	1592.6	1290.9	6220.0	0.
CAUSE 10	0.	0.	0.	0.	0.	0.	0.	0.
CAUSE 11	0.	0.	0.	0.	0.	0.	0.	0.
CAUSE 12	0.	0.	5112.7	0.	0.	0.	0.	0.
CAUSE 13	272.6	0.	0.	0.	0.	0.	0.	0.
CAUSE 14	312.5	0.	0.	0.	0.	115.3	0.	0.
CAUSE 15	5512.3	0.	0.	0.	0.	0.	0.	0.
CAUSE 16	3436.5	0.	3340.8	0.	0.	0.	8137.4	0.

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