



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Local POR
TIC

October 10, 1990

Docket No.: 50-213

Mr. W. G. Council, Vice President
Nuclear Engineering and Operations
Connecticut Yankee Atomic Power Company
Post Office Box 270
Hartford, Connecticut 06101

SUBJECT: SEP TOPICS VI-7.C.1, VII-6, VIII-1, VIII-2, AND VIII-3,
LOSS OF OFFSITE POWER - HADDAM NECK

Dear Mr. Council:

As part of the staff's efforts to obtain reliable information on loss of offsite power in connection with SEP Topics VI-7.C.1, VII-6, VIII-1, VIII-2, and VIII-3, we have prepared the enclosed status report. We are forwarding it to you for review and comment regarding the causes and possible remedies for those events described. We request your response within 60 days of your receipt of this letter.

Sincerely,

Dennis M. Crutchfield
Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing

Enclosure:
As stated

cc w/enclosure:
See next page

THIS DOCUMENT CONTAINS
POOR QUALITY PAGES

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cc w/enclosure:

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LOSS OF OFFSITE POWER

SURVEY STATUS REPORT

Abstract: This report describes the method for data analysis and the results of a survey of loss of power events at domestic nuclear power plants.

Introduction: As a result of the staff efforts on several related Generic Activities (e.g., A-35 and A-44) the staff became concerned about the accuracy of the available loss of offsite power data. This concern, along with the results of the Lewis Study, lead the staff to request that all nuclear power plants provide the information specified in Table 1.

Of the 69 licensed nuclear power plants, 13 did not respond. These plants are identified in Table 2. In addition to the survey input, data was also obtained from Licensee Event Reports while evaluating Diesel Generator experience.

Discussion: The steps in data reduction and analysis are summarized below.

1. The data was sorted into Type A or B data in accordance with Table 1. (No Type C data was received).
2. For each event a cause code was assigned. The cause codes are presented in Table 3.
3. A map showing the distribution of the number of each type of failure as a function of each respondent plant was prepared. This is presented as Table 4.*
4. The "age" of each plant was determined based on the date of its first reported loss of offsite power until June 3, 1980. This date is presented as Table 5. (Because Crystal River 3 and Duane Arnold reported that no loss of offsite power events have occurred, the age could not be established and all data fields were set to zero.)

*
Computer output is presented in Appendix A (data) and Appendix B (results).

5. The data of Table 4 was re-plotted as a function of age to yield loss of power event rates (events/year).*
6. The data was subjected to several different analyses to determine if it could be characterized on a generic basis. These attempts were not generally successful because of the large scatter in the data. However, all attempts are identified in the results below.
7. Beyond the attempts to characterize the data on a generic basis, each plant was evaluated, for each of the causes, to determine if its failure experience was significantly different from the average. Significant was defined as a "target" value (events/year) greater than or equal to the mean plus three standard deviations.
8. A draft report (Revision 1) was sent to the utilities that experienced a high number of events in excess of the target values for comment. As a result of the comments received from one of these utilities, the methods were changed such that Table 4 now presents the total number of lines lost per plant per cause and the loss of power rates were calculated on a per line basis by normalizing the data of Table 4 by the number of offsite lines shown in Table 6. (Prior to these changes, plants having a relatively large number of lines, e.g. 5, were exceeding the target values much more often than those with two lines. Thus, those plants that, by virtue of redundancy, were least likely to experience a total loss of power had been shown in a worse light than the smaller grids.)

Results: The following are the numerical results of this study.

1. There have been 1102 reported total and partial losses off offsite power. This represents a mean event rate of 2.75 events/year.
2. There have been 105 total losses of offsite power reported by the 66 respondents. This represents an average rate of 0.26 events/year.
3. The mean duration of a total loss of offsite power is 3.6 hours with a standard deviation of 5.71 hours.
4. The mean time to partial recovery (from a total loss of offsite power) is 2.08 hours with a standard deviation of 4.78 hours.
5. The mean duration of a partial loss of offsite power is 10.66 hours with a standard deviation of 141.57 hours.

6. An attempt was made to obtain a least squares fit of the mean value of the time of outage vs. the percentage of offsite power lost (% lines). No such fit was achieved (confidence level was less than 95%).
7. The mean duration of outage due to lightening strikes is 0.78 hours with a standard deviation of 4.29 hours.
8. The mean voltage drop is 16.19% with a standard deviation of 29.05%.
9. The mean frequency drop is 3.75 Hz with a standard deviation of 5.55 Hz.
10. The mean frequency decay rate is 1.31 Hz/sec with a standard deviation of 1.8 Hz/sec.
11. Palisades has reported the most significant annual event rates as noted below:
 - (a) Total event rate 3.62 vs. a target of 3.55,
 - (b) Cause 5 event rate 0.25 vs. a target of 0.25,
 - (c) Cause 7 event rate 0.32 vs. a target of 0.21,
 - (d) Cause 22 event rate 0.66 vs. a target of 0.63, and
 - (e) Cause 29 event rate 0.13 vs. a target of 0.08.
12. Haddam Neck, Turkey Point 3, Indian Point 3, Pilgrim 1, Maine Yankee, and Calvert Cliffs 2 had a 2 causes each that exceeded the target values.

Conclusions

1. The loss of offsite power rate is 2.75 events/reactor year for some loss and 0.26 events/reactor year for total loss.
2. The Palisades station lightening protection and protective relaying system should be further evaluated to determine the causes for the relatively high frequency of trips and to determine if suitable modifications can be made to reduce these rates.
3. Depending on the results of the Palisades studies, consideration should be given to similar studies of the Haddam Neck lightening protection.

Recommendation

Pursue the evaluation of Palisades.

TABLE 1

REQUEST FOR ADDITIONAL INFORMATION
USED IN SURVEY

- A. For losses of offsite power where less than all offsite power was lost:
1. How many circuits to the offsite network are normally available and how many were lost during the event?
 2. What was the cause of the event?
 3. Why did the other lines not fail when some did fail?
 4. Was any voltage increase or decrease experienced just prior to or during the outage? If so, please give details, voltages reached, decay rate, affects on equipment operation, etc.?
 6. How long was power unavailable from the circuit?
 7. Date of Event.
- B. For losses of all offsite power:
1. How long was the Power off? How long for partial recovery? Please give details.
 2. If turbine trip occurred, how soon after did loss of offsite power occur?
 3. If power was recovered promptly (10 minutes or less), was it due to automatic or manual actions?
 4. Was any voltage increase or decrease experienced just prior to or during the outage? If so, please give details, voltages reached, affects, etc.
 5. Was any frequency decay experienced just prior to or during the outage? If so, please give details, lowest frequency reached, decay rate, affects on equipment operation, etc.
 6. Date of Event.
- C. Were there any other loss of offsite power events other than we have listed? If so, please give details of each event.

TABLE 2

PLANTS NOT PROVIDING THE DATA REQUESTED IN TABLE 1

ORB#1

50-295 Zion 1
50-304 Zion 2

ORB#4

50-346 Davis-Besse 1
50-269 Oconee 1
50-270 Oconee 2
50-287 Oconee 3
50-312 Rancho Seco
50-289 Three Mile Island 1
50-320 Three Mile Island 2

ORB#3

50-325 Brunswick 1
50-366 E. I. Hatch 2

ORB#5

50-155 Big Rock Point

TABLE 3
CAUSE CODES

<u>Code</u>	<u>Cause</u>
?	Not reported
0	Unknown
3	Manual scram
4	Circuit breaker trip during relay testing, improper yard switching operations, improperly set relays, maintenance errors, relay testing errors, test equipment failure, CT failure, maintenance outages, wiring errors
5	Fault with or without protective relaying failure or with or without manual scram, bolted faults
7	Protective relay or carrier failure
9	Insulator failure (lightening arrester, transmission line insulator, transformer bushing, pot head, cable insulation)
13	Foreign conducting object
15	Winter storm
20	Breaker failure
22	Lightening
23	System undervoltage
24	Transformer winding failure
25	Forest fires
29	Construction activities
31	Summer storm
32	System collapse
34	Mechanical failure of conductors or stays or supporting structures other than code 36
42	System imbalance
Misc.	Miscellaneous (i.e. (1) failure is an instrument inverter with a second channel bypassed, (2) turbine generator voltage regulator failure, (10) turbine rumback due to loss of control rod position indication, (12) inadequate line height, (28) lightening with breaker failure, (33) false relay operation with redundant line(s) out of service for maintenance, (35) automatic scram, (36) motor vehicle hitting pole, and (42) system imbalance.

TABLE 5

AGE

3	Indian Point	7.87	278	Peach Bottom 3	6.05
10	Dresden 1	13.56	280	Surry 1	5.98
29	Yankee Rowe	16.98	281	Surry 2	5.98
133	Humbolt Bay	9.54	282	Prairie Island 1	3.16
155	Big Rock Point	8.35	285	Ft. Calhoun	6.76
206	San Onofre 1	12.37	286	Indian Point 3	2.89
213	Haddam Neck	12.1	287	Oconee 3	6.41
219	Oyster Creek	12.25	289	Three Mile Island 1	3.01
220	Nine Mile Point	6.54	293	Pilgrim 1	8.29
237	Dresden 2	6.25	295	Zion 1	1.23
244	GINNA	11.5	296	Browns Ferry 3	6.56
245	Millstone 1	8.94	298	Cooper	4.28
247	Indian Point 2	7.87	301	Point Beach 2	9.32
249	Dresden 3	6.26	302	Crystal River 3	
250	Turkey Point 3	6.26	304	Zion 2	1.23
251	Turkey Point 4	6.26	305	Kewaunee	1.56
254	Quad Cities 1	4.77	306	Prairie Island 2	3.16
255	Palisades	8.91	309	Maine Yankee	1.76
259	Browns Ferry 1	6.56	315	D.C. Cook 1	5.29
260	Browns Ferry 2	6.56	316	D.C. Cook 2	5.29
263	Monticello	9.21	317	Calvert Cliffs 1	6.45
265	Quad Cities 2	4.77	318	Calvert Cliffs 2	4.34
266	Point Beach 1	9.32	321	E.I. Hatch 1	2.68
267	Fort St. Vrain	5.37	324	Brunswick 2	5.19
269	Oconee 1	6.41	331	Duane Arnold	
270	Oconee 2	6.54	333	FitzPatrick	1.42
271	Vermont Yankee	8.09	334	Beaver Valley 1	3.47
272	Salem 1	3.09	335	St. Lucie 1	3.05
277	Peach Bottom 2	6.05	336	Millstone 2	4.17
			344	Trojan	4.13
			346	Davis Besse	0.23
			348	Farley 1	2.71
			368	Arkansas One 2	5.28
			409	La Crosse	9.37

TABLE 6
NUMBER OF OFFSITE LINES

<u>DOC</u>	<u>NL</u>	<u>DOC</u>	<u>NL</u>
3	2	304	2
10	4	305	3
29	2	306	2
133	2	309	2
155	2	313	4
206	7	315	2
213	2	316	2
219	3	317	2
220	2	318	2
237	7	321	2
244	2	324	2
245	2	331	2
247	2	333	2
249	7	334	2
250	7	335	2
251	7	336	2
254	4	338	2
255	5.3*	344	2
259	8	346	2
260	8	348	2
261	6.5*	368	4
263	2	409	2
265	4		
266	2		
267	2		
269	2		
270	2		
271	5		
272	2		
277	2		
278	2		
280	2		
281	2		
282	2		
285	7		
286	4		
287	2		
289	2		
293	3		
295	2		
296	8		
298	5		
301	2		
302	2		

* average number available during study period

APPENDIX A
DATA

0112
000000
-REWIN*TOP A KEY*
FORMD FOR A KEY 1
FILE
PRINT

TOP A KEY

COLUMN CONTENT/SCALE

1/1 DOCKET
2/0 NUMBER OF OFFSITE LINES NORMALLY AVAILABLE
3/11 NUMBER OF LINES LOST DURING THE EVENT
4/14 CAUSE (CODE)
5/17 REASON THAT NOT ALL OF THE LINES FAILED (CODE)
6/20(T) VOLTAGE INCREASE(+) OR DECREASE (-), EXTREME VALUE/VOLTS, BEFORE (B) OR DURING (D) OUTAGE,
EQUIPMENT DAMAGE (Y OR N)
7/35(T) FREQUENCY INCREASE (+) OR DECREASE(-),EXTREME VALUE/HZ,MAXIMUM RATE/HZ/SEC, BEFORE ((B) OR
• DURING (D) EVENT, EQUIPMENT DAMAGE (Y OR N)
8/52(T) DURATION OF LOSS/HOURS
9/58(T) DATE MM/DD/YY

50-104	4	1	15	1	0	*B,N	0	0.05	12/ 1/74
50-104	4	1	15	1	0	*B,N	0	0	12/ 1/74
50-104	4	1	15	1	0	*B,N	0	0	12/ 1/74
50-104	4	1	15	1	0	*B,N	0	0	12/ 1/74
50-104	4	1	15	1	0	*B,N	0	0	12/ 1/74
50-104	4	1	34	1	0	*B,N	0	0	5/21/74
50-104	4	1	22	1	0	*B,N	0	0	3/ 6/74
50-104	4	1	22	1	0	*B,N	0	0	3/ 4/74
50-104	4	1	4	1	0	*B,N	0.17	0	3/29/79
50-104	4	1	22	1	0	*B,N	0	0	7/20/76
50-104	4	1	4	1	0	*B,N	0	0	1/26/76
50-104	4	1	15	1	0	*B,N	0.63	0	1/26/76
50-104	4	1	15	1	0	*B,N	2.4	0	3/27/75
50-104	4	1	13	1	0	*B,N	0.48	0	3/27/75
50-104	4	1	9	1	0	*B,N	0	0	1/17/75
50-104	4	1	0	0	0	*B,N	0.03	0	1/18/79
50-104	4	1	22	1	0	*B,N	0	0	7/13/76
50-104	4	1	7	1	0	*B,N	0	0	1/10/75
50-104	4	1	22	1	0	*B,N	0	0	2/20/79
50-104	4	1	0	0	0	*B,N	0	0	6/30/78
50-104	4	1	4	1	0	*B,N	22.28	4	2/78
50-104	4	1	0	0	0	*B,N	0.68	0	12/21/77
50-104	4	1	9	1	0	*B,N	0.28	0	12/21/77
50-104	4	1	0	0	0	*B,N	0	0	1/18/79
50-104	4	1	0	0	0	*B,N	0	0	2/ 8/78
50-104	4	1	0	0	0	*B,N	0	0	2/ 8/78
50-104	4	1	0	0	0	*B,N	0	0	2/ 3/78
50-104	4	1	0	0	0	*B,N	0	0	2/ 4/76
50-104	4	1	0	0	0	*B,N	0	0	8/30/75
50-104	4	1	0	0	0	*B,N	0	0	8/22/75
50-104	4	1	0	0	0	*B,N	0	0	8/11/75
50-104	4	1	0	0	0	*B,N	0	0	2/21/75
50-104	4	1	22	1	0	*B,N	0	0	6/25/78
50-104	4	1	0	0	0	*B,N	0	0	8/22/75
50-104	4	1	0	0	0	*B,N	0	0	8/ 1/75
50-104	4	1	34	1	0	*B,N	15.92	7	2/74
50-104	4	1	0	0	0	*B,N	20.33	4	5/79
50-104	4	1	15	1	0	*B,N	0	0	12/20/77
50-104	4	1	15	1	0	*B,N	0	0	12/20/77
50-104	4	1	34	1	0	*B,N	0	0	12/20/77
50-104	4	1	22	1	0	*B,N	0	0	10/25/77
50-104	4	1	0	0	0	*B,N	0.13	0	5/21/77
50-104	4	1	22	1	0	*B,N	0	0	1/28/77
50-104	4	1	9	1	0	*B,N	0.67	0	6/20/75
50-104	4	1	0	0	0	*B,N	3.37	4	7/74
50-104	4	1	0	0	0	*B,N	19.45	0	11/26/78
50-104	4	1	15	1	0	*B,N	0	0	7/31/78
50-104	4	1	0	0	0	*B,N	9.82	0	12/20/77
50-104	4	1	31	3	0	*B,N	0	0	1/ 1/76
50-104	4	1	31	3	0	*B,N	197.7	0	5/20/75

50-108	4	1	34	1	-0	r,r,N -0	r,r,N	33.59	3/28/75
50-108	4	1	15	1	-0	r,r,N -0	r,r,N	0	3/27/75
50-108	4	1	22	1	-0	r,r,N -0	r,r,N	0	6/ 6/74
50-108	4	1	22	1	-0	r,r,N -0	r,r,N	0	10/15/79
50-108	4	1	22	1	-0	r,r,N -0	r,r,N	0	8/18/79
50-108	4	1	22	1	-0	r,r,N -0	r,r,N	0	8/ 5/79
50-108	4	1	34	1	-0	r,r,N -0	r,r,N	1.25	3/29/79
50-108	4	1	4	1	-0	r,r,N -0	r,r,N	0.07	6/22/77
50-108	4	1	42	1	-0	r,r,N -0	r,r,N	0.53	5/24/77
50-108	4	1	13	1	-0	r,r,N -0	r,r,N	0.29	4/ 6/74
50-108	4	1	9	1	-0	r,r,N -0	r,r,N	0	3/18/74
50-108	4	1	9	1	-0	r,r,N -0	r,r,N	0	3/18/74
50-108	4	1	9	1	-0	r,r,N -0	r,r,N	0	3/18/74
50-108	4	1	9	1	-0	r,r,N -0	r,r,N	0	3/28/74
50-334	2	1	4	1	-0	r,r,N -0	r,r,N	0.92	5/11/77
50-334	2	1	7	1	-0	r,r,N -0	r,r,N	0.98	11/17/77
50-334	2	1	4	1	-0	r,r,N -0	r,r,N	0.63	12/12/76
50-250	7	4	9	1	-0	r,r,N -0	r,r,N	0.05	4/ 4/79
50-251	7	4	9	1	-0	r,r,N -0	r,r,N	0.05	4/ 4/79
50-244	2	1	9	1	-0	r,r,N -0	r,r,N	1.2	1/ 2/71
50-266	2	1	13	2	-0	r,r,N -0	r,r,N	?	4/13/71
50-301	2	1	13	2	-0	r,r,N -0	r,r,N	?	4/13/71
50-348	2	1	7	1	0?	r,r,N -0	r,r,N	5.52	8/12/78
50-298	5	4	15	3	-0	r,r,N -0	r,r,N	0.48	2/21/76
50-344	2	1	4	1	-0	r,r,N -0	r,r,N	13.78	4/16/76
50-344	2	1	4	1	-0	r,r,N -0	r,r,N	0.27	1/23/77
50-344	2	1	4	1	-0	r,r,N -0	r,r,N	3.87	4/29/77
50-344	2	1	4	1	-0	r,r,N -0	r,r,N	0.5	10/18/77
50-263	2	1	4	2	-0	r,r,N -0	r,r,N	0.02	3/17/71
50-263	2	1	4	2	-0	r,r,N -0	r,r,N	0.57	12/ 7/71
50-263	2	1	5	1	-0	r,r,N -0	r,r,N	123.1	5/ 1/72
50-263	2	1	4	1	-0	r,r,N -0	r,r,N	0.52	10/11/72
50-263	2	1	4	1	-0	r,r,N -0	r,r,N	0.48	9/ 9/72
50-263	2	1	22	3	-0	r,r,N -0	r,r,N	48.93	6/26/76
50-263	2	1	27	1	-0	r,r,N -0	r,r,N	24	16/16/78
50-254	4	1	4	1	-0	r,r,N -0	r,r,N	7.70	8/26/75
50-265	4	1	4	1	-0	r,r,N -0	r,r,N	7.70	8/26/75
50-254	4	0	23	1	-0	r,r,N -0	r,r,N	0.67	2/13/78
50-265	4	0	23	1	-0	r,r,N -0	r,r,N	0.67	2/13/78
50-254	4	3	5	1	-0	r,r,N -0	r,r,N	?	11/ 6/79
50-254	4	3	5	1	-0	r,r,N -0	r,r,N	?	11/ 6/79
50-272	2	1	25	1	-0	r,r,N -0	r,r,N	0.75	5/13/77
50-272	2	1	25	1	-0	r,r,N -0	r,r,N	1.28	7/ 8/77
50-272	2	1	4	1	-0	r,r,N -0	r,r,N	4.68	7/ 8/77
50-272	2	1	4	1	-0	r,r,N -0	r,r,N	1.73	6/11/77
50-272	2	1	4	1	-0	r,r,N -0	r,r,N	2.38	7/20/78
50-315	2	1	5	1	-0	r,r,N -0	r,r,N	73.1	2/17/75
50-315	2	1	5	1	-0	r,r,N -0	r,r,N	73.1	2/17/75
50-315	2	1	28	1	-0	r,r,N -0	r,r,N	2.18	9/ 1/77
50-315	2	1	28	1	-0	r,r,N -0	r,r,N	2.18	9/ 1/77
50-315	2	1	29	1	-0	r,r,N -0	r,r,N	3.63	12/13/77
50-315	2	1	29	1	-0	r,r,N -0	r,r,N	3.63	12/13/77
50-316	2	1	31	1	-0	r,r,N -0	r,r,N	10.5	4/ 6/77
50-316	2	1	31	1	-0	r,r,N -0	r,r,N	10.5	4/ 6/77
50-286	4	1	22	1	-?	r,r,N -?	r,r,N	0.93	5/ 6/77
50-286	4	1	22	1	-?	r,r,N -?	r,r,N	32.17	1/24/78
50-293	3	1	15	1	-0	r,r,N -0	r,r,N	1.6	2/19/72

50-293	5	1	51	1	±0	B-N ±0	±B-N	0	7.0	9/ 3/72
50-293	3	1	54	1	±0	B-N ±0	±B-N	0	0.52	2/ 2/13
50-293	3	1	9	1	±0	B-N ±0	±B-N	0	10.75	3/29/73
50-293	3	1	9	1	±0	B-N ±0	±B-N	0	19.07	3/30/73
50-293	3	1	35	1	±0	B-N ±0	±B-N	0	0.92	9/ 8/73
50-293	3	1	9	1	±0	B-N ±0	±B-N	0	1.22	3/21/74
50-293	3	2	22	1	±0	B-N ±0	±B-N	0	1.6	4/15/74
50-293	3	1	22	1	±0	B-N ±0	±B-N	0	0.1	5/ 7/74
50-293	3	2	0	0	±0	B-N ±0	±B-N	0	1.35	5/26/74
50-293	3	1	13	1	±0	B-N ±0	±B-N	0	0.17	9/ 6/74
50-293	3	1	9	1	±0	B-N ±0	±B-N	0	16.58	11/10/74
50-293	3	1	9	1	±0	B-N ±0	±B-N	0	15.33	11/11/74
50-293	3	1	0	0	±0	B-N ±0	±B-N	0	1.15	11/11/74
50-293	3	1	51	1	±0	B-N ±0	±B-N	0	0.17	11/13/74
50-293	3	1	13	1	±0	B-N ±0	±B-N	0	1.02	12/ 2/74
50-293	3	1	13	1	±0	B-N ±0	±B-N	0	0.15	12/25/74
50-293	3	1	36	1	±0	B-N ±0	±B-N	0	0.003	12/25/74
50-293	3	1	0	0	±0	B-N ±0	±B-N	0	7.08	4/30/75
50-293	3	1	0	0	±0	B-N ±0	±B-N	0	0.3	4/30/75
50-293	3	1	14	1	±0	B-N ±0	±B-N	0	9.82	5/01/75
50-293	3	1	36	1	±0	B-N ±0	±B-N	0	5.27	9/12/75
50-293	3	2	20	1	±0	B-N ±0	±B-N	0	1.02	9/13/75
50-293	3	1	15	1	±0	B-N ±0	±B-N	0	0.98	1/12/76
50-293	3	2	22	1	±0	B-N ±0	±B-N	0	0.53	3/13/76
50-293	3	1	36	1	±0	B-N ±0	±B-N	0	0.03	6/19/76
50-293	3	1	7	1	±0	B-N ±0	±B-N	0	0.03	8/ 4/76
50-293	3	1	7	1	±0	B-N ±0	±B-N	0	0.03	8/ 4/76
50-293	3	1	0	0	±0	B-N ±0	±B-N	0	0.17	12/12/76
50-293	3	1	15	1	±0	B-N ±0	±B-N	0	0	1/ 7/77
50-293	3	1	15	1	±0	B-N ±0	±B-N	0	0	1/ 7/77
50-293	3	1	34	1	±0	B-N ±0	±B-N	0	32.28	1/10/77
50-293	3	1	0	0	±0	B-N ±0	±B-N	0	0.003	1/12/77
50-293	3	2	25	1	±0	B-N ±0	±B-N	0	0.52	5/ 1/77
50-293	3	1	7	1	±0	B-N ±0	±B-N	0	2.9	5/ 2/77
50-293	3	1	22	1	±0	B-N ±0	±B-N	0	0.17	7/21/77
50-293	3	1	20	1	±0	B-N ±0	±B-N	0	1.97	12/ 6/77
50-293	3	1	15	1	±0	B-N ±0	±B-N	0	27.18	1/20/78
50-293	3	1	7	1	±0	B-N ±0	±B-N	0	1.67	7/ 3/78
50-293	3	2	22	1	±0	B-N ±0	±B-N	0	0.37	8/ 6/78
50-293	3	2	22	1	±0	B-N ±0	±B-N	0	0.23	7/27/79
50-293	3	1	22	1	±0	B-N ±0	±B-N	0	0.27	8/28/79
50-293	3	1	0	0	±0	B-N ±0	±B-N	0	0.47	1/20/68
50-293	3	1	0	0	±0	B-N ±0	±B-N	0	0.28	3/25/68
50-293	3	1	4	1	±0	B-N ±0	±B-N	0	0.2	4/ 2/68
50-293	3	1	7	1	±0	B-N ±0	±B-N	0	0.03	6/11/68
50-293	3	1	4	1	±0	B-N ±0	±B-N	0	0.13	6/13/68
50-293	3	1	0	0	±0	B-N ±0	±B-N	0	2.22	1/ 6/69
50-293	3	1	31	1	±0	B-N ±0	±B-N	0	7.22	2/ 6/69
50-293	3	3	31	1	±0	B-N ±0	±B-N	0	20	2/24/69
50-293	3	1	25	1	±0	B-N ±0	±B-N	0	0.03	8/22/69
50-293	3	1	4	1	±0	B-N ±0	±B-N	0	0.015	1/12/70
50-293	3	1	4	1	±0	B-N ±0	±B-N	0	0.62	5/19/70
50-293	3	1	31	1	±0	B-N ±0	±B-N	0	0.03	12/21/70
50-293	3	1	7	1	±0	B-N ±0	±B-N	0	0.03	6/22/71
50-293	3	1	29	1	±0	B-N ±0	±B-N	0	0.08	6/22/71
50-293	3	1	7	1	±0	B-N ±0	±B-N	0	0.05	9/15/71
50-293	3	1	7	1	±0	B-N ±0	±B-N	0	7.47	10/31/71

±0.5/130K

±0.2/4K

50-206	7	1	0	0	-0	*B,N -0	*B,N	7.75	1/15/72
50-206	7	1	3	1	-0	*B,N -0	*B,N	0.52	5/25/72
50-206	7	1	29	1	-0	*B,N -0	*B,N	7.06	8/ 9/72
50-206	7	1	4	1	-0	*B,N -0	*B,N	0.93	8/12/72
50-206	7	1	42	1	-0	*B,N -0	*B,N	0	8/12/72
50-206	7	1	22	1	-0	*B,N -0	*B,N	1.3	8/12/72
50-206	7	1	7	1	-0	*B,N -0	*B,N	0.08	4/ 1/73
50-206	7	1	0	0	-0	*B,N -0	*B,N	0.05	8/ 6/73
50-206	7	1	9	1	-0	*B,N -0	*B,N	0.18	8/15/73
50-206	7	1	13	1	-0	*B,N -0	*B,N	0.45	8/16/73
50-206	7	1	9	1	-0	*B,N -0	*B,N	0.08	9/17/73
50-206	7	1	0	1	-0	*B,N -0	*B,N	0.13	11/29/73
50-206	7	1	0	0	-0	*B,N -0	*B,N	0.13	2/23/74
50-206	7	1	0	0	-0	*B,N -0	*B,N	0.03	4/15/74
50-206	7	1	9	1	-0	*B,N -0	*B,N	5.02	11/ 7/74
50-206	7	1	0	0	-0	*B,N -0	*B,N	5.55	2/15/75
50-206	7	1	13	1	-0	*B,N -0	*B,N	0.13	4/23/75
50-206	7	1	0	0	-0	*B,N -0	*B,N	0.07	8/12/75
50-206	7	1	25	1	-0	*B,N -0	*B,N	1.12	9/23/75
50-206	7	1	0	0	-0	*B,N -0	*B,N	0.00	9/24/75
50-206	7	4	25	1	-0	*B,N -0	*B,N	4.42	1/21/76
50-206	7	1	34	1	-0	*B,N -0	*B,N	2.18	1/30/76
50-206	7	1	9	1	-0	*B,N -0	*B,N	0.02	3/31/76
50-206	7	1	22	1	-0	*B,N -0	*B,N	0.03	9/24/76
50-206	7	1	34	1	-0	*B,N -0	*B,N	3.75	5/12/77
50-206	7	1	22	1	-0	*B,N -0	*B,N	0.05	7/23/77
50-206	7	1	25	1	-0	*B,N -0	*B,N	0	11/29/77
50-206	7	1	5	1	-0	*B,N -0	*B,N	2.5	3/ 8/78
50-206	7	1	0	0	-0	*B,N -0	*B,N	0.15	5/22/78
50-206	7	1	0	0	-0	*B,N -0	*B,N	0.3	5/28/78
50-206	7	1	7	1	-0	*B,N -0	*B,N	0.01	6/ 4/78
50-206	7	1	0	0	-0	*B,N -0	*B,N	0	6/15/78
50-206	7	1	0	0	-0	*B,N -0	*B,N	0.17	6/17/78
50-206	7	1	22	1	-0	*B,N -0	*B,N	0.07	12/19/78
50-206	7	1	25	1	-0	*B,N -0	*B,N	2.23	9/15/79
50-219	3	1	42	1	-0	*B,N -0	*B,N	0.02	8/24/78
50-10*	4	1	4	1	-0	*B,N -0	*B,N	7.25	1/22/78
50-219	3	1	15	1	-0	*B,N -0	*B,N	0	3/ 4/68
50-219	3	1	4	1	-0	*B,N -0	*B,N	0	4/19/69
50-219	3	1	22	1	-0	*B,N -0	*B,N	0	6/14/69
50-219	3	1	9	1	-0	*B,N -0	*B,N	0	10/27/71
50-219	3	1	13	1	-0	*B,N -0	*B,N	2.02	6/11/72
50-219	3	1	13	1	-0	*B,N -0	*B,N	2.02	6/11/72
50-219	3	1	22	1	-0	*B,N -0	*B,N	0	7/ 3/72
50-219	3	1	22	1	-0	*B,N -0	*B,N	0.02	6/30/73
50-219	3	1	4	1	-0	*B,N -0	*B,N	0	9/17/74
50-219	3	1	4	1	-0	*B,N -0	*B,N	0	9/17/74
50-219	3	1	4	1	-0	*B,N -0	*B,N	1.65	12/18/74
50-10*	4	1	20	1	-0	*B,N -0	*B,N	29.93	6/25/78
50-10*	4	1	0	0	-0	*B,N -0	*B,N	5.65	10/21/77
50-10*	4	1	0	0	-0	*B,N -0	*B,N	19.8	1/20/77
50-10*	4	1	22	1	-0	*B,N -0	*B,N	0	7/19/79
50-10*	4	1	9	1	-0	*B,N -0	*B,N	0	9/30/77
50-10*	4	1	9	1	-0	*B,N -0	*B,N	0.07	1/24/77
50-10*	4	1	9	1	-0	*B,N -0	*B,N	0.07	12/18/76

50-285	7	1	34	1	1	344/345K	B,N	-60	*B,N	0	12/20/73
50-285	7	1	0	1	1	0	B,N	-60	*B,N	0	5/10/74
50-285	7	1	0	1	1	0	B,N	-60	*B,N	0	5/10/74
50-285	7	1	0	1	1	0	B,N	-60	*B,N	0	5/18/74
50-285	7	1	0	1	0	345/345K	B,N	0,60	*B,N	0	8/ 8/74
50-285	7	1	31	1	344/345K	B,N	-60	*B,N	0,97	8/13/74	
50-285	7	1	4	1	1	0	B,N	-60	*B,N	0,07	1/29/75
50-285	7	2	9	1	1	0	B,N	-60	*B,N	0	2/28/75
50-285	7	2	9	1	1	0	B,N	-60	*B,N	0,12	3/ 1/75
50-285	7	2	9	1	1	0	B,N	-60	*B,N	0	3/ 1/75
50-285	7	2	9	1	1	0	B,N	-60	*B,N	0	3/ 1/75
50-285	7	2	9	1	1	0	B,N	-60	*B,N	7	3/13/75
50-285	7	2	29	1	1	0	B,N	-60	*B,N	0,08	3/17/75
50-285	7	1	4	1	1	0	B,N	-60	*B,N	0,2	4/ 7/75
50-285	7	1	0	1	1	0	B,N	-60	*B,N	0	4/22/75
50-285	7	1	0	1	1	0	B,N	-60	*B,N	0	6/ 3/75
50-285	7	1	0	1	1	0	B,N	-60	*B,N	3,45	6/ 3/75
50-285	7	1	0	1	1	0	B,N	-60	*B,N	0,13	11/ 9/75
50-285	7	1	0	1	1	0	B,N	-60	*B,N	0,13	12/ 9/75
50-285	7	1	4	1	1	0	B,N	-60	*B,N	0,08	12/27/75
50-285	7	1	4	1	1	0	B,N	-60	*B,N	0,12	1/ 7/76
50-285	7	2	15	1	300/345K	B,N	-60	*B,N	0,9	2/21/76	
50-285	7	1	9	1	1	0	B,N	-60	*B,N	4,67	3/29/76
50-285	7	3	4	1	360/345K	B,N	-60	*B,N	1,4	5/26/76	
50-285	7	1	9	1	1	0	B,N	-60	*B,N	0	2/10/77
50-285	7	1	34	1	1	0	B,N	-60	*B,N	14,58	2/23/77
50-285	7	1	22	1	1	0	B,N	-60	*B,N	0	4/17/77
50-285	7	1	31	1	1	0	B,N	-60	*B,N	0,08	6/28/77
50-285	7	1	0	1	1	310/345K	B,N	-60	*B,N	0	9/ 2/77
50-285	7	1	22	1	1	0	B,N	-60	*B,N	0	9/ 8/77
50-285	7	1	9	1	1	0	B,N	-60	*B,N	0	2/ 7/78
50-285	7	1	20	1	1	0	B,N	-60	*B,N	2,43	2/10/78
50-285	7	1	0	1	1	0	B,N	-60	*B,N	0	5/19/78
50-285	7	2	0	1	353/345K	B,N	-60	*B,N	0	6/22/78	
50-285	7	1	9	1	1	0	B,N	-60	*B,N	0	10/19/78
50-285	7	1	0	1	1	0	B,N	-60	*B,N	0	11/20/78
50-285	7	1	34	1	322/345K	B,N	-60	*B,N	22,25	9/ 8/79	
50-317	2	1	9	1	1	0	B,N	-60	*B,N	8,3	2/ 3/76
50-318	2	1	9	1	1	0	B,N	-60	*B,N	8,3	2/ 3/76
50-317	2	1	4	1	1	0	B,N	-60	*B,N	4,97	5/18/76
50-318	2	1	4	1	1	0	B,N	-60	*B,N	4,97	5/18/76
50-317	2	1	4	1	1	0	B,N	-60	*B,N	3,15	5/18/76
50-318	2	1	4	1	1	0	B,N	-60	*B,N	3,15	5/18/76
50-317	2	1	4	1	1	0	B,N	-60	*B,N	4,85	5/21/76
50-318	2	1	4	1	1	0	B,N	-60	*B,N	4,85	5/21/76
50-317	2	1	4	1	1	0	B,N	-60	*B,N	0	12/ 2/76
50-318	2	1	4	1	1	0	B,N	-60	*B,N	0	12/ 2/76
50-317	2	1	29	1	1	0	B,N	-60	*B,N	70,78	12/14/76
50-318	2	1	29	1	1	0	B,N	-60	*B,N	70,78	12/14/76
50-317	2	1	34	1	1	0	B,N	-60	*B,N	5,52	9/ 9/79
50-318	2	1	34	1	1	0	B,N	-60	*B,N	5,52	9/ 9/79
50-317	2	1	4	1	1	0	B,N	-60	*B,N	6,78	11/11/79
50-318	2	1	4	1	1	0	B,N	-60	*B,N	6,78	11/11/79
50-317	2	1	4	1	1	0	B,N	-60	*B,N	3,88	1/ 8/77
50-318	2	1	4	1	1	0	B,N	-60	*B,N	3,88	1/ 8/77
50-317	2	1	4	1	1	0	B,N	-60	*B,N	0,17	11/14/79
50-318	2	1	4	1	1	0	B,N	-60	*B,N	0,17	11/14/79

50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	9.3	3/23/76
50-261	7	1	22	1	0.0	rD,N 0.60	rO,D,N	0.02	6/18/75
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	96.02	10/ 6/74
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	0.1	6/10/74
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	7.35	4/ 3/74
50-261	1	1	1	1	0.0	rD,N 0.60	rO,D,N	5.27	4/ 4/74
50-261	1	1	1	1	0.0	rD,N 0.60	rO,D,N	0.02	7/12/73
50-261	8	1	4	1	0.0	rD,N 0.60	rO,D,N	17.15	6/10/77
50-261	8	1	4	1	0.0	rD,N 0.60	rO,D,N	3.28	6 -1/73
50-261	8	1	4	1	0.0	rD,N 0.60	rO,D,N	12.18	10/11/73
50-261	8	1	4	1	0.0	rD,N 0.60	rO,D,N	9.67	10/25/73
50-261	6	1	4	1	0.0	rD,N 0.60	rO,D,N	7.27	8/22/72
50-261	6	1	4	1	0.0	rD,N 0.60	rO,D,N	9.18	8/28/72
50-261	1	4	1	0.0	rD,N 0.60	rO,D,N	10.63	8/22/71	
50-261	4	1	4	1	0.0	rD,N 0.60	rO,D,N	11.57	7/19/71
50-261	3	1	4	1	0.0	rD,N 0.60	rO,D,N	24.02	6/27/71
50-261	4	1	4	1	0.0	rD,N 0.60	rO,D,N	36.15	12/22/79
50-261	4	1	4	1	0.0	rD,N 0.60	rO,D,N	3.45	6/ 5/79
50-261	4	1	4	1	0.0	rD,N 0.60	rO,D,N	0.02	12/30/78
50-261	5	1	4	1	0.0	rD,N 0.60	rO,D,N	0.02	11/ 1/78
50-261	5	1	4	1	0.0	rD,N 0.60	rO,D,N	3.45	10/15/78
50-261	6	1	4	1	0.0	rD,N 0.60	rO,D,N	9.87	8/ 7/78
50-261	6	1	4	1	0.0	rD,N 0.60	rO,D,N	4.12	7/ 5/78
50-261	6	1	4	1	0.0	rD,N 0.60	rO,D,N	2.58	7/24/78
50-261	6	1	4	1	0.0	rD,N 0.60	rO,D,N	1.07	6/29/78
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	0.02	2/ 5/78
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	9.77	2/ 4/78
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	2.48	6/12/78
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	0.02	12/ 1/77
50-261	7	1	7	1	0.0	rD,N 0.60	rO,D,N	0.02	2/ 8/77
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	1.05	12/30/76
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	0.02	10/17/76
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	15.67	6/29/76
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	2.08	11/12/76
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	15.7	10/ 4/76
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	5.83	3/ 7/75
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	25.72	1/ 4/75
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	0.02	1/ 5/75
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	9.05	6/ 9/74
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	13.68	1/20/74
50-261	8	1	4	1	0.0	rD,N 0.60	rO,D,N	3.15	11/16/73
50-261	8	1	4	1	0.0	rD,N 0.60	rO,D,N	12.95	11/23/73
50-261	5	1	31	1	0.0	rD,N 0.60	rO,D,N	11.48	10/ 9/73
50-261	5	1	4	1	0.0	rD,N 0.60	rO,D,N	0.2	7/14/72
50-261	6	1	4	1	0.0	rD,N 0.60	rO,D,N	6.18	7/14/72
50-261	4	1	22	1	0.0	rD,N 0.60	rO,D,N	9.07	7/15/72
50-261	4	1	4	1	0.0	rD,N 0.60	rO,D,N	8.63	5/31/79
50-261	4	1	4	1	0.0	rD,N 0.60	rO,D,N	15.08	3/ 5/79
50-261	4	1	4	1	0.0	rD,N 0.60	rO,D,N	10.43	3/23/79
50-261	4	1	4	1	0.0	rD,N 0.60	rO,D,N	2.13	1/14/79
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	9.82	6/ 2/78
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	5.43	6/ 3/78
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	24	5/ 5/78
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	23.5	5/14/78
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	681.2	4/ 2/78
50-261	7	1	15	1	0.0	rD,N 0.60	rO,D,N	0.02	1/25/78
50-261	8	1	4	1	0.0	rD,N 0.60	rO,D,N	4.9	7/22/77
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	8.03	4/17/77
50-261	8	1	4	1	0.0	rD,N 0.60	rO,D,N	2.67	4/24/77
50-261	6	1	4	1	0.0	rD,N 0.60	rO,D,N	3.78	4/25/77
50-261	7	1	4	1	0.0	rD,N 0.60	rO,D,N	4.37	7/27/75

50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	8.42	9/22/75
50-261	7	1	22	1	0.0	rD,N 0.60	r0,D,N	0.02	2/18/75
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	3.97	11/15/74
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	15.5	6/21/74
50-261	7	1	7	1	0.0	rD,N 0.60	r0,D,N	0.02	7/31/74
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	17	5/29/74
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	0.22	5/30/74
50-261	8	1	4	1	0.0	rD,N 0.60	r0,D,N	20.58	8/25/73
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	23	4/ 1/73
50-261	8	1	4	1	0.0	rD,N 0.60	r0,D,N	6.13	10/14/73
50-261	6	1	4	1	0.0	rD,N 0.60	r0,D,N	10.48	9/13/72
50-261	6	1	4	1	0.0	rD,N 0.60	r0,D,N	13.68	9/29/72
50-261	6	1	4	1	0.0	rD,N 0.60	r0,D,N	2.67	8/ 9/72
50-261	6	1	4	1	0.0	rD,N 0.60	r0,D,N	8.27	8/14/72
50-261	6	1	4	1	0.0	rD,N 0.60	r0,D,N	10.03	8/31/72
50-261	5	1	4	1	0.0	rD,N 0.60	r0,D,N	0.5	4/ 1/72
50-261	5	1	4	1	0.0	rD,N 0.60	r0,D,N	4.45	4/ 3/72
50-261	5	1	22	1	0.0	rD,N 0.60	r0,D,N	0.02	4/18/72
50-261	5	1	22	1	0.0	rD,N 0.60	r0,D,N	0.02	4/12/72
50-261	5	1	4	1	0.0	rD,N 0.60	r0,D,N	10.3	4/25/72
50-261	5	1	4	1	0.0	rD,N 0.60	r0,D,N	21.37	3/31/72
50-261	4	1	4	1	0.0	rD,N 0.60	r0,D,N	17.22	1/13/72
50-261	3	1	22	1	0.0	rD,N 0.60	r0,D,N	0.02	6/27/71
50-261	2	1	4	1	0.0	rD,N 0.60	r0,D,N	10.3	1/12/71
50-261	4	1	4	1	0.0	rD,N 0.60	r0,D,N	7.3	6/18/79
50-261	4	1	7	1	0.0	rD,N 0.60	r0,D,N	0.02	2/ 7/79
50-261	8	1	7	1	0.0	rD,N 0.60	r0,D,N	0.02	5/ 6/77
50-261	8	1	22	1	0.0	rD,N 0.60	r0,D,N	0.02	5/26/77
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	2.03	11/22/76
50-261	7	1	22	1	0.0	rD,N 0.60	r0,D,N	0.02	5/13/76
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	10.38	4/17/75
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	4.9	6/ 4/75
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	11.87	8/13/74
50-261	7	1	22	1	0.0	rD,N 0.60	r0,D,N	0.02	5/30/74
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	3.83	12/13/73
50-261	8	1	4	1	0.0	rD,N 0.60	r0,D,N	13.42	8/12/73
50-261	8	1	4	1	0.0	rD,N 0.60	r0,D,N	7.38	6/30/73
50-261	8	1	4	1	0.0	rD,N 0.60	r0,D,N	3.4	9/28/72
50-261	5	1	4	1	0.0	rD,N 0.60	r0,D,N	4.05	6/ 4/72
50-261	5	1	22	1	0.0	rD,N 0.60	r0,D,N	0.02	6/14/72
50-261	4	1	4	1	0.0	rD,N 0.60	r0,D,N	15.67	1/13/72
50-261	4	1	4	1	0.0	rD,N 0.60	r0,D,N	15.87	10 - 71
50-261	4	1	4	1	0.0	rD,N 0.60	r0,D,N	17.43	10/ 7/71
50-261	3	1	4	1	0.0	rD,N 0.60	r0,D,N	15.87	6/27/71
50-261	2	1	4	1	0.0	rD,N 0.60	r0,D,N	29.4	3/12/71
50-261	2	1	4	1	0.0	rD,N 0.60	r0,D,N	1.83	3/21/71
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	3.7	6/27/78
50-261	8	1	4	1	0.0	rD,N 0.60	r0,D,N	0.92	7/15/77
50-261	8	1	4	1	0.0	rD,N 0.60	r0,D,N	1.97	7/22/77
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	6.33	9/18/74
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	7.4	7/16/74
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	0.98	1/15/74
50-261	7	1	4	1	0.0	rD,N 0.60	r0,D,N	60.95	1/23/74
50-261	5	1	4	1	0.0	rD,N 0.60	r0,D,N	8.68	2/23/72

PRINT

50-309	2	1	0	1	-0	.D,N 0,0	.0,D,N	0.02	2/ 4/72
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.42	4/19/72
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	9.57	4/23/72
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	3.68	4/30/72
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	53.93	5/ 8/72
50-309	2	1	5	1	-0	.D,N 0,0	.0,D,N	0.17	5/30/72
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	57.8	7/10/72
50-309	2	1	22	1	-0	.D,N 0,0	.0,D,N	0.02	8/27/72
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	4.67	1/16/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	7.8	1/17/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.87	1/18/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	0.62	1/22/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	0.63	1/19/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	7.02	1/27/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	1.2	2/21/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.02	3/27/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.77	4/24/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.08	5/13/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5	6/ 6/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	2.02	6/ 8/73
50-309	2	1	0	1	-0	.D,N 0,0	.0,D,N	0.02	9/ 6/73
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	4.28	3/ 1/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.1	3/ 6/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.28	3/ 7/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.83	3/ 8/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.48	3/11/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.03	3/12/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.27	3/13/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.92	3/14/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.42	4/ 7/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	3.62	5/24/74
50-309	2	1	22	1	-0	.D,N 0,0	.0,D,N	0.02	7/ 9/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.15	9/10/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	7.42	10/ 3/74
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	4.67	10/ 4/74
50-209	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.03	1/ 8/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.33	1/10/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.2	1/14/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.25	1/15/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.32	1/24/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.25	1/28/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.93	1/30/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	1.17	1/31/75
50-309	2	1	7	7	-0	.D,N 0,0	.0,D,N	?	1/31/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.45	2/ 3/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	6.12	2/ 7/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.83	2/10/75
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	2.25	4/ 7/76
50-309	2	1	5	1	-0	.D,N 0,0	.0,D,N	2.65	5/11/76
50-309	2	1	5	1	-0	.D,N 0,0	.0,D,N	2.13	5/11/76
50-309	2	1	4	1	-0	.D,N 0,0	.0,D,N	5.82	6/24/76

50-309	2	1	22	1	-0	*B*N 0+0	*O*B*N	0.02	7/27/76
50-309	2	1	22	1	-0	*B*N 0+0	*O*B*N	0.02	7/31/76
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	4.43	8/18/76
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	3.95	8/26/76
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	4.53	2/8/77
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	4.3	4/27/77
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	1.57	8/4/77
50-309	2	1	22	1	-0	*B*N 0+0	*O*B*N	0.02	8/14/77
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	5.13	10/1/77
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	5.87	11/2/77
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	5.45	11/3/77
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	6.47	12/5/77
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	6.5	12/7/77
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	0.02	12/15/77
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	1.07	12/20/77
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	0.27	12/22/77
50-309	2	1	0	1	-0	*B*N 0+0	*O*B*N	8.3	5/25/78
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	3.87	12/15/78
50-309	2	1	0	1	-0	*B*N 0+0	*O*B*N	0.02	1/25/79
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	3.88	10/17/79
50-309	2	1	4	1	-0	*B*N 0+0	*O*B*N	0.8	11/21/79

*****TOP B KEY*

FOUND TOP B KEY

---FILE

PRINT

TOP B KEY

COLUMN CONTENT/SCALE

1/1 DOCKET #
2/8 DURATION OF POWER LOSS/HOURS, CAUSE (CODE)
3/12(C) TIME TO PARTIAL RECOVERY/HOURS
4/23(C) TURBINE TRIP (T OR D)
5/25 TIME FROM TURBINE TRIP TO LOSS OF OFFSITE POWER/SECONDS
6/31(C) WAS POWER RESTORED IN LESS THAN OR EQUAL TO TEN MINUTES? (Y OR N)
7/33 IF YES, WAS RESTORATION AUTOMATIC (A) OR MANUAL (M)?
8/35 VOLTAGE INCREASE (+) OR DECREASE (-), EXTREME VOLTAGE/VOLTS, BEFORE (B) OR DURING (D) OUTAGE,
EQUIPMENT DAMAGE (Y OR N)
9/50(C) FREQUENCY INCREASE (+) OR DECREASE (-), EXTREME VALUE/HZ, MAXIMUM RATE/HZ/SEC, BEFORE (B) OR
DURING EVENT (D), EQUIPMENT DAMAGE (Y OR N)
10/67(C) DATE MM/DD/YY

50-409	0.33+4	Y	T	Y	N	0+0	0+0	0+0	0+0	0+0	12/21/79
50-409	0.03+4	Y	N	0+0	Y	0+0	0+0	0+0	0+0	0+0	9/17/74
50-409	1.03+29	Y	N	0+0	N	0+0	0+0	0+0	0+0	0+0	10/23/74
50-409	0.17+4	Y	N	0+0	Y	0+0	0+0	0+0	0+0	0+0	5/12/75
50-409	5.38+9	Y	N	0+0	N	0+0	0+0	0+0	0+0	0+0	7/ 5/75
50-324	0.07+7	Y	N	0+0	N	0+0	0+0	0+0	0+0	0+0	3/26/75
50-255	0.93+5	Y	N	0+0	N	0+0	0+0	0+0	0+0	0+0	9/ 2/71
50-255	4.75+0	Y	I	0	N	0+0	0+0	0+0	0+0	0+0	9/24/77
50-255	3.5+0	Y	I	0	N	0+0	0+0	0+0	0+0	0+0	11/25/77
50-255	1.5+0	Y	I	0	N	0+0	0+0	0+0	0+0	0+0	12/11/77
50-336	27.77+9	Y	I	0	N	0+0	0+0	0+0	0+0	0+0	8/10/76
50-155	0.02+4	Y	I	0	Y	0+0	0+0	0+0	0+0	0+0	1/25/72
50-317	7+5	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	12/20/73
50-298	7+4	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	2/21/76
50-285	7+5	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	3/13/75
50-321	7+4	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	9/28/77
50-135	499.2+5	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	7/17/70
50-135	28+31	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	7/20/72
50-003	0.92+23	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	5/ 6/77
50-286	7+27	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	7/20/72
50-247	0.92+23	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	9/ 8/73
50-219	7+4	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	10/17/74
50-255	0.5+4	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	4/15/74
50-293	7+22	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	5/ 1/77
50-293	7+25	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	10/13/73
50-266	7+13	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	6/ 7/73
50-206	7+4	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	5/16/77
50-251	7+1	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	4/ 3/73
50-251	7+1	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	4/ 4/73
50-316	0.67+7	Y	I	-300	Y	0+0	0+0	0+0	0+0	0+0	2/19/80
50-029	4.18+7	Y	N	0	N	0+0	0+0	0+0	0+0	0+0	11/ 9/65
50-205	1.83+7	0	I	0	N	0+0	0+0	0+0	0+0	0+0	8/22/77
50-317	11.2+35	0.27	I	-7	N	0+0	0+0	0+0	0+0	0+0	4/11/78
50-310	11.2+3	0.27	I	-7	N	0+0	0+0	0+0	0+0	0+0	4/11/78
50-317	5.83+4	Y	I	-7	N	0+0	0+0	0+0	0+0	0+0	4/13/78
50-310	5.83+4	Y	I	-7	N	0+0	0+0	0+0	0+0	0+0	4/13/78
50-333	0+4	0	N	-	Y	A	0+0	0+0	0+0	0+0	10/ 4/78
50-333	0.05+7	0.05	N	-	Y	H	0+0	0+0	0+0	0+0	3/27/79
50-244	0.5+13	Y	N	F	N	0+0	0+0	0+0	0+0	0+0	3/ 4/71
50-244	7+13	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	12/ 5/68
50-206	0.07+4	0.07	N	-	Y	H	0+0	0+0	0+0	0+0	4/22/80
50-247	14.75+22	2.42	I	F	N	0+0	0+0	0+0	0+0	0+0	6/ 3/80
50-3	14.75+22	2.42	N	-	N	0+0	0+0	0+0	0+0	0+0	6/ 3/80
50-309	0.02+24	0.02	Y	-	Y	H	0+0	0+0	0+0	0+0	8/31/78
50-269	1+4	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	1/ 4/74
50-270	1+4	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	1/ 4/74
50-287	1+4	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	1/ 4/74
50-313	0.32+4	Y	I	0	N	0+0	0+0	0+0	0+0	0+0	4/ 7/80
50-368	0.32+4	Y	I	0	N	0+0	0+0	0+0	0+0	0+0	4/ 7/80
50-259	7+4	Y	I	-7	Y	0+0	0+0	0+0	0+0	0+0	11/10/73
50-260	7+4	Y	I	-7	Y	0+0	0+0	0+0	0+0	0+0	11/10/73
50-296	7+4	Y	I	-7	Y	0+0	0+0	0+0	0+0	0+0	11/10/73
50-296	7+22	Y	N	-	N	0+0	0+0	0+0	0+0	0+0	7/13/77
50-206	0.07+4	0.07	N	-	N	0+0	0+0	0+0	0+0	0+0	4/22/80
50-334	7+24	Y	I	240	Y	0+0	0+0	0+0	0+0	0+0	7/26/78
50-409	7+4	Y	I	-7	Y	0+0	0+0	0+0	0+0	0+0	8/17/72
50-255	7+7	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	9/27/77
50-271	7+24	Y	Y	0	Y	0+0	0+0	0+0	0+0	0+0	12/27/72
50-305	158.7+24	16.33	I	0	N	0+0	0+0	0+0	0+0	0+0	1/17/80

APPENDIX B
RESULTS

PKINT

DATA SUMMARY FOR 9/ 6/80

TOTAL NUMBER OF REPORTED EVENTS

LOF A14 = 244
LOF SA10 = 166
LOF AB14 = 142
LOF AC1 = 167
LOF AD1 = 72
LOF B35 = 105
* = 206

TOTAL = 1102

RATIO OF TOTAL LOSS TO PARTIAL LOSS = 10.53 %

RATIO OF TOTAL LOSSES TO ALL EVENTS = 9.53 %

RATIO OF PARTIAL LOSSES TO ALL EVENTS = 90.47 %

TRIP EVENT DISTRIBUTION

7 = 6	11 = 0	28 = 2
0 = 141	12 = 4	29 = 16
1 = 5	13 = 32	31 = 19
2 = 1	14 = 0	32 = 1
3 = 2	15 = 90	33 = 2
4 = 352	20 = 9	34 = 26
5 = 29	22 = 173	35 = 2
7 = 48	23 = 4	36 = 6
9 = 101	24 = 9	42 = 5
10 = 1	25 = 16	

TOTAL LOSS OF OFFSITE POWER

MAXIMUM HOURS = 28.88
MINIMUM HOURS = 0.0
MEAN = 3.6
SIGMA = 5.71
N = 75

TIME TO PARTIAL RECOVERY

MAXIMUM HOURS = 24.62
MINIMUM HOURS = 0.0
MEAN = 2.08
SIGMA = 4.78
N = 42

PARTIAL LOSS OF OFFSITE POWER FOR A TYPE DATA AND TIME TO RECOVERY ON B TYPE DATA

MAXIMUM HOURS = 4380
MINIMUM HOURS = 0 (BREAKER CYCLE TIME)
MEAN = 10.66
SIGMA = 141.57
N = 993

FRACTION REMAINING VS. TIME TO RESTORE

MEAN - 3 SIGMA	MEAN	MEAN + 3 SIGMA	% REMAINING
0	16.17	75.18	88
0	6.64	127.91	86
0	1.85	13.93	83
0	4.93	22.94	80
0	4.14	53.67	75
0	3.14	26.84	71
0	4.01	26.44	67
0	10.7	38.6	57
0	6.64	58.5	50
0	1.51	7.69	43
0	60.11	371.69	40
0	10.16	82.94	33
0.48	0.48	0.48	20
0	3.6	20.72	00.00

NO CORRELATION FOR Y F(X) !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

DATA FOR LIGHTENING STRIKES

MAXIMUM HOURS = 40.93
 MINIMUM HOURS = 0
 MEAN = 0.78
 SIGMA = 4.29
 N = 163

VOLTAGE CHANGE (%)

MAXIMUM = +17.39
 MINIMUM = -100
 MEAN = -16.19
 SIGMA = 29.05
 N = 24

MINIMUM FREQUENCY (HZ)

MAXIMUM = 60
 MINIMUM = 36
 MEAN = 56.75
 SIGMA = 5.55
 N = 20

RATE OF FREQUENCY DECAY (HZ/SEC)

MINIMUM = 0
 MAXIMUM = 5
 MEAN = 1.31
 SIGMA = 1.8
 N = 13

290
 501
 302
 304
 305
 306
 309
 313
 315 0.09 0.09
 316 0.09 0.09
 317 0.08
 318 0.12
 321
 324
 331
 333
 334
 335
 336
 338
 344
 348
 368
 409 0.11
 410 0.01 0.01 0.01 0.01 0.02
 5 = 0.02 0.03 0.04 0.04 0.09

0.06

0.19

0.6

0.14

0.37

PROBABILITY OF TOTAL LOSS = (1102/400.69) X 0.0953 = 0.26 / REACTOR YEAR

VALUE - MEAN + 3 SIGMA

1016 (-3.55)	ITEM 13 (<0.2)	ITEM 31 (>0.11)
255	266	318
309	293	
ITEM 0 (-0.53)	ITEM 15 (>0.42)	ITEM 32 (>0.13)
213	155	286
237	293	
249	ITEM 20 (>0.25)	ITEM 34 (>0.12)
	296	317
MISC (-0.30)	ITEM 22 (<0.63)	ITEM 7 (>0.29)
250	213	533
251	255	348
ITEM 3 (-0.11)	ITEM 23 (>0.00)	
250	3	
318	247	
	265	
	278	
ITEM 4 (-2.05)	ITEM 24 (>0.48)	
261	305	
309	334	
346		
ITEM 5 (-0.25)	ITEM 25 (>0.21)	
255	272	
335		

ITEM / (-0.21) ITEM 29 (-0.00)
255
ITEM 9 (-0.65) 315
245 316
336

KAMB - 1
255 = 5 (101,5,7,22,29)
213 = 2 (0,22)
250 = 2 (MISC,3)
286 = 2 (20,32)
293 = 2 (13,15)
309 = 2 (101,4)
310 = 2 (3,31)

--REWIRED UP KATE 27*
--FLUSH

END OF FILE