

ATTACHMENT 1

DUKE POWER COMPANY

12 HOUR SHIFT EXPERIENCE

JUNE 20, 1984

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50-370

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## INTRODUCTION

In 1978, the operators at one of Duke Power Company's fossil stations (Belews Creek Steam Station) proposed to the plant management that a different shift rotation schedule be implemented. Management subsequently appointed a committee to thoroughly evaluate the feasibility of a revised shift rotation. Two years later the committee presented to corporate management the plans for a twelve hour shift based upon programs in existence at other industries in the Southeast. The appropriate approvals were obtained and a four section, twelve hour shift program was implemented on a trail basis in January 1981.

After six months an evaluation was made to determine if the twelve hour shift program was satisfactory to the station employees as well as enabling the plant to meet the Company's objectives of safe and efficient operation. The employees were very much in favor of the twelve hour shift and the evaluation of employee performance also indicated favorable results. After additional evaluation periods, the four section, twelve hour shift was approved as the normal schedule for operators at Belews Creek Steam Station. Enclosures (1) and (2) are copies of the evaluations done at Belews Creek.

A short time after the twelve hour shift was approved at Belews Creek the nuclear station operators expressed an interest in this program. An additional evaluation of twelve hour shifts was conducted based upon the needs of the nuclear plants, and in January of 1983 the program was initiated. A year and a half of operating the nuclear stations with twelve hour shifts has proven that the program is working. The Company plans to continue its efforts in this area by allowing other station groups (Maintenance, Chemistry, Health Physics, etc.) to participate in the twelve hour shift program. Catawba Nuclear Station will initially utilize the same twelve hour shift rotation that the Belews Creek Station has tested and proven to be so successful. In October of this year, it is projected that Catawba will switch to the five section rotation presently in use at the McGuire and Oconee Nuclear Stations.

### Typical Twelve Hour Shift Rotation

One of the major reasons for the success of the twelve hour shift program at Duke Power Company is the positive effect it has on employee morale. To understand why the operators perceive the program as a benefit it is necessary to examine the twelve hour shift and compare it to the eight hour shift rotation.

An example of the twelve hour rotation is presented in Enclosure (3). It is a typical ten week cycle used at the operating nuclear stations. As indicated in the enclosure, the maximum number of consecutive twelve hour shifts worked is four. This occurs only four times in the ten week cycle and only two of these times are on the night shift. On the eight hour shift the operator worked seven days consecutively. The number of consecutive days worked is significant because as disclosed in the two year study prior to initial implementation of this program, employee productivity begins to drastically decrease after six consecutive days of twelve hour shifts. Our experience has shown that working four consecutive twelve hour days is less fatiguing to the operator than working seven consecutive eight hour days. As discussed later in this report the Company's personnel safety record and a decrease in Reportable Occurances due to personnel errors support this fact. It is also consistent with employee comments that they are more rested on the twelve hour shift than they were on the eight hour rotation.

The twelve hour shift schedule enables the operator to be off 173 days per year as opposed to only 92 days when working an eight hour shift. Twelve hour shifts also allow the operator an additional ten weekends off per year. Enclosure (4) compares the eight hour and twelve hour shifts in terms of hours worked and time off.

### Employee Response to Twelve Hour Shift Program

As indicated earlier, the increased number of days off per year is the major advantage mentioned by the operators when discussing the twelve hour shift program. Additional benefits mentioned are the reduction in commuting costs by approximately thirty percent, an increase in job satisfaction, and less difficulty in maintaining alertness on the night shift.

The job satisfaction as well as improved employee morale is attributed to the overwhelming majority of shift personnel who prefer the twelve hour shift rotation. Initially, approximately eighty percent of the employees had indicated an interest in going on a twelve hour shift rotation. Today, ninety-seven percent of the operators favor continuation of the program. Station groups other than Operations are interested in the twelve hour shift program. At Oconee Nuclear Station, for example, ninety percent of the maintenance personnel who work a twelve hour shift volunteered for the program. The benefits of groups other than operations being on a twelve hour shift are numerous. Improved response time to equipment problems can eliminate plant shutdowns and has contributed to higher capacity factors. A positive team spirit has developed among Operations, Health Physics, and Maintenance since they all rotate on the common twelve hour shift schedule. The Materials group is more effective because materials can be pre-staged on the night shifts for use by the oncoming day shift workers.

Job satisfaction is also enhanced by the twelve hour shift program because the same shift now completes many evolutions which used to be turned over when working eight hour days. The operators can now see the end result of their efforts more frequently, providing the shift workers with a significant feeling of accomplishment.

## Company Benefits of Twelve Hour Shift

### Productivity

An immediate benefit to the Company of having only two shifts per day versus three is that there is obviously one less shift turnover per twenty-four hour period. This enables the manhours normally involved in the third turnover process for each watch station to be applied to more productive tasks. Improved productivity also results from enabling a single shift to complete numerous evolutions instead of turning them over to the following shift. Reducing the number of turnovers also decreases the probability for error in failing to turn over information correctly.

### Employee Attrition/Absenteeism

The evaluation period to-date has not been sufficient to fully assess the effect the twelve hour shift program has on employee attrition. Resignations and requests for transfer have remained fairly constant and have not been attributable to avoiding the twelve hour shift. Absenteeism can be reduced by high morale and job satisfaction, just as the attrition rate can. A review of absenteeism data over the last four years shows that percentages have continued to remain quite low indicating no adverse effect from the twelve hour shifts. This data is tabulated in Enclosure (5) for the operating nuclear stations.

### Personnel Safety

An improvement in the personnel safety record of the nuclear stations cannot be directly attributed to implementing the twelve hour shifts. Management's continued emphasis on personnel safety as well as the individual employee's contributions are only a few of the reasons Duke Power Company maintains an excellent safety record. It has been determined that the minor medical injuries that did occur the last year and a half are not related to the implementation of the twelve hour shift. There has been no indication from the safety statistics that the twelve hour shift program results in increased employee fatigue and a resultant increase in personnel injuries. It is noteworthy that Oconee Nuclear Station received the Edison Electric Institute award for two million manhours worked without a lost work day case through February of this year. Catawba Nuclear Station and McGuire Nuclear Station have each recently received awards for one million manhours worked without a lost work day case.

### Personnel Error

Since implementation of the twelve hour shift program, Duke Power Company's nuclear stations have shown a decrease in the number of reportable occurrences caused by personnel error. Enclosures (6) and (7) graphically display this information for Oconee and McGuire Nuclear Stations. The information on these enclosures is represented in terms of reactor years. Because Oconee Nuclear Station is a three unit plant, the number of reportable station occurrences is divided by three before being plotted. This affords a better comparison between stations which vary in the number of operating units. Similarly, the data for McGuire Nuclear Station has been adjusted to account for the licensing and initial criticality of its second unit in 1982.



Personnel Error (continued)

Because the above method of tracking reportable occurrences includes errors caused by non-shift employees in groups other than Operations, a more detailed review was conducted. Enclosure (8) lists the number of reportable occurrences caused by personnel error for Operations shift personnel only. This data has not been stated in terms of reactor years, but indicates the total number of occurrences per year per station. Obviously, Duke's improved performance in this area cannot be solely attributed to implementing the twelve hour shift program. What can be deduced, however, is that we have not decreased the quality of our operations. There is no evidence to suggest that working a twelve hour shift results in an increase in operator fatigue and a corresponding increase in personnel error.

### Summary

This report provides a quantitative assessment of specific Duke Power Company achievements in the area of nuclear power plant operation. No single activity can be identified as the basis for Duke Power's success in the nuclear industry. The Company's programs to ensure personnel safety, employee job satisfaction, and a high level of proficiency are continually being reviewed and modified as necessary as we approach our goals of excellence. As can be seen from enclosures (9) and (10), Duke's overall nuclear capacity factor and unit availability have steadily increased, and are above the industry average. Enclosures (11) and (12) show the decreasing trends in forced outages and forced load reductions since 1983. The twelve hour shift program has undoubtedly had an effect on employee morale, personnel errors, absenteeism, productivity, and ultimately power generation. The twelve hour shift program is contributing to the success of the nuclear stations.



DUKE POWER COMPANY

P. O. BOX 557

BELEWS CREEK STEAM STATION  
WALNUT COVE, N. C. 27052

TELEPHONE: AREA 919  
427-0274

October 11, 1983

Julian D'Amico, General Manager  
Fossil Stations  
Fossil Production  
Duke Power Company  
Charlotte, NC

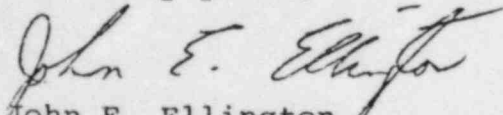
Subject: Twelve Hour Operations Shift  
Belews Creek Steam Station  
File: BC-108.65

Dear Sir:

Attached are the current statistics of most pertinence to the twelve-hour shift schedule. All other factors or opinions are unchanged from those mentioned in the first six month review (attachment #2) with the exception that there have been no further problems obtaining people for off-schedule overtime.

I hope this suffices for your present need of information related to this item. If not please let me know.

Sincerely yours,

  
John E. Ellington  
Superintendent of Operations

JEE/jbe

Attachments 2

12 Hour Shift Schedule  
Fossil Production  
Belews Creek Steam Station  
Program Evaluation

1) Sickness Allowance

Base Data  
1980  
234 days (1876 hours)

Twelve Hour History  
1981  
179 days (2153 hours)  
23.5% less (14.8% more)

1982  
110 days (1316 hours)  
(53.0% less) (29.9% less)

1983 (Jan-June)  
73 days (882 hours)

2) Sickness Allowance for Appointments

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983 (Jan-June)</u>
82 hours	102 hours	120 hours	46 hours
	(24.4% more)	(46.3% more)	

3) Overtime off-schedule

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983 (Jan-June)</u>
7405 hours	2953	3106	1455
	(60% less)	(58% less)	

4) Medical only injuries

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983 (Jan-June)</u>
3	2	4	0

5) Disabling Injuries

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983 (Jan-June)</u>
1	0	1	0

6) Resignations

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983 (Jan-June)</u>
1	1	0	0

7) Requests for Transfer

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983 (Jan-June)</u>
1	0	2*	1

\*Same person twice.

12 Hour Shift Schedule  
Steam Production Department  
Belews Creek Steam Station  
Program Evaluation

A 12 hour shift schedule for operations began on a trial basis at Belews Creek Steam Station January 5, 1981. An evaluation of this schedule was made at the end of six months. The detailed results of this evaluation are included later in this report. Belews Creek operators are continuing to work the 12 hour schedule awaiting final approval for its continuance.

Overall the 12 hour schedule has worked very well, both for station management and the operators. Our recommendation is that the 12 hour schedule be approved as the normal schedule for operators at Belews Creek Steam Station.

At the end of the trial period, we secured the operators' reaction to the schedule and compared the specific items listed in the original proposal to the Personnel Resources Committee.

97.7% (43 of 44) operators want to continue the 12 hour schedule. 97.7% (43 of 44) desire to remain on the 7 AM, 7 PM shift change times. 93.2% (41 of 44) want to remain on the two week rotation between day shift and night shift.

Some typical comments received from the operators are:

"Everyone seems to appreciate the consideration given to the operators."

"This system is great["

"Best thing that has been done for the benefit of the operators in a long time."

"The 12 hour schedule is a big improvement over old schedule."

"Having worked the old schedule for 5 years, I think the 12 hour shift is one of the top benefits to us the operators."

"I love it."

"The 12 hour shift has been beneficial to my family as well as me. Makes me not dread 3rd shift now. Not working 2nd means a lot."

Results of specific items are:

- a) Sickness allowance (other than appointment time) - 4.3% less (6 mos '81' vs 6 mos '80')
- b) Sickness allowance for appointments - 24% less (6 mos '81' vs 6 mos '80')

12 Hour Shift Schedule  
Belews Creek Steam Station  
Page 2

- c) Percent Overtime Off-schedule hours - 3.2% (6 mos '81') vs 9.0% (12 mos '80') a 64% reduction.
- d) Medical only injuries - 0 (6 mos '81') vs 3 (12 mos '80') [(2) Jan - June '80', (1) July - Dec. '80']
- e) Disabling injuries - 0 (6 mos '81') vs 1 (12 mos '80') [(1) Jan - June '80', (0) July - Dec '80]
- f) Resignations - 0 (6 mos '81') vs 1 (12 mos '80') [occurred 3/80, female operator]
- g) Requests for transfer - 0 (6 mos '81') vs 1 (12 mos '80')

The following items were also evaluated.

- a) Employee morale - the concensus of station management, shift supervision, and operators themselves is that morale is definitely higher.
- b) Productivity - difficult to measure. Supervisors opinion is that productivity is better; operators are able to complete many jobs in a 12 hour period rather than leave them partially complete and resume the next day; equipment is kept cleaner; less time in each 24 hr. period used to change shifts; better communications with 2 shifts per 24 hr. period.
- c) Ability to obtain personnel for off-schedule overtime - no problem during the first 4-1/2 months. In the last 1-1/2 months there were two occurrences when there was some difficulty in obtaining operators for emergency callout. One occurrence was at 5 PM on a Saturday. So far we do not consider this a major problem. We will continue to monitor this closely, and if it becomes necessary, we plan to establish an assigned "on call" list to cover emergency needs. We have discussed these two occasions with the operators.
- d) Quality of work - Supervision's input is that quality has not suffered. If anything, it has improved because of higher morale and most of the items listed under "productivity."

DUKE POWER COMPANY

P. O. BOX 557

BELEWS CREEK STEAM STATION  
WALNUT COVE, N. C. 27052

TELEPHONE: AREA 919  
427-0274

February 27, 1984

Julian D'Amico  
General Manager  
Fossil Production  
Duke Power Company  
Charlotte, NC

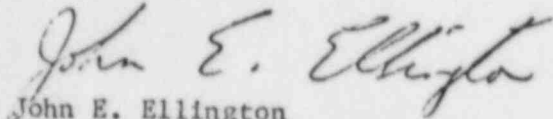
Subject: Twelve Hour Operations Shift  
Belews Creek Steam Station  
File: BC-108.65

Dear Sir:

Attached are the current statistics of most pertinence to the twelve-hour shift schedule. All other factors or opinions are unchanged from those mentioned in the previous review with the exception that there have been no further problems obtaining people for off-schedule overtime.

I hope this suffices for your present need of information related to this item. If not please let me know.

Sincerely yours,

  
John E. Ellington  
Superintendent of Operations

JEE/jaw

Attachments 1

12 Hour Shift Schedule  
Fossil Production  
Belews Creek Steam Station  
Program Evaluation

1) Sickness Allowance

Base Data  
1980  
234 days (1876 hours)

Twelve Hour History  
1981  
179 days (2153 hours)  
23.5% less (14.8% more)

1982  
110 days (1316 hours)  
53.0% less (29.9% less)

1983  
185 days (2224 hours)  
20.9% less (18.6% more)

2) Sickness Allowance for Appointments

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
82 hours	102 hours	120 hours	77 hours
	(24.4% more)	(46.3% more)	(6.1% less)

3) Overtime off-schedule

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
7405 hours	2953	3106	2385
	(60% less)	(58% less)	(68% less)

4) Medical only injuries

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
3	2	4	4

5) Disabling Injuries

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
1	0	1	0

6) Resignations

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
1	1	0	0

7) Requests for Transfer

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
1	0	2*	2*

\*Same person accounts for three of these four requests.



TYPICAL 12 HOUR SHIFT ROTATION

D O N O N O N O N O N O D O D O T O T O D O  
 3 4 4 3 4 7 3 4 3 3 4 3 4 1 4 2 5 2 3 4

O = OFF DAYS

D = DAY SHIFT (0700 - 1900)

N = NIGHT SHIFT (1900 - 0700)

T = TRAINING (8 HR. WORK DAYS)

- o ROTATION CYCLE COMPLETED EVERY 10 WEEKS.
- o OFF 6 WEEKENDS OUT OF 10.
- o MAXIMUM CONSECUTIVE 12/HR. SHIFTS WORKED IS 4.  
OCCURS 4 TIMES IN 10 WEEKS.
- o MAXIMUM CONSECUTIVE 8/HR. DAYS WORKED IS 5.  
OCCURS ONCE IN 10 WEEKS.
- o DURING 10 WEEK CYCLE ONLY 4 PERIODS WORKED ON NIGHT SHIFT.  
6 PERIODS WORKED ON DAYS.
- o DURING 10 WEEK CYCLE 1 PERIOD OF 7 CONSECUTIVE DAYS OFF.  
(AT LEAST 5 PER YEAR)

SCHEDULE COMPARISONS

	<u>8 HR.</u>	<u>12 HR.</u>
MAX. CONSECUTIVE SHIFT DAYS WORKED	7	4
HOURS/DAY	8	12*
ROTATING SHIFT	YES	YES
NUMBER OF SHIFTS/DAY	3	2
DAYS WORKED/YEAR	273	192**
TOTAL HOURS WORKED/YEAR	2184	2128
DAYS OFF/YEAR	92	173
WEEKENDS OFF/YEAR	21	31

\*9 DAYS PER 10 WEEK CYCLE ARE 8 HOUR DAYS

\*\*45 DAYS ARE 8 HOUR DAYS

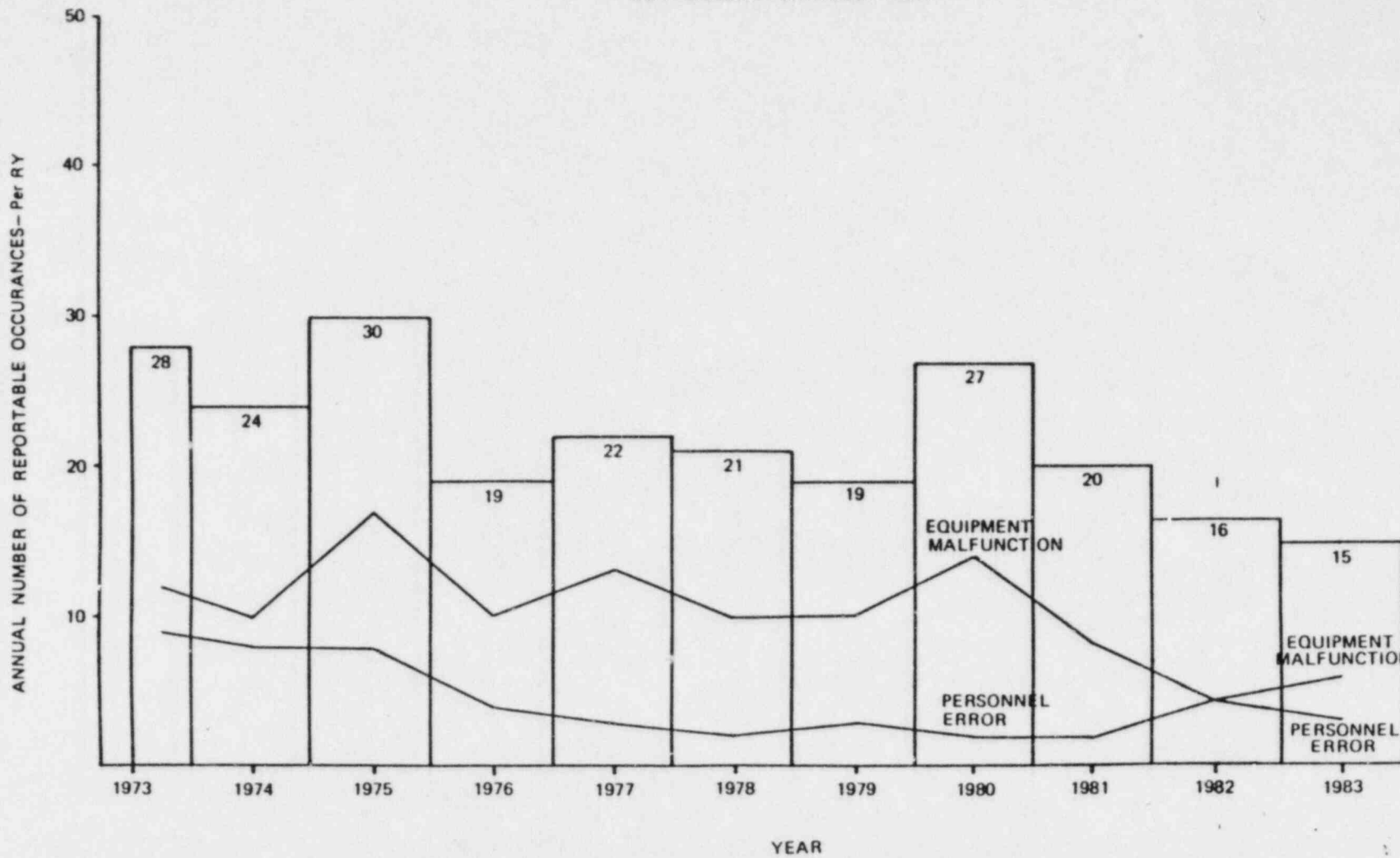
EMPLOYEE ABSENTEEISM<sup>(1)</sup>

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u> <sup>(2)</sup>
OCONEE NUCLEAR STATION	2.23%	1.60%	1.56%	1.23%
MCGUIRE NUCLEAR STATION	1.77%	2.34%	2.25%	2.70%

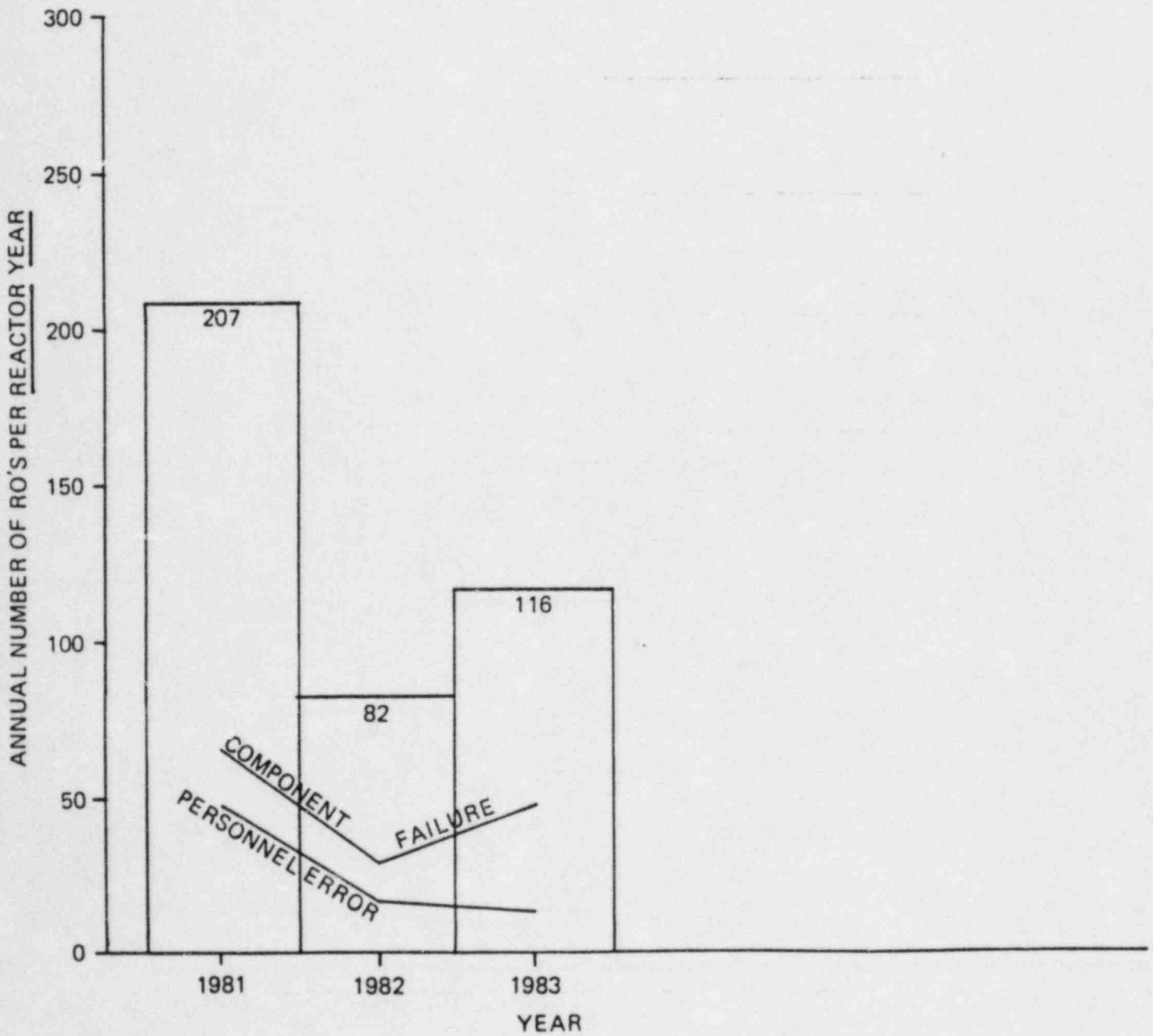
NOTES: (1)  $\% = \frac{\text{TOTAL OPERATIONS HOURLY EMPLOYEE ABSENTEEISM DUE TO SICKNESS}}{\text{TOTAL OPERATIONS HOURLY EMPLOYEE MANHOURS AVAILABLE}}$

(2) THROUGH MAY 31ST

OCONEE NUCLEAR STATION  
RO FREQUENCY (THROUGH 1983)



McGUIRE NUCLEAR STATION  
REPORTABLE OCCURRENCE  
FREQUENCY (THROUGH 1983)



PERSONNEL ERRORS<sup>(1)</sup>

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u> <sup>(2)</sup>
OCONEE NUCLEAR STATION	12	8	6	0
MCGUIRE NUCLEAR STATION	19	9	12	3

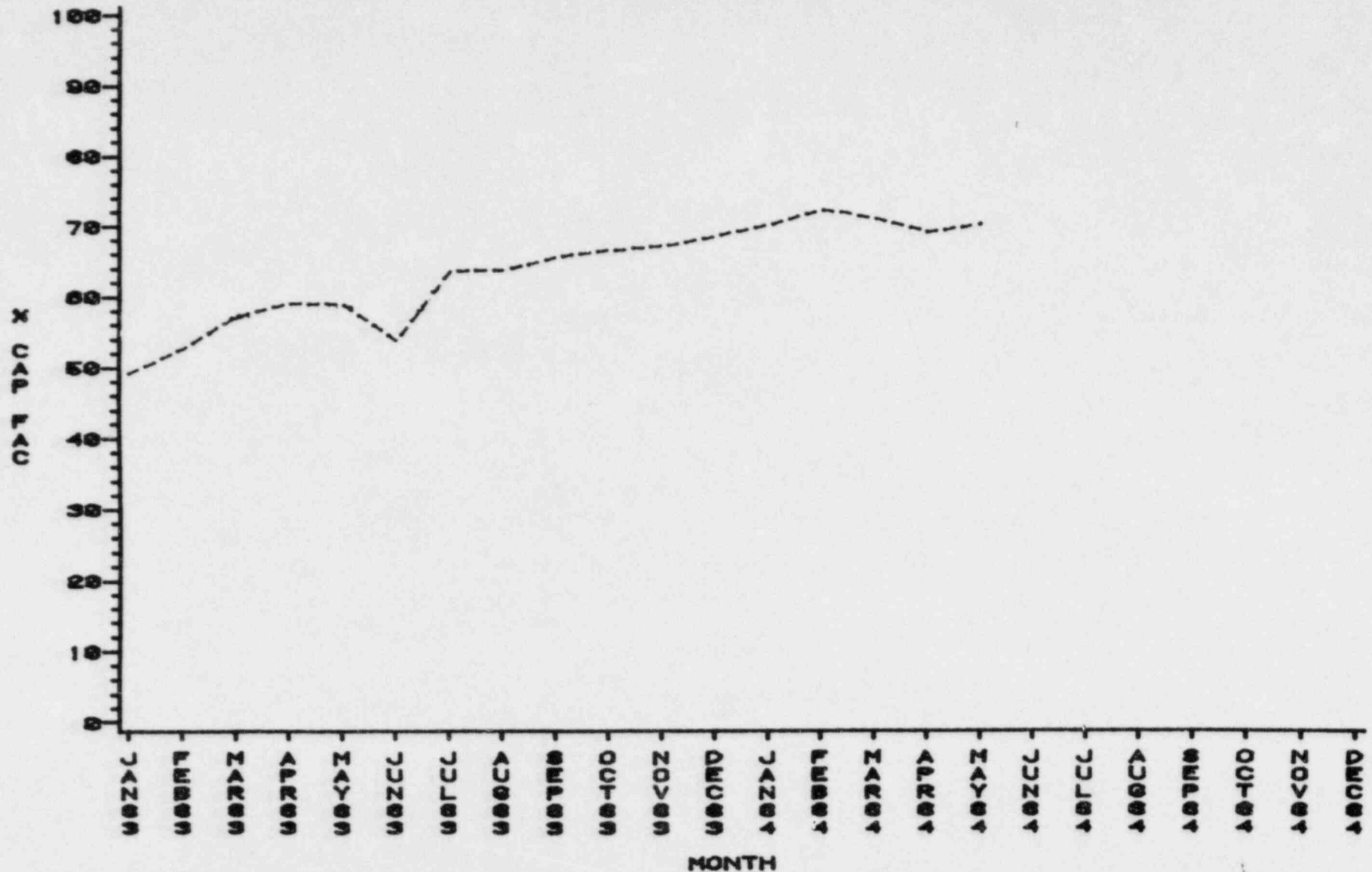
NOTES: (1) NRC REPORTABLE ERRORS COMMITTED BY SHIFT OPERATIONS PERSONNEL

(2) THROUGH MAY 31ST



# DUKE NUCLEAR CAPACITY FACTOR

STATUS AS OF MAY 31, 1984 - PAST 12 MONTH AVERAGE

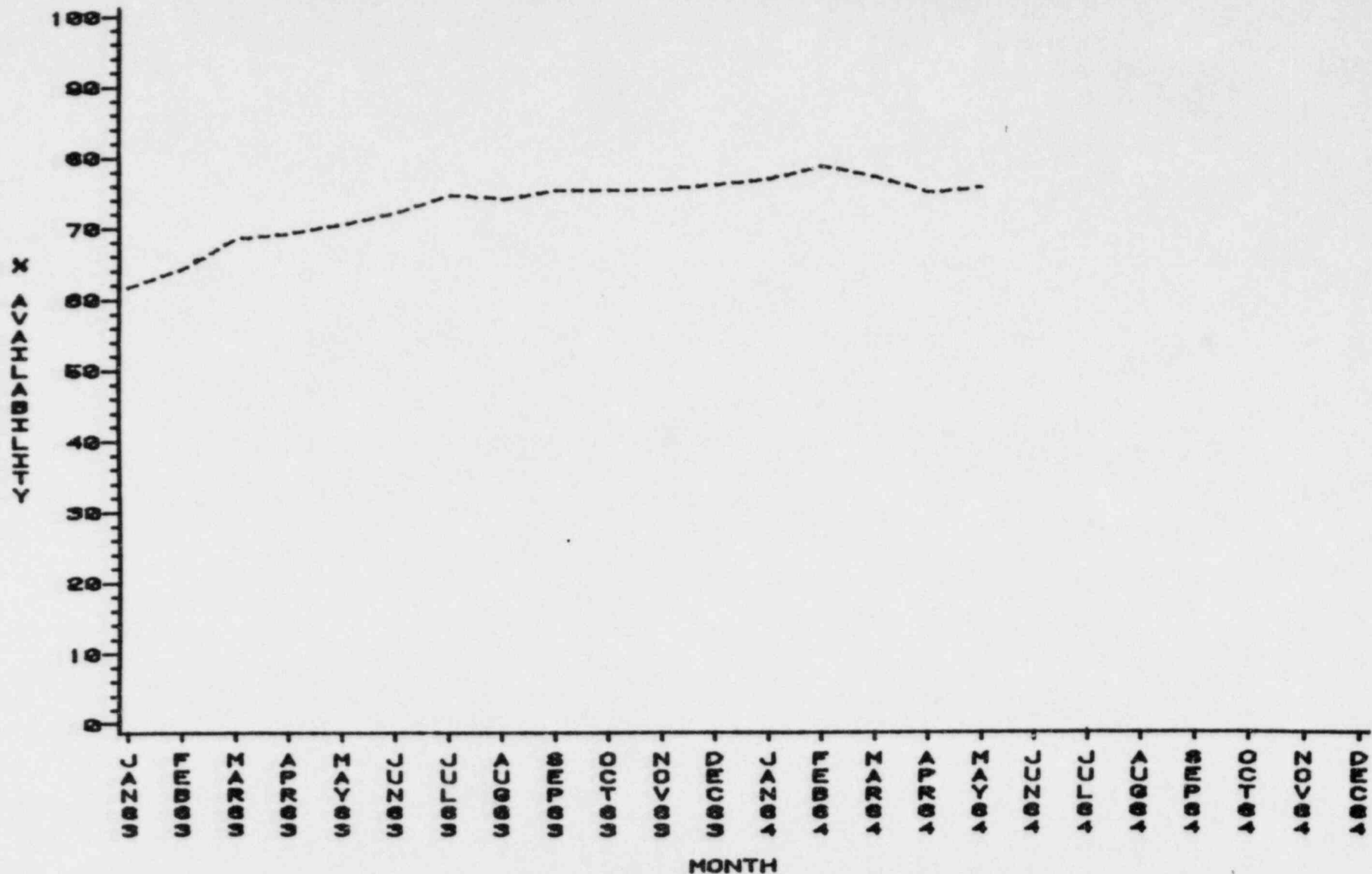


LEGEND: CLASS ----- DUKE POWER

CAPACITY FACTOR = THE RATIO OF ACTUAL ENERGY PRODUCTION OVER A GIVEN PERIOD OF TIME TO THE MAX ENERGY PROD. CAPABILITY.

# DUKE NUCLEAR AVAILABILITY

STATUS AS OF MAY 31, 1984 - PAST 12 MONTH AVERAGE

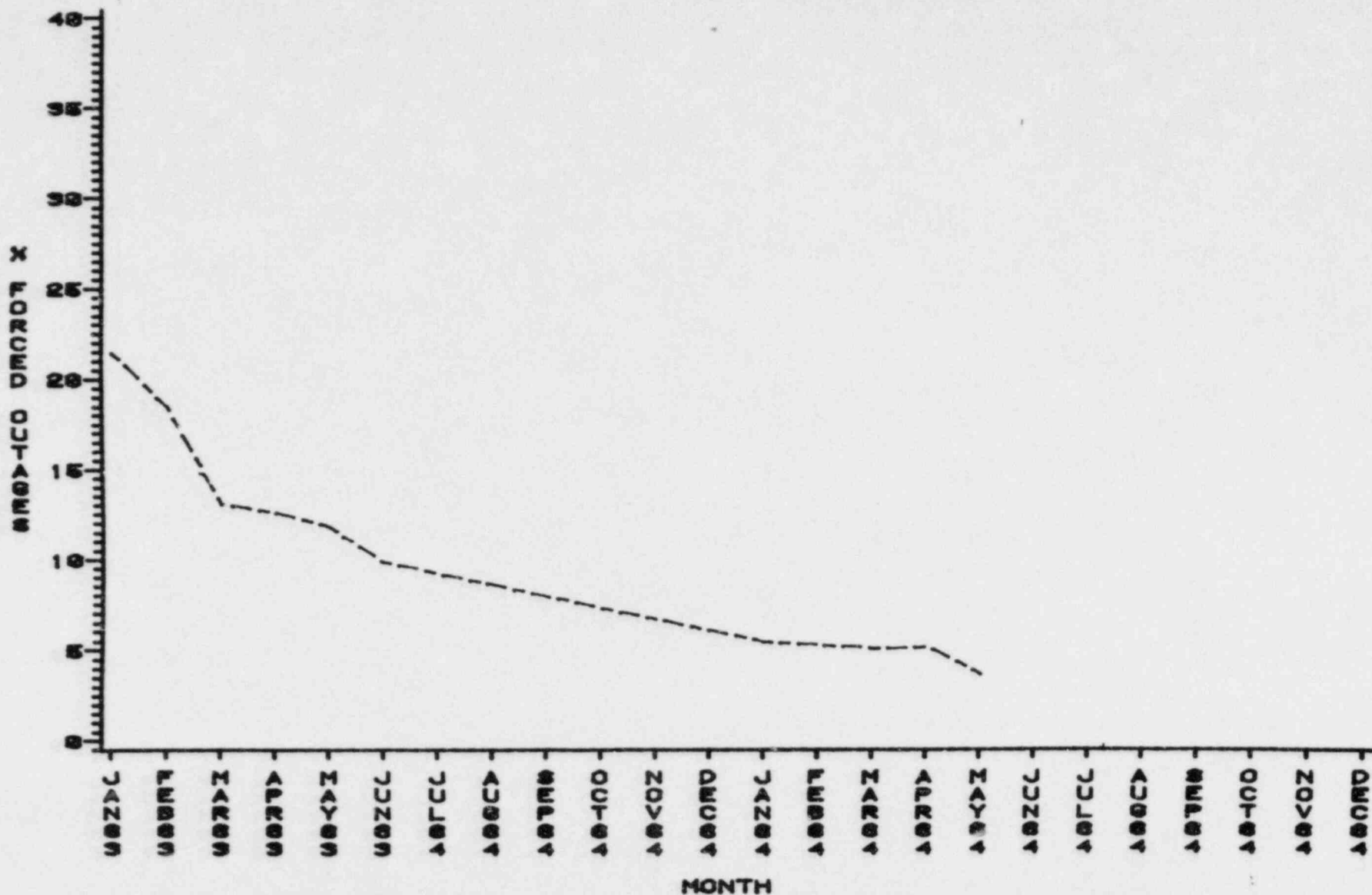


LEGEND: CLASS      ----- DUKE POWER

AVAILABILITY = THE PERCENT OF TIME A UNIT IS AVAILABLE FOR SERVICE DURING A GIVEN PERIOD, WHETHER OPERATED OR NOT.

# NUCLEAR FORCED OUTAGES

STATUS AS OF MAY 31, 1984 - PAST 12 MONTH AVERAGE

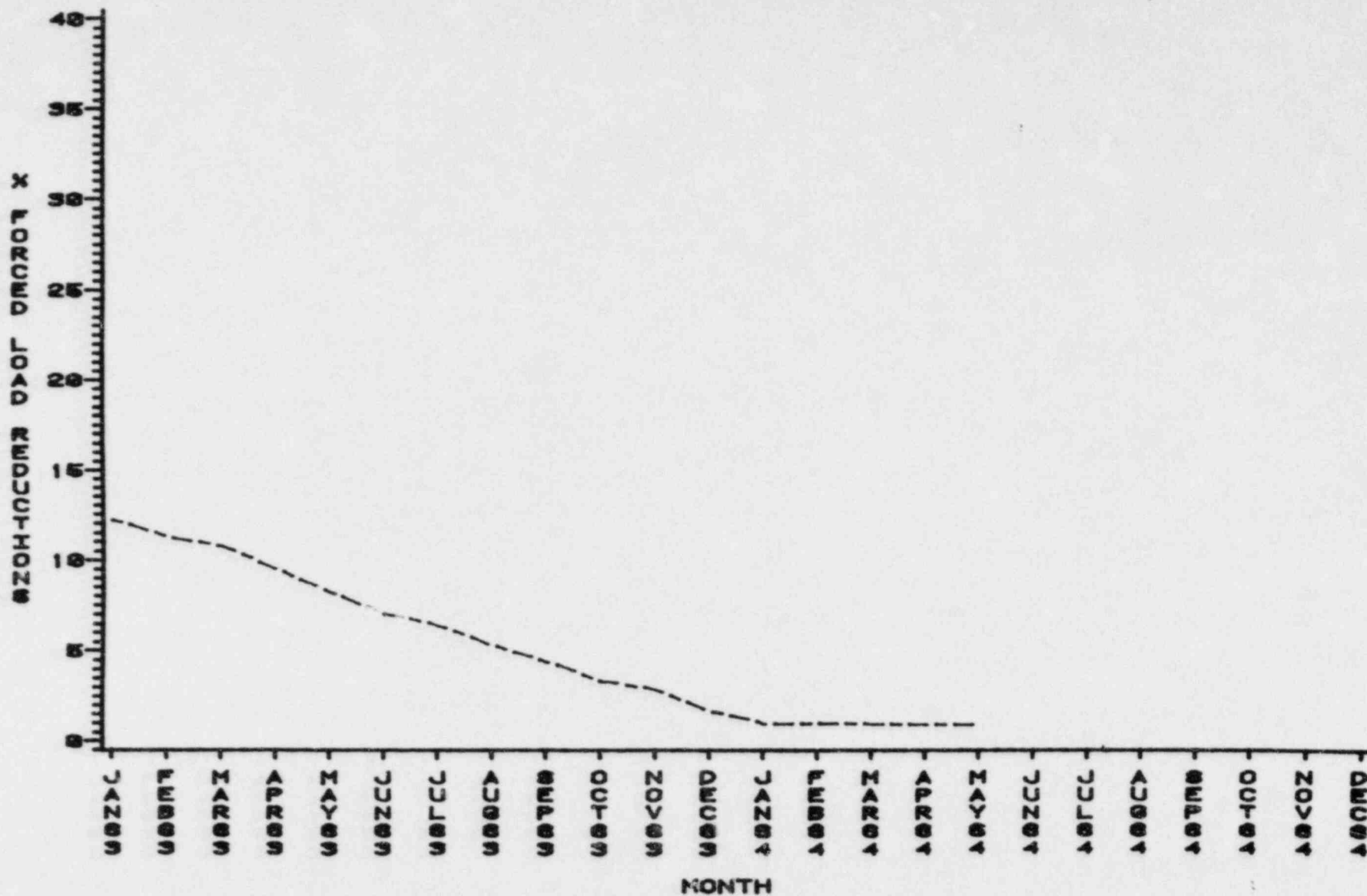


LEGEND: CLASS      ----- DUKE POWER

FORCED OUTAGE FACTOR : PERCENT OF TIME UNIT IS NOT AVAILABLE DURING A GIVEN PERIOD DUE TO FORCED OUTAGES.

# FORCED LOAD REDUCTIONS

STATUS AS OF MAY 31, 1964 - PAST 12 MONTH AVERAGE



LEGEND: CLASS      ----- DUKE POWER

FORCED DERATING FACTOR: THE RATIO OF EQUIVALENT FORCED DERATED HOURS TO THE TOTAL HOURS IN THE PERIOD UNDER CONSIDERATION.

ATTACHMENT 2

June 8, 1984

Mr. H. B. Tucker  
Vice President, Nuclear Production Department  
Duke Power Company  
P.O. Box 33189  
Charlotte, N.C. 28242

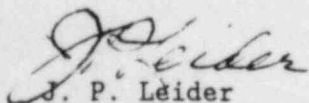
Dear Mr. Tucker:

As you requested, I have attached the Utility Advisor Evaluation Team's report of the evaluation of the Catawba Nuclear Station Shift Advisor Program conducted June 6-8, 1984.

I would appreciate receiving a copy of your revised Shift Advisor program description.

Should you desire additional information, we will be pleased to discuss this with you.

Yours very truly,



J. P. Leider  
Supervisor Safety Engineering Group  
Office of Nuclear Safety  
Commonwealth Edison Company

JPL/jd

cc: E. L. Thomas

Enclosure