



Carolina Power & Light Company

SERIAL: NLS-84-054

FEB 02 1984

Director of Nuclear Reactor Regulation
Attention: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing
United States Nuclear Regulatory Commission
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
BATTERY CAPACITY TESTING

Dear Mr. Vassallo:

At the request of your staff, a meeting was held on December 29, 1983 at the Brunswick Steam Electric Plant (BSEP) to discuss the events following the failure of emergency battery 2A2 to pass an 18 month load profile surveillance test. This test required that the battery maintain a load of 1211.9 amperes for 60 seconds (and subsequent lesser loads for 30 minutes and 7 1/2 hours) with a minimum output voltage of 105 volts. Copies of the slides and materials presented at that meeting are attached for your information.

As you are aware, following the initial failure of the battery to pass this test, Carolina Power & Light Company (CP&L) embarked on two parallel paths to resolve the situation. The first of these was to locate and purchase new batteries as quickly as possible. A new battery was installed and tested and also failed to pass the required test. In the subsequent several weeks, all efforts to improve the peak load handling capability of these new batteries were unsuccessful, and CP&L ultimately re-installed the old batteries and successfully passed a test at an approved reduced peak 60 second current on December 31, 1983.

Gould, who manufactured both the original and replacement batteries has not yet determined why the new batteries did not meet the test requirements or improve with pre-conditioning cycles. They have committed to continue their investigation, however.

It is apparent that the test value of 1211.9 amperes (now 1074.9) represents an extreme limit for the Gould 1200 amp-hour battery. Although the specification for the batteries indicates a one minute capacity in excess of 1328 amperes, it does not necessarily include the affects of intercell connections.

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Carolina Power & Light Company is presently conducting a DC load and battery sizing study in accordance with IEEE 485-1983 and other BSEP design codes and standards. This effort is scheduled for completion by February 15, 1984 at which time a determination will be made as to what further actions may be required. These may include further changes to the Technical Specifications, procedural revisions or modifications of the DC battery electrical system.

Should you have any further questions on this issue, please contact a member of our Licensing Staff.

Yours very truly,



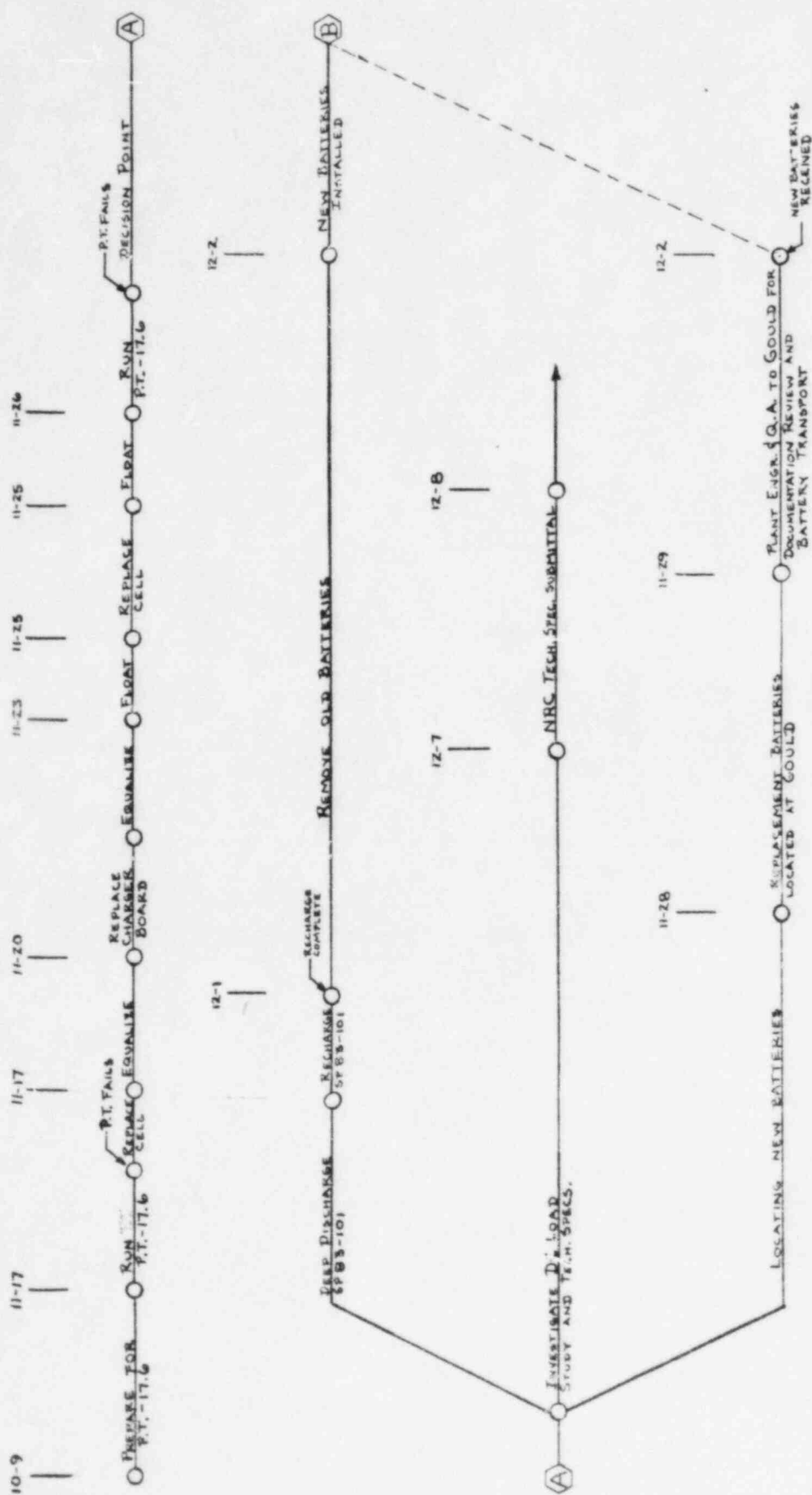
A. B. Cutter, Vice President
Nuclear Engineering & Licensing

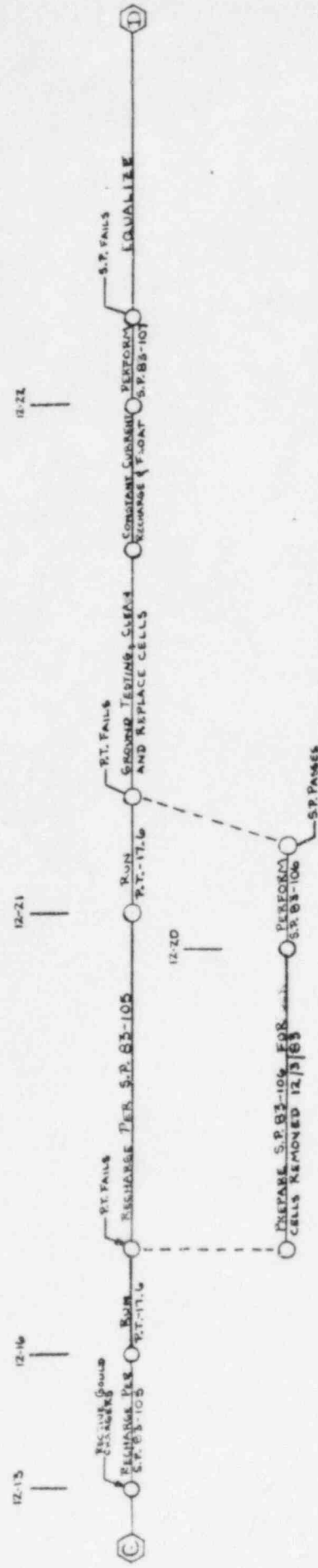
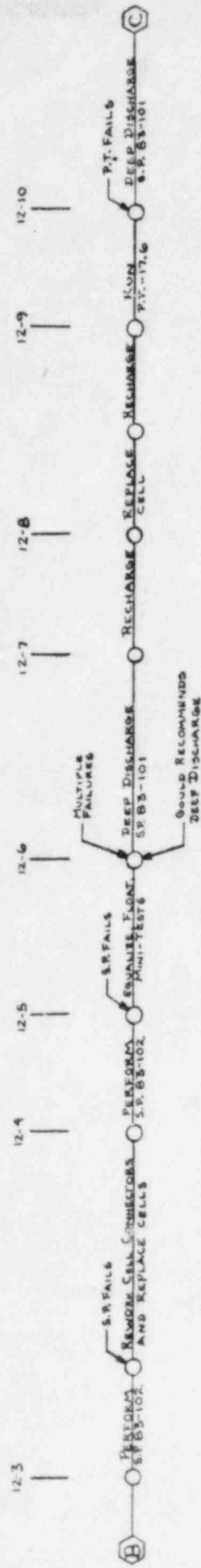
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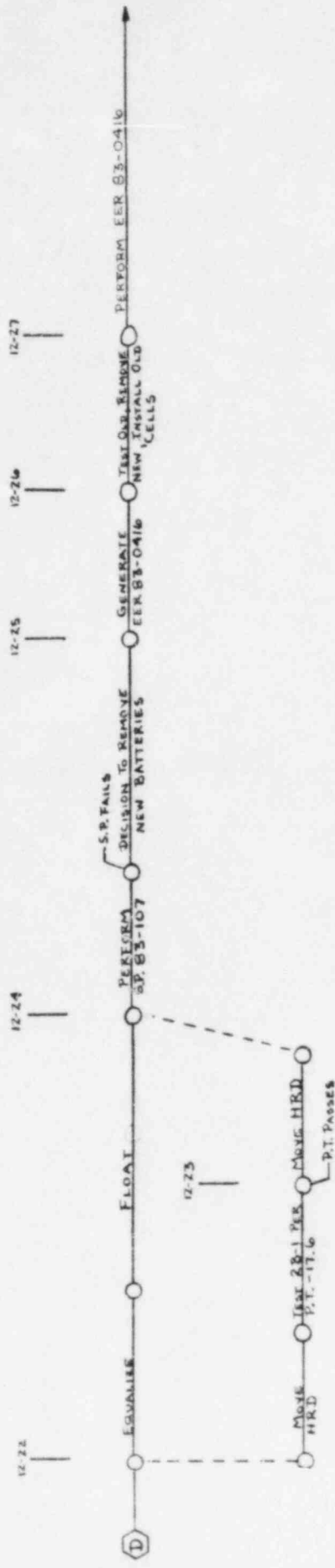
cc: Mr. D. O. Myers (NRC-BSEP)
Mr. J. P. O'Reilly (NRC-RII)
Mr. M. Grotenhuis (NRC)

AGENDA

Chronology of Current Battery PT Performance	25 min.	Dan Moore Tech Support
Battery PT Performance History	15 min.	Dan Moore Tech Support
Battery Maintenance Practices	15 min.	Joel Dimmette Maintenance
Current Status and Considerations	10 min.	Al Bishop Tech Support
Questions		Open
Facility Tour		Bob Poulk Reg Compliance







2A-2 Battery Repair Sequence

<u>Date(s)</u>	<u>Work Items Completed</u>
10/9 - 11/17	Equalize/float batteries for PT-17.6.
11/17	Run PT-17.6, batteries failed at 8.4 sec.
11/17	Cell number 27 was not responding properly and was replaced.
11/17 - 11/20	Equalized battery bank 2A-2.
11/20	Battery charger performing erratically, amplifier board was replaced.
11/20 - 11/23	Continued equalization battery bank 2A-2.
11/23 - 11/25	Floated battery bank 2A-2.
11/25	Replacement cell number 27 was not performing properly and was replaced and battery bank was returned to float.
11/26	Run PT-17.6, batteries failed. Voltage below 105 Vdc at 8.4 seconds. Retest voltage below 105 Vdc at 15.6 seconds.
11/26	Decision Point 1. Initiate purchase order for new batteries. 2. Generate procedure to deep discharge and recharge batteries. 3. Determine if technical specifications and dc load study are too restrictive.
11/27 - 12/2	Perform SP 83-101 to deep discharge batteries to 0.5 Vdc per cell and recharge batteries to $\geq 95\%$ capacity. Locate new batteries at Gould factory. Engineering/QA visit factory. Batteries shipped. Begin removal of recharged 2A-2 and installed new 2A-2.
12/3 - 12/4	Performed/failed SP 83-102 (1.8 sec). Reworked intercell connectors, removed five cells. Equalize. Failed 83-102 again (1.8 sec). Equalized.
12/5	Completed mini tests of 83-102 - Voltage at 103.62. Batteries put on equalizer.

ORIGINAL

<u>Date(s)</u>	<u>Work Items Completed</u>
12/6	Performed three mini tests, all of which failed (104.95V, 105.34V, 104.9V). SP 83-101 (deep discharge) initiated.
12/7	Technical specification change submitted. Deep discharge completed. Recharge started.
12/8	Replaced cell #47. Continued recharge. Prepared evaluation to shorten float and equalize line.
12/9 - 12/10	PT-17.6 failed after nine seconds.
12/11 - 12/15	Deep discharge/recharge per 83-101 initiated. SP 83-105 equalize/float with constant current charger.
12/17-21	Performed PT-17.6. Failed at 104.68 volts in seven seconds. Battery discharged and recharged per SP 83-105. Prepared/implemented SP 83-106 for spare cells.
12/21	Performed PT-17.6. Failed at 104.28 volts in two seconds. Replaced cell 29. Recharged and float.
12/22-23	Performed SP 83-107. Failed at 104.38 in eight seconds. 2A2 on equalize/float. Performed PT-17.6 on 2B-1. Passed.
12/24	Performed SP 83-107 and 2A-2. Failed at 104.61 in thirty seconds and 104.42 in forty seconds. Decided to remove newer cells and reinstall original battery 2A-2.
12/25-29	Replaced 2A-2 cells. Prepared EER 83-0416 to reinstate original cells and test per SP 83-107.

2A-2 CAPACITY TEST DATA

December 1982 - 1296.65 amp/hours @ > 105 volts

November 27, 1983 - 1128 amp/hours @ > 105 volts. (See note 1)

1. One cell dropped below 1.75 volts at 1128 amp/hours although the battery voltage was > 105 volts at the time. No further data on battery bank voltage was taken, only pilot cell was monitored. Therefore, battery bank capacity is > 1128 amp/hours. This was conducted by Special Procedure SP-83-101.

Conclusion:

Technical specifications requirement for 60-month capacity test requires 80% of manufacturers rating or $0.80 \times 1200 = 960$ amp/hours. Therefore, battery is not in jeopardy of failing capacity test.

Unit 2 Data - Load Profile Test

Date	5-79	4-80	2-82	11-83
Battery	2A-1	2A-1	2A-1	2A-1
30 secs	107.7 (1068)	107.8 (1051)	107.6 (1051)	106.45 (1067)
30 mins	117.9 (241)	118.1 (238)	118.0 (241)	117.69 (246)
7 hrs 45 mins	116.5 (87)	116.7 (84)	116.1 (90)	115.88 (91)

Date	5-79	4-80	2-82
Battery	2A-2	2A-2	2A-2
30 secs	105.8 (1231)	106.2 (1220)	105.6 (1225)
30 mins	119.6 (171)	119.1 (170)	119.1 (171)
7 hrs 45 mins	118.4 (63)	118.7 (59)	118.0 (66)

Date	5-79	4-80	2-82	11-83
Battery	2B-1	2B-1	2B-1	2B-1
30 secs	106.7 (1107)	107.4 (1098)	108.2 (1099)	106 (1100)
30 mins	118.6 (188)	118.9 (185)	118.7 (188)	119 (180)
7 hrs 45 mins	118.2 (66)	118.4 (65)	118.6 (68)	119 (54)

Date	5-79	4-80	2-82	11-83
Battery	2B-2	2B-2	2B-2	2B-2
30 secs	108.3 (1047)	108.4 (1037)	108.8 (1033)	107.83 (1056)
30 mins	118.3 (214)	118.6 (211)	118.5 (214)	118.07 (219)
7 hrs 45 mins	118.1 (74)	118.0 (70)	117.3 (76)	117.42 (76)

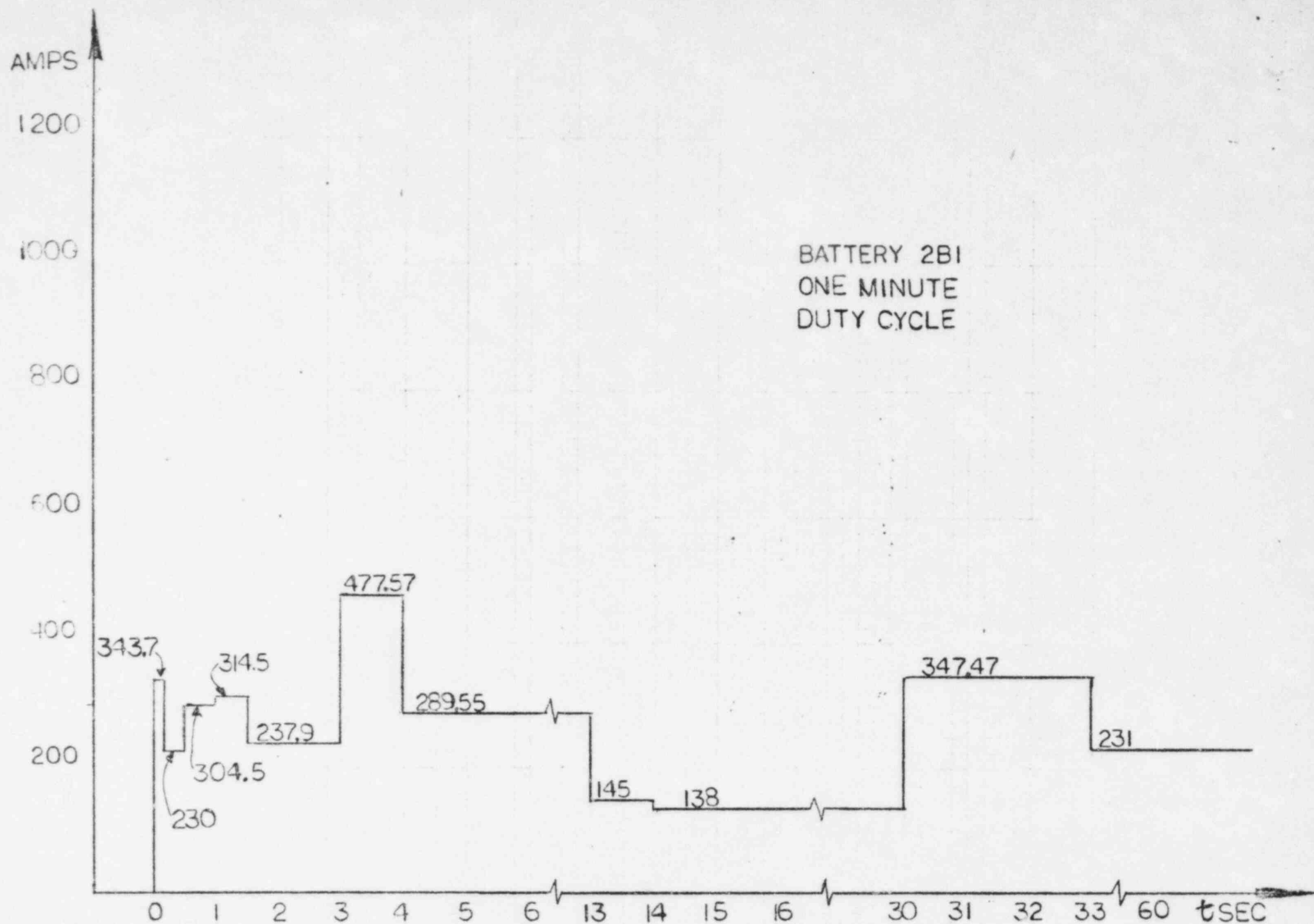
BATTERY 2A-2

1 MINUTE

DUTY CYCLE

1) ASSUMPTIONS

- A) UNIT 2 IS IN OPERATION
- B) UNIT 1 IS IN COLD SHUTDOWN
- C) LOSS OF OFFSITE POWER (LOOP) & SMALL
BREAK LOCA ON UNIT 2 PRESENTS WORST
CASE LOADING ON 2A-2 BATTERY
- D) 2A-2 BATTERY CHARGER FAILED (SINGLE
FAILURE)



AMPS

1200

1000

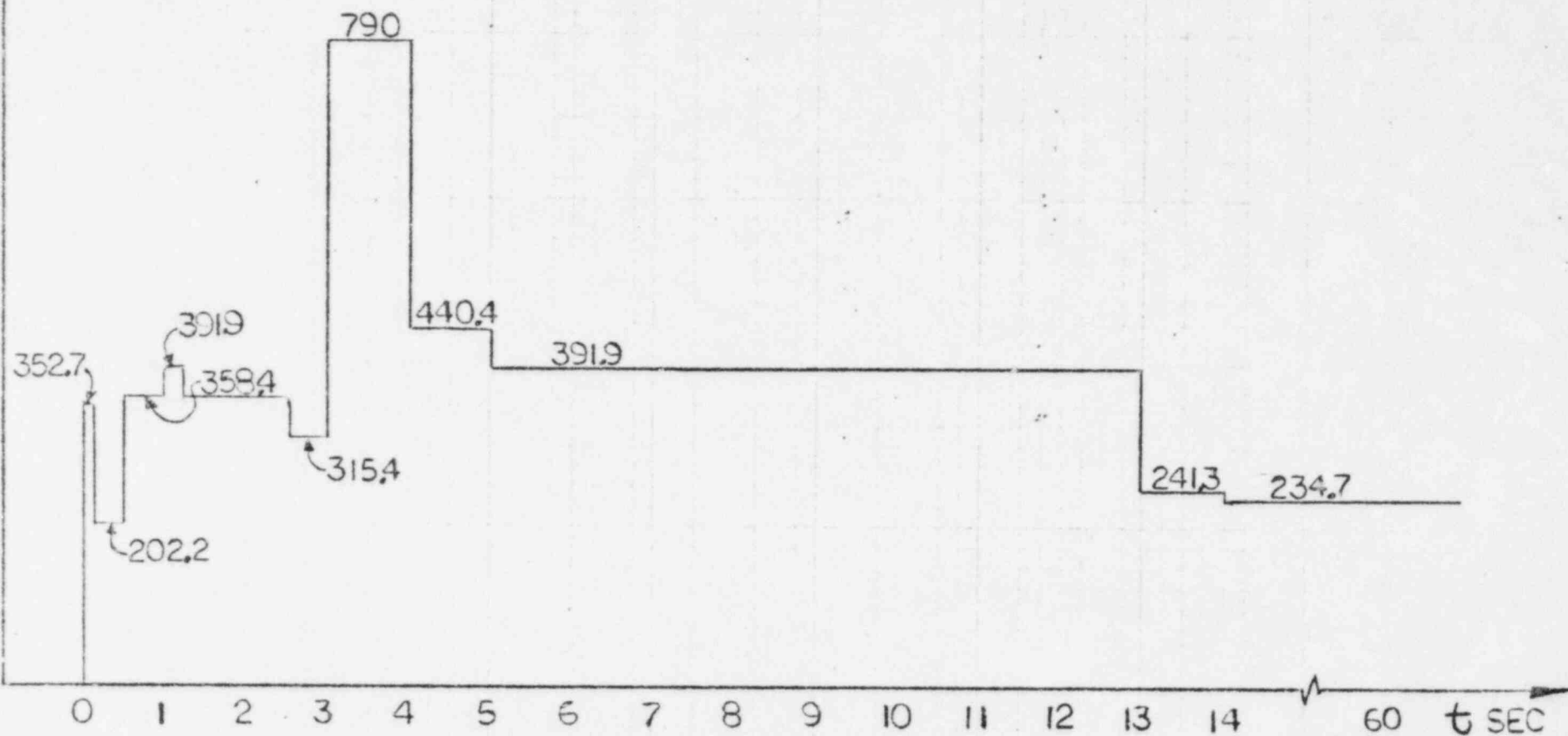
800

600

400

200

BATTERY 2A2
ONE MINUTE
DUTY CYCLE



BATTERY OPERABILITY CHECKS

TECHNICAL SPECIFICATION REQUIREMENT

0 7 DAYS

PILOT CELLS/SPECIFIC
GRAVITY/VOLTAGE

0 28 DAYS

NO REQUIREMENT

0 92 DAYS

INDIVIDUAL CELLS/
SPECIFIC GRAVITY/
VOLTAGE

0 18 MONTHS/SPECIFIC GRAVITY/
VOLTAGE

PHYSICAL CONDITION

CONNECTIONS

BATTERY CHARGER

BRUNSWICK PRACTICE

0 7 DAYS

+ OVERALL BANK
VOLTAGE

0 28 DAYS

7 DAY REQUIREMENT

+

INDIVIDUAL CELL VOLTAGE

+

ELECTROLYTE LEVEL

+

CHARGER OUTPUT VOLTAGE

+

CURRENT

0 92 DAYS

28 DAY REQUIREMENT

+

INDIVIDUAL SPECIFIC
GRAVITY

0 12 MONTHS

(CHARGER - 18 MONTHS)

BATTERY MAINTENANCE PROBLEMS/CORRECTIVE ACTION

O CONNECTORS

- VENDOR CITED CONNECTORS AS CAUSE OF PAST BATTERY P.T. FAILURES
- STRETCHING OF CONNECTOR BOLTS DUE TO CONNECTOR CLEANING
- OPTIONS
 - O CHECK CLEANLINESS INSTEAD OF ACTUAL CLEANING
 - O REPLACE LEAD COATED BRONZE HARDWARE WITH SS BOLTS
- SS HARDWARE CHANGEOUT ON ALL BATTERIES

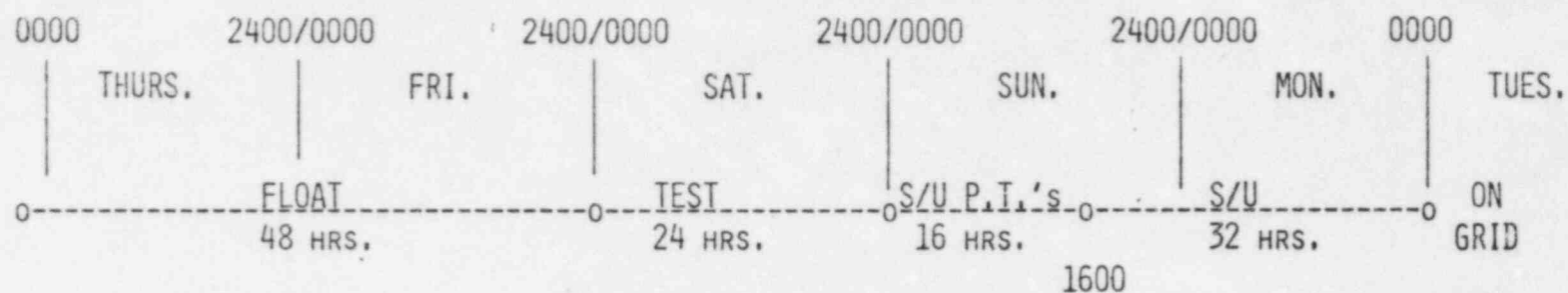
O LOW INDIVIDUAL CELL VOLTAGE/SPECIFIC GRAVITY

- INDICATIONS ON MONTHLY, QUARTERLY, OR 18 MONTH CHECKS
- BATTERIES PLACED ON EQUALIZE ^{WORTH} *DATE if P.C. is below 2.6 of 48*
any low and goes down
- CHANGE OUT UNRESPONSIVE CELLS

O WATER ADDITION

- CONSIDERED NORMAL BY VENDOR
- Effective water being used*

CURRENT STATUS



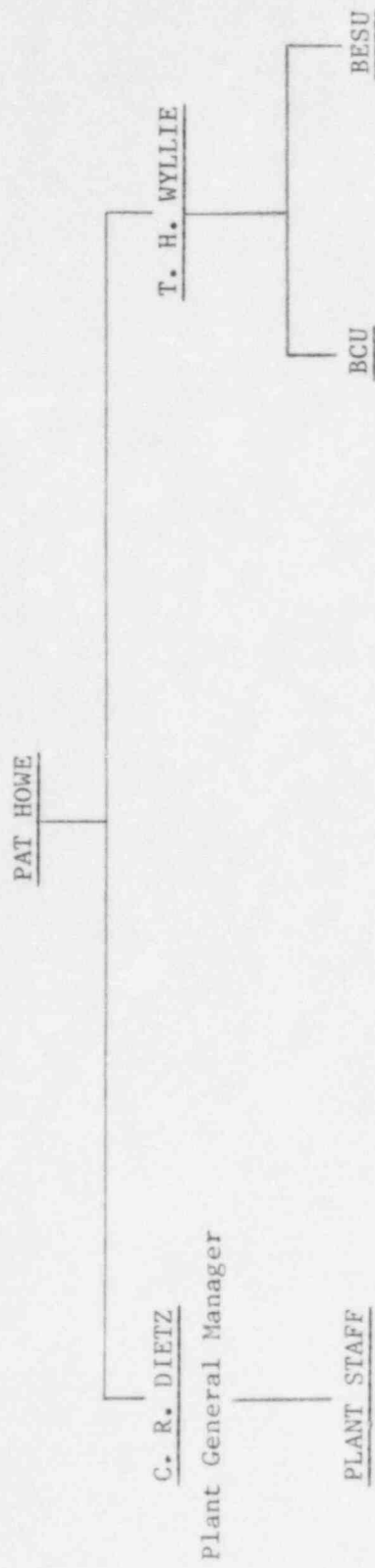
OTHER CONSIDERATIONS

- O CONTINGENCY PLANS
 - O MANUFACTURE OF NEW SET OF NCX 1200's
 - O PRESENTLY IN 3RD PRECONDITION CYCLE, READY FOR TEST 1/06/84.
TEST AFTER 2ND CYCLE INDICATED POTENTIALLY STRONGER BATTERY.
 - O MODIFICATION TO INSTALL HARRIS PLANT BATTERIES (1350 C&D) IN PROGRESS
 - O NEW LAYOUT APPEARS FEASIBLE
 - O PLAN TO TEST C&D BATTERY PRIOR TO INSTALLATION

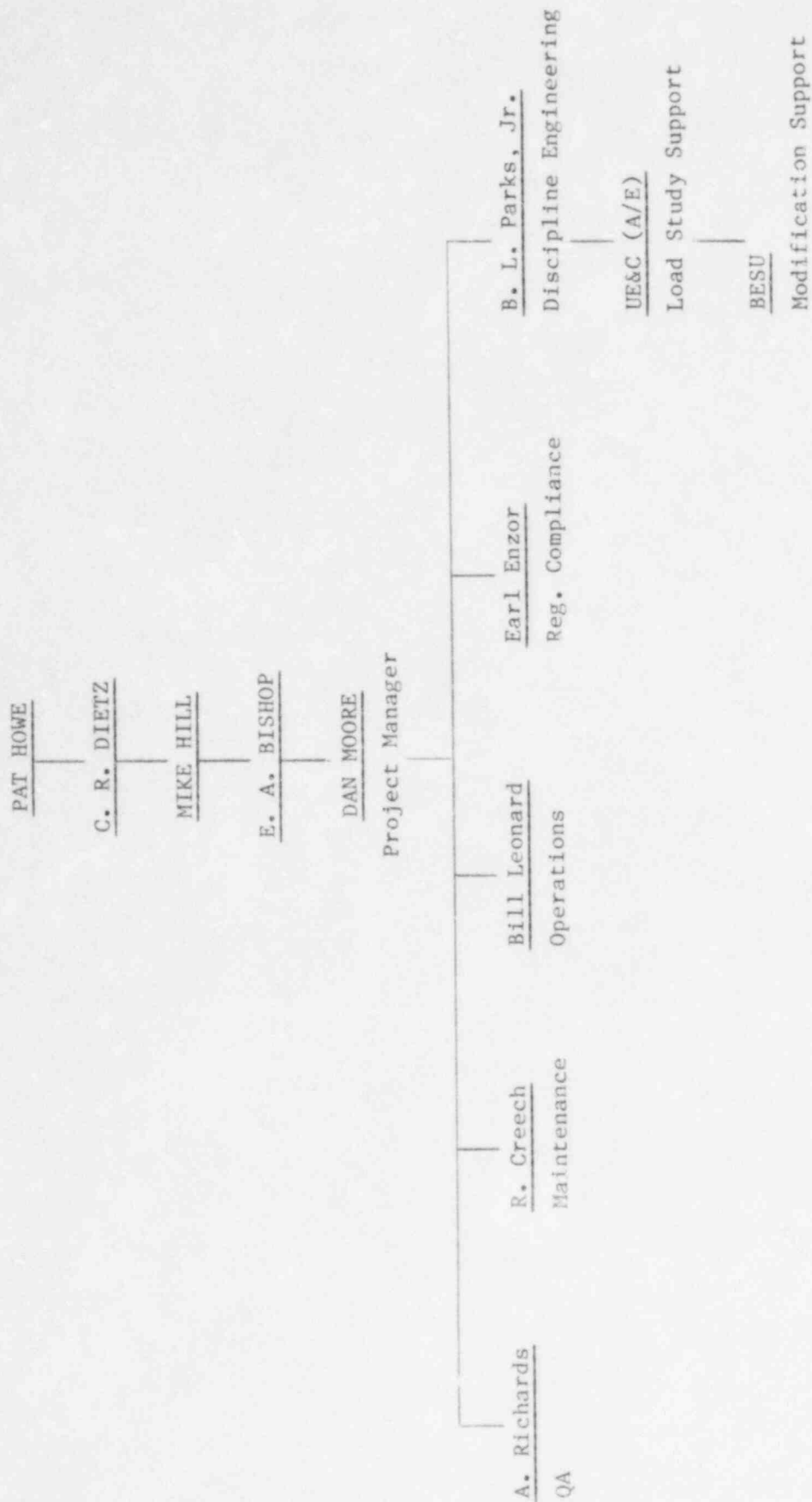
- 0 SUBMIT TECH SPEC CHANGE FOR FURTHER REDUCTION IN CURRENT
- 0 PRELIMINARY ANALYSIS INDICATES SIGNIFICANT REDUCTION POSSIBLE
- 0 ROOT CAUSE ASSESSMENT
 - 0 EVALUATE DESIGN OF EXISTING BATTERIES/CHARGERS FOR MODIFICATION IN UPCOMING OUTAGE
 - 0 PERFORM FAILURE ASSESSMENT OF "NEW" GOULD BATTERIES

BRUNSWICK NUCLEAR PROJECT

(PARTIAL REPRESENTATION)



PROJECT TEAM FOR BATTERY PROBLEM



(9441JSD1cv)