Consumers Power Company

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December 14, 1981

Director, Nuclear Reactor Regulation
Att Mr Dennis M Crutchfield, Chief
Operating Reactors Branch No 5
US Nuclear Regulatory Commission
Washington, D C 20555

DOCKET 50-255 - LICENSE DPR-20 -
PALISADES PLANT - SEP TOPIC VII-3, SYSTEMS REQUIRED FOR SAFE SHUTDOWN

By letter dated November 10, 1981, Consumers Power Company submitted information regarding the capacity of the new station batteries recently installed at Palisades. Mr Ray Scholl subsequently requested additional information to show the basis for the battery life valves provided.

Attached is a copy of the calculations performed to derive the battery life valves. In addition, the DC load profiles for Batteries 1 and 2 are enclosed. As was indicated in our letter of November 10, the battery life valves are approximate and should not be considered exact. They do, however, show that substantial margin exists to allow a long time for operator action in the event of a total loss of AC power.

We trust that this information will resolve any remaining staff concerns on this issue.

Robert A Vincent

Robert A Vincent
Staff Licensing Engineer

CC Director, Region III, USNRC
NRC Resident Inpsector - Palisades

ATTACHMENT

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Consumers Power Company Nuclear Activities Dept. Engineering Calculation	Subject Battery Life Calculations Palisades SEP Topic VII-3	Page 1 Of 4
	By RAC Date *	Chkd [illegible] Date 12/11/81

** Battery Life Calculations for SEP Topic VII-3 to address GDC-17 concerns

Ref: Bechtel load study (Document E46). Pertinent portions attached.

I. Life using expanded 2-hour profile shown as pages 1-A, 1-C of E46.

1. Assume Battery fully charged, on float at time of Loss of offsite power.

2. Loads used are shown on profiles as "Known Future Load" currents

3. Battery capacities are 1800 A-H nominal

4. Calculations are simplistic in nature and do not account for capacity variations due to discharge rate, temperature, etc. Calculations provide approximate values for life.

5. Calculations assume that loads between times 11 and 119 on 1-A and 1-C are continuous for battery life except that the loads shown for minutes 1-11 and 119-120 are applied at the beginning and end of discharge as they are in the 2-hr profile.

* Original Calcs. 11/9/81. Rewritten in present form 12/10/81.
** This info included in LTR. CPCo to NRC dated 11/10/81.

Calculations-Battery No. 1

Peak Periods

Time			
	0-1 min	860A x 1/60 HR =	14.33AH
	1-11 min	397 x 10/60 =	66.17AH
	119-120 min	417 x 1/60 =	6.95AH

∴ Discharge for these 12 min = 87.45AH

Steady State Period

Capacity available = 1800 - 87.45 = 1712.55

∴ Time = $\frac{1712.55\ AH}{242\ AMPS}$ = 7.08 hours

∴ Total life = 7.08 hrs + 12/60 hr = **7.28 hours**

Battery No. 2

Peak Periods

Time			
	0-1 min	964A x 1/60 hr =	16.07AH
	1-11 min	468A x 10/60 hr =	78.0 AH
	119-120min	488A x 1/60 hr =	8.13 AH

∴ Discharge for these 12 min = 102.20AH

Steady State Period

Capacity available = 1800 - 102.2 = 1697.8AH

∴ Time = $\frac{1697.8\ AH}{313\ A}$ = 5.42 hours

∴ Total life = 5.42 + 12/60 = **5.62 hours**

II Life using 2-hour profiles shown on pages 1-A and 1-C of E 4/6 plus realistic steady state loads.

1. Assumptions 1-4 above are used here
2. Calculations assume that the full 2-hour profiles are followed by the SS currents of 86 and 84 amps respectively.

Calculations - Battery No. 1

Disch from 2-hr profile

Time		
	0-1	860 A x 1/60 hr = 14.33
	1-11	397 A x 19/60 h = 66.17
	11-119	242 A x 108/60 h = 435.60
	119-120	417 A x 1/60 h = 6.95
	Total	523.05 AH

Remaining life = 1800 - 523.05 = 1276.95 AH

Remaining time = $\frac{1276.95 \text{ AH}}{86 \text{ A}}$ = 14.85 hours

∴ Total life = 14.85 h + 2h = **16.85 hours**

Battery 1

Consumers Power Company Nuclear Activities Dept. Engineering Calculation	Subject	Page 4 Of 4
	By [illegible] Date *	Chkd Kar Date 12/11/81

Calculations - Battery No 2

Disch from 2-hour profile

Time		
	0-1	964A x 1/60 = 16.07AH
	1-11	468A x 10/60 = 78.0 AH
	11-119	313A x 108/60 = 563.4 AH
	119-120	488A x 1/60 = 8.13AH
	Total	665.60AH

Remaining Life 1800 - 665.6 = 1134.4AH

Remaining time = $\frac{1134.4\ AH}{84\ A}$ = 13.50 hrs

∴ Total life = 13.50 + 2 = 15.5 hours

Battery 2

DOCUMENT E46 - LOAD TABULATION AND LOAD PROFILE FOR 125V DC BATTERY SYSTEMS 1 AND 2

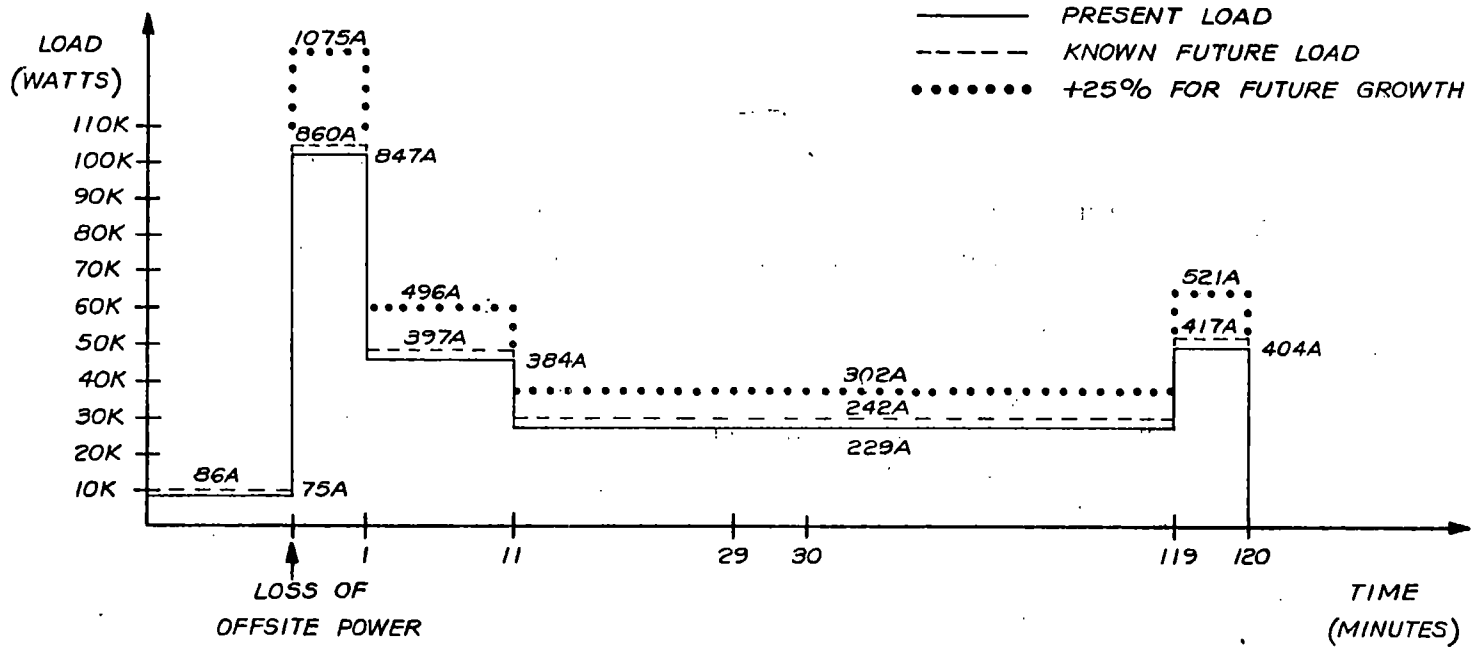
PALISADES NUCLEAR PLANT

COVERT, MICHIGAN

Pal 1-21

DOCUMENT E46-LOAD TABULATION AND LOAD PROFILE FOR 125 V DC BATTERY SYSTEMS NO. 1 AND NO. 2

LOAD PROFILE (2 HOURS)
BATTERY 1



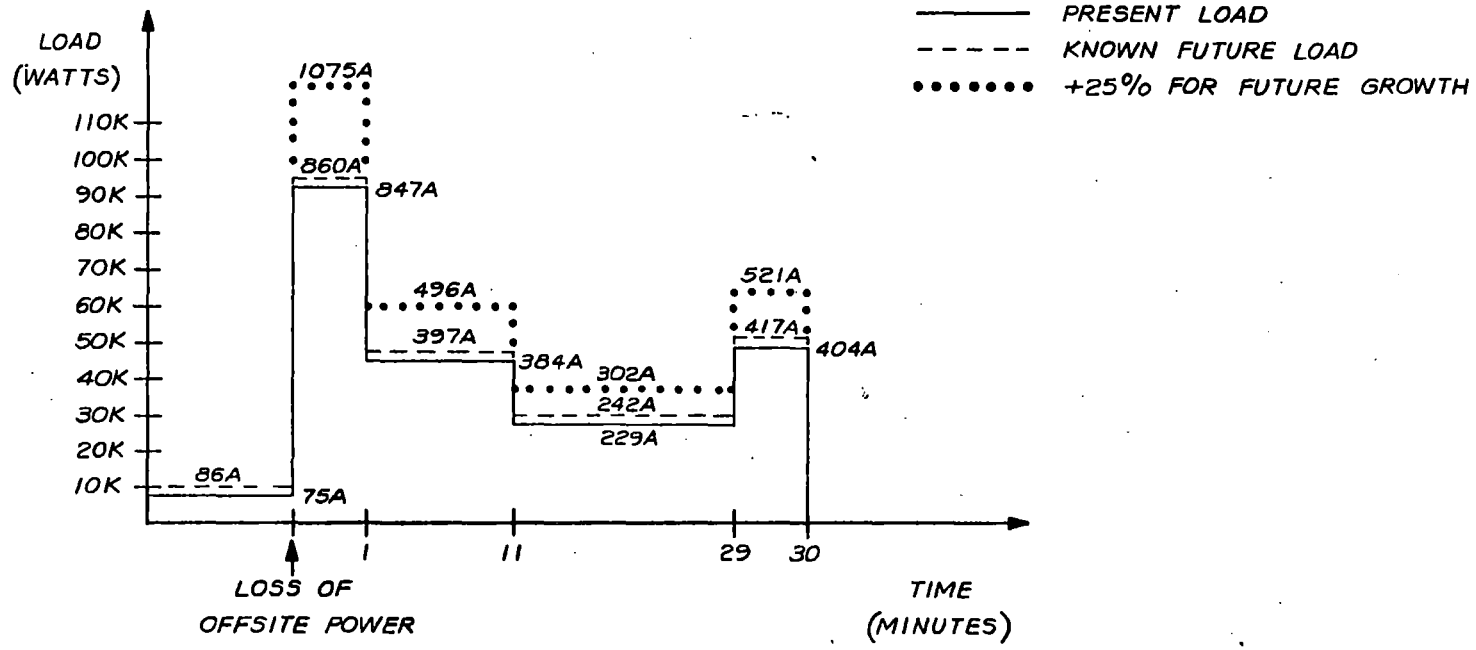
NOTES:

1. VOLTAGE ASSUMED TO BE 125V DC, EXCEPT FOR INVERTER LOADS DURING EMERGENCY WHERE VOLTAGE ASSUMED TO BE 105V DC SINCE POWER DEMAND FOR INVERTERS IS CONSTANT.

DOCUMENT E-6 - LOAD TABULATION AND LOAD PROFILE FOR 125 V DC BATTERY SYSTEMS NO. 1 AND NO. 2

LOAD PROFILE (30 MINUTES)

BATTERY I



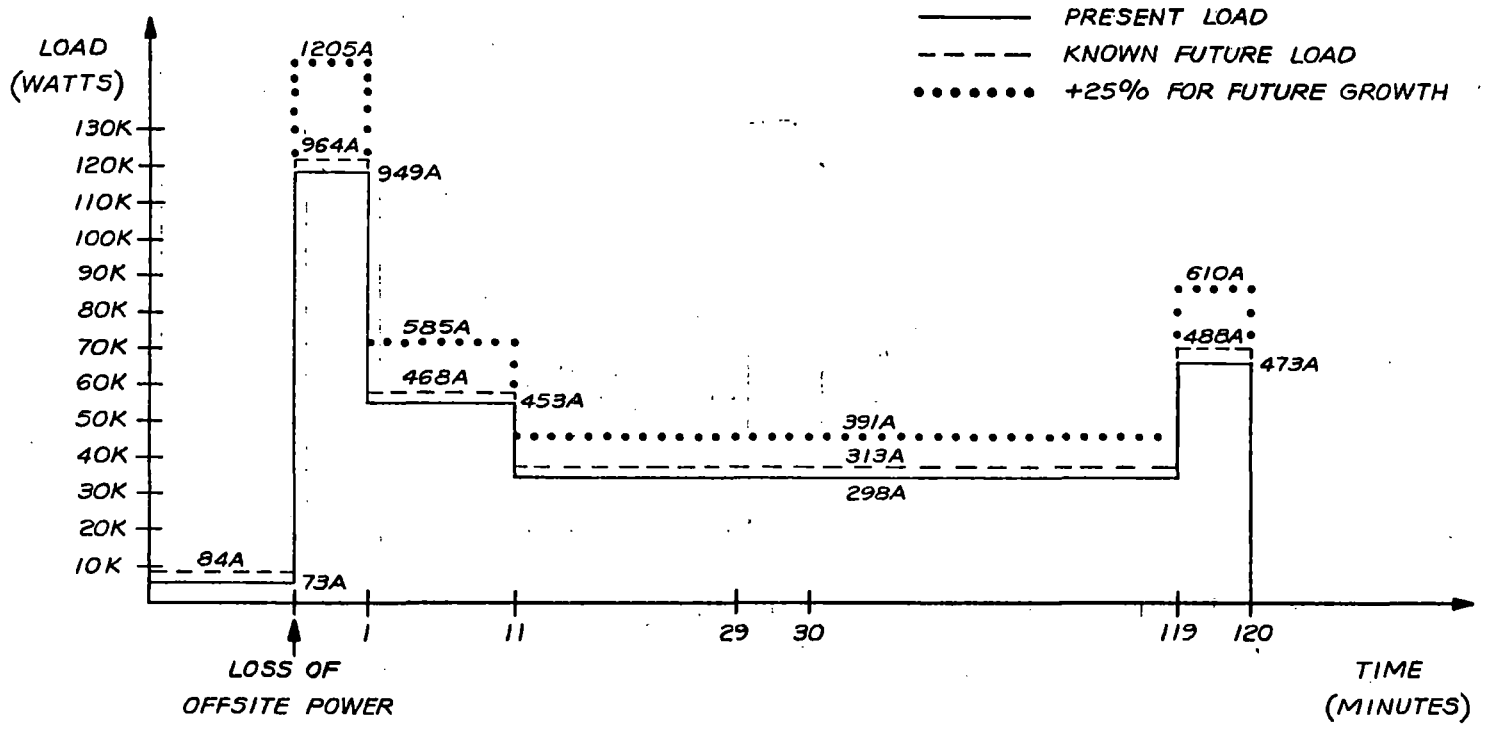
NOTES:

1. VOLTAGE ASSUMED TO BE 125V DC, EXCEPT FOR INVERTER LOADS DURING EMERGENCY WHERE VOLTAGE ASSUMED TO BE 105V DC SINCE POWER DEMAND FOR INVERTERS IS CONSTANT.

DOCUMENT E46-LOAD TABULATION AND LOAD PROFILE FOR 125 V DC BATTERY SYSTEMS NO. 1 AND NO. 2

LOAD PROFILE (2 HOURS)

BATTERY 2



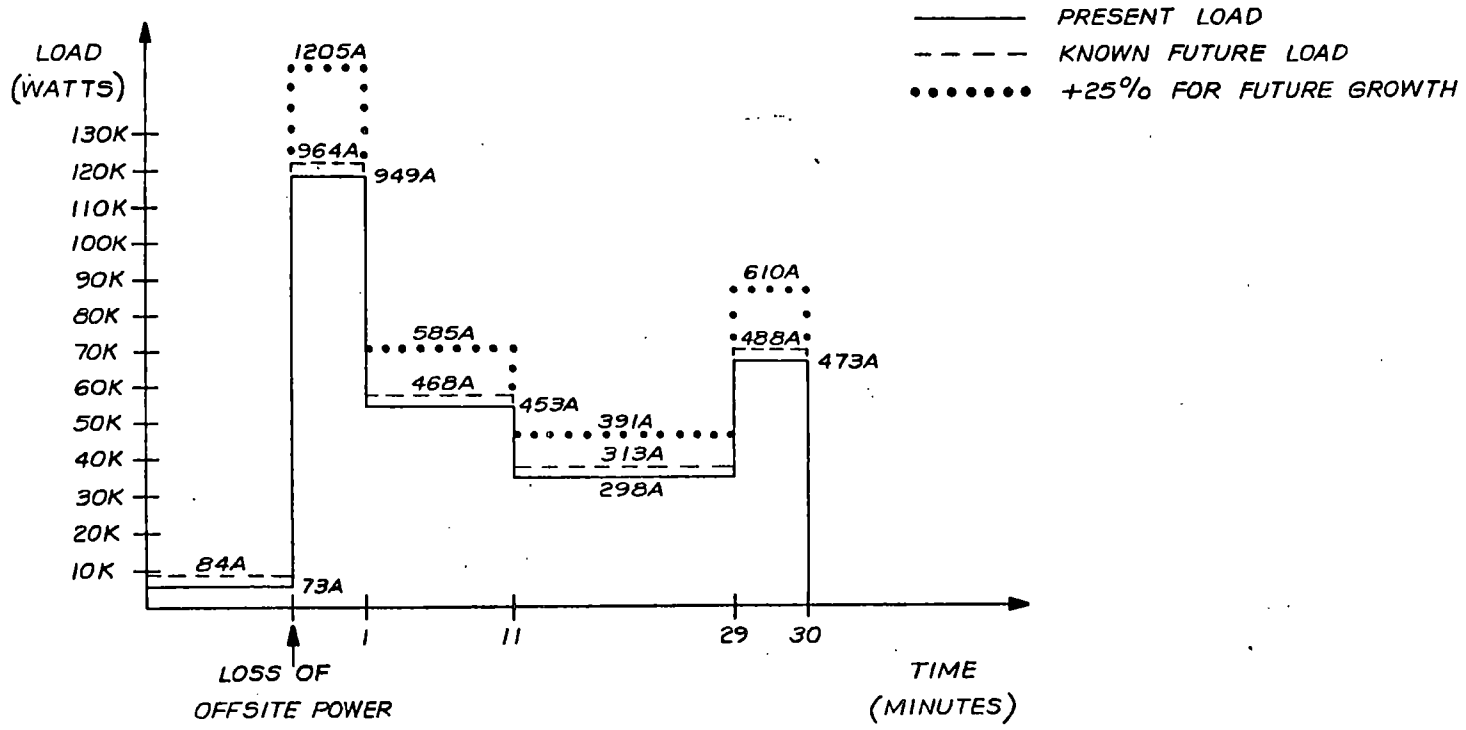
NOTES:

1. VOLTAGE ASSUMED TO BE 125V DC, EXCEPT INVERTER LOADS DURING EMERGENCY WHERE VOLTAGE ASSUMED TO BE 105V DC SINCE POWER DEMAND FOR INVERTERS IS CONSTANT.

DOCUMENT E46-LOAD TABULATION AND LOAD PROFILE FOR 125 V DC BATTERY SYSTEMS NO. 1 AND NO. 2

LOAD PROFILE (30 MINUTES)

BATTERY 2



NOTES:

1. VOLTAGE ASSUMED TO BE 125V DC, EXCEPT FOR INVERTER LOADS DURING EMERGENCY WHERE VOLTAGE ASSUMED TO BE 105V DC SINCE POWER DEMANDS FOR INVERTER IS CONSTANT.

SUMMARY OF LOADS BATTERY 1

Load Description	LOAD (Watts) C	N	NI	E	E1	E2	E3	E4	E5	E6
Inv D08 (See Note 3)	769	702	-	891	-	-	-	-	-	-
Pump P81A	12	-	30	-	24,465	9,715	-	-	-	-
Pump P81C	12	-	30	-	24,465	9,715	-	-	-	-
Panel D11	2,967	625	8,748	3,878	18,078	125	172	260	172	260
Panel D11A	1,843	-	12,375	10,875	10,423	-	-	21,750	-	21,750
Inv D06 (See Note 3)	1,235	224	-	420	-	-	-	-	-	-
PA Sys Inv	-	1,000	-	4,125	-	-	-	-	-	-
TOTAL	6,838	2,551	21,183	20,189	77,431	19,555	172	22,010	172	22,010
Known Future (See Note 2)	1,370	-	-	-	-	-	-	-	-	-

Cycle	Description
C	Constant Load - Always on
N	Normal Load - Only on during normal conditions (not emergency)
NI	Normal Intermittent - Comes on intermittently only during normal conditions
E	Emergency Load - Only comes on during emergency (loss of offsite power)
E1	Only on during first minute of emergency
E2	Only on during next 10 minutes of emergency
E3	Only on during next 18 minutes of emergency
E4	Only on during last 1 minute of emergency for 30 minute load profile
E5	Only on during next 89 minutes of emergency
E6	Only on during last 1 minute of emergency for 2 hour load profile

NOTES:

1. Inverter loads are assumed to be constant VA load at the ac output end.
2. Known future loads include auxiliary hot shutdown panel C150 and radiation monitor loads 1,250 and 120 watts, respectively.
3. D06 and D08 inverter loads tabulated separately under GWO-8428 (TMI modification job).

SUMMARY OF LOADS ON BATTERY 2

Load Description	LOAD (Watts) C	N	NI	E	E1	E2	E3	E4	E5	E6
Emergency Lighting	-	-	-	10,000	-	-	-	-	-	-
Inv D07 (See Note 3)	2,015	224	-	809	-	-	-	-	-	-
Panel D21	2,498	1,172	7,202	6,176	22,676	65	141	318	141	318
Panel D21A	1,765	-	12,375	10,875	10,423	-	-	21,750	-	21,750
Pump P81D	12	-	30	-	24,465	9,715	-	-	-	-
Pump P81B	12	-	30	-	24,465	9,715	-	-	-	-
Inv D09 (See Note 3)	758	702	-	405	-	-	-	-	-	-
TOTAL	7,060	2,098	20,637	28,265	82,029	19,495	141	22,068	141	22,068
Known Future (See Note 2)	1,370	-	-	480	-	-	-	-	-	-

Cycle	Description
C	Constant Load - Always on
N	Normal Load - Only on during normal conditions (not emergency)
NI	Normal Intermittent - Comes on intermittently only during normal conditions
E	Emergency Load - Only comes on during emergency (loss of offsite power)
E1	Only on during first minute of emergency
E2	Only on during next 10 minutes of emergency
E3	Only on during next 18 minutes of emergency
E4	Only on during last 1 minute of emergency for 30 minute load profile
E5	Only on during next 89 minutes of emergency
E6	Only on during last 1 minute of emergency for 2 hour load profile

NOTE:

1. Inverter loads are assumed to be constant VA load at the ac output end.
2. Known future loads include post-accident sampling panel, hydrogen analyzer monitoring panel, and radiation monitor loads 1,250, 480, and 120 watts, respectively.
3. D07 and D09 inverter loads tabulated separately under GWO-8428 (TMI modification job).