



Quantification of Energy Efficiency in the Utilities of the U.S. Affiliate States (Excluding US Virgin Islands)

Data Handbook



Pacific Power Association.

Prepared for Chuuk Public Utility Corporation.

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Table of Contents

1.	Introc	duction 2				
2. Data Content						
	2.1 Generator					
	2.2 Station Transformer					
	2.3 Distribution Feeder					
		2.3.1 Feeder	5			
		2.3.2 Distribution Transformer	7			
2.4 Circuit Breaker and Sw itches						
	2.5 Reactor and Capacitor					
No	Io Appendix for this document					

List of Exhibits:

Table 1 – Generators	. 3
Fable 2 – Station Transformers	. 4
Table 3 – Feeders	. 5
Table 4 – Inventory of distribution materials	. 6
Table 5 – Transformer count and kVA capacity sum	.7
Table 6 – Typical transformer data	. 7
Table 7 – Inventory of distribution transformers	. 8
Table 8 – HV Circuit Breakers (VCBS and OCBS)	. 9
Table 9 – Pad Mount Switches	. 9
Table 10 – Capacitor Data	10
Table 11 – Future Reactor Data	10

i





1. Introduction

KEMA Inc has been awarded by the Pacific Pow er Association (PPA) in Fiji to carry out a project called "Quantification of Energy Efficiency in the Utilities of the U.S. Affiliate States (Excluding US Virgin Islands)".

As part of the deliverables of this project, an Electrica I Data Handbook has been prepared containing all the electrical characteristics of the power system high voltage equipment for each of the utilities. This document represents the Electrical Data Handbook for Chuuk Public Utility Corporation (CPUC). All relevant data of the high and medium voltage assets, such as generation data, impedances of lines, cables, transformers, and other equipments are included as far as the relevant data could be gathered. KEMA has incorporated major data of components and equip ment in power generation, transmission, distribution and metering. A data template is established to hold comprehensive equipment data, for example for transformer power ratings, primary and secondary voltages, load and no load losses, tap changer data, BI L ratings, cooling class, applicable standards, weight, etc.

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2. Data Content

All data contents are identified based on the information KEMA received.

2.1 Generator

There are 4 generators in the Weno Power station of CPUC. However, #2 Caterpillar 3516 unit is out of service. The Caterpillar D399 unit is also out of service.

CPUC	Substation	WENO					
CFUC	Engine #	1	2	3	4		
	ENGINE MAKE	Caterpillar	Caterpillar	Caterpillar	Caterpillar		
S	ENGINE MODEL	3516	3516	3516	D399 PC		
TAIL	ENGINE SERIAL NUMBER	25Z06707	25Z06667	25Z06438	36Z01855		
R DE	NAME PLATE RATING (KW)	1,600	1,600	1,600	1,600		
RATC	DE-RATED (KW)	1,200	1,200	1,200	1,200		
ENE	SPEED (RPM)	1800	1800	1800			
0	FUEL TYPE	Diesel	Diesel	Diesel	Diesel		
	YEAR INSTALLED	2007	2007	2007	1985		
AILS	MAKE	Caterpillar	Caterpillar	Caterpillar	Caterpillar		
DET	ТҮРЕ						
ATOR	MODEL NO.	SR4B	SR4B	SR4B	800-687361111		
ERN	SERIAL NO.	5WN01508	5WN03166	5WN01257	80484-2		
АГТІ	VOLTAGE (V)	480	480	480	4,160		
REMARKS			Out of service		Out of service		

Table 1 – Generators





2.2 Station Transformer

Three substation step-up transformers are operated in Weno power substation to transfer power from 480v generator bus es to 13.8kv for generator #1,2,3 and 4.16 generator bus to 13.8kv for generator #4 to the substation bus. Z1, Z0 impedances are as specified in *CPUC Data Outstanding.docx*. CPUC shall update the data with specific values provided by the transformer manufacture.

	Substatio	on Name	Weno			
CRUC	Transform	ner Make	WEG #1	WEG #2	WEG #3	KULMAN
CFUC	Seria	NO.	189098	184814	188408	A67931
	Year of Manufacture		2002	2002	2002	
	Rating	(MVA)	2.5	2.5	2.5	3
6	NO. of F	Phases	3	3	3	3
TICS	Vector	Group	YNd1	YNd1	YNd1	YNd1
RIS		High	13800	13800	13800	13200/7620
CTE	voltage (v)	Low	480	480	480	4160
ARA	Impedance (%)	Z1	6.49	6.07	6.18	4.9
CH		ZO	5.516	5.16	5.253	4.165
CAL		X/R	7.128	7.128	7.128	10.799
TRI	Losses (Watts)	No Load				
ILEC		Full Load				
ш	Max. Current (A)	HV	110.1	110.1	110.1	138
		LV	3007	3007	3007	418
TANK	Oil	Vol (Gals)	269	269	269	1105
CORE &		Weight (Lbs)	2006	2006	2006	8940
		Net	10913	11045	11045	28560
DETTALEO	WEIGHT (EBS)	Core, Coil & TC	8907	9039	9039	11540
TAPS &	NO. of	Taps	5	5	5	5
DETAILS	Tapchang	ger Type	NLTC	NLTC	NLTC	NLTC
COOLING METHOD			ONAN	ONAN	ONAN	ONAN
REMARKS						

Table 2 – Station Transformers





2.3 Distribution Feeder

2.3.1 Feeder

There are 4 main distribution feeders in CPUC's system. The feeders are 13.8kV overhead lines. All CPUC feeders have 3-phase 4 wires. The conductor size is 1/0 and 2/0. Due to lack of information, feeder parameters have been determined as according to typical data for the specified conductor type and size with default structures of feeders as provided in Easy Power. The feeder data template is provided in the table below with a summary of feeder information as represented in the Easy Power model. CPUC can add or update with additional data in the future.

NAME	F1	F2	F3	F4
CONDUCTOR S PER PHASE	1	1	1	1
MATERIAL	Aluminum	Aluminum	Aluminum	Aluminum
SIZE	2/0	1/0	2/0	2/0
LENGTH	2.5 miles	3.5 miles	8.0 miles	6.0 miles
TEMP (C)	75	75	75	75
GMD (ft)	3.4	3.4	3.4	3.4
AVERAGE HEIGHT (ft)	45	45	45	45
R1 (Ohms/mile)	0.838	1.057	0.838	0.838
X1 (Ohms/mile)	0.6802	0.6946	0.6802	0.6802
R0 (Ohms/mile)	1.123	1.342	1.123	1.123
X0 (Ohms/mile)	3.123	3.137	3.123	3.123
Xc (mohm-mile)	0.1567	0.1602	0.1567	0.1567
Xc0 (mohm-mile)	0.4484	0.4519	0.4484	0.4484
RATING Amps	270	230	270	270
REMARKS	Hospital, water supply installation, deep wells, government offices, new legislature building and central part of the island	Northeast part of the island, Xavier high school and Hans Micronesia hotel	Main down town, port, shipping area, hotels, Blue Lagoon hotel, southwest and southeast part of town	Airport, sewage plant, High Tied & RS Plaza hotel and northern part of town

Table 3 – Feeders





An additional list of inventory of distribution materials is provided in file *annexure 2.11.pdf*. The table below shows the inventory. CPUC should update this table with up to date information later.

Insulator Brackets	Inventory
Pin Insulator	300
Double upset spool bolts	300
Strain Insulator	300
Crossarm Brace	Inventory
Flat Brace 1 3/4"x3/16"x28"	240
Crossarm 3 3 /4"x4 3/4" x8'	300
Cutout Assembly	Inventory
Type 'C' 200A Cutout Fuse 15kV Assy.	90
Secondary Conductor (600V Insulated)	Inventory
Triplex Service drop-copper #6 Gothic	5000
Triplex Service drop -copper #4	2000
Quadraplex Service drop -copper #6 Gothic	1500
#6 Soft drawn tie wire/CU	2000
#6 Soft dra wn tie wire/AL	4000
#2, 7 wire Alum inum Alloy	15000
Other	Inventory
Hand Operated Crimping Tool	2
Oxide-inhibiting Joint Compounds	10

Table 4 – Inventory of distribution materials





2.3.2 Distribution Transfor mers

The list of distribution transformers is shown in the table below:

Feeder No.	Inventory	Total Capacity (kVA)
F1	38	1621.5
F2	16	372.5
F3	98	4127.5
F4	76	1895
Total	228	8016.5

Table 5 – Transformer count and kVA capacity sum

CPUC has distribution transformers of 15, 25, 37.5, 50, 75 and 100 kVA in sizes.

CPUC	Impedance			Losses	(watts)	
kVA	Z%	R%	Χ%	No Load	Full Load	
5	2.2	2.1	0.8	41	144	
10	1.8	1.4	1.2	68	204	
15	1.7	1.3	1.2	84	282	
25	1.7	1.2	1.2	118	422	
37.5	1.7	1.1	1.3	166	570	
50	1.8	1.1	1.4	185	720	
75	1.7	0.9	1.4	285	985	
100	1.9	1.9	1.7	355	1275	
200	2.4	1.1	2.2	544	2653	
Total						

Table 6 – Typical transformer data

Z%, R%, X%, No Load and Full Load Losses are typical value s for transformers in the same class of voltage and kVA capacity. CPUC shall update the data with specific values provided by the transformer manufacture. ¹

¹ Reference: Electric Power Distributi on System Engineering, Turan Gonen





Another list of inventory of distribution transformers is provided in file *annexure 2.11.pdf*. The table below shows the inventory. CPUC should update this handbook with up to date information later.

Transformers (SEC: 120/240V)	Inventory
10 kVA	30
15 kVA	25
25 kVA	25
37.5 kVA	20
50 kVA	15
100 kVA	6
Transformers (SEC: 240/480V)	Inventory
10 kVA	15
15 kVA	15
25 kVA	6

Table 7 – Inventory of distribution transformers





2.4 Circuit Breaker and Switches

There is no circuit breaker data or switch data provided for CPUC system.

The table below is provided as a template for future data capture.

Table 8 – HV Circuit Breakers (VCBS and OCBS)

Location	Туре	Voltage Rating	Quantity
Total			

Table 9 – Pad Mount Switches

Location	Voltage Rating	Quantity
Total		





2.5 Reactors and Capacitors

There are no reactors or capacitors in the CPUC system.

The table below is provided as a template for future capacitor data.

Location	Voltage Rating	MVAr	Quantity
Total			

Table 10 – Capacitor Data

The table below is provi ded as a template for future reactor data.

Table 11 – Future Reactor Data

Location	Voltage Rating	IMPEDANCE	Quantity
Total			





No Appendix for this document.