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

Data Handbook

Pacific Power Association.

Prepared for American Samoa Power Authority.

April 30, 2012 – version 1 - Final

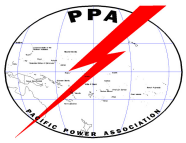

Table of Contents

List of Exhibits:

1. Introduction

KEMA Inc has been awarded by the Pacific Power 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)".

In this Electrical Data Handbook all the electrical characteristics of the power system high voltage equipment of American Samoan Power Authority (ASPA) in the main island of American Samoa is provided. All relevant data of the high and medium voltage assets, such as generation data, impedances of lines, cables, transformers, and other equipments if exists. KEMA has incorporated major data of components and equipment in power generation, transmission, distribution and metering. Data template is established to hold comprehensive equipment data, for example for transformers data collected power ratings, primary and secondary voltages, load and no load losses, tap changer data, BIL ratings, cooling class, applicable standards, weight, etc.

2. Data Content

All data contents are identified based on the ETAP power system model and other information KEMA received.

2.1 Generators

There are 17 generators in ASPA power stations. Generator data are provided in the table below. The MW de-rated value for the generator units are provided separately from the ETAP model.

Table 1 – Generators

Power Station	ID	Manufacture	Purchasing Date	MVA	MW	MW de-rated	KV	Poles	RPM
Tafuna	T-6	Deutz	1993	5590	4750	4100	13.2	12	600
	T-4	Deutz	1999	5590	4750	4200	13.2	12	600
	T-3	Deutz	1994	5590	4750	4100	13.2	12	600

	T- 2	Deutz	1993	5590	4750	4100	13.2	12	600
	T7 SS	Caterpillar	1986	1650	1400	800	0.48	12	600
	T8 SS	Caterpillar	1986	1650	1400	800	0.48	12	600
Satala	SA_Gen1	Caterpillar	2010	2050	1640		13.2	4	1800
	SA_Gen2	Caterpillar	2010	2050	1640		13.2	4	1800
	SA_Gen6	Caterpillar	2010	2050	1640		13.2	4	1800
	SA_Gen5	Caterpillar	2010	2050	1640		13.2	4	1800
	SA_Gen3	Caterpillar	2010	2050	1640		13.2	4	1800
	SA_Gen4	Caterpillar	2010	2050	1640		13.2	4	1800
	SA_Gen7	Caterpillar	2010	2050	1640		13.2	4	1800
	SA_Gen8	Caterpillar	2010	2050	1640		13.2	4	1800
	SA_Gen9	Caterpillar	2010	2050	1640		13.2	4	1800
	SA_Gen10	Caterpillar	2010	2050	1640		13.2	4	1800
	SA_Gen11	Caterpillar	2010	2050	1640		13.2	4	1800

2.2 Station Transformers

There are two 750kVA transformers in Satala power station transferring power from the 13.2kV generator terminal bus to 480V bus serving power station's own loads. There are two 750kVA transformers in Tafuna power station serving as step -up transformer to transfer power generated by the Caterpillar units from 480V to 13.2kV at the power station terminal bus. Station transformer data are provided in table below.

Table 2 – Station Transformers

ID	Location	PrimkV	SeckV	kVA	PosZ	PosX/R ratio	ZeroZ	Zero XoverR	Type	Class	SubType
SST2	Satala	0.48	13.2	750	5.75	5.79	5.75	5.79	Liquid-Fill	OA	Mineral Oil
SST1	Satala	0.48	13.2	750	5.75	5.79	5.75	5.79	Liquid-Fill	OA	Mineral Oil
T1	Tafuna	0.48	13.2	750	5.75	10.67	5.75	10.67	Liquid-Fill	OA	Mineral Oil
T5	Tafuna	0.48	13.2	750	5.75	10.67	5.75	10.67	Liquid-Fill	OA	Mineral Oil

Class OA: Oil-immersed, self-cooled.

2.3 34.5kV interconnection

There is a 34.5kV interconnection connecting the two power stations in ASPA system. Two pairs of power transformers are operated at the terminals of the 34.5kV interconnection transferring power from 13.2kv to 34.5k V. The transformer data are provided in table below.

Table 3 – Power Transformers

ID	Location	Prim kV	SeckV	kVA	PosZ	PosX/R ratio	ZeroZ	Zero XoverR	Type	Class	SubType
T-TLA	Satala	34.5	13.20	5000	7.8	12.14	7.8	12.14	Liquid-Fill	OA	Mineral Oil
T-TLB	Satala	34.5	13.20	5000	7.8	12.14	7.8	12.14	Liquid-Fill	OA	Mineral Oil
TafunaT1	Tafuna	34.5	13.20	5000	7.8	12.14	7.8	12.14	Liquid-Fill	OA	Mineral Oil
TafunaT2	Tafuna	34.5	13.20	5000	7.8	12.14	7.8	12.14	Liquid-Fill	OA	Mineral Oil

Class OA: Oil-immersed, self-cooled.

The underground cable data for the 34.5kV interconnection is provided in the table below.

Table 4 – 34.5kV Interconnection Line

ID	FromBus	ToBus	Length feet	RPos	RZero	XPos	XZero	Cable Size	Material
Cable1	STie-Bus	TTie-Bus	50160	0.07100	0.36600	0.089	0.26100	4/0	Copper

RPos, RZero, XPos, XZero values are in Ohms per 1000 feet at 75 degrees Celsius.

2.4 Distribution Feeder

There are 8 distribution feeders in ASPA's system. Besides that, there are 2 dedicated feeders serving industrial customers. All feeders are 13.2 kV, with combination of overhead lines and underground cables. A summary of feeder conductor data are provided in the tables below.

Table 5 – Under Ground Cables

ID	FromBus	ToBus	Length feet	RPos	RZero	XPos	XZero	Cable Size	Material
500 MCM, 2500 ft	S_K	SK_Vault	2500	0.04658	0.07452	0.0421	0.10735	500	Aluminum
SP-SPVault	S_P	SP_Vault	3200	0.04658	0.07452	0.0421	0.10735	500	Aluminum
F4-F4_Vault	Bus299	F4_Vault	3200	0.04658	0.07452	0.0421	0.10735	500	Aluminum
Cable23	F4_Vault	SW_Marine	1584	0.06500	0.20475	0.0446	0.10972	4/0	Copper
From SW Marine LVS	SK_Vault	SW_Marine	1056	0.06400	0.10240	0.0466	0.11883	4/0	Copper
Vault_Leloaloa	F4_Vault	Leloaloa	415	0.04658	0.07452	0.0421	0.10735	500	Aluminum
Cable26	F_1	F1_Vault	2640	0.06500	0.20475	0.0446	0.10972	4/0	Copper
Satala-Hotel	Bus302-1.3 mls from Sat	Hotel	5808	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
SPVault-SPBus	SP_Vault	SP_BUS	300	0.04920	0.15498	0.0526	0.12940	500	Aluminum
Leloaloa-Aua	Leloaloa-	Aua	6864	0.10496	0.16794	0.0466	0.11883	4/0	Aluminum
Aua-Lauli'l	Aua	Lauli'l	9240	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Lauli'l-Alega	Lauli'l	Alega (barefoot)	7656	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Alega-$2	Alega (barefoot)	$2 Beach	2640	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
$2-Auto	$2 Beach	Auto	1056	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Auto-Amaua	Auto	Amaua	3696	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Amaua-Fagaitua	Amaua	Fagaitua	3168	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Fagaitua-Pagai	Fagaitua	Pagai	3168	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable22	Feeder_5	S-Tree	1000	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable25	S-Tree	Samoa-Const	1000	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable27	Samoa-Const	Lions Inter	1000	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable28	Lions Inter	N-Mart	1000	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable29	N-Mart	C.B.T	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable30	C.B.T	F-INC	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable31	F-INC	Paea	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable32	Paea	Hong K	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable33	Hong K	Ioelu	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum

Cable34	Ioelu	Ku	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable2	F1_Vault	StarKist	1000	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Hotel-Laumei	Hotel	Laumei	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Hotel-Rainmaker	Hotel	Rainmaker	150	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Laumei-Utulei	Laumei	Utulei	200	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Shimsaki-Election	Shimsaki	Election	150	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Tourism-Shimsaki	Tourism	Shimsaki	572	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Shimsaki-PRI	Shimsaki	PRI	572	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
PRI-W.Sword	PRI	W.Sword	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable11	Ku	Sega	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable12	Sega	Emma	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable14	Emma	Cocopt Inter	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable16	Cocopt Inter	SM Store	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable17	SM Store	Perez	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable18	Perez	Toele	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable19	Toele	Fotu	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable20	Fotu	Fe'e PT	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable21	Fe'e PT	Komisi	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable36	Komisi	Faanu	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable37	Faanu	Paisano	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable38	Paisano	Matu'u	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable39	Matu'u	Aveina	1000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable40	Aveina	Thompson	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable41	Thompson	C-Yard	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable42	C-Yard	Papa Anchor	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable43	Papa Anchor	Sea Anchor	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable44	Sea Anchor	Riser	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable45	Riser	Moms_K	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable46	Moms_K	M-Vault	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable47	M-Vault	F/Booster	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable48	F/Booster	Fiapule	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable49	Fiapule	Sifaga	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable50	Sifaga	Faatiliga	500	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable51	Faatiliga	Fagaalu Fdr5	580	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Laumei-Tourism	Laumei	Tourism	572	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable57	Mbrothers	Leloa-loa	1000	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum

Cable58	Mt.. Alava	Mbrothers	1000	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable59	StarKist	Mt.. Alava	1000	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable60	Auasi	Aunuu	12672	0.51000	1.60650	0.061	0.15006	6	Copper
Cable75	Army Reserve	Stad-ium	1300	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
FC Moores	FCJNCT	FC Shop	528	0.07100	0.37900	0.089	0.32300	4/0	Copper
Cable78	Satala_Bus A	Freezer	150	0.04658	0.07452	0.0421	0.10735	500	Aluminum
Cable79	FAA	Stadium	1300	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable81	Stadium	CULESS	1600	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable83	CULESS	FC Junct	587	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable85	FC Junct	FC-Moores	528	0.07100	0.37900	0.089	0.32300	4/0	Copper
Cable87	FC Junct	node	60	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable89	SewerPlant	Fagagogo	5280	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Matafau-LBJ Junction	Matafau	LBJ Junction	2700	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable92	Taf_BusB	Feeder_7	164	0.08050	0.12880	0.0484	0.12342	3/0	Copper
Cable93	Taf_BusB	Feeder_5	328	0.10496	0.16794	0.0466	0.11883	4/0	Aluminum
Cable94	Taf_BusA	Fder_6	164	0.06400	0.10240	0.0466	0.11883	4/0	Copper
Cable101	Stad-ium	CUL	1600	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable102	CUL	FCJNCT	587	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable105	Bus266	CUL	5280	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
W.Sword-Matafau	W.Sword	Matafau	2000	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
LBJ Jnct-LBJ	LBJ Junction	LBJ	800	0.10660	0.33579	0.0583	0.14342	4/0	Aluminum
Cable4	SKist_CanBus	SKist2_HV	200	0.04658	0.07452	0.0421	0.10735	500	Aluminum
Cable5	SKist2_HV	SKistMain_Bus	300	0.04658	0.07452	0.0421	0.10735	500	Aluminum
Cable6	SP Freezer	SP_BUS	750	0.07100	0.37900	0.089	0.32300	4/0	Copper
Leloa-SP Frzer	To SP Freezer	SP Freezer	750	0.07100	0.37900	0.089	0.32300	4/0	Copper
Cable9	F_3	Bus109	3960	0.10496	0.16794	0.0466	0.11883	4/0	Aluminum
Cable24	Bus18	Bus19	1584	0.10496	0.16794	0.0466	0.11883	4/0	Aluminum
Cable55	Bus21	Bus24	1584	0.10496	0.16794	0.0466	0.11883	4/0	Aluminum
Cable91	Pago-Plaza	Bus20	1056	0.10496	0.16794	0.0466	0.11883	4/0	Aluminum
Cable110	Bus20	Bus18	1056	0.10496	0.16794	0.0466	0.11883	4/0	Aluminum
Cable113	Bus23	Bus22	1056	0.10496	0.16794	0.0466	0.11883	4/0	Aluminum
Cable115	Bus19	Bus21	1584	0.10496	0.16794	0.0466	0.11883	4/0	Aluminum
Cable116	Bus24	Gov. Res.	1056	0.10496	0.16794	0.0466	0.11883	4/0	Aluminum
Blue Sky-Sopowaqa	Blue Sky	Sopowaqa	5280	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable120	Sopowaqa	Siufaga	3696	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Alofau-Blue Sky	Alofau	Blue Sky	2112	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum

Pagai-Alofau	Pagai	Alofau	2112	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Amouli- Auasi	Amouli	Auasi	4488	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Siufaga-Amoulii	Siufaga	Amouli	2112	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable121	F_8	Bus301-1mile from Satala	5280	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum
Cable125	Bus301-1mile from Satala	Bus302-1.3 mls from Sat	1584	0.10660	0.33579	0.0446	0.10972	4/0	Aluminum

RPos, RZero, XPos, XZero values are in Ohms per 1000 feet at 75 degrees Celsius.

Table 6 – Overhead Lines

ID	FromBus	ToBus	Length mile	RPos	RZero	XPos	XZero	YPos	YZero	Impedance Unit @75°C	Material
Line3	Bus111	Bus114	1.00	0.4810	1.1501	1.0120	2.8730	6.0505	2.9747	Ohms	Copper
Line141	Fder_6	Bus111	0.10	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Copper
Line142	Bus114	OP Malaeimi Bus Fdr6	0.50	0.2405	0.5751	0.5060	1.4365	3.0000	1.5000	Ohms	Copper
Line144	OP Malaeimi Bus Fdr6	BP House Bus	0.30	0.1443	0.3450	0.3036	0.8619	1.8000	0.9000	Ohms	Copper
Line145	BP House Bus	ACE Bus	0.10	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Copper
Line146	ACE Bus	Well 89 Bus	0.10	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Copper
Line148	Well 89 Bus	L. Grant Bus	0.25	0.1203	0.2875	0.2530	0.7182	1.5000	0.7000	Ohms	Copper
Line149	Mapusaga Bus	ASCC Bus	0.15	0.0722	0.1725	0.1518	0.4309	0.9000	0.4000	Ohms	Copper
Line150	ASCC Bus	Saleia	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line151	Saleia	Apiolefaga	0.05	0.0241	0.0575	0.0506	0.1436	0.3000	0.1000	Ohms	Copper
Line152	L. Grant Bus	Mapusaga Bus	0.05	0.0241	0.0575	0.0506	0.1436	0.3000	0.1000	Ohms	Copper

Line154	Apiolefaga	Well 85	0.05	0.0241	0.0575	0.0506	0.1436	0.3000	0.1000	Ohms	Copper
Line155	Well 85	LDS	0.05	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Aluminum
Line156	LDS	Jack Smith	0.10	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Aluminum
Line157	Jack Smith	TeeOff-Aloau	0.45	0.2164	0.5175	0.4554	1.2928	2.7000	1.3000	Ohms	Copper
Line159	John Faumuina	Bus-36	0.20	0.0962	0.2300	0.2024	0.5746	1.2000	0.6000	Ohms	Copper
Line160	Bus-36	Canco	0.30	0.1443	0.3450	0.3036	0.8619	1.8000	0.9000	Ohms	Copper
Line161	Samia	Gauta	0.10	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Aluminum
Line162	TeeOff-Aloau	John Faumuina	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line164	Gauta	Tia	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line165	Canco	Samia	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line166	Tia	Futiga Junct	0.30	0.1443	0.3450	0.3036	0.8619	1.8000	0.9000	Ohms	Copper
Line167	Veitogi	Futiga Junct	0.50	0.7215	1.7252	1.5179	4.3094	9.0757	4.4620	Ohms	Copper
Line168	Futiga Junct	LandFill	0.20	0.0962	0.2300	0.2024	0.5746	1.2000	0.6000	Ohms	Copper
Line170	LandFill	Cap_Bus	0.20	0.0962	0.2300	0.2024	0.5746	1.2000	0.6000	Ohms	Copper
Line171	Cap_Bus	Malaeloa Junct	0.40	0.1924	0.4600	0.4048	1.1492	2.4000	1.2000	Ohms	Copper
Line172	Malaeloa Junct	Bus83	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line173	Edgar/Pati	BFactory	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line175	BFactory	I_Purifier	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line176	I_Purifier	Midkiff Jction	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line177	Malaeloa Junct	Eti	0.40	0.1924	0.4600	0.4048	1.1492	2.4000	1.2000	Ohms	Copper
Line178	Bus83	Edgar/	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper

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Line180	Bus39	Bus83	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line182	Bus78	Bus80	0.05	0.0241	0.0575	0.0506	0.1436	0.3000	0.1000	Ohms	Copper
Line183	Eti	Marist	0.60	0.2886	0.6901	0.6072	1.7238	3.6000	1.8000	Ohms	Copper
Line184	Bus86	Bus87	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line185	Marist	Midkiff Jction	0.30	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Aluminum
Line186	Bus80	Bus86	0.05	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Copper
Line188	Bus78	Bus66	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line189	Bus68	Satele	0.20	0.0962	0.2300	0.2024	0.5746	1.2000	0.6000	Ohms	Copper
Line190	Bus66	Bus39	0.05	0.0241	0.0575	0.0506	0.1436	0.3000	0.1000	Ohms	Copper
Line192	Bus87	Bus88	0.35	0.1683	0.4025	0.3542	1.0055	2.1000	1.0000	Ohms	Copper
Line193	Midkiff	Midkiff Jction	0.40	0.1924	0.4600	0.4048	1.1492	2.4000	1.2000	Ohms	Copper
Line194	Bus88	Bus68	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line196	Bus155	Bus160	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line197	Midkiff Jction	Kruse	0.10	0.0481	0.1222	0.1012	0.2804	0.6050	0.3286	Ohms	Copper
Line198	Bus17	Bus163	1.00	0.4810	1.1500	1.0120	2.8730	1.0000	3.0000	Ohms/ mile	Copper
Line201	Bus68	Bus95	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line203	Bus95	Transmitter	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line204	Vailoa	Bus101	0.20	0.0962	0.2300	0.2024	0.5746	1.2000	0.6000	Ohms	Copper
Line206	Bus117	Bus106	0.15	0.0722	0.1725	0.1518	0.4309	0.9000	0.4000	Ohms	Copper
Line207	Transmitter	Vailoa	0.30	0.1443	0.3450	0.3036	0.8619	1.8000	0.9000	Ohms	Copper
Line209	Bus101	Bus117	0.15	0.0722	0.1725	0.1518	0.4309	0.9000	0.4000	Ohms	Copper
Line211	Bus106	Bus121	0.20	0.0962	0.2300	0.2024	0.5746	1.2000	0.6000	Ohms	Copper
Line212	Bus135	Bus123	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line214	Bus121	Bus127	0.05	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Aluminum
Line216	Bus147	Bus131	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line218	Bus127	Bus135	0.15	0.0722	0.1725	0.1518	0.4309	0.9000	0.4000	Ohms	Copper
Line222	Bus123	Bus143	0.10	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Aluminum
Line224	Bus143	Bus147	0.10	0.0481	0.1150	0.1012	0.2873	0.6000	0.3000	Ohms	Aluminum
Line228	Bus131	Bus155	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper

Line230	Kruse	Bus160	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line235	Leone HS	Midkiff	0.40	0.1924	0.4600	0.4048	1.1492	2.4000	1.2000	Ohms	Copper
Line236	Satele	Leone HS	0.20	0.0962	0.2300	0.2024	0.5746	1.2000	0.6000	Ohms	Copper
Line240	NewFderBus	Army Reserve	0.50	0.4810	1.1501	1.0120	2.8730	6.1000	3.0000	Ohms	Copper
Line242	Bus26	Veitogi	0.80	0.7215	1.7252	1.5179	4.3094	9.0757	4.4620	Ohms	Copper
Line248	WW	ToSW33	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line249	ToSW33	ToSW38	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line250	ToSW38	Airport	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line251	Feeder_7	WW	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line253	ToSW33	GenSup	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line255	Bus38	Bus41	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line256	GenSup	Bus38	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line266	Bus41	Bus42	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line267	Bus42	Bus45	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line268	Bus45	Bus44	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line270	Bus44	Bus47	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line276	KBookStore	KanaanaH	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line278	IslChoice	GaryS	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line280	Bus63	Bus62	0.25	0.1203	0.2875	0.2530	0.7182	1.5000	0.7000	Ohms	Copper
Line284	ArmyRes	FAA	0.20	0.0962	0.2300	0.2024	0.5746	1.2000	0.6000	Ohms	Copper
Line288	Airport	FAA	0.50	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line296	Ottoville2	manutafa	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line297	manutafa	State Dept	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line299	Ottoville1	Ottoville2	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line302	node	Gabbard	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
linex	Bus214	Bus215	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line338	Bus163	Bus226	2.00	0.4810	1.1500	1.0120	2.8730	1.0000	3.0000	Ohms/mile	Copper
Line340	Bus230	Bus228	2.00	0.4810	1.1500	1.0120	2.8730	1.0000	3.0000	Ohms/mile	Copper

Line341	Bus226	Bus230	2.00	0.4810	1.1500	1.0120	2.8730	1.0000	3.0000	Ohms/ mile	Copper
Line345	Bus245	Bus249	2.00	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line346	Bus249	Bus251	1.00	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line347	Bus254	Bus245	1.00	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line349	Bus251	Bus253	2.00	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line352	TeeOff-Aloau	Tafeta	1.60	2.3900	3.0591	1.1279	2.9889	5.1785	2.7472	Ohms/ mile	Copper
Line354	Tafeta	Aoloau	2.40	2.3900	3.0591	1.1279	2.9889	5.1785	2.7472	Ohms/ mile	Copper
Line356	Bus216	Bus212	0.20	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line358	Bus47	Ottoville1	0.20	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line359	Bus212	Bus214	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line360	Bus215	Bus218	0.70	0.3367	0.8051	0.7084	2.0111	4.2000	2.1000	Ohms	Copper
Line361	State Dept	Gabbard	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line362	FC-Moores	Bus216	0.20	0.0962	0.2300	0.2024	0.5746	1.2101	0.5949	Ohms	Copper
Line364	KananaH	Bus47	0.20	0.0962	0.2300	0.2024	0.5746	1.2000	0.6000	Ohms	Copper
Line366	GaryS	KBookStore	0.20	0.0962	0.2300	0.2024	0.5746	1.2101	0.5949	Ohms	Copper
Line367	Bus60	Bus61	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line368 Fdr7	OP Malaeimi Bus Fdr6	Bus60	0.05	0.0241	0.0575	0.0506	0.1436	0.3000	0.1000	Ohms	Copper
Line369	Bus59	IslChoice	0.25	0.1203	0.2875	0.2530	0.7182	1.5000	0.7000	Ohms	Copper
Line375	Auasi	Utumea	0.25	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line376	Utumea	Alao	0.80	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Alao-Tula	Alao	Tula	0.10	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Tula-Onenoa	Tula	Onenoa	1.30	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line384	Afono	Aua	1.30	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line386	Vatia	Afono	1.30	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line391	Bus293	Fagaitua	0.40	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line392	Masefau	Bus293	2.90	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper

Line394	Masausi	Sailele-	0.50	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line75	Bus293	Masausi	0.40	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper
Line381	Amouli	AOA	0.60	0.0481	0.1150	0.1012	0.2873	0.6050	0.2975	Ohms	Copper

RPos, RZero, XPos, XZero , YPos, YZero values are of units as specified at 75 degrees Celsius.

Note: It is recommended to ASPA to check these parameters against equipment inventory to verify the units in ETAP model. With the ETAP model, if the unit is specified as Ohms per mile, then ETAP will calculate the lump sum impedance/reactance value for the line section based on the length specified. However, if the unit is Ohms, then ETAP will use the specified values as lump sum impedance/reactance value for the line section.

2.5 Distribution Transformer

Distribution transformers counts are provided by ASPA. List of distribution transformers is provided in the tables below. No Load Losses and Total Losses are typical values for transformer in the same class of voltage and k VA capacity[1]. ASPA shall update the data with specific values provided by the t ransformer manufacturer.

Table 7 – Distribution Transformers

ASPA	kVA Rating	Count	No Load Losses Watt	Total Losses Watt	Total kVA Installed
single-phase	10	171	73	215	1710
	15	182	84	305	2730
	25	314	118	437	7850
	37.5	154	166	585	5775
	50	115	185	735	5750
	75	85	285	1050	6375
	100	54	355	1300	5400
	150	9	463.209	1941.791	1350
	225	8	576.8675	3089.398	1800
	300	11	716	3920	3300
	500	16	1140	5640	8000
three-phase	750	7	1800	9400	5250
	2000	6	4050	21550	12000
	4500	1	7520	40840	4500
Total		1133			71790

[1] Reference: Electric Power Distribution System Engineering, Turan Gonen

2.6 Capacitor

The table below provides capacitor data as indicated in the ETAP model .

Table 8 – Capacitor Data

ID	Location	KV	KvarPerBank	NumBanks	Total kVAr	Status
CAP1	Feeder_4	13.2	200	3	600	on-line
CAP2	Feeder_3	13.2	200	3	600	off-line
CAP3	Feeder_6	13.2	200	3	600	off-line
CAP5	Feeder_6	13.2	200	3	600	off-line
CAP7	Feeder_6	13.2	200	3	600	off-line
CAP8	Feeder_8	13.2	300	3	900	off-line
CAP10	Feeder_5	13.2	300	3	900	on-line
CAP12	Feeder_5	13.2	300	3	900	off-line

No Appendix for this document.