

Electricity Fact Sheet

2011 - 2016

October 2017

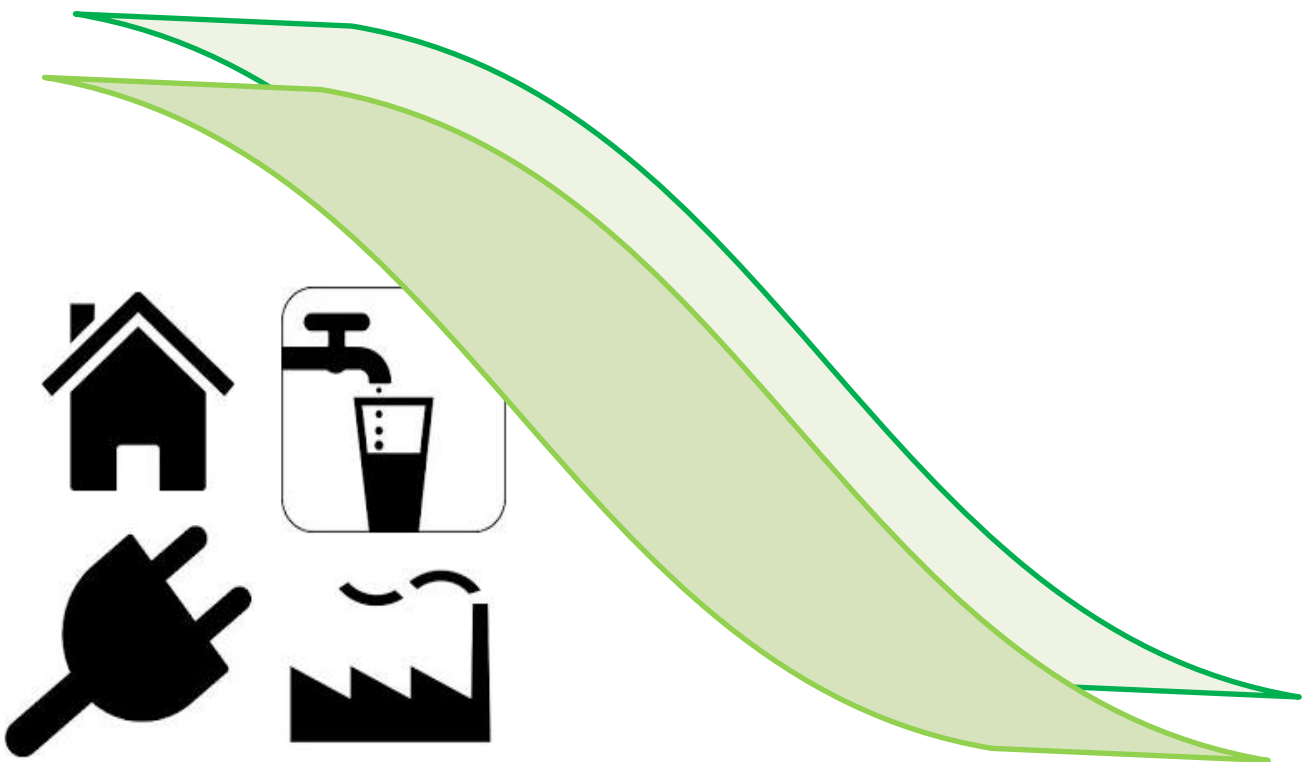


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1 Introduction

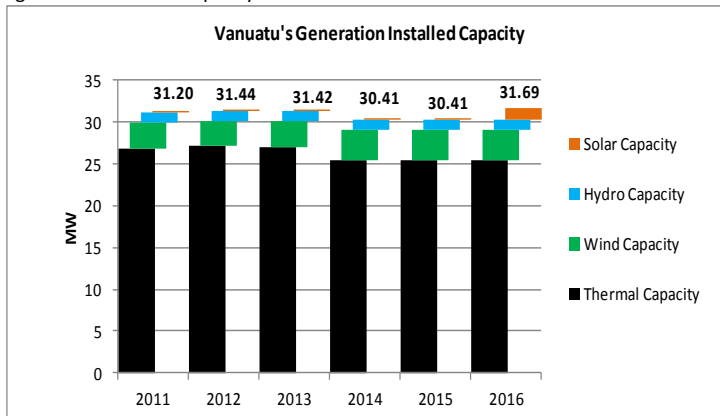
The Utilities Regulatory Authority (URA) is pleased to present this Electricity Fact Sheet providing information on electricity in Vanuatu particularly within the four concession areas of Port Vila, Luganville, Malekula (Lakatoro) and Tanna (Lenakel) in which the two main utilities, UNELCO¹ and VUI² operates. The sheet does not embrace information/data on areas outside the concession areas that generate and use electricity.

Data presented is consolidated for all concession areas. If readers would like specific details of any facts presented in this fact sheet corresponding to a particular concession area, they can refer to the appendix of this fact sheet. Since this fact sheet is the first of its kind, providing six years (2011 to 2016) statistics would be proper to enable readers to appreciate and evaluate data on electricity services in Vanuatu. For subsequent issuance of this fact sheet, data will be presented in rolling period of six (6) years so users of this fact sheet may appreciate changes in the electricity services in Vanuatu going forward.

2 Generation installed capacity in Vanuatu

Figure 1 below shows the total installed capacity of available generation resources in Vanuatu. Refer to Appendix 12.1 for details provided for each concession areas.

Figure 1: Generation capacity in Vanuatu



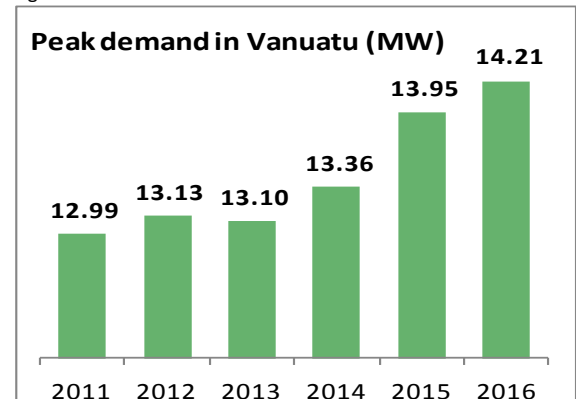
Source: UNELCO & VUI Annual Technical Reports

In Efate two new wind turbines were installed in 2014 (275 kW/turbine). The Government Solar farm (767 kW) and Undine Bay Solar farm (510 kW) both were commissioned in 2016 in Efate. In Luganville Concession, Solar PV with capacity of 40 kW was introduced in 2014 and in operation since then. In Malekula and Tanna, both concessions have solar plant of 20 kW each installed and commissioned in 2013. Tanna's solar plant capacity was further increased in 2015 with additional 10 kW installed.

To date, a 1 MW solar plant is under construction at the Kawene area (around Devil's Point area) with anticipated date of completion and commissioning towards the end of 2017.

3 Peak demand in Vanuatu

Figure 2: Peak demand in Vanuatu

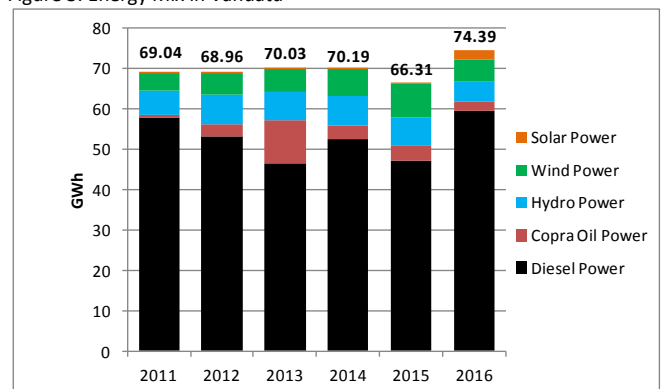


Source: UNELCO & VUI Annual Technical Reports

Overall peak demand in Vanuatu has been constantly increasing from 2011 to 2016. Peak demand per concession area is detailed in Appendix 12.2 for corresponding years.

4 Energy mix in Vanuatu

Figure 3: Energy Mix in Vanuatu



Source: UNELCO & VUI Annual Technical Reports

The above graph shows the consolidated gross electricity generation in Vanuatu in all concession areas. Refer to Appendix 12.3 for gross electrical energy generated by concession area.

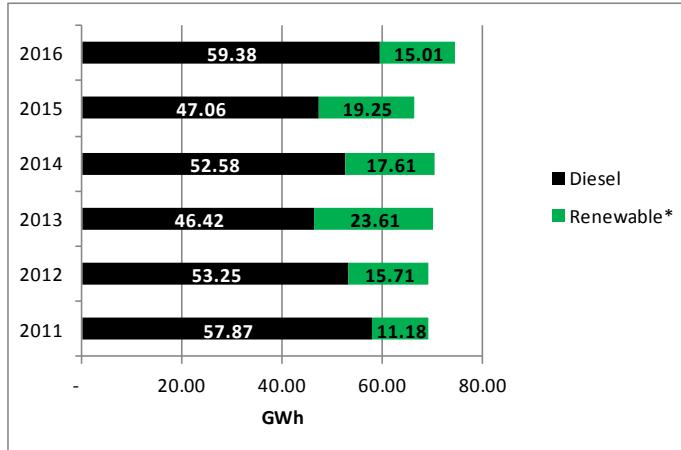
In addition, the availability of generation energy sources (e.g. Solar, wind etc) in the respective concession areas differ respectively from each other and thus impacts the energy mix. Refer to Appendix 12.4 for details in the energy mix per concession area for the years under review.

¹ Union Electrique du Vanuatu Limited (operating in Port Vila (1986), Malekula (2000) & Tanna (2000))

² Vanuatu Utilities and Infrastructure Limited (operating in Santo, Luganville (2011))

5 Renewable penetration in Vanuatu

Figure 4: Renewable penetration in Vanuatu



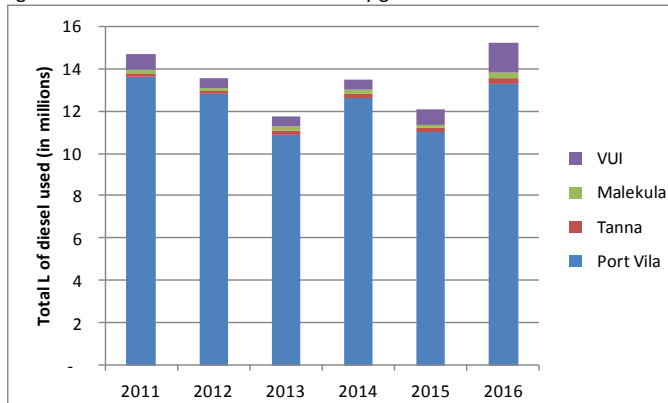
* Renewable is inclusive of electricity from Copra oil, Solar, Wind & Hydro
Source: UNELCO and VUI Annual Technical Reports

It has been observed that the changes in the quantity of copra oil used in generation has quite an impact on the evolution of renewable penetration into the overall energy mix in Vanuatu. For instance, in 2013 the copra oil cost per litre was favourable over diesel cost per litre thus quite a huge quantity of copra oil was utilized that year increasing the renewable penetration in the overall energy mix. In addition, the newly added solar and wind capacity further contributed in the development of renewable penetration.

6 Litres (L) of diesel and copra oil used in electricity production

Figure 5 below shows the total L of diesel utilized in all concession areas for electricity production. It can be noted that in 2016, total L of diesel consumed was higher than prior years merely due to the El Nino effect (hydro production in Santo falls resulting more reliance on diesel) and the low diesel cost experienced during that year (favouring diesel to be used over copra oil in the UNELCO concessions).

Figure 5: Total L of diesel used in electricity generation in all concession area



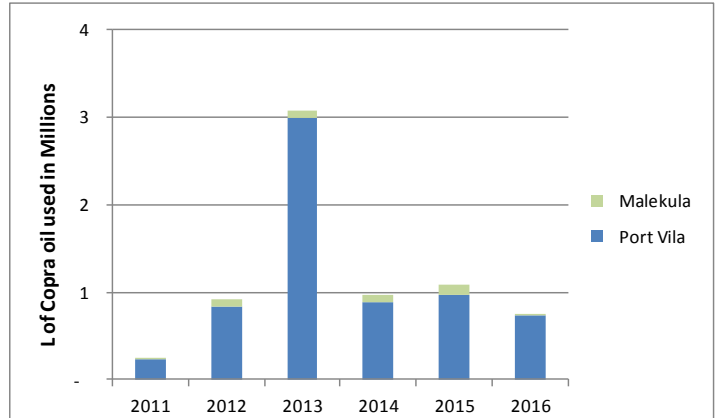
Source: UNELCO monthly tariff submission and Luganville concession reports

Refer to Appendix 12.5 for detail on litres of diesel consumed

per concession site.

Figure 6 below conveys the total litres of copra oil used. Copra oil is limitedly used for electricity production in the concessions of Port Vila and Malekula.

Figure 6: Total L of Copra oil used in electricity generation

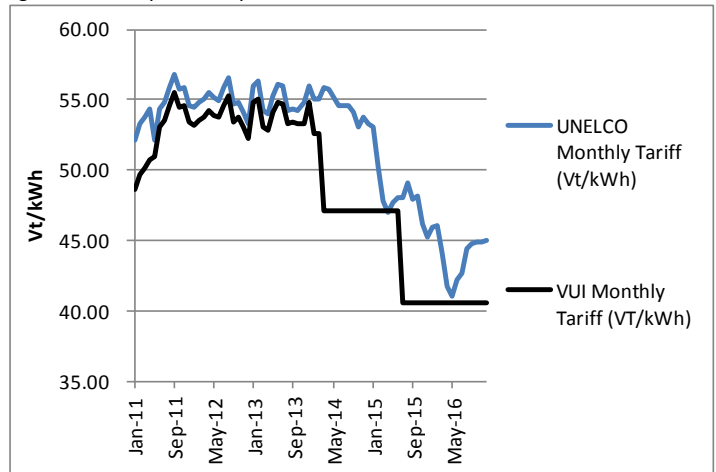


Source: UNELCO monthly tariff submission

Copra oil is not efficient as diesel. That said, there are cases whereby the diesel cost exceeds the copra cost which would favour the use of copra oil over diesel. Appendix 12.6 presents the data on L of copra oil used in generation per concession for the respective years.

7 Electricity Prices

Figure 7: Monthly Electricity Prices Evolution



Source: UNELCO monthly tariff submission and Luganville concession reports

Electricity in Vanuatu continues to remain one of the costly goods after high cost of importing diesel into the country and the great reliance on diesel base generation. You can access the Electricity comparison report³ to assess electricity prices around the Pacific island countries and Vanuatu.

Electricity prices charged in the UNELCO concessions is computed monthly to track changes in the diesel cost and other parameters such as changes in the material cost, labour cost and renewable penetration in the overall generation mix. In 2014, VUI lodged its tariff application with the URA for its review. In its final decision, the URA reduced VUI's tariff by 14% from Dec-13

³ http://www.ura.gov.vu/index.php?option=com_content&view=article&id=106&Itemid=219&lang=en

tariff and accepted VUI's proposal of revising its tariff on annual basis rather than monthly. The volatility in diesel cost is absorbed by the utility and annual reconciliation is undertaken to compensate utility or customers for the actual diesel cost incurred by the utility during the tariff period against that established during tariff review. In early 2017, the URA has further reduced VUI's electricity prices from its previous prevailing tariff by 10.44%.

It is further worth mentioning that URA is currently reviewing UNELCO's electricity tariff. Once a final decision has been made on the tariff, the public in particular UNELCO's electricity customers will be made aware of the new rates applicable.

8 Electricity customers and use in Vanuatu

To begin this section, Table 1 below is useful to fully interpret and understand the data conveying the electricity customer population and electricity consumption/use within the concession areas of Vanuatu.

Table 1: Major Customer Class Details

Customer Class	Details
Industrial	Private High Voltage Users, Government High Voltage Users,
Commercial	Business Users
Non-Commercial	Small Domestic Customers, Prepaid Users, Other Low Voltage Users, Government Low Voltage
Others	Street Lights/Sports Field

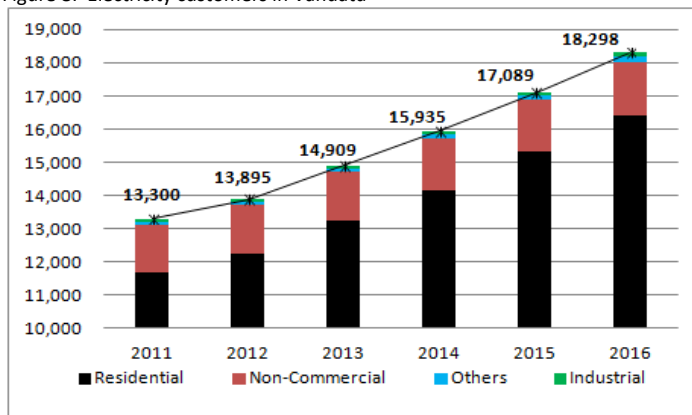
The subsequent sections (8.1 & 8.2) will present data in accordance to Table 1 above.

Appendix 12.7 and 12.8 details customer count by major categories per concession area and further the power consumption by major user type per concession area respectively. It should be read in accordance with details provided in Table 1 above.

8.1 Electricity customer number

Figure 8 presents the movement in customer numbers through the years under focus.

Figure 8: Electricity customers in Vanuatu



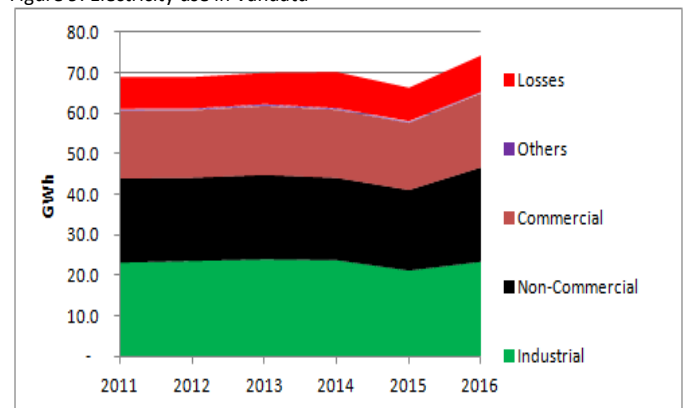
Source: UNELCO and VUI Annual Technical Reports

In the recent years, new added customers in Vanuatu grows by an average of 7% annually from 2012 to 2016 showing commitments by both utility companies in extending electricity access to unserved population within its respective concession areas and also through extension of the concession boundaries. In addition, the Global Partnership on Output-Based Aid (GPOBA) funded through the world bank which was launched and implemented in 2014 subsidising customer connection cost in particular small domestic customers have heavily impacted the new connection rate as well.

Again Appendix 12.7 details customer number per concession area by major customer groupings as presented in Figure 8.

8.2 Electricity usage in Vanuatu

Figure 9: Electricity use in Vanuatu



Source: UNELCO and VUI Technical Reports

Losses as depicted in above graph are representative of power loss in transmission and distribution, energy consumed by generating plants auxiliaries and by utilities' employees and internal usage.

9 Electricity network length by concession area

Figures below show the length of Low Voltage (LV) and High Voltage (HV) lines in the four concession areas. The sum of the lengths of the HV and LV lines should not be considered as the total distance covered by the electricity network on ground as there are some portions of the network where LV and HV lines run in parallel on the same poles.

Figure 10: HV and LV line in km by concession area

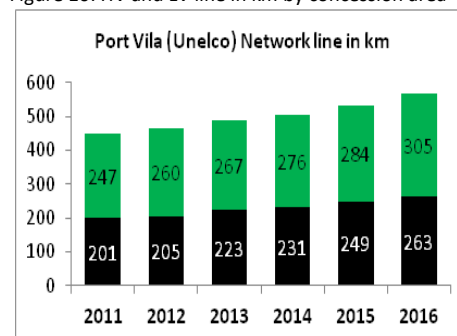
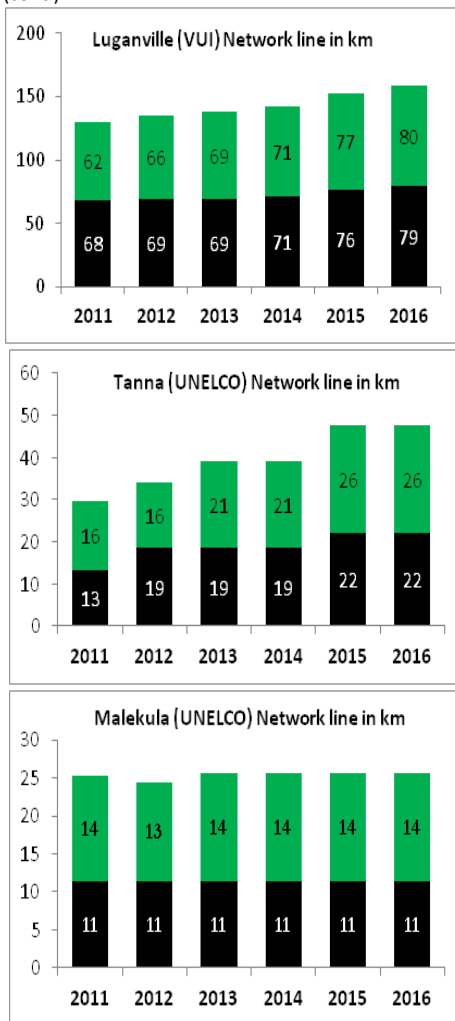


Figure 10 above is continued on following page.

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Figure 11: HV and LV line in km by concession area (cont.)



■ Low Voltage
 ■ High Voltage

Source: UNELCO and VUI Technical Reports

The HV lines are for transmission of HV power from the generating sources to the distribution transformers. LV lines run from the transformers to the customer respective meters. (HV Lines are set at 5.5KV, 20KV and 33kV while LV lines distribute power rated at 230 V single phase and 380 V, three phase).

Major network extension undertaken by the two utilities for the years under review:

- ✓ In Malekula, the development in network lines has been stagnant over the years under review. UNELCO recently completed and commissioned the North East Malekula extension from PRV plantation to Vao village in early 2017. The extension was primarily funded by the European Union and

partly by UNELCO comprising LV line of 17.3 km and 25.6 km HV extensions (not covered in Fig. 7).

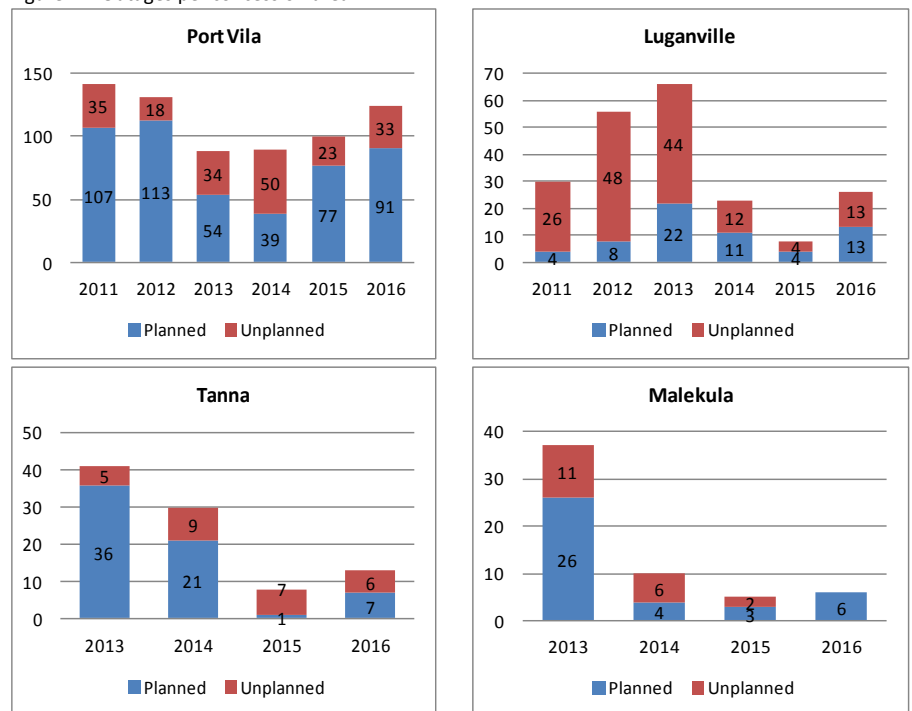
The overall distance covered on-ground by this extension is est. 25 km.

- ✓ The Efate ring-road transmission was underway in the recent years which saw electrifications of villages at the north of Efate Island. The electricity network is currently at the Emua village moving towards the north east of the island. From the south of the island towards south east of the island, the present network terminates at the Rentapao area with plans to further network coverage eastwardly.
- ✓ In Luganville Santo, VUI has been active in providing electricity access to the unserved population within the Luganville suburbs through the funds allocated in its tariff and the Santo fund further accumulated through funds collected from Luganville customers. A major extension undertaken by VUI was the Million Dollar Point area which saw a total distance of est. 2.2 km covered in 2015 funded through the Santo fund. Detail of projects covered under the Santo fund can be found in the Santo fund reports issued by the URA in August 2017⁴.
- ✓ Network extension in Tanna also grew in the recent years but remain idle for years 2015 to 2016. Major extension covered during the years saw the network extension towards the Whitegrass airport and the Whitegrass Ocean Resort towards the north of the island. The electricity service was further extended up to Lounalopen area which saw a substantial uptake of customers.

10 Reliability and outages of electric system by concession

10.1 Number of Outages (Planned and Unplanned) per concession area

Figure 12: Outages per concession area



Source: UNELCO and VUI Technical Reports
Data prior 2013 for Tanna and Malekula is not available.

⁴ <http://www.ura.gov.vu/attachments/article/105/Santo%20Fund%20for%20Electricity%20related%20projects%20August%202017-%20Final.pdf>

Planned outages are outages planned by utility, purposely to allow utility in carrying out maintenance works, network upgrades and to connect extensions to the electricity network. The period of time electricity service is unavailable to customers is usually communicated beforehand to customers via various communication means (e.g. radio, newspaper etc) for customers' awareness and preparation towards such time.

Unplanned outages are interruptions of electricity supply to customers that are caused by technical faults, vandalism and/or force majeure acts to the electricity network.

10.2 Reliability of system by concession area

Table 2: SAIFI and SAIDI by Concession

Years	Planned/ Unplanned/All	Port Vila		Lugaville		Tanna		Malekula	
		SAIFI	SAIDI	SAIFI	SAIDI	SAIFI	SAIDI	SAIFI	SAIDI
2011	Planned	2.1	279.7	0.5	58.3	N/A	N/A	N/A	N/A
	Unplanned	10.4	496.9	18.0	263.8	N/A	N/A	N/A	N/A
	All	12.5	777.0	18.5	322.1	N/A	N/A	N/A	N/A
2012	Planned	3.0	329.0	1.3	352.9	N/A	N/A	N/A	N/A
	Unplanned	6.5	216.4	16.9	178.6	N/A	N/A	N/A	N/A
	All	9.5	545.0	18.2	531.5	N/A	N/A	N/A	N/A
2013	Planned	1.0	109.0	1.2	326.8	6.5	243.2	3.0	276.0
	Unplanned	6.0	127.0	11.4	154.1	2.6	610.3	10.0	529.0
	All	7.0	236.0	12.6	480.9	9.1	853.3	13.0	805.0
2014	Planned	0.3	35.8	1.4	325.1	3.1	422.9	0.7	45.0
	Unplanned	1.7	0.0	12.0	40.0	7.2	115.0	6.0	309.0
	All	0.3	37.5	13.4	365.1	10.2	537.9	7.0	354.0
2015	Planned	1.2	130.1	0.5	135.6	0.1	4.4	1.0	170.0
	Unplanned	6.0	94.0	6.8	241.4	4.0	49.9	2.0	45.0
	All	7.1	224.1	7.3	377.0	4.1	54.3	3.0	215.0
2016	Planned	1.2	242.4	0.8	219.1	1.0	66.8	0.5	118.0
	Unplanned	0.2	119.6	12.1	495.8	4.2	28.4	-	-
	All	1.4	362.0	12.8	714.9	5.2	95.2	0.5	118.0

Source: UNELCO and VUI Technical Reports

N/A – Not Available

SAIFI – (System Average Interruption Frequency Index) is a measure of the number of times the average utility customer experiences an outage

SAIDI – (System Average Interruption Duration Index) is the average outage duration for each customer served reported in minutes

10.3 Customer complaint by concession

Table 3: Customer complaint count

	2011	2012	2013	2014	2015	2016
Port Vila	N/A	127	104	214	183	190
Tanna	N/A	0	0	0	5	5
Malekula	N/A	0	3	0	0	0
Luganville	N/A	2	0	0	0	1

Source: UNELCO and VUI Technical Reports

The data above is annually updated by the utility and provided to the URA. It represents customer complaints directly received by the utility from its customers. However, it does not include customer complaints received directly by the URA.

Customer complaints are more pronounced for Port Vila reflecting its large customer base and further its customers' in-depth knowledge of electricity usage compare to the other three concessions.

11 Closing remarks

We hope this electricity fact sheet is of some value to those interested specifically in the electricity services in Vanuatu in particular within the four (4) concession areas.

We welcome any suggestions from readers to enhance this electricity fact sheet to further provide better understanding and benefit to the users/readers of this Electricity fact sheet.

Thank you!



About the Utilities Regulatory Authority

The URA is the independent economic regulator for water and electricity services in Vanuatu, established by the URA Act no. 11 of 2007 with amendments.

As part of its functions, the Commission is monitoring the provision of electricity and water by utility companies and public services, promoting access and the long term interest of the customers.

Please call us if you have any question on (678) 23335 or visit our office at the Office of the Utilities Regulatory Authority, VNPF Compound, Corner Pierre Lamy & Andre Ballande Street, Port Vila, Vanuatu.

www.ura.gov.vu

12 Appendixes

12.1 Appendix: Generation Capacity by Concession

Port Vila	Unit	2011	2012	2013	2014	2015	2016
Thermal Capacity	kW	23,154	23,372	23,372	21,830	21,830	21,830
Wind Capacity	kW	3,025	3,025	3,025	3,575	3,575	3,575
Solar Capacity	kW	87	87	87	87	81	591
IPP Solar Capacity	kW	-	-	-	-	-	767
Total	kW	26,266	26,484	26,484	25,492	25,486	26,763
Luganville							
Thermal Capacity	kW	2,850	2,850	2,850	2,850	2,850	2,850
Hydro Capacity	kW	1,200	1,200	1,200	1,200	1,200	1,200
Solar Capacity	kW	-	-	-	40	40	40
Total	kW	4,050	4,050	4,050	4,090	4,090	4,090
Tanna							
Thermal Capacity	kW	449	440	419	394	394	394
Wind Capacity	kW	-	-	-	-	-	-
Solar Capacity	kW	-	20	20	20	32	32
Total	kW	449	460	439	414	426	426
Malekula							
Thermal Capacity	kW	430	465	429	389	389	389
Wind Capacity	kW	-	-	-	-	-	-
Solar Capacity	kW	-	20	20	20	20	20
Total	kW	430	485	449	409	409	409

12.2 Appendix: Peak demand by Concession

Peak Demand	Unit	2011	2012	2013	2014	2015	2016
Port Vila	kW	11,085	11,170	11,160	11,420	11,731	11,850
Luganville	kW	1,650	1,713	1,637	1,611	1,850	1,932
Tanna	kW	115	117	173	160	184	200
Malekula	kW	136	130	125	170	185	223
Total	kW	12,986	13,130	13,095	13,361	13,950	14,205

12.3 Appendix: Total Gross Energy Generation by Concession

	Unit	2011	2012	2013	2014	2015	2016
Port Vila	kWh	59,460,721	58,856,779	59,529,952	59,672,161	55,407,674	62,614,398
Luganville, Santo	kWh	8,412,954	8,833,600	9,055,515	8,993,594	9,492,217	10,121,700
Tanna	kWh	521,539	599,104	720,696	793,351	695,810	910,000
Malekula	kWh	649,706	675,042	725,180	734,752	717,564	742,000
Total	kWh	69,044,920	68,964,525	70,031,343	70,193,858	66,313,265	74,388,098

12.4 Appendix: Energy Mix by Concession

Port Vila	Unit	2011	2012	2013	2014	2015	2016
Diesel Power	kWh	54,313,662	50,765,454	43,467,732	49,727,151	43,607,631	52,827,972
Copra Oil Power	kWh	784,526	2,799,924	10,399,690	3,042,939	3,417,525	2,366,265
Wind Power	kWh	4,295,197	5,177,418	5,549,198	6,788,264	8,268,207	5,416,201
Solar Power	kWh	67,336	113,983	113,332	113,807	114,311	873,750
IPP Solar Power	kWh	-	-	-	-	-	1,130,398
Total	kWh	59,460,721	58,856,779	59,529,952	59,672,161	55,407,674	62,614,586
Luganville							
Diesel Power	kWh	2,405,240	1,448,530	1,831,150	1,571,730	2,366,756	5,007,610
Hydro Power	kWh	6,007,714	7,385,070	7,207,400	7,378,780	7,069,830	5,053,900
Solar Power	kWh	-	-	16,965	43,084	55,631	60,190
Total	kWh	8,412,954	8,833,600	9,055,515	8,993,594	9,492,217	10,121,700
Tanna							
Diesel Power	kWh	521,539	580,186	691,274	762,493	659,842	870,000
Solar Power	kWh	-	18,918	29,422	30,858	35,968	40,000
Total	kWh	521,539	599,104	720,696	793,351	695,810	910,000
Malekula							
Diesel Power	kWh	627,986	458,877	434,684	521,746	426,201	674,000
Copra Oil Power	kWh	21,720	212,250	259,316	181,413	260,284	38,000
Solar Power	kWh	-	3,915	31,180	31,593	31,079	30,000
Total	kWh	649,706	675,042	725,180	734,752	717,564	742,000

12.5 Appendix: Total Litres of Diesel oil utilized in generation by concession

Diesel Oil used in gen. In litres	2011	2012	2013	2014	2015	2016
Port Vila	13,600,743	12,779,503	10,880,350	12,585,632	11,010,356	13,298,662
Tanna	167,121	173,382	201,482	232,842	200,600	264,450
Malekula	201,400	151,200	165,229	186,878	159,800	234,905
UNELCO	13,969,264	13,104,085	11,247,061	13,005,352	11,370,756	13,798,018
VUI	702,885	418,980	527,007	464,235	688,857	1,426,685 ⁵

12.6 Appendix: Total Litres of Copra oil utilized in generation by concession

Copra Oil used in gen. In Litres	2011	2012	2013	2014	2015	2016
Port Vila	226,770	831,991	2,992,328	883,380	968,036	726,111
Malekula	8,316	85,396	85,728	79,840	109,847	16,992
TOTAL	235,086	917,387	3,078,056	963,220	1,077,883	743,103

⁵ El Nino effect resulting more reliance of diesel

12.7 Appendix: Customer number per Category by Concession

Port Vila	Unit	2011	2012	2013	2014	2015	2016
Residential	No.	8,569	9,102	9,836	10,619	11,250	12,030
Commercial ⁶	No.	1,084	1,101	1,106	1,196	1,171	1,215
Industrial	No.	62	65	67	69	68	72
Others	No.	75	74	75	76	74	72
Total	No.	9,790	10,342	11,084	11,960	12,563	13,389
Luganville							
Residential	No.	1,942	1,991	2,028	2,061	2,340	2,604
Commercial	No.	322	316	324	337	364	372
Industrial	No.	14	15	15	16	18	20
Others	No.	24	27	29	33	36	42
Total	No.	2,302	2,349	2,396	2,447	2,758	3,038
Tanna							
Residential	No.	641	655	847	934	1,161	1,208
Commercial	No.	16	22	23	23	21	21
Industrial	No.	-	-	-	-	-	-
Others	No.	5	5	5	5	5	32
Total	No.	662	682	875	962	1,187	1,261
Malekula							
Residential	No.	517	494	525	539	557	563
Commercial	No.	27	26	27	26	23	24
Industrial	No.	-	-	-	-	-	-
Others	No.	6	6	6	5	5	27
Total	No.	550	526	558	570	585	614

12.8 Appendix: Customer Energy Consumption by Major Category per Concession

Port Vila	Unit	2011	2012	2013	2014	2015	2016
Residential	kWh	18,209,592	17,811,605	18,096,274	17,334,452	16,951,013	19,789,413
Commercial ⁷	kWh	15,481,646	15,391,881	15,911,204	15,862,023	15,443,523	17,259,136
Industrial	kWh	20,700,570	21,118,421	21,391,272	21,293,797	18,624,385	20,500,993
Others	kWh	542,839	738,029	729,469	780,208	760,019	772,486
Total	kWh	54,934,647	55,059,936	56,128,219	55,270,480	51,778,940	58,322,028
Losses	kWh	4,526,074	3,796,843	3,401,733	4,401,681	3,628,734	4,292,370
Luganville							
Residential	kWh	2,016,557	2,162,809	2,137,959	2,248,770	2,248,424	2,644,190
Commercial	kWh	3,122,674	3,142,915	3,130,235	3,075,682	3,365,141	3,563,545
Industrial	kWh	2,363,349	2,367,033	2,465,057	2,357,913	2,458,535	2,769,188
Others	kWh	147,409	154,917	198,097	244,069	245,051	312,026
Total	kWh	7,649,989	7,827,674	7,931,348	7,926,434	8,317,151	9,288,949
Losses	kWh	762,965	1,005,926	1,124,167	1,067,160	1,175,066	832,751⁸

⁶ Customer number includes Water HV & LV

⁷ Energy (kWh) consumed includes Water HV & LV

⁸ Reduced line loss on 20 kV line due to reduced load due to drought

Tanna	Unit	2011	2012	2013	2014	2015	2016
Residential	kWh	341,804	353,934	400,134	427,517	387,680	530,740
Commercial	kWh	116,263	152,593	233,652	252,656	206,367	249,196
Industrial	kWh	-	-	-	-	-	-
Others	kWh	2,113	16,872	20,361	19,746	17,790	20,215
Total	kWh	460,180	523,399	654,147	699,919	611,837	800,151
Losses	kWh	61,359	75,705	66,549	93,432	83,973	109,849
Malekula							
Residential	kWh	332,350	348,162	382,208	426,706	421,337	443,142
Commercial	kWh	248,460	264,481	241,241	211,798	193,685	193,394
Industrial	kWh	-	-	-	-	-	-
Others	kWh	7,168	15,545	16,471	14,773	16,232	16,791
Total	kWh	587,978	628,188	639,920	653,277	631,254	653,327
Losses	kWh	61,728	46,854	85,260	81,475	86,310	88,673