Pacific Power Utilities

Benchmarking Report

2020 Fiscal Year

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Pacific Power

Benchmarking

Summary Report

2020 Fiscal Year

Prepared by Pacific Power Association

October 2021

Table of Contents

Contents

1. Introduction 6
   1.1 Benchmarking Overview 6
2. Governance 7
   2.1 Key Governance Results 7
   2.2 Governance Assessment 7
3. Gender 10
4. Data Reliability 11
5. KPI Results 12
   5.1 Introduction 12
   5.2 Generation 13
      5.2.1 Load Factor 13
      5.2.2 Capacity Factor 13
      I. 5.2.3 Availability Factor 14
      5.2.4 Generation Labour Productivity 15
      5.2.5 Specific Fuel Consumption (kwh/Litre) 16
      5.2.6 Specific Fuel Consumption (kWh/kg) 17
      5.2.7 Specific Lubricating Oil Consumption 17
      5.2.8 Forced Outage 18
      5.2.9 Planned Outage 19
      5.2.10 Generation Operations and Maintenance (O&M) Costs 19
      5.2.11 Power Station Usage / Station Auxiliaries 19
      5.2.12 IPP Generation 20
      5.2.13 Renewable Energy to Grid 20
   5.3 Transmission Indicators 22
      5.3.1 Transmission (General) 22
   5.4 Distribution Indicators 23
      5.4.1Network Delivery Losses 23
      5.4.2 Distribution Transformer Utilization 23
      5.4.3 Distribution Reliability 24
      5.4.4 Customers per Distribution Employee 25
      5.4.5 Distribution O & M Expenses 25
   5.5 SAIDI and SAIFI 26
      5.5.1 System Average Interruption Duration Index (SAIDI) 26
      5.5.2 System Average Interruption Frequency Index (SAIFI) 26
      5.7.1 Tariff Impact 28

5.7 Financial Indicators....28
Conducting tariff analysis of Pacific utilities is highly complex due to the different tariff schedules and structures. This section therefore compares the impact of the tariff schedule applied to customers of various categories. 28
5.7.4 Utility Cost Breakdown....29
5.7.5 Debt to Equity Ratio....30
5.7.6 Return on Assets....30
5.7.7 Return on Equity....31
5.7.8 Current Ratio....31
5.7.9 Operating Ratio....31
5.7.10 Debtor Days....32
5.8 Human Resources & Safety Indicators....33
5.8.1 Lost Time Injury Duration Rate....33
5.8.2 Lost Time Injury Frequency Rate....33
5.8.3 Overall Labour Productivity....34
5.9 Overall Composite Indicator....34

1. Introduction

1.1 Benchmarking Overview

Twenty utilities out of the twenty-six utility members have provided data for the 2020 report, an increase of five from the fifteen that participated in 2019. Southern California Edison has also participated for the first-time providing data for their Santa Catalina Island grid.

This exercise commenced in 2001 and recommenced in 2010 after a lapse of 9 years. The list of participating utilities during this period is shown in Table 1.1.

Table 1.1: Utility Participation in 2001 and from 2010 to 2020

Utility			Data Period											
			2001	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Acronym	Name	Country/ Territory	Year Data Collected											
			2002	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
ASPA	American Samoa Power Authority	Amercian Samoa	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CPUC	Chuuk Public Utility Corporation	Fed. Staes of Micronesia (FSM)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CUC	Commonwealth Utilities Corporation	Commonwealth of Northern Marianas	×	✓	✓	✓	✓	×	✓	×	✓	✓	✓	×
EDT	Electricite de Tahiti	French Polynesia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×
EEC	Electricite et Eau de Caledonia	New Caladonia	✓	×	×	✓	✓	✓	✓	✓	✓	✓	✓	✓
EEWF	Electricite et Eau de Wallis et Futuna	Wallis & Futuna	✓	×	×	×	×	×	×	×	×	×	×	×
ENERCA	Societe Neo-Caledonnenne D'Energie	New Caladonia	✓	×	×	×	×	×	×	×	×	×	×	✓
EPC	Electric Power Corporation	Samoa	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	×	✓
EFL	Energy Fiji Limited	Fiji	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×
GPA	Guam Power Authority	Guam	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	×	✓
KAJUR	Kwajalein Atoll Joint Utility Resources	Marshall Islands (RMI)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×
KUA	Kosrae Utilities Authority	Fed. States of Micronesia (FSM)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MEC	Marshall Energy Company	Marshall Islands (RMI)	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓
NPC	Niue Power Corporation	Niue	✓	✓	×	×	×	×	×	×	×	×	×	×
NUC	Nauru Utilities Corporation	Nauru	×	✓	✓	✓	×	×	✓	✓	✓	✓	×	✓
PPL	PNG Power ltd.	Papua New Guinea (PNG)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PPUC	Palau Public Utilities Corporation	Palau	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PUB	Public Utilities Board	Kiribati	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	✓
PUC	Pohnpei Utilities Corporation	Fed. States of Micronesia (FSM)	✓	×	✓	✓	✓	×	✓	✓	✓	✓	✓	✓
SCE	Southern California Edison	Santa Catalina Island												✓
SP	Solomon Power	Solomon Islands	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TAU	Te Aponga Uira O Tunu-Te-Varovaro	Cook Islands	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TEC	Tuvalu Electricity Corporation	Tuvalu	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TPL	Tonga Power Limited	Tonga	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UNELCO	UNELCO Vanuatu Ltd.	Vanuatu	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
YEPSC	Yap State Public Service Corporation	Fed. States of Micronesia (FSM)	×	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	✓
		Total	20	21	21	21	21	19	22	18	21	22	15	20

2. Governance

2.1 Key Governance Results

The governance data provided by utilities for previous reports and the 2020 report is shown in Table 2.1.

Table 2.1: Quality Standard and Regulatory Structures of Utilities

Utilities	Power Quality Standards	Self-Regulated or Externally regulated	Public or Private Ownership
ASPA	Self	Self	Public
CPUC	US	Self	Public
CUC	US	External	Public
EDT	concession contract	External	Private
EEC	EN50160	External	Private
EPC	AUS/NZ	External	Public
EFL	AUS/NZ	External	Public
KAJUR	self	Self	Public
KUA	KUA	Self	Public
MEC	MEC	Self	Public
NUC	AUS/NZ	Self	Public
PPL	AUS/NZ	External	Public
PPUC	JIS, NEC	Self	Public
PUB	Self	Self	Public
PUC	Self	Self	Public
SCE	US	External	Private
SP	Self	Self	Public
TAU	AUS/NZ	External	Public
TEC	AUS/NZ	Self	Public
TPL	Self	External	Public
UNELCO	Concession contract	External	Private
YEPSC	NEC	Self	Public

2.2 Governance Assessment

The composite governance score introduced in the 2012 Fiscal Year Report has again been utilised in this years' power benchmarking exercise for the purpose of analysing if good governance mechanisms are delivering tangible benefits to utilities in the form of improved financial performance. The composite score is comprised of the same weighted indicators as the 2012 Fiscal Year Report, determined from relevant responses in the governance questionnaire using a governance scorecard (Table 2.2).

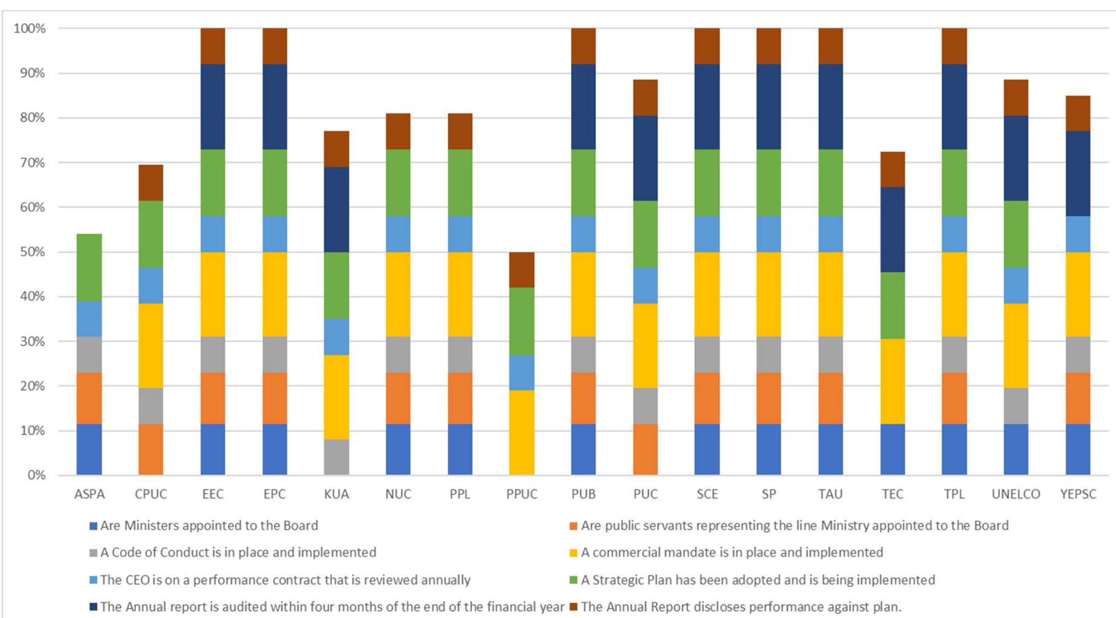
Table 2.2 Governance Scorecard

Governance Indicator	Good Governance	Poor Governance	Score
Are Ministers appointed to the Board?	No	Yes	12%
Are Ministers/ public servants representing line/ sector Ministry appointed to the Board?	No	Yes	12%
Is a Code of Conduct in place and implemented?	Yes	No	8%
Is a commenrcial mandate in place and implemented?	Yes	No	19%
Is the CEO on a performance contract with annual reviews?	Yes	No	8%
Has a Strategic Plan (at least 3 years forecasts) been adopted and implemented?	Yes	No	15%
Is the Annual Report (audited) completed within four months of the end of the reporting year?	Yes	No	19%
Does the Annual Report disclose performance against Plan?	Yes	No	8%
Total Score			**100%**

Note: A good governance score results in full marks for each indicator, whilst a poor governance result receives a zero for each applicable indicator. In regard to the indicator on Annual Reports being completed within four months of the end of the reporting year, this has been used as a good practice standard, but it is acknowledged that several utilities have agreements with their regulators that allow for longer periods for production of Annual Reports.

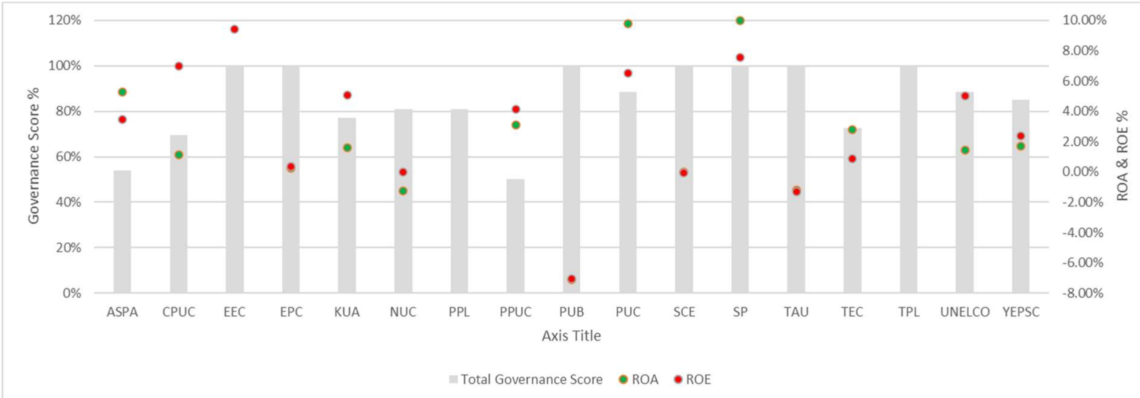
The composite Governance Score for utilities which provided sufficient responses to enable scores to be determined are presented in Figure 2.1.

Figure 2.1: Composite Governance Score for 2020 FY



The Comparison of Governance Score to the Return on Total Assets and Return on Equity is shown in Figure 2.2.

Figure 2.2: Composite Governance Score compared with ROA and ROE



3. Gender

The gender make-up of the Pacific Island utilities in presented in Table 3.1.

Table 3.1: Gender Make up of Utility Workforce

Workforce Gender Make-up	
Total Employees	5,126
% Male employees	80.3%
% Female employees	19.7%
Total Technical Employees	2,630
% Technical Male employees	95.0%
% technical Female employees	5.0%
Total Management Staff	141
% Management Staff - Male	73.8%
% Management Staff - Female	26.2%

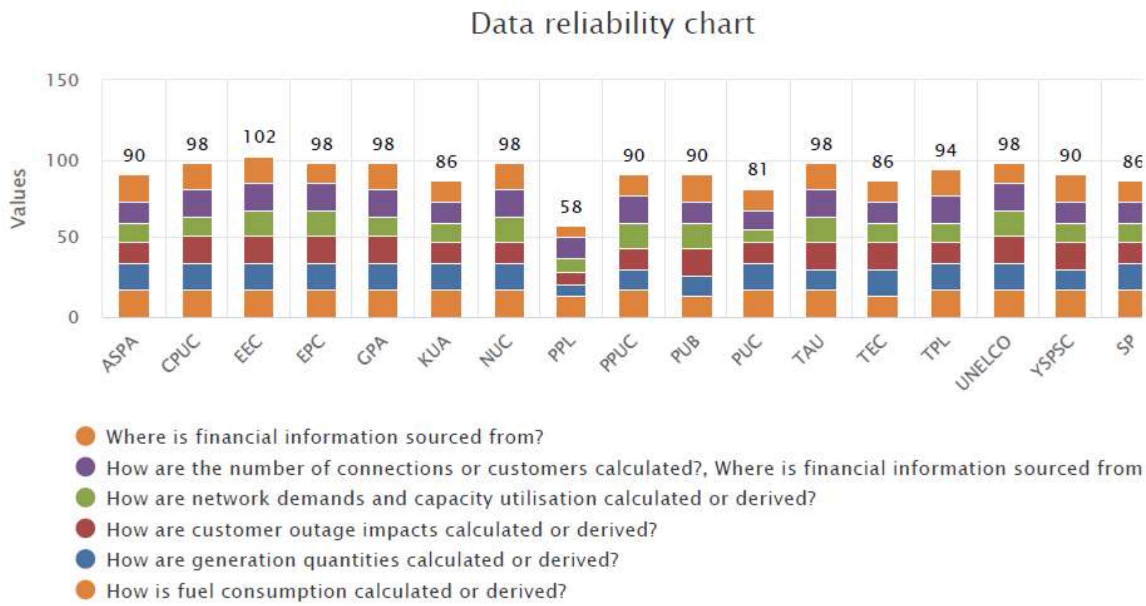
Female employees make up 19.7% of the total workforce. In 2018 and 2019 this stood at 18.2% and 19% respectively. This seem to indicate a small increase year on year.

In the Technical employment sections, female employees make up a much small component (5%) while the female component of management staff is greater (26.2%) when compared to the overall employment make-up. The drive for gender balance seem to be more effective at the management level of the organization than in the technical section.

4. Data Reliability

Figure 4.2 aggregates the reliability scores submitted by each of the utilities in order to rank the relative reliability of the data that was submitted. These aggregate scores have furthermore been utilised as a weighting in this reporting in calculating the Composite Indicator for the 2020 FY.

Figure 4.2: Data Reliability Chart



5. KPI Results

5.1 Introduction

This section provides performance results for the 20 (2020 FY) and 15 (2019 FY) utilities that participated in each relevant reporting year. The results from 2018 FY have also been included for further comparison. The results are comprised of 46 KPIs, with each indicator graphically presented with both the regional average (arithmetic mean) and median (middle) values.

An indication of utility size is also provided via a colour coding of red, orange, or green as determined by utility size in accordance with the PPA's membership level categorisations: green indicates an annual peak load of less than 5MW (small); orange indicates an annual peak load of between 5MW and 30MW (medium); and red indicates an annual peak load of 30MW or greater (large). In order to facilitate comparison of results by size, all graphs are shown in the order of minimum to maximum demand. Table 5.1.1 furthermore provides an overview of some key characteristics of the participating utilities, including the applicable colour coding.

Table 5.1.1: Utility Key Characteristics

Utilities	Peak Demand (for largest Grid)	Size Category	Smaller Grids Serviced	Total Annual Energy Produced (MWH)	Renewable Energy Contribution (%)
ASPA	25.00	medium	Yes	173,582	2.3%
CPUC	2.97	small	Yes	16,894	5.1%
EEC	86.49	large	Yes	490,011	12.0%
EPC	29.99	medium	Yes	192,410	44.4%
EFL	180.22	Large	Yes	977,150	64.2%
GPA	247.00	large	Yes	1,686,618	3.0%
KUA	1.29	small	No	6,927	3.2%
MEC	9.40	medium	Yes	65,141	0.8%
NUC	5.75	medium	No	39,151	7.7%
PPL	131.40	large	Yes	1,500,704	44.7%
PPUC	11.50	medium	Yes	86,239	2.0%
PUB	5.60	medium	No	32,993	6.8%
PUC	6.15	medium	No	37,482	4.1%
SCE	5.60	medium	Yes	27,418	0.0%
SP	15.91	medium	Yes	98,950	1.7%
TAU	5.53	medium	No	31,207	13.7%
TEC	1.42	small	Yes	9,649	15.7%
TPL	11.49	medium	Yes	76,016	11.8%
UNELCO	13.20	medium	Yes	59,736	14.7%
YEPSC	1.90	small	Yes	10,646	19.5%
Total				5,618,924	17.10%

Note:

1. The Peak demand is for the largest grid operated by the utility, while the energy demand is aggregate for all the grids operated by the utility.

2. The data for Tahiti, KAJUR, CNMI Wallis & Futuna, Tahiti and part of New Caledonia was not provided.

5.2 Generation

5.2.1 Load Factor

The Load Factor (LF) is the average load demand divided by the peak demand over a period. In this report the period is the fiscal year and the LF is given for the largest grid operated by the utility.

The LF is an indicator of the utilization of production capacity. Production capacity is maintained to provide for peak demand. A lower LF indicates a load profile with a greater peak compared to the average load and a lower utilization of production capacity.

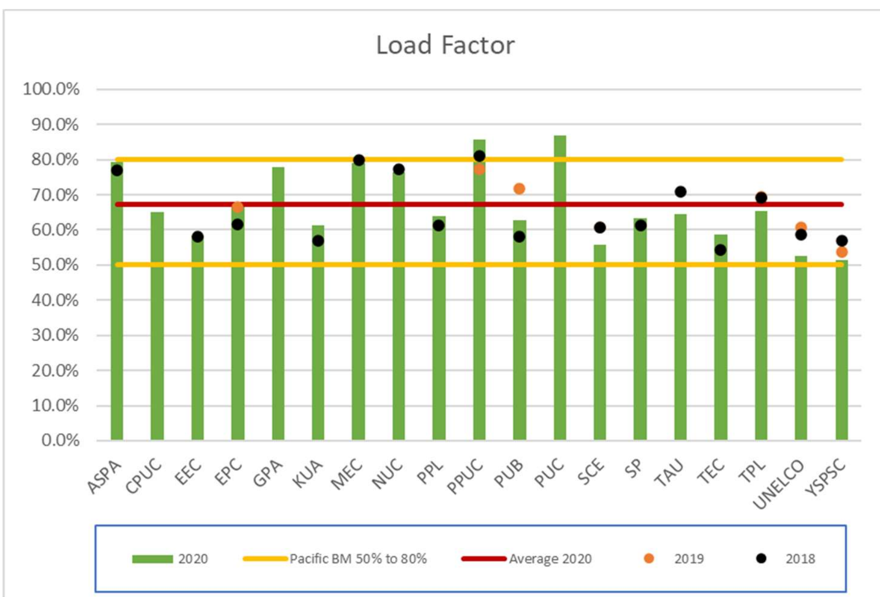
A high LF implies a relatively flat demand profile and higher capacity utilization. This generally indicates an efficient use of production resources. However, a high LF could result from limiting peak demand by regular load shedding due to insufficient reliable production capacity. In this instance the high LF does not indicate an improved performance but is rather a symptom of insufficient reliable production capacity to meet the demand.

The minimum LF deemed acceptable is 50% while a benchmark of 80% is set for Pacific Island Utilities.

Demand side management strategies, time of use tariffs, peak lopping and demand shifting strategies can be adopted to limit the peak demand and improve the LF. This is expected to be an increasingly important activity in Pacific power sector policies."[1]

Figure 5.2.1 shows that LF has remained stable over the last three years, with a current average of 67 %.

Figure 5.2.1: Load Factor (%) 2020, 2019, 2018



Average LF for 2020: 67%

Higher is better provided peak demand is not being limited by insufficient production capacity

5.2.2 Capacity Factor

Capacity factor (CF) is also an indicator of effectiveness in relation to the use of generation resources. It is a similar measure to LF. Where LF measures average power as a percentage of maximum demand, CF measures average power demand as a percentage of installed firm

[1] PPA ADB, Pacific Power Utilities, pp. 5-1.

capacity. The lower the CF the greater the production reserve capacity available to provide for demand when production units are taken out of service for maintenance purposes or for repairs due to faults. It also may suggest over investment in production capacity which situation is best avoided.

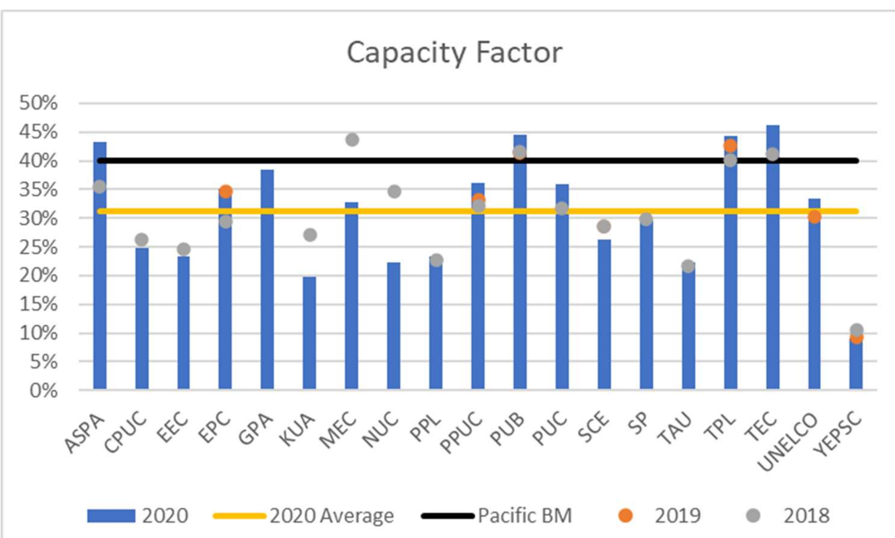
A higher CF indicates a peak demand that approaches available production capacity. This may cause difficulties in scheduling maintenance for the generating plants and may result in load shedding during peak load periods when generators are taken out of service due to faults.

The investment in production capacity is determine by the power security policy adopted by the utility. Utilities may adopt a security policy of N-1 or N-2. N-1 production capacity is the maintenance of sufficient production capacity to cater for the loss of the generating unit with the largest capacity in the fleet. Likewise, N-2 caters for the loss of the two largest units in the fleet.

The minimum form production capacity is determined by the power security policy adopted based on experience concerning the reliability, the cost of investment and expectations regarding the lifespan of the firm production equipment. Installing more capacity than required would be an inefficient way of utilising a utilities financial resources, while, underinvesting may compromise the reliability of power supply.

As shown in Figure 5.2.2, the CF has remained generally stable between 2018 and 2020, with an average of 30%. This is below the Pacific benchmark of over 40%. However following utilities TEC, NUC, TPL, PUB and ASPA have achieved a capacity factor above 40 percent. No strong correlation exists between utility size and the CF results.

Figure 5.2.2: Capacity factor (%) 2020, 2019, 2018



Average CF for 2020 is 30%

Too high a CF risk having insufficient capacity to meet demand at all times

A low CF indicates over investment in capacity.

Pacific Benchmark >40%

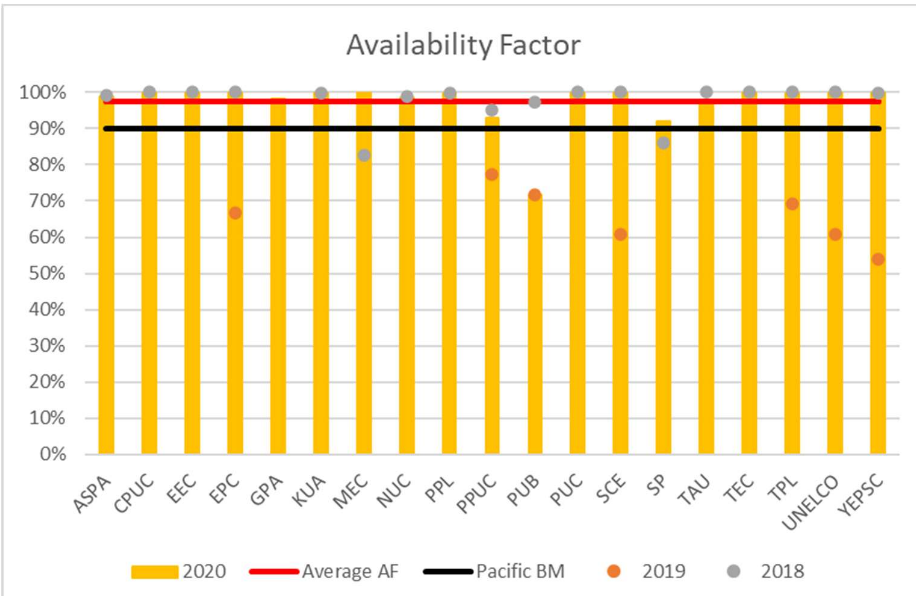
5.2.3 Availability Factor

The availability factor (AF) is an indicator of how well a power plant is operated and maintained. It is determined by the actual hours the unit is available for production divided by the maximum available hours for the period. Because power plants need to be taken out of service for routine maintenance an AF of 100% is not achievable. The type of power plant and its mode of operation may affect the AF. For a base load diesel power plant, with higher running hours more routine maintenance would be required and subsequently resulting in a lower AF. For such power plant an AF between 90% and 95% is expected. For a plant that is operated less frequently the AF should be a little higher.

A higher than expected AF may mean the plant is not being sufficiently maintained and this could lead to more frequent breakdown in the near future. A lower AF indicates more frequent breakdowns and outages for repairs as a result of poor maintenance and operation protocols.

The average AF in 2020 was 97%. This seem to indicate more an error in the data provided although if true it is a level that could not be maintained for too long as it indicates cutting out on scheduled maintenance. More frequent breakdown will eventually occur.

Figure 5.2.3: Availability Factor (%) 2020, 2019, 2018



Average AF for 2020 is 97%

Too high an AF may indicate inadequate maintenance

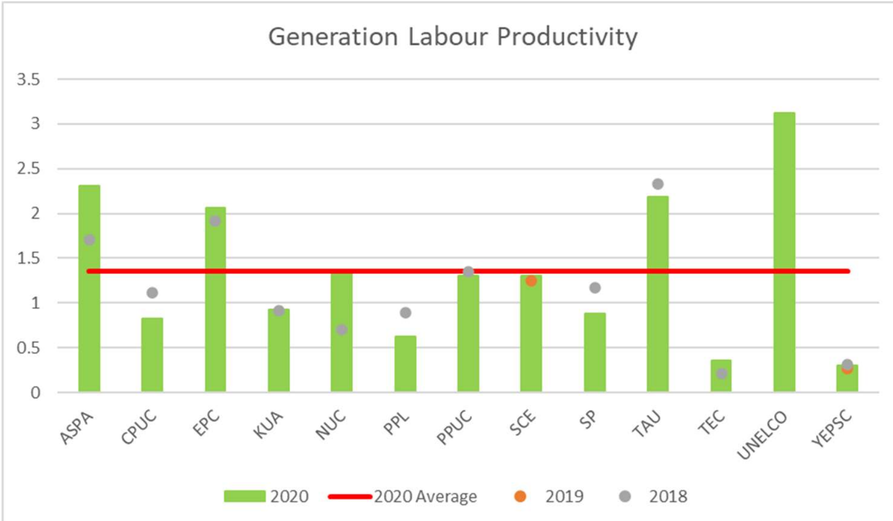
Higher is better

A low CF indicates maintenance shortfalls and reliability issues

5.2.4 Generation Labour Productivity

Generation Labour Productivity (GPL) is a measure of the total energy produced per full-time equivalent (FTE_G). For power utilities, the indicator of service has traditionally been the amount of electricity generated per employee, but this may change over time as Pacific utilities provide more energy efficiency services to customers and independent power producers are included in the power production sector.

Figure 5.2.4: Generation Labour Productivity



Average GLP for 2020 is 1.3 GWH/FTE$_G$

Higher is better

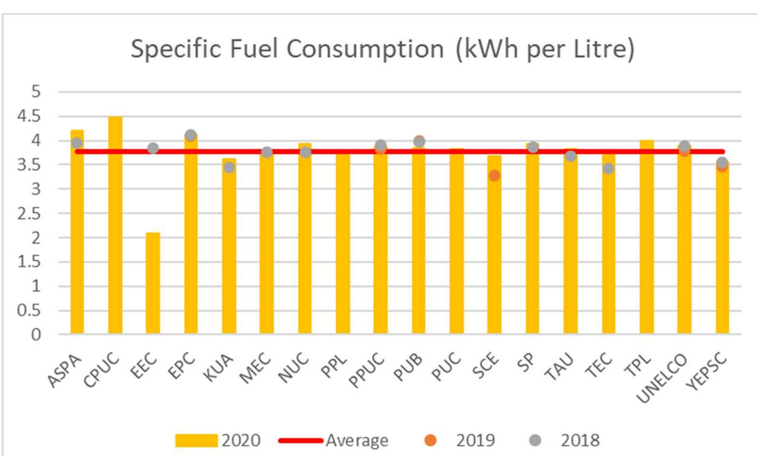
5.2.5 Specific Fuel Consumption (kwh/Litre)

Specific fuel consumption (SFC) is a measure of the efficiency of fuel use for power generation, and is often reported in kWh/litre, kg/kWh or kWh/gallon. It is a critical performance indicator because fuel accounts for the bulk of generation costs in a typical PPA–member diesel-based power utility. Importantly, SFC refers to the efficiency of utility generation only – it does not include purchased energy from Independent Power Producers (IPPs). Furthermore, non-diesel generation is not factored into this indicator.

As power utilities transition away from fossil fuel-based production of power to renewable resources, and more IPPs are engaged in the production of energy, the impact of fossil fuel will factor less in the overall efficiency and costs of energy production.

In Figure 5.2.5, most utilities are operating close to the Benchmark of 4 kWh per litre of fuel. CPUC have the highest SFC at 4.46 kwh per litre. This probably is reflecting an error in the fuel usage data as such a high SFC is unattainable. ASPA has the next highest SFC and this may reflect the use of heat recovery technology on the diesel generators to produce additional energy. EEC SFC seem a little low. However, the bulk of their energy is imported from the grid and produced by renewable sources. Less than 2% of their energy is produced by their own fossil fuel production capacity. This is an example where a lower SFC is not significant to the overall performance of the utility.

Figure 5.2.5: Specific Fuel Consumption 2020,2019 and 2018



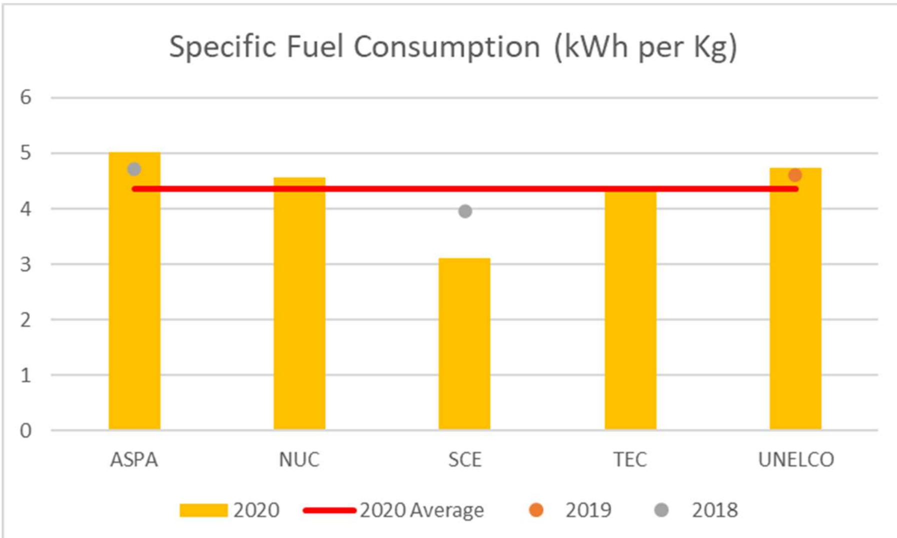
Average 3.8 kWh per litre

Higher is better

5.2.6 Specific Fuel Consumption (kWh/kg)

This measure is an alternative to the previous measure indicating the same performance. This measure however incorporates the specific gravity of the fuel oil.

Figure 5.2.6: Specific Oil Consumption (kWh/kg) 2020, 2019, 2018



Average 4.36 kWh per kg fuel oil

Higher is better

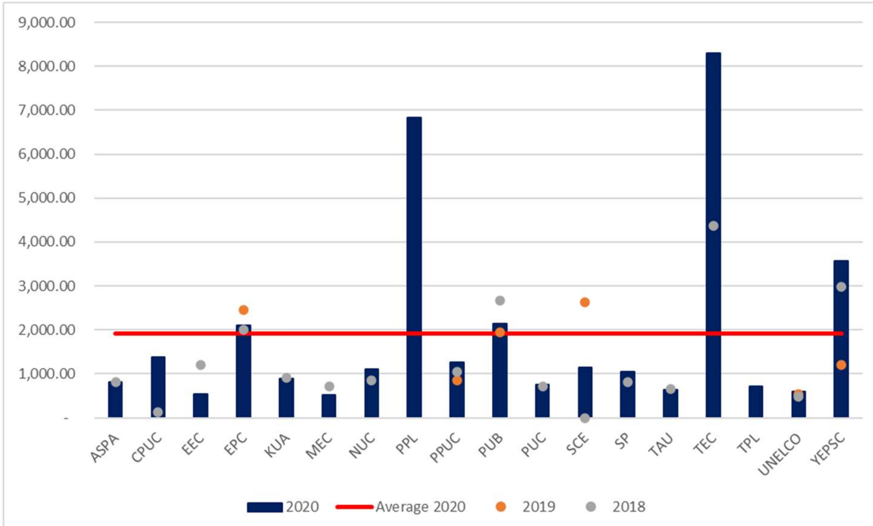
5.2.7 Specific Lubricating Oil Consumption

Specific Lubricating Oil Consumption (SLOC) in addition to SFC is a measure of petroleum-fuelled generation efficiency and is determined by the number of kWh generated per litre of lubricating oil consumed. The benchmark varies according to the size and condition of the diesel engine. Lower lubricating oil efficiency can be attributed to poor maintenance, e.g. due to worn piston rings or leaks in the system. Reasonable values are about 500–700 kWh per litre for a 1 MW engine and 1,000–1,300 kWh per litre for a 4–5 MW engine.

Figure 5.2.7 indicates that TEC and PPL have extremely high SLOC causing the overall average to be 1,976 kWh per litre. Without TEC and PPL data, the average is 1,230 kWh per litre. Most utilities are operating within the range of acceptability.

SLOC much like the SFC will become less important as an indicator as the contribution to the energy produced is increased from renewable sources.

Figure 5.2.7: Specific Lubrication Oil Consumption – 2020, 2019, 2018



Average 1,976 kWh per litre

Higher is better

5.2.8 Forced Outage

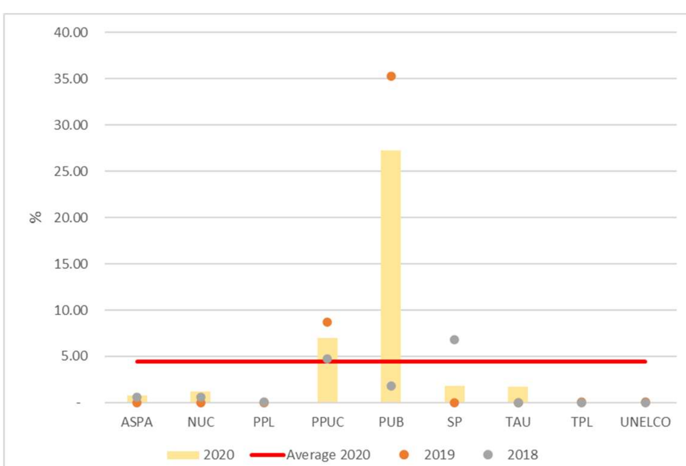
A forced outage is an unplanned outage (or generator downtime) that has been forced on the utility. Unplanned outages are attributable to issues with generators that compelled the utility to take them out of service.

Based on the data provided, the average forced outage rate for 2019 is 5.5%. This has reduced to 4.95% in 2020.

While utilities are improving in providing outage data, information gaps remain. This requires attention in the coming year. As Figure 5.2.8 shows, forced outages have decreased on average from 5.5 % to 4.95%. This however is not comparing the same data set as some utilities that participated for the 2019 report did not participate in 2020 and vice versa. The 2020 average is largely skewed by one utility - PUB.

The Pacific benchmark is less than 3%. In this regard most the utilities that participated are within the target. Both PUB and PPUC exceed the benchmark. This indicates a high number of incidents and/or long duration of incidents, the reasons for which must be ascertained and addressed.

Figure 5.2.8: Forced Outages 2020, 2019, 2018



Average 4.95%

Lower is better.

5.2.9 Planned Outage

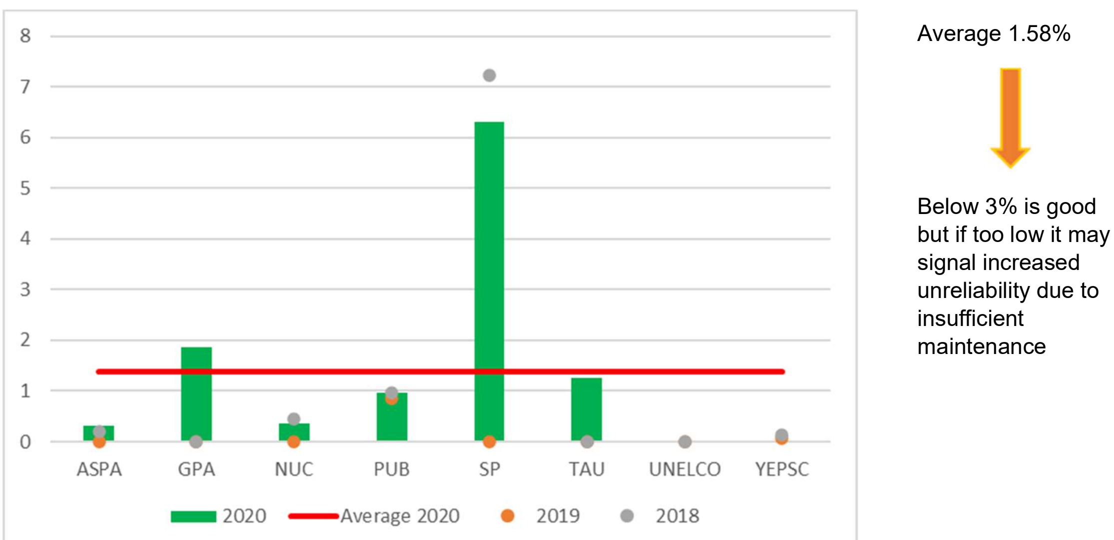
Planned or scheduled outages measure the proportion of downtime for planned maintenance activities requiring the plant to be shut down. It is a scheduled loss of generating capacity as a percentage of installed capacity to generate energy. Planned maintenance of generating equipment is often compromised in Pacific Island utilities. Some reasons for this are; (1) insufficient form reserve capacity to allow the extended shutdown of generators due for scheduled maintenance, (2) a lack of spare parts in store, and (3) lack of funds for major contracted service work. When the intervals between maintenance are extended, the probability that generators will break down increases.

As Figure 5.2.9 shows, planned outages reduced from 1.77% on average to 1.58%. On the face of it, this is a good result as it maintains the average within the Pacific benchmarking target. However, inadequate data was provided by few utilities to draw any real conclusion.

This lack of data may indicates the need to ensure accurate record-keeping and regular review of maintenance regimes.

The results need to be considered together with the forced outage indicator. For example, PUB has a planned outage indicator of 97% and an extremely high forced outage indicator. This implies scheduled maintenance is compromised. Increasing scheduled maintenance and the quality of maintenance should significantly reduce the forced outage indicator.

Figure 5.2.9: Planned Outages



5.2.10 Generation Operations and Maintenance (O&M) Costs

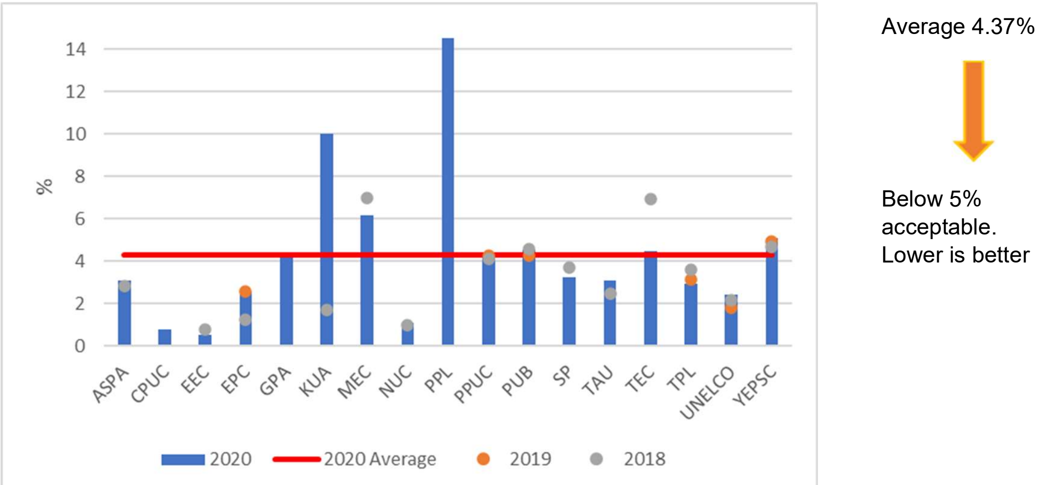
The indicator used is the expenditure on O&M for generating equipment per MWh generated, expressed in USD. Only UNELCO provided data of $US 1.6 million.

5.2.11 Power Station Usage / Station Auxiliaries

This indicator measures the usage of power in % by the power station to generate electricity. Below 5% is considered acceptable, and lower it is the better. As shown in Figure 5.2.11, the average reported value for 2020 was 4.37% compared to 2.87% in 2019. The data indicates that overall station usage has increased.

The Power Station Usage for PPL, KUA and MEC are well above the acceptable usage. The others are within the acceptable level.

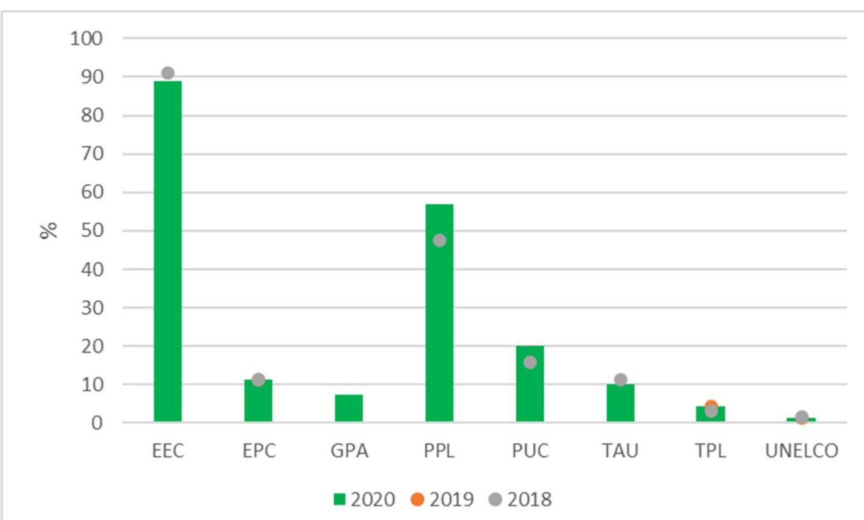
Figure 5.2.11: Power Station Usage



5.2.12 IPP Generation

Independent Power Producer arrangements are increasingly adopted by Pacific Island utilities to involve the private sector in meeting the challenges of capacity investment to satisfy the demand for power. Figure 5.2.12 illustrates the percentage of energy demand met by IPP's for utilities that have adopted this arrangement in their production mix.

Figure 5.2.12: IPP Production of Energy 2020, 2019, 2018

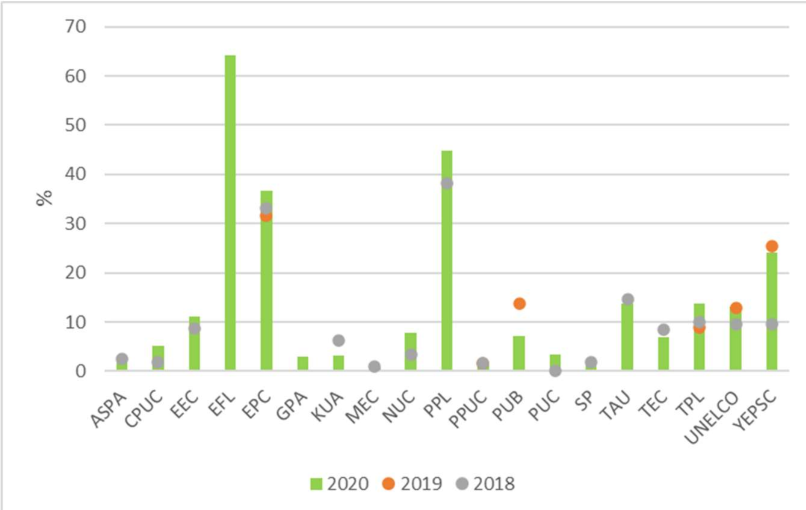


5.2.13 Renewable Energy to Grid

The Pacific Island states have adopted aggressive aspirational target for transitioning to renewable energy to mitigate the impact of climate change. The power sector is a major sector involved in the implementation of this policy.

The contribution to the energy production mix for the utilities that responded to the survey is presented in Figure 5.2.13.

Figure 5.2.13: Renewable Energy Contribution: 2020, 2019, 2018



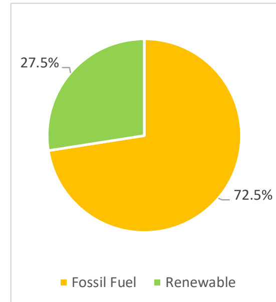


Figure 5.2.14: Renewable Energy Contribution

The total renewable energy contribution for the utilities that reported their data is 27.5% as shown in Figure 5.2.14.

Of this Hydro power generation makes up most of the renewable energy generated followed by solar and wind.

5.3 Transmission Indicators

5.3.1 Transmission (General)

For the purpose of the benchmarking exercise, the transmission network is defined as equipment operating at a voltage greater than 33kV. For utilities that have a transmission network, the benchmarking questionnaire requested data to determine transmission losses and outage statistics as a measure of transmission system reliability. System reliability has been tracked based on transmission reliability (outage events per kilometre) and average transmission outage duration (in hours).

Four utilities that are members of the PPA have transmission networks and of the four, two participated in 2020 benchmarking survey. The utilities that have transmission networks are GPA, PPL, EFL and EDT. Transmission KPIs were not presented in previous benchmarking reports due to the limited data provided. It still remains inadequate for drawing firm conclusions and attention will be needed to improve data quality for the next round of benchmarking.

Utility	Transmission Losses (%)		Transmission Reliability (Outages/100kM)		Transmission SAIDI (Mins/Customer)				Transmission SAIFI (Events/Customer)			
					Planned		Unplanned		Planned		Unplanned	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
GPA				21.34			1420.64	24.36				
PPL				15.38			4.26	21.95				
Note:		Insufficient data										

Table 5.3.1: Transmission Indicators 2019, 2020

5.4 Distribution Indicators

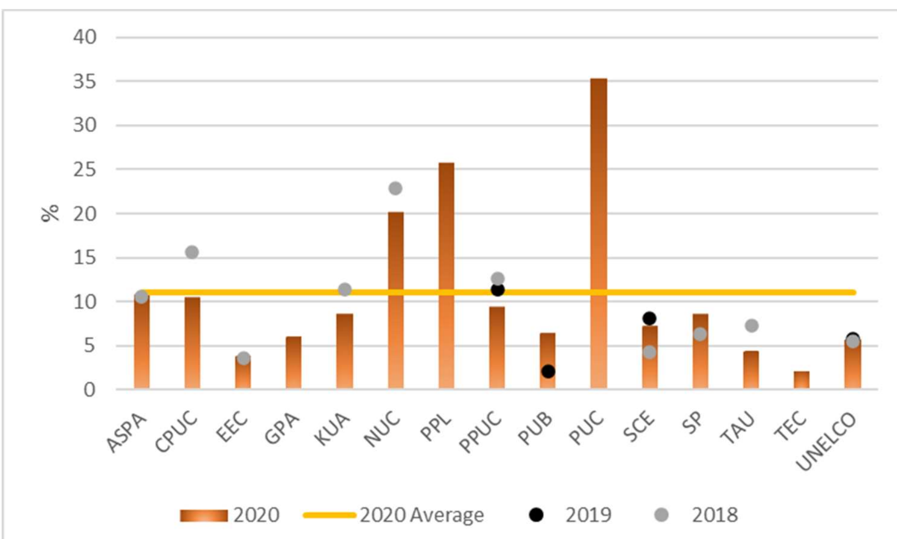
5.4.1 Network Delivery Losses

Network delivery losses are defined as the net generation minus electricity sold, divided by net generation, and expressed as a percentage. Net Generation is energy generated less the power station auxiliary usage. For utilities that have a transmission network, this loss includes the transmission and distribution network losses. This is only true for four of the utility members of the PPA who have transmission network. For the other utility members who do not have a transmission network the Network Delivery Losses is equal to the Distribution Losses. Therefore, in this report the Distribution loss is not presented separately as in previous reports.

The losses may be either technical or non-technical losses. Technical losses are mainly caused resistance in the network lines and cables which may be exacerbated by imbalances in the currents for each phase and high resistance joints in the distribution system. These depend on distribution voltages, sizes and kinds and state of conductors or cables used, transformer types, condition and loading, and the wire sizes of service feeds to consumers' meters. Non-technical losses are those attributable to electricity used by a consumer but not paid for, including electricity theft, meter reading and accounting errors, unmetered connections, metering errors, etc.

This category should not include the use of electricity within the utility itself (other facility use), free provision for street lighting, or electricity provided to the water, waste management or sewerage section of the utility, that may not be paid for within utilities that are responsible for electricity, water and sewerage services.

Figure 5.4.1: Network (Distribution) Delivery Losses 2020, 2019, 2018



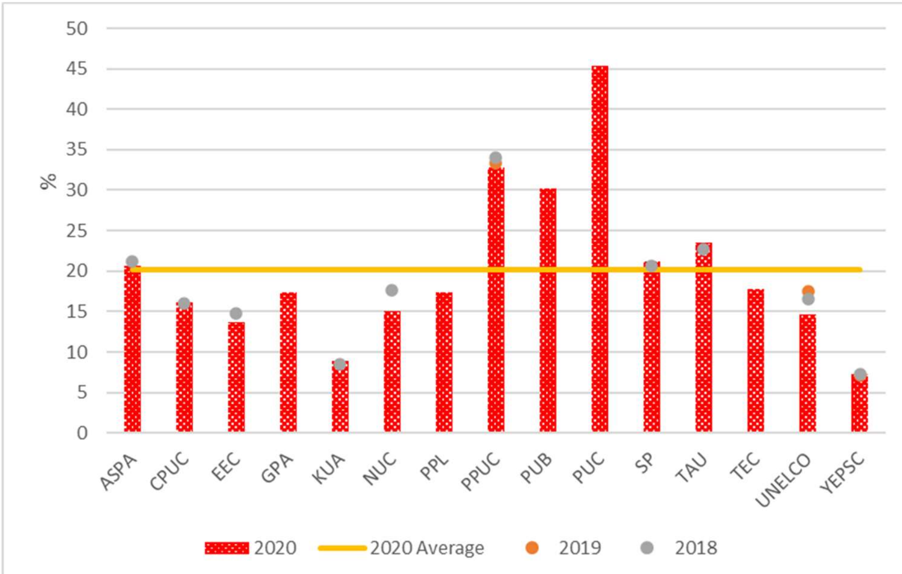
Average 11.07%

Lower is better
Below 10% with
Transmission &
5% with
Distribution only,
is acceptable.

5.4.2 Distribution Transformer Utilization

This indicator measures the transformer average load against the transformer capacity in megavolt amperes (MVA). It is calculated by dividing the total electricity sold by the total capacity of distribution transformers. High utilisation implies an efficient capital expenditure process for investing in distribution transformer capacity to meet the demands of customers. This process takes into consideration demand, demand growth and contingency requirements to maintain supply security and reliability. As seen in Figure 5.4.2, on average, transformer utilisation in Pacific utilities is low and currently stands at an average of 20%. In 2002 a regional goal of 30% was set. The report noted that “this can only be achieved in the long term because of the long lead times required to improve usage of capital assets.

Figure 5.4.2: Transform Utilization Capacity 2020, 2019, 2018



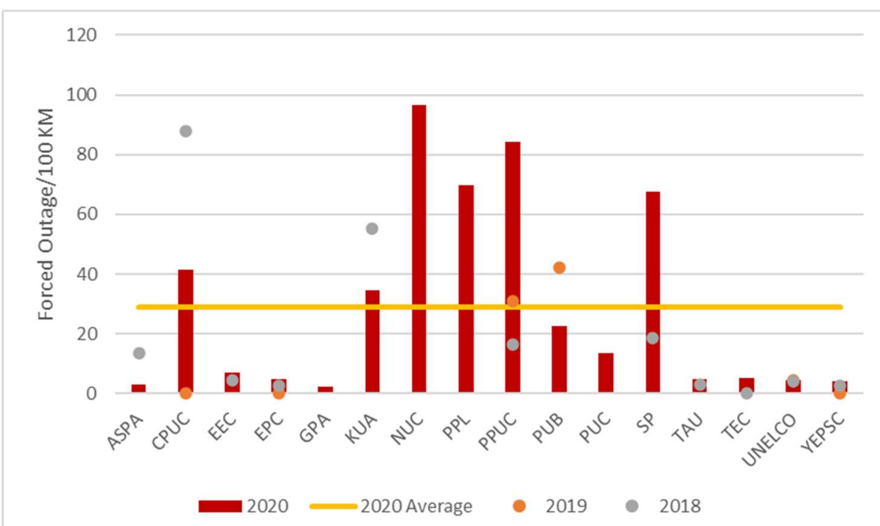
Average 20%

Benchmark set at 30% or higher. 40% is best efficiency.

5.4.3 Distribution Reliability

This indicator looks at forced outage events per 100km of distribution line as a way of measuring the reliability of the distribution network. The average is 29 events per 100 KM of distribution lines. (refer to Figure 5.4.3). Ongoing maintenance to preserve the condition of infrastructure is key to improving reliability and customer service which is reflected by this indicator.

Figure 5.4.3: Distribution Reliability 2020, 2019, 2018



Average is 29 events/100 KM

Lower is better

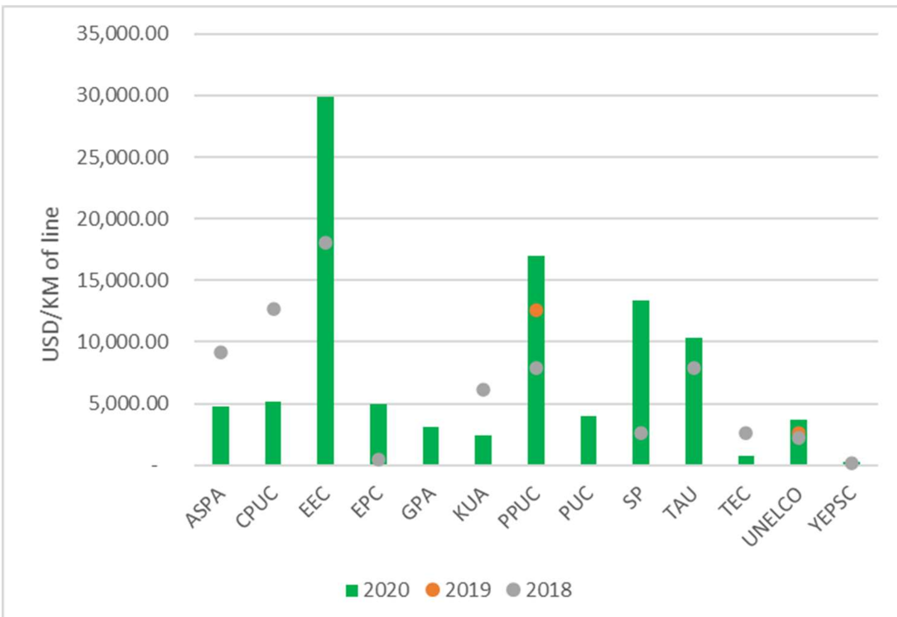
5.4.4 Customers per Distribution Employee

The number of customers per distribution employee full time equivalent is another indicator of labour productivity. Unfortunately, insufficient data was provided by the utilities for this indicator to be graphed for the fiscal year 2020.

5.4.5 Distribution O & M Expenses

The Distribution Operations and Maintenance O&M costs is the total expenses incurred in the operations and maintenance of the distribution network, converted to USD using the exchange rate provided in Table 6. This includes all vehicle operating costs and all other costs related to distribution operations.

Figure 5.5.5: Distribution Operations and Maintenance Expenses



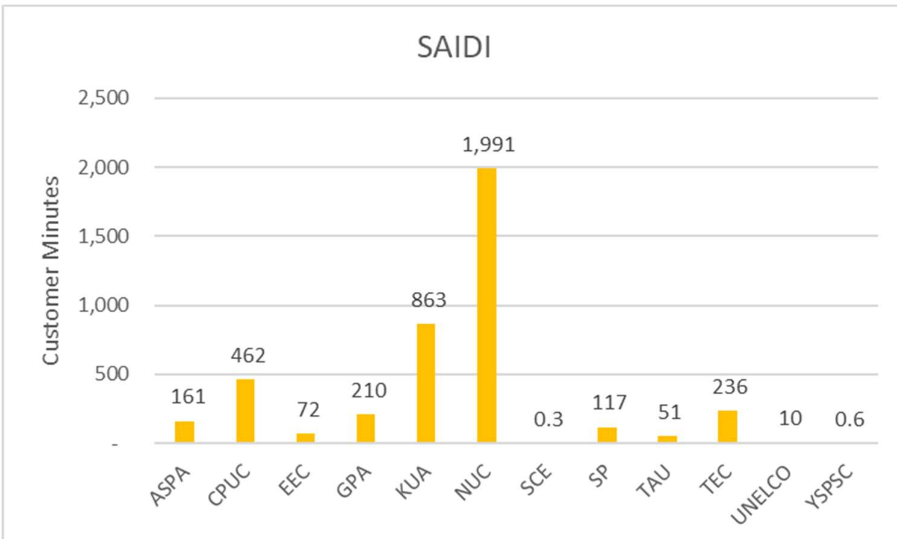
5.5 SAIDI and SAIFI

5.5.1 System Average Interruption Duration Index (SAIDI)

SAIDI indicates the average duration of power outages experienced by customers and is measured in customer minutes. The results are shown in Figure 5.5.1 as the total of all outages that have resulted in a power interruption to customers. The categories based on the source of the interruption are, planned and unplanned generation events, and planned and unplanned network events. For the utilities not included in Figure 5.5.1, the data was either not provided or appears to be faulty or is well below the benchmark.

The benchmark for Pacific Island utilities is to be below 200 customer minutes.

Figure 5.5.1: SAIDI 2020 (Minutes per Customer)



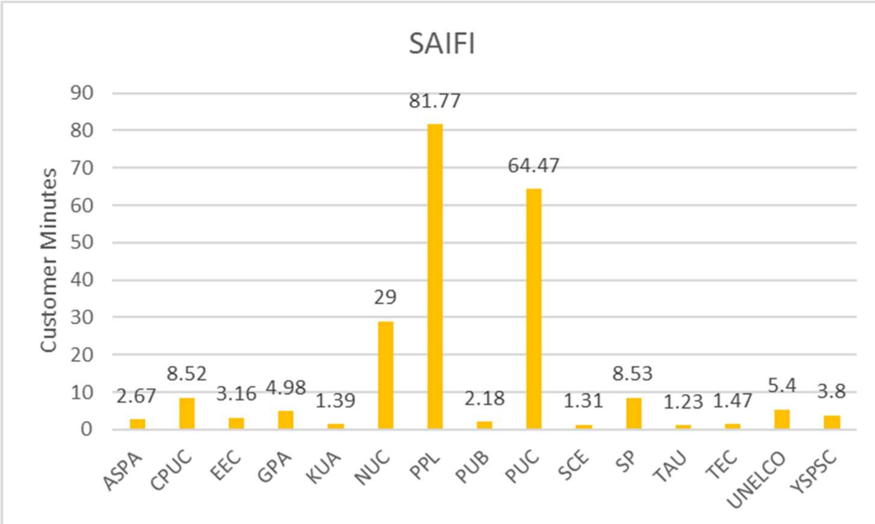
Lower is better.
Target to be below
200 Cust. Mins.

5.5.2 System Average Interruption Frequency Index (SAIFI)

SAIFI indicates the average frequency of power interruptions experienced by customers over the fiscal year. For small island utilities the power interruptions to customers caused by generation events can be significant compared to distribution network events. Figure 5.5.2 shows the total SAIFI for each utility. Again, those utilities not included have either not provided data, or the data provided appears to be unreasonably high, or the index is well within the benchmark.

The benchmark for Pacific Island utilities is to be below the average of 10 events per customer.

Figure 5.5.2: SAIFI - Interruptions per Customer 2020, 2019, 2018



Lower is better. Target to be below 10 interruptions/ customer.

5.7 Financial Indicators

5.7.1 Tariff Impact

Conducting tariff analysis of Pacific utilities is highly complex due to the different tariff schedules and structures. This section therefore compares the impact of the tariff schedule applied to customers of various categories. The monthly bills for a domestic or residential customers with a usage of 50 kWh and 200 kWh is compared, ranked and graphed in ascending order. The same is done for a commercial customer with a usage of 1,000 kWh per month.

(i) Residential Customer (50 kWh per month)

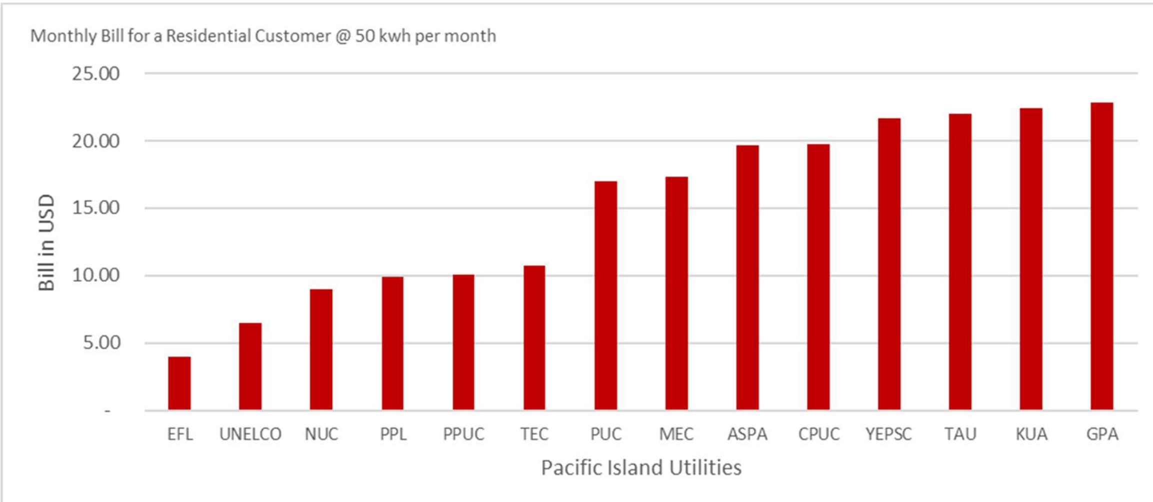


Figure 5.7.1: Residential Customer with Usage of 50 kWh per month

(ii) Residential Customer (200 kWh per month)

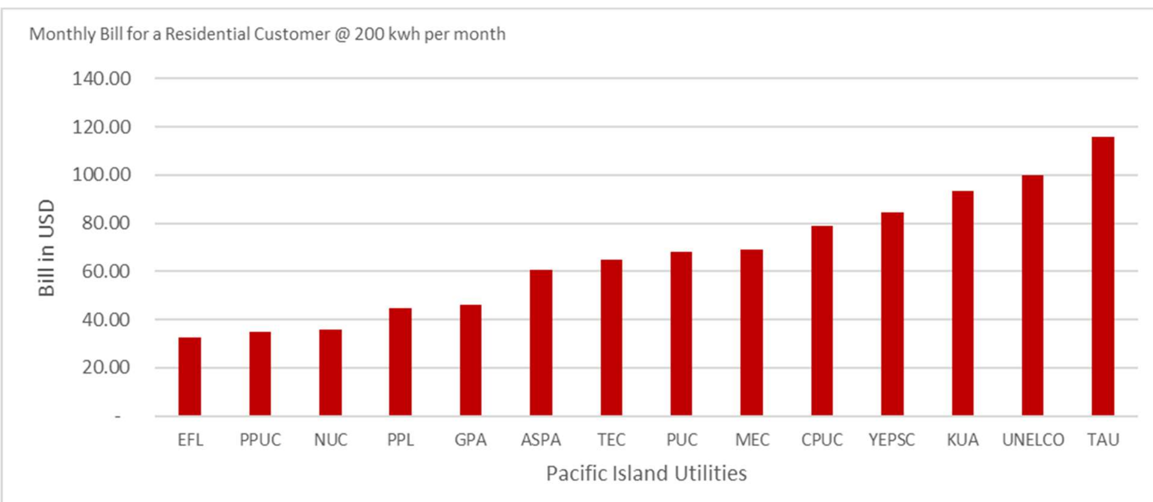


Figure 4.7.2 Residential Customer with Usage of 200 kWh per month

(iii) Commercial Customer (1,000 kWh per month)

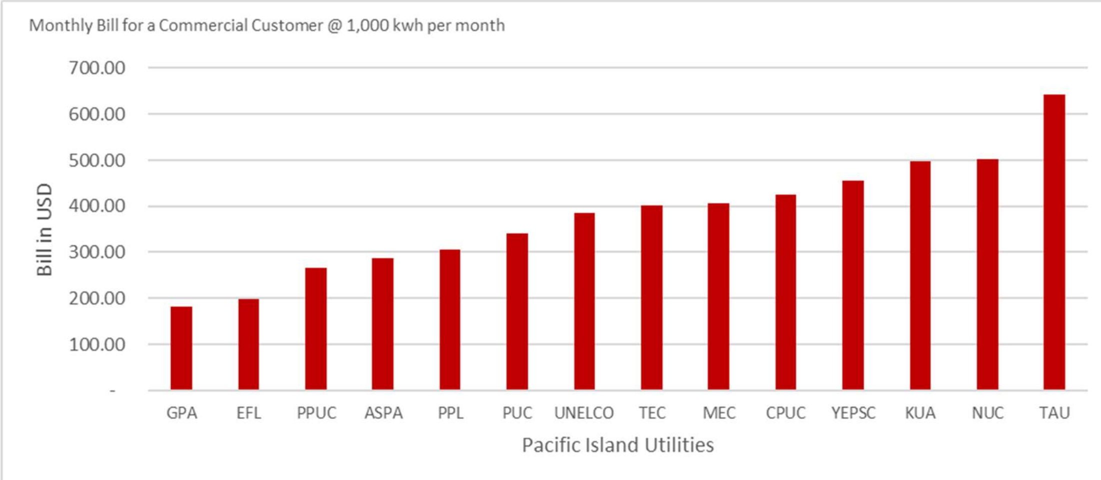


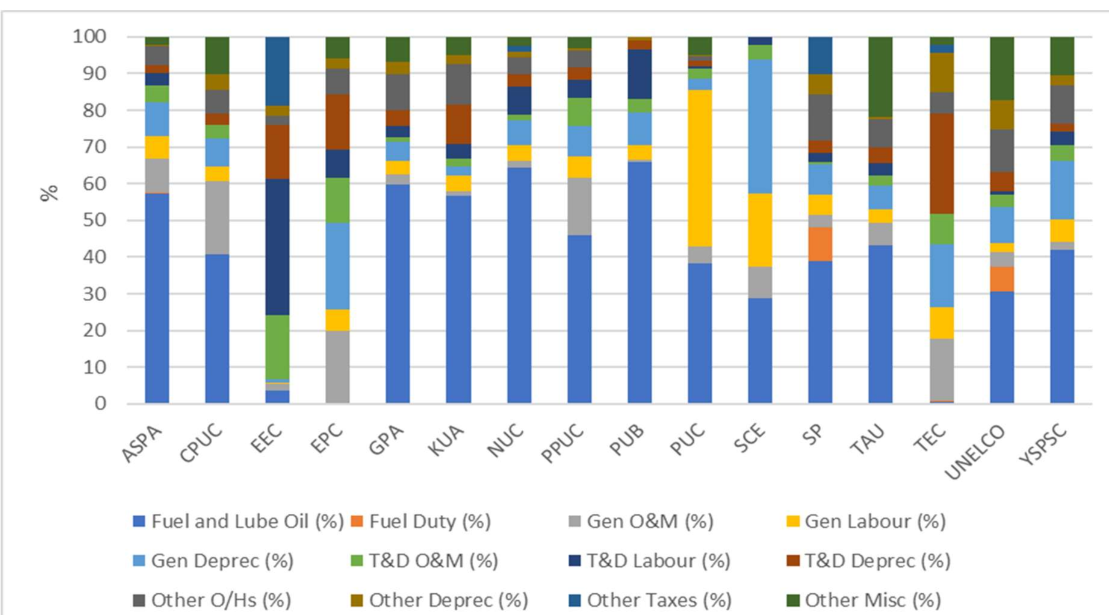
Figure 5: Commercial Customer with Usage of 1,000 kWh per month

5.7.4 Utility Cost Breakdown

The cost categories for which information was collected included hydrocarbon-based fuel and lubrication costs, duty on fuel and lubricating oil, generation O&M, labour and deprecation, transmission and distribution O&M, labour and depreciation, and other overhead expenditure, duty, taxes and miscellaneous costs. The percentage contributions of each component are presented for the utilities that reported sufficient data in Figure 5.7.4 below.

Other than the fact that fuel and lubricating oil costs dominate, as expected, with fuel duty regimes varying significantly, cost structures will vary with system topology, fuel mix and the other characteristics of the service area, customer base and organisational structure.

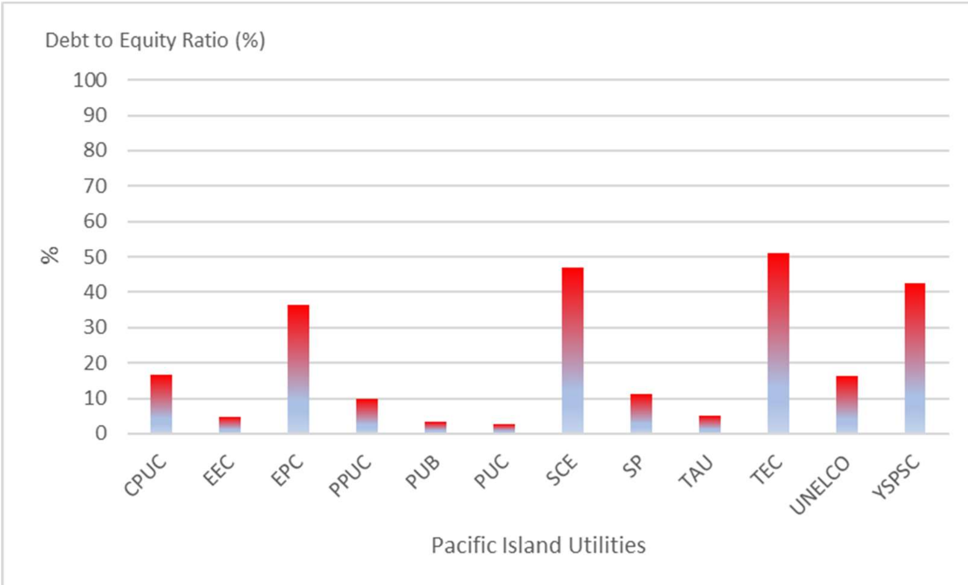
Figure 5.7.4: Utility Cost Breakdown 2020



5.7.5 Debt to Equity Ratio

The indicator used for the level of utility debt is the ratio of long-term debt to equity plus long-term debt, expressed as a percentage (debt / (debt + equity)). Borrowing to improve services may be justified, but a high debt-to-equity ratio places a utility in a vulnerable position. Some smaller utilities do not have access to debt funding and rely on their government or grants from donors for large projects and so have no long-term debt obligations.

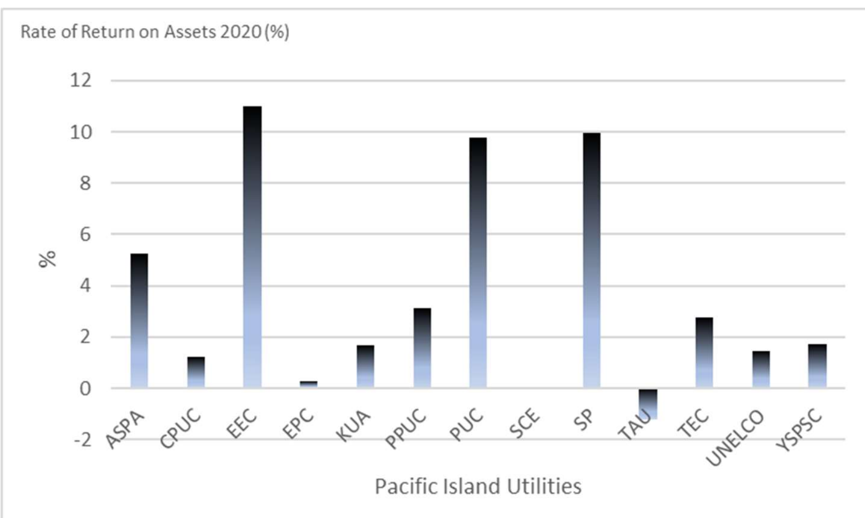
Figure 5.7.5: Debt to Equity Ratio



5.7.6 Return on Assets

The Rate of Return on Assets (RORA) is the return generated from the investment in the assets of the business. ROA indicates how efficient management is at using its assets to generate earnings. Pacific power utilities generally do not earn commercial rates of return, and this is reflected in Figure 5.7.6.

Figure 5.7.6: Return on Assets 2020

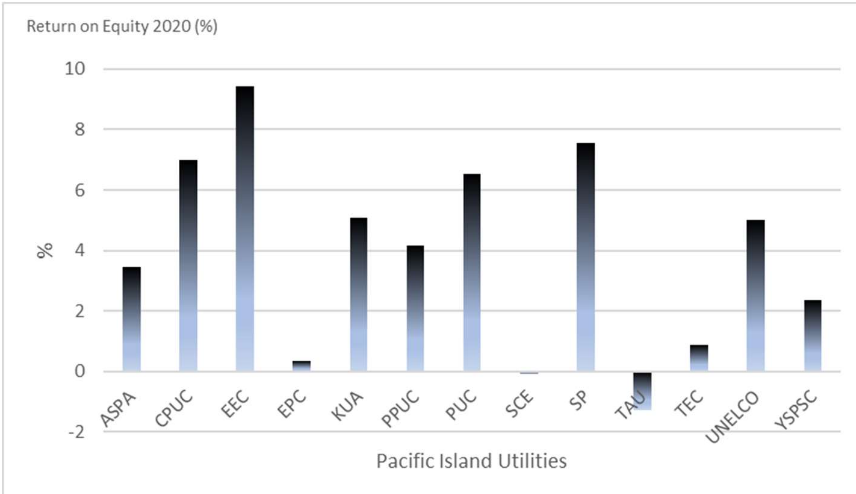


Higher is better

5.7.7 Return on Equity

ROE measures financial returns on owners' funds invested. Results for ROE are shown in Figure 5.7.7. Some outlying values have been disregarded as their accuracy is not credible.

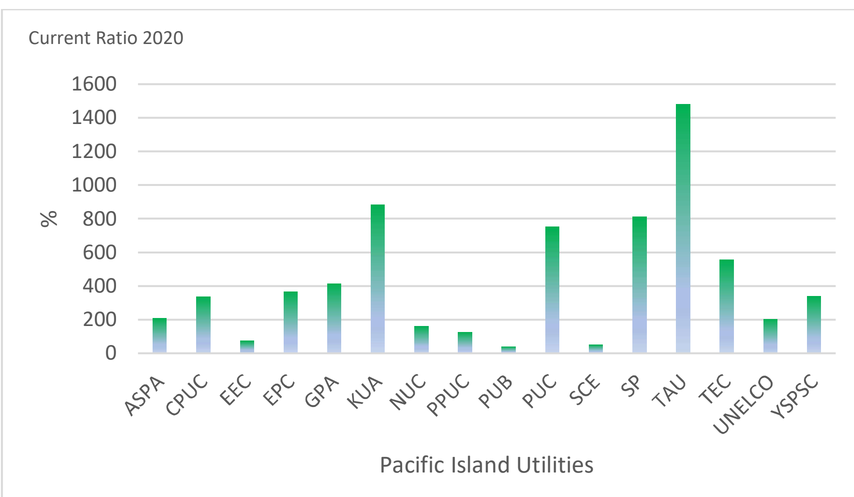
Figure 5.7.7: Return on Equity 2020



5.7.8 Current Ratio

The current ratio measures the ability of business to pay its creditors within the next 12 months, i.e., the ability of the utility to meet its current liabilities from current assets. A current ratio above 100% is desirable. A ratio below 100% implies that the utility is not able to cover for its current liabilities.

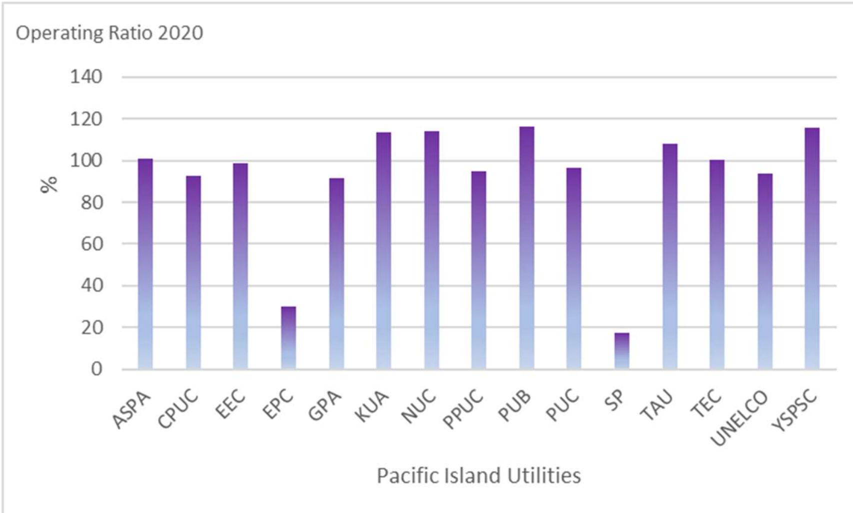
Figure 5.7.8: Current Ratio 2020



5.7.9 Operating Ratio

The operating ratio is a measure of how efficiently a business is operating, in this case, providing electricity service. It is determined by the Costs of Goods and Services (COGS) divided by the revenue earned. A smaller operating ratio indicates a more efficient operation, and an operating ratio below 100 indicates a profitable operation. An operating ratio above 100 indicates that it is costing an organisation more to produce the service than is being returned by the revenue, which is often the case in Pacific power utilities. As shown in Figure 5.7.9, six utilities have an operating ratio above100 and ten utilities have an operating ratio below 100.

Figure 5.7.96: Operating Ratio 2020

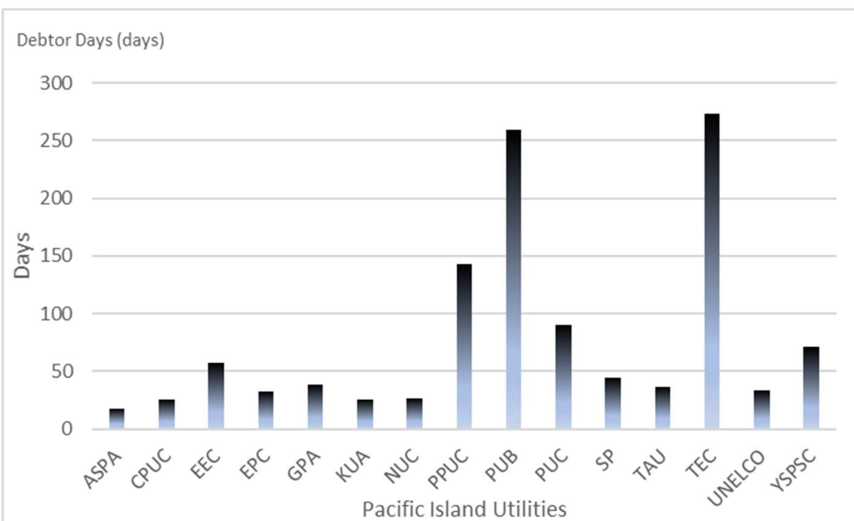


Higher is better

5.7.10 Debtor Days

This indicator measures how long it takes, on average, for the utility to collect debts. In 2020, the Pacific average was 78.7 days compared to the Pacific benchmark of 50 and the average DD in 2019 was 88 days.

Figure 7.7.10: Debtor Days



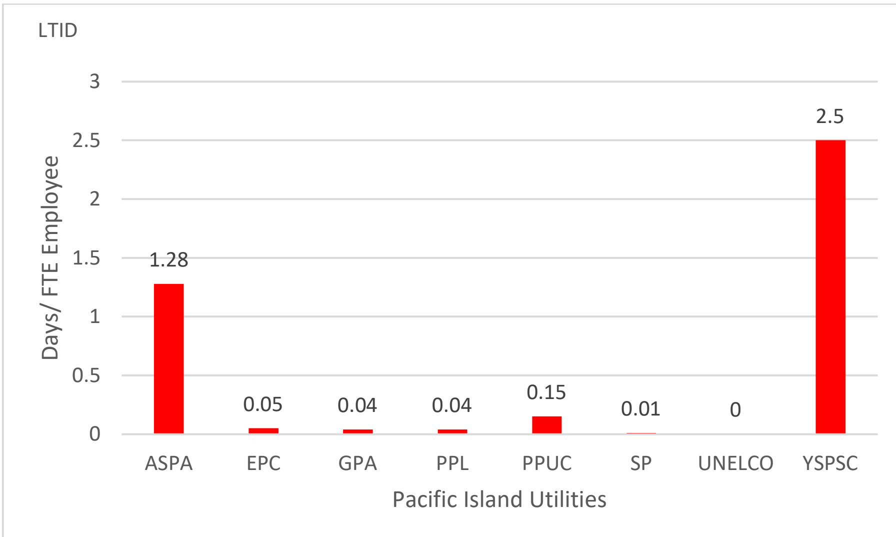
Lower is Better

5.8 Human Resources & Safety Indicators

5.8.1 Lost Time Injury Duration Rate

The average for 2020 FY was 0.58 days per FTE employee, compared to 0.36 days for 2019 FY. Unfortunately, only a limited of utilities responded making it difficult to draw any significant conclusions. This is an area that may need improvements in monitoring and recording of incidents.

Figure 5.8.1: Lost Time Injury Duration rate 2020

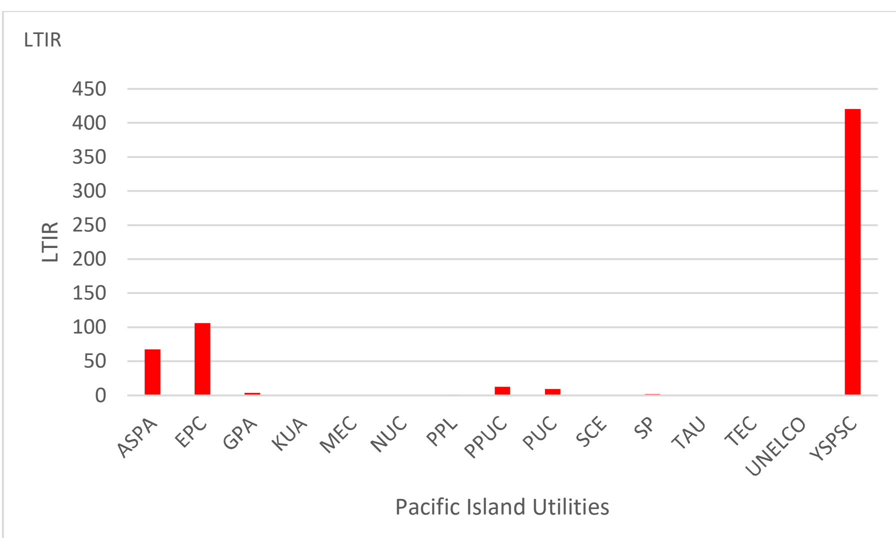


Lower is Better

5.8.2 Lost Time Injury Frequency Rate

The average for 2019 is 9.84 and the median 0.83. This has significantly risen from results recorded in 2018 FY. ASPA and EEC have frequency rates above Pacific benchmark indicating a need for improved safety management.

Figure 5.8.2: Lost Time Injury Frequency rate (Number of incidents per million hours 2020)

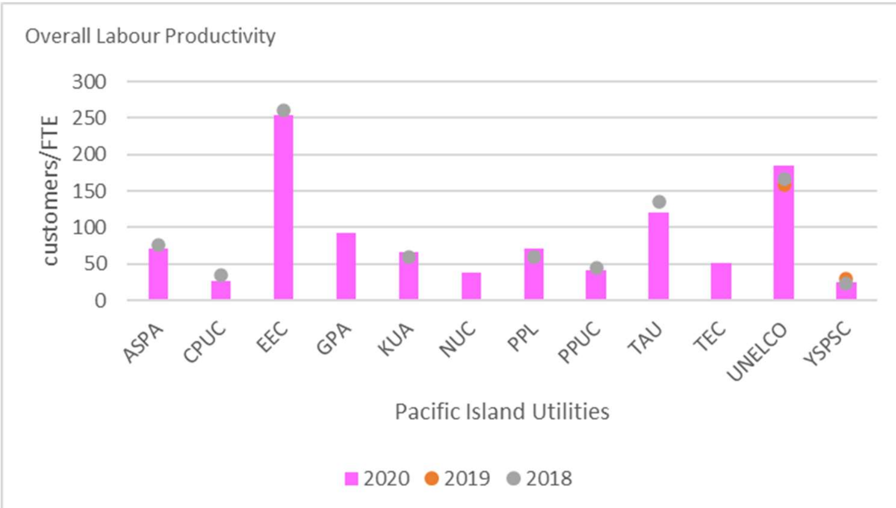


Lower is Better

5.8.3 Overall Labour Productivity

The average productivity in 2020 is 123 customers per Employee FTE, up from 94 in 2019 FY. A higher productivity is expected of larger utilities that operate with some economies of scale.

Figure 5.8.3: Overall Labour Productivity



Note: EEC is a distribution utility involved in minimal energy production.

5.9 Overall Composite Indicator

The overall composite indicator of utility performance was developed in 2011 to rank comparative performances between utilities. Where gaps existed in the data submitted by some utilities it was not possible to calculate an aggregate score.

The overall composite indicator is a simple indicator that equally weights generation efficiency, capacity utilisation, system losses and overall labour productivity, as derived from quantitative scores on a scale up to 100%.

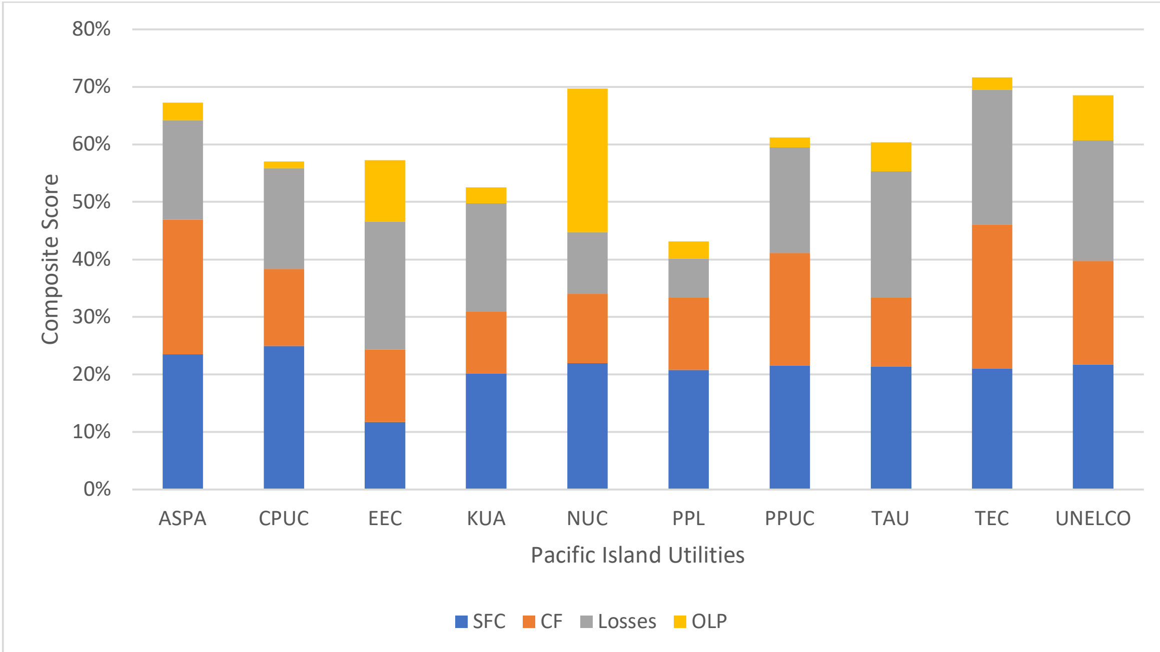
This indicator was considered to be a valid assessment of technical performance. However, analysis of this year's result show that the indicator needs to be reviewed to better reflect the changing times.

The composite technical indicator reflects the heavy reliance of power production on fossil fuels and its high impact on the production expenses. With the aggressive pursuance of renewable energy production this indicator that is skewed to favour efficient fossil fuel production, will become less relevant going forward.

For example, EEC in Figure 5.9.1 is unfairly rated as fossil fuel production is less than 1% of its total energy produced and imported from the grid. Its impact on the overall efficiency of production is negligible.

Components of Composite Indicator (Maximum score 100%)
Generation efficiency: specific fuel consumption (25%)
Efficient utilisation of assets: capacity factor (25%)
System losses: network delivery losses (25%)
Overall labour productivity: customers per full time utility employee (25%)
Final score weighted in terms of comparative data reliability

Figure 5.9.1: Composite Score 2020


80%
70%
60%
50%
40%
30%
20%
10%
0%
Composite Score
ASPA
CPUC
EEC
KUA
NUC
PPL
PPUC
TAU
TEC
UNELCO
Pacific Island Utilities
SFC
CF
Losses
OLP

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Contact: same as above

15. **NIUE POWER CORPORATION**
Postal: P O Box 29, Alofi,
NIUE
Telephone: + (683) 4119 / 4383
Facsimile: + (683) 4385
CEO: Vacant
Mr. Andre Siohane
Director General Infrastructure Ministry
Email: Andre.Siohane@mail.gov.nu
Contact: same as above

16. **PALAU PUBLIC UTILITIES CORPORATION**
Courier: Oldiais Building, Madalaii,
Koror
PALAU 96940
Postal: P O Box 1372, Koror,
PALAU 96940
Telephone: + (680) 488 3870 / 72 / 77
Facsimile: + (680) 488 3878
Website: www.ppuc.com
CEO: Mr. Gregory Decherong
Chief Executive Officer
Email: g.decherong@ppuc.com

17. **PNG POWER LTD**
Postal: P O Box 1105, Boroko 111,
National Capital District,
PAPUA NEW GUINEA
Telephone: + (675) 324 3111/3332
Website: www.pngpower.com.pg
Managing Director
Mr. Flagon Bekker
Email: FBekker@pngpower.com.pg

18. **POHNPEI UTILITIES CORPORATION**
Courier: Kapwaresou Street,
Kolonia, Pohnpei,
FSM 96941
Postal: P O Box C,
Kolonia, Pohnpei,
FSM 96941
Telephone: + (691) 320 2374
Facsimile: + (691) 320 2422
Website: www.puc.fm
CEO: Mr. Nixon T. Anson
Chief Executive Officer
Email: nanson@mypuc.fm

19. **PUBLIC UTILITIES BOARD**
Courier: Tatirerei Road, Betio, Tarawa,
KIRIBATI
Postal: P O Box 443, Betio,
Tarawa,
KIRIBATI
Telephone: + (686) 25 201 / 26 929
Facsimile: + (686) 26 106
Website: www.pub.com.ki
CEO: Mr. James Young
Chief Executive Officer
Email: ceo@pub.com.ki

20. **SOLOMON POWER**
Courier: Ranadi Industrial Area, Honiara,
SOLOMON ISLANDS
Postal: P O Box 6, Honiara,
SOLOMON ISLANDS
Telephone: + (677) 42480
Website: www.siea.com.sb
CEO: Mr. Donald Kiriau
Chief Executive Officer
Email: Donald.Kiriau@solomonpower.com.sb

21. **TE APONGA UIRA O TUMU-TE-VAROVARO**
Courier: Te Aponga Uira Tutakimoa,
Avarua, Rarotonga,
COOK ISLANDS
Postal: P O Box 112, Rarotonga,
COOK ISLANDS
Telephone: + (682) 20 054
Facsimile: + (682) 21 944
Website: www.teaponga.com
CEO: Ms. Lesley Katoa
Chief Executive Director
Email: lesley@electricity.co.ck

22. **TONGA POWER LTD**
Courier: Corner Taufa'ahau & Mateialona Roads, Kolofo'ou,
Nuku'alofa,

KINGDOM OF TONGA
Postal: P O Box 429, Nuku'alofa,
KINGDOM OF TONGA
Telephone: + (676) 27 390
Facsimile: + (676) 23 047
Website: www.tongapower.to
CEO: Mr. Nikolasi Fonua
Acting Chief Executive Officer
Email: nfonua@tongapower.to

23. TUVALU ELECTRICITY CORPORATION
Courier: Funafuti,
TUVALU
Postal: P O Box 32, Funafuti,
TUVALU
Telephone: + (688) 20 352 / 358
Facsimile: + (688) 20 351
Website: www.tectuvalu.tv
CEO: Mr. Mafalu Lotolua
General Manager
Email: mlotolua@ tectuvalu.tv
Or:
Mafaluloto2@gmail.com
Contact: same as above

24. UNELCO VANUATU LTD
Courier: Union Electrique Du Vanuatu Ltd
Ru de Paris, Boite Postale 26,
Port Vila,
VANUATU
Postal: P O Box 26,
Port Vila,
VANUATU
Telephone: + (678) 26 200
Facsimile: + (678) 25 011
Email: unelco@unelco.com.vu
Website: www.unelco.com.vu
CEO: Mr. Marc Perraud
Managing Director
Email : marc.perraud@engie.com

25. YAP STATE PUBLIC SERVICES CORPORATION
Courier: Power Plant Road # 1, Colonia,
Yap State,
FSM 96943
Postal: P O Box 667, Colonia, Yap,
FSM 96943
Telephone: + (691) 350 4427
Facsimile: + (691) 350 4518 9power plant)
CEO: Mr. Faustino Yangmog
General Manager
Email: sapthiy@gmail.com

Table 6: Currency Conversion Table for 2019 & 2020

Pacific Utility	Country/ Territory	Local Currency	2019				2020		
			Bench Mark Period Start	Benchmark Period End	End Year Conversion	Benchmarking Period Start	Benchmarking Period End	End of Fiscal Year Conversion	Conversion rate difference
ASPA	Amercian Samoa	USD	1-Oct-18	30-Sep-19	1	1-Oct-19	30-Sep-20	1	-
CPUC	Fed. Staes of Micronesia (FSM)	USD	1-Oct-18	30-Sep-19	1	1-Oct-19	30-Sep-20	1	-
CUC	Commonwealth of Northern Marianas	USD	1-Oct-18	30-Sep-19	1	1-Oct-19	30-Sep-20	1	-
EDT	French Polynesia	XPF	1-Jan-19	31-Dec-19	0.00938	1-Jan-20	31-Dec-20	0.0103	-0.0009200
EEC	New Caladonia	XPF	1-Jan-19	31-Dec-19	0.00938	1-Jan-20	31-Dec-20	0.0103	-0.0009200
EEWF	Wallis & Futuna	XPF	1-Jan-19	31-Dec-19	0.00938	1-Jan-20	31-Dec-20	0.0103	-0.0009200
ENERCAL	New Caladonia	XPF	1-Jan-19	31-Dec-19	0.00938	1-Jan-20	31-Dec-20	0.0103	-0.0009200
EPC	Samoa	WST	1-Jul-18	30-Jun-19	0.377029	1-Jan-20	31-Dec-20	0.3967	-0.0196710
EFL	Fiji	FJD	1-Jan-19	31-Dec-19	0.461883	1-Jan-20	31-Dec-20	0.4819	-0.0200170
GPA	Guam	USD	1-Oct-18	30-Sep-19	1	1-Oct-19	30-Sep-20	1	-
KAJUR	Marshall Islands (RMI)	USD	1-Oct-18	30-Sep-19	1	1-Oct-19	30-Sep-20	1	-
KUA	Fed. States of Micronesia (FSM)	USD	1-Oct-18	30-Sep-19	1	1-Oct-19	30-Sep-20	1	-
MEC	Marshall Islands (RMI)	USD	1-Oct-18	30-Sep-19	1	1-Oct-19	30-Sep-20	1	-
NPC	Niue	NZD	1-Oct-18	30-Sep-19	0.120274	1-Oct-19	30-Sep-20	0.7216	-0.6013260
NUC	Nauru	AUD	1-Jul-18	30-Jun-19	0.670404	1-Jul-19	1-Jul-20	0.71641	-0.0460060
PPL	Papua New Guinea (PNG)	PGK	1-Jul-18	30-Jun-19	0.715129	1-Jul-19	1-Jul-20	0.2825	0.4326290
PPUC	Palau	USD	1-Jan-19	31-Dec-19	1	1-Jan-20	31-Dec-20	1	-
PUB	Kiribati	AUD	1-Oct-18	30-Sep-19	0.670404	1-Oct-19	30-Sep-20	0.71641	-0.0460060
PUC	Fed. States of Micronesia (FSM)	USD	1-Jan-19	31-Dec-19	1	1-Jan-20	31-Dec-20	1	-
SCE	Santa Catalina Island	USD	1-Jan-20	31-Dec-20	1	1-Jan-20	31-Dec-20	1	-
SP	Solomon Islands	SBD	1-Oct-18	30-Sep-19		1-Oct-19	30-Sep-20	0.125	-0.1250000
TAU	Cook Islands	NZD	1-Jan-19	31-Dec-19	0.120274	1-Jan-20	31-Dec-20	0.7216	-0.6013260
TEC	Tuvalu	AUD	1-Jul-18	30-Jun-19	0.670404	1-Jul-19	1-Jul-20	0.71641	-0.0460060
TPL	Tonga	TOP	1-Jan-19	31-Dec-19	0.721305	1-Jan-20	31-Dec-20	0.43973	0.2815750
UNELCO	Vanuatu	VUV	1-Jul-18	30-Jun-19	0.00908213	1-Jul-19	1-Jul-20	0.0087	0.0003821
YEPSC	Fed. States of Micronesia (FSM)	USD	1-Jan-19	31-Dec-19	1	1-Jan-20	31-Dec-20	1	-