Kingdom Of Lesotho

Bureau of Statistics

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2022 Energy Report

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Mission: To coordinate the National Statistical System (NSS) and produce accurate, timely and reliable culturally relevant and internationally comparable statistical data for evidence-based planning, decision making, research, policy, program formulation and monitoring and evaluation to satisfy the needs of users and producers.

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1.0 Introduction

"Detailed, complete, timely and reliable statistics are essential to monitor the energy situation at a country level as well as at an international level. Energy statistics on supply, trade, stocks, transformation and demand are indeed the basis for any sound energy policy decision". IEA (2004), Energy Statistics Manual, OECD Publishing, Paris, https://doi.org/10.1787/9789264033986-en.

"In addition to the hydropower abundance in Lesotho, the country also relies heavily on biomass fuels to meet its major rural population basic needs of cooking and heating space. The country does not have any proven fossil fuels sources; hence it does not produce any crude oil, and consequently there is a huge dependency on imported fossil fuels. Most of the electricity produced is based on hydro sources; however, the country requires energy imports from neighboring countries to meet its demand." https://energypedia.info/wiki/Lesotho_Energy_Situation

1.1 Coverage and scope

The report comprises secondary data on installed capacity, production, consumption, imports and exports of energy commodities. Electricity data was obtained from Lesotho Highlands Development Authority (LHDA) and Lesotho Electricity Company (LEC), while petroleum fuels data was obtained from Petroleum Fund, Lesotho Defense Force, Matekane Group of Companies, Mission Aviation Fellowship (MAF) and liquefied petroleum gas importing companies. Charcoal production and imports of other energy commodities will also be discussed in this report.

2.0 Results

Electricity data from LHDA and LEC is for the years 2018 to 2022. LEC data also includes electricity generation from mini hydro-electric power station. Petroleum fuels data is for the year 2022 while aviation data is for the years 2018 to 2022. Charcoal production and LPG imports data ranges from 2018 to 2022.

3.0 Electricity

Electricity is an energy carrier with a very wide range of applications. It is used in almost all kinds of human activity ranging from industrial production, household use, and agriculture, commerce for running machines, lighting and heating, (Energy Statistics manual, 2010).

3.1 Generated Electricity

'The electricity supply industry in Lesotho is dominated by two state owned entities, namely the Lesotho Electricity Company (LEC), which is the monopoly transmitter, distributor and supplier of electricity, and the Lesotho Highlands Development Authority (LHDA), which is the main generator of electricity through its 'Muela Hydro Power Station. The generating station is part of the Lesotho Highlands Water Project'. http://www.lewa.org.ls/sectors/default.php

3.1.1 Installed Capacity

This is the intended full load sustained output of a power plant. It is used by authorities to classify the power output of a power station in mega or kilowatts. In Lesotho there are six power stations: Two hydro-power stations ('Muela and Mantsonyane), a hybrid diesel-hydro power station in Semonkong, solar mini-grid at Moshoeshoe I international airport, Ramarothole solar power station and a hybrid solar-LPG mini-grid of One Power. The power station in Semonkong is a mini-grid that supplies only the Semonkong town with electricity. The power produced in Mantsonyane and Moshoeshoe I is fed into the main grid. Ramarothole Power station is still under construction. Mantsonyane power station is not operational because it was flooded. Included also is the capacity of solar installed in Health centres as well as solar lights.

Installed capacity of electric power stations in Megawatts (MW) is shown in table 1. 'Muela is the main producer of electricity with a capacity of 72MW (three 24MW generators). The Mantsonyane power station has a capacity of 2MW. The largest capacity of the solar station is 0.36 MW of Health centres, followed by 0.28MW for Moshoeshoe 1 and the lowest is One Power with 0.05 MW. The diesel generator capacity of Semonkong is 500kVA which is approximately 0.5MW assuming a power factor of one (1) and the LPG generator of One Power is 0.02MW. Installed solar lights capacity is 0.08MW.

Table 1: Installed Capacity of Electric Power Stations in Megawatts (MW)

Areas	Generation Method	Capacity
Semonkong	Hydro	0.18
Semonkong	Diesel	0.50
Mantsonyane	Hydro	2.00
Muela	Hydro	72.00
Moshoeshoe 1	Solar	0.28
One Power	Solar	0.05
One Power	LPG	0.02
Health Centres	Solar	0.36
Solar lights	Solar	0.08

Source: Lesotho Highlands Development Authority, Lesotho Electricity Company, Department of Energy

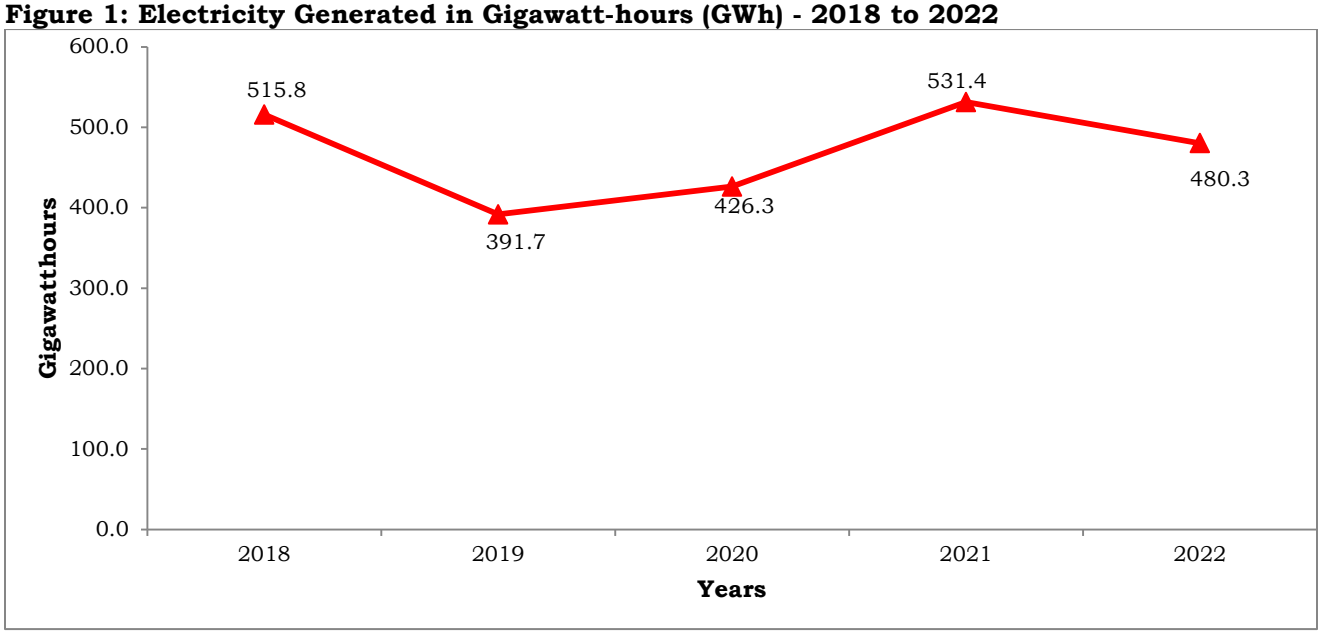
3.1.2 'Muela Generation

"Electricity in Lesotho is supplied by Muela's hydroelectric power station (72MW), with some small hydro projects also providing generation capacity"
https://www.usaid.gov/powerafrica/lesotho

Figure 1 illustrates electricity generated in Gigawatt-hours (GWh) for the years 2018 to 2022. Electricity generation dropped from 515.8GWh in 2018 to 391.7GWh in 2019, increased from 391.7GWh in 2019 to 426.3GWh in 2020. It further increased from

426.3GWh of 2020 to 531.4GWh in 2021. Currently, electricity generation decreased by 9.6 percent from 531,4GWh in 2021 to 480.3GWh in 2022.

Figure 1: Electricity Generated in Gigawatt-hours (GWh) - 2018 to 2022



Source: Lesotho Highlands Development Authority

3.2 Mini-grid Generation

A mini-grid is an aggregation of loads and one or more energy sources operating as a single system providing electric power and possibly heat isolated from a main power grid. A modern mini-grid may include renewable and fossil fuel-based generation, energy storage, and load control. A mini grid can be fully isolated from the main grid (wide area synchronous grid) or interconnected to it Mini-grid - Wikipedia.

"Lesotho Electricity Company (LEC) generates, transmits, and distributes electricity. The company also owns and operates hydro power stations". https://energypedia.info/wiki/Lesotho_Energy_Situation.

Semonkong mini-grid is one of the mini-grid owned and operated by LEC. It is a hybrid diesel-hydro power station which serves Semonkong area. Recently it is operating with diesel generator because of challenges with hydro.

Table 2 presents electricity generated from Semonkong power station in kilowatt-hours (kWh) by months for the years 2020 to 2022. During 2020 the months of January, February and March have no records as the source did not provide such data. Electricity generation for 2020 was highest in December (67300.8 kWh) and lowest in September with 50,927.4 kWh. In 2021 and 2022, generation was highest in July (74,431.0kWh and 78,424.1kWh) and lowest in February with 47,285.4kWh and 54,630.2kWh respectively.

Table 2: Electricity Generated from Semonkong Power Stations in Kilowatt-hours (kWh) by Months- 2020 to 2022

Months	2020	2021	2022
January	-	55,419.8	59,980.9
February	-	47,285.4	54,630.2
March	-	56,010.0	64,587.4
April	52,225.1	60,147.3	67,367.8
May	56,780.0	67,464.8	70,866.6
June	58,506.6	68,654.0	75,836.0
July	61,526.3	74,431.0	78,424.1
August	62,351.7	71,388.8	77,132.1
September	50,927.4	65,880.4	69,172.8
October	57,632.7	65,649.6	64,485.1
November	54,469.5	61,112.1	63,341.9
December	67,300.8	65,845.7	68,876.8
Total	**521,720.1**	**759,288.9**	**814,701.7**

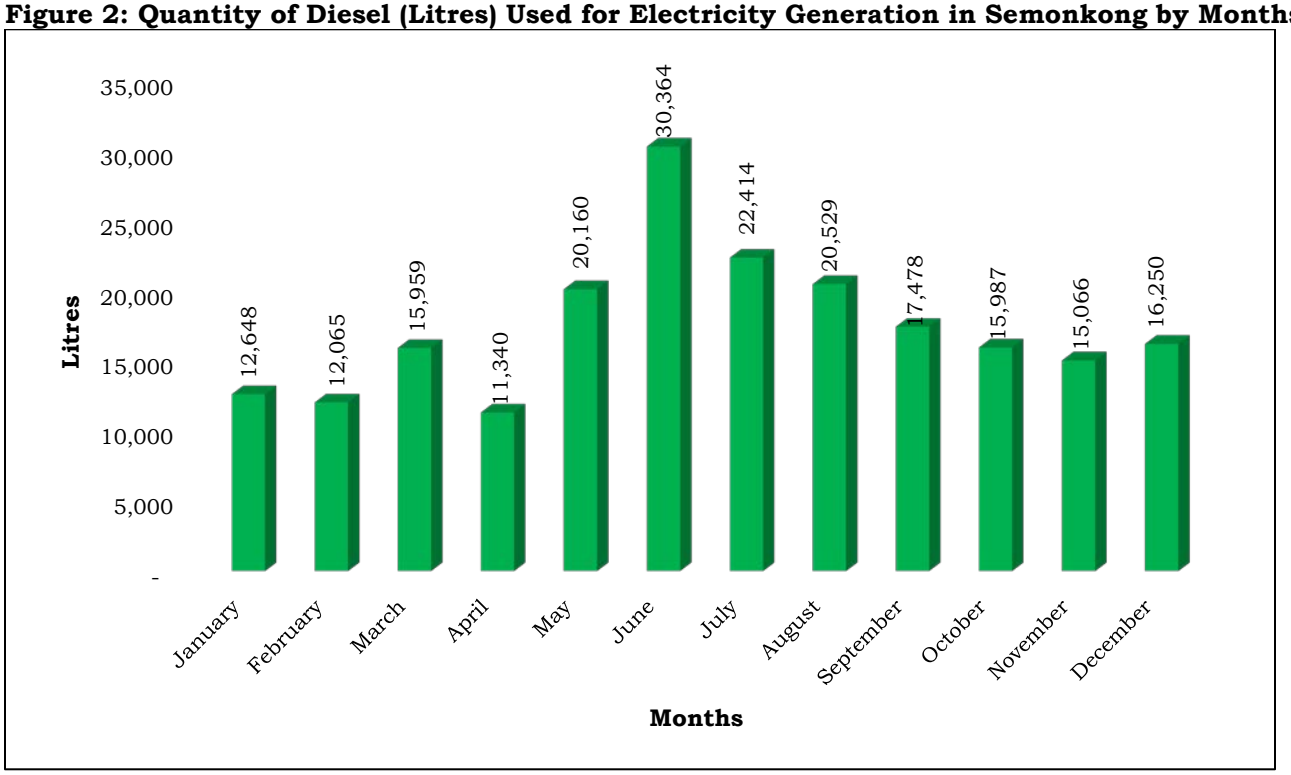
Source: Lesotho Electricity Company

3.2.1 Diesel Used for Electricity Generation Semonkong

Fuel consumption is the major portion of diesel plant owning and operating cost for power applications, whereas capital cost is the primary concern for backup generators. Specific consumption varies, but a modern diesel plant will, at its near-optimal 65-70% loading, generate at least 3 kWh per litre (ca. 30% fuel efficiency ratio). Diesel generator - Wikipedia

Figure 2 depicts quantity of diesel in litres used for electricity generation in Semonkong by months for the year 2022. It is observed that most of the diesel was used in June (30,364 litres), followed by July with 22,414 litres. The lowest quantity of diesel used for generation was in April with 11,340 litres.

Figure 2: Quantity of Diesel (Litres) Used for Electricity Generation in Semonkong by Months



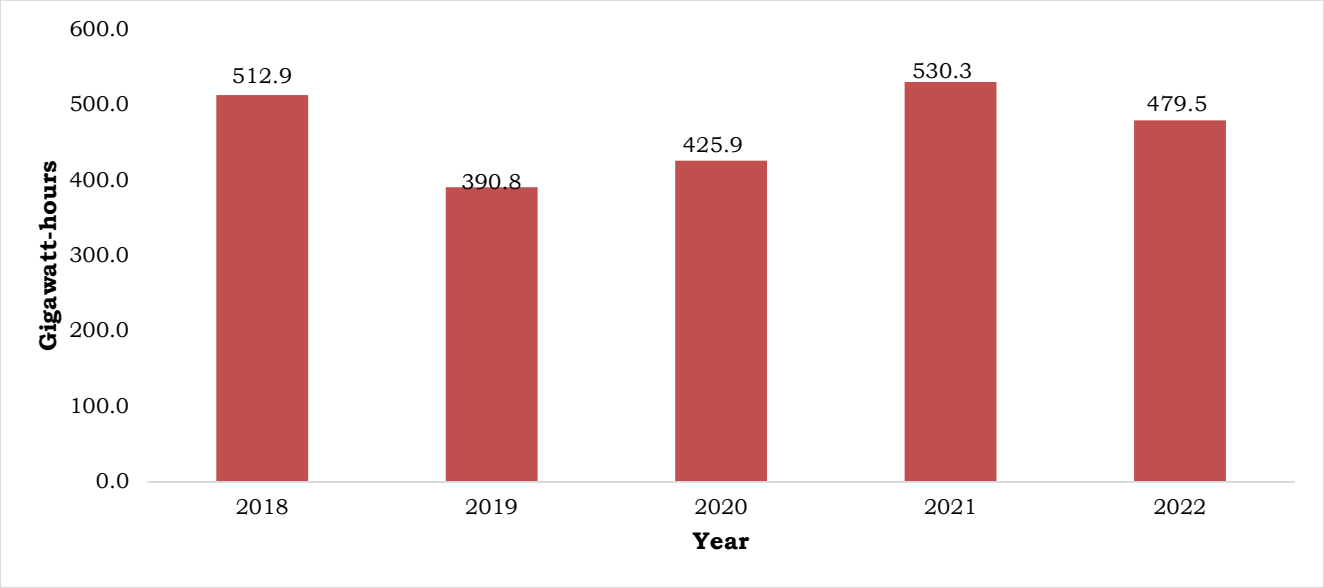
Source: Lesotho Electricity Company

3.3 Electricity Sales to LEC

Most of the electricity purchased by LEC is that generated from 'Muela Hydro Electric Power Station.

Electricity sales from 'Muela to LEC in Gigawatt-hours (GWh) for the years 2018 to 2022 are displayed in figure 3. It is observed that electricity sales to LEC were highest in 2021 (530.3GWh) and lowest in 2019 with 390.8GWh. Electricity sales declined by 9.6 percent from 2021 to 2022 (530.3 GWh to 479.5GWh).

Figure 3: Electricity Sales from Muela to LEC in Gigawatt-hours - 2018 to 2022



Source: Lesotho Highlands Development Authority

3.4 Electricity Purchases

Lesotho Electricity company is a utility company charged with the responsibility of supplying electrical energy to all households in Lesotho. https://twitter.com/online_lec?lang=en.

LEC does this by purchasing electricity from different generating companies.

Table 3 portrays electricity purchased from 'Muela, Eskom and Electricidade De Mozambique (EDM) by LEC in Gigawatt-hours for the year 2022. It is observed that most of the electricity was purchased from 'Muela with 479.52GWh. The highest purchases from 'Muela were in June (44.83GWh) and the least in November with 31.66GWh. Electricity purchases from Eskom were higher in November and lower in February with 40.58GWh and 25.25GWh respectively. Generally, most of the electricity purchases were observed in May with 96.44GWh.

Table 3: Electricity Purchased in GWh from 'Muela, Eskom and EDM by Months- 2022

Months	'Muela	Eskom	EDM	Total
January	39.64	31.68	3.72	75.04
February	38.49	25.25	3.36	67.09
March	42.56	32.16	4.80	79.53
April	42.56	35.53	4.65	82.73
May	44.73	35.90	15.81	96.44
June	44.83	30.73	16.05	91.61
July	41.41	35.49	16.59	93.48
August	39.25	40.44	16.59	96.28
September	38.87	36.65	4.65	80.17
October	34.47	34.76	4.81	74.03
November	31.66	40.58	3.43	75.66
December	41.07	30.45	3.64	75.16
Total	**479.52**	**409.62**	**98.08**	**987.23**

Source: Lesotho Electricity Company

3.5 Electricity Imports and Exports

Lesotho exports excess electricity produced by 'Muela Hydropower station to Eskom, when electricity demand is low since electricity cannot be stored. It also imports electricity from Eskom and EDM to meet its high electricity demand.

Table 4 indicates electricity imports and exports by months in Gigawatt-hours for the year 2022. Bulky electricity imports by LEC were observed in August (57.03GWh). A smaller quantity of electricity was imported in February with 28.61GWh. Most of the exports were in February with 0.32GWh). There were no exports in July to December including May. Electricity imports were 507.71GWh in 2022 and exports 0.74GWh.

Table 4: Electricity Imports and Exports by Month in Gigawatt hours- 2022

	Gigawatt-hours	
Months	**Imports**	**Exports**
January	35.40	0.28
February	28.61	0.32
March	36.97	0.11
April	40.18	0.02
May	51.71	0.00
June	46.78	0.01
July	52.08	0.00
August	57.03	0.00
September	41.30	0.00
October	39.57	0.00
November	44.00	0.00
December	34.09	0.00
Total	**507.71**	**0.74**

Source: Lesotho Highlands Development Authority, Lesotho Electricity Company

3.6 Electricity Consumption

Lesotho Electricity Company (Pty) Ltd mission is to provide reliable, safe, environmentally friendly and quality electricity for sustainable economic growth and improved quality of life for the people of Lesotho Vision and Mission – Lesotho Electricity Company.

3.6.1 Electricity Tariff

Electricity tariff is the amount of money frame by the supplier for the supply of electrical energy to various types of consumers. In other words, the tariff is the methods of charging a consumer for consuming electric power. https://circuitglobe.com/electricity-tariffs.html.

Table 5 represents approved energy charges in Maloti per kilowatt-hour (M/kWh) for the years 2018/2019 to 2022/2023. Generally, electricity tariffs started to increase in 2021/2022 with the exception of street lighting tariff, which started to increase from 2018/2019 to 2019/2020 by 4.8 percent. The increase in 2021/2022 was around 8.0 percent for high and low voltage consumers and 9.8 percent for General Purpose and Domestic. Lifeline Domestic increased by 9.2 percent. The tariff increased again from 2021/2022 to 2022/2023 by about 6 percent for high and low voltage consumers. Domestic and General Purpose increased by 7.5 percent, Street lighting by 7.2 percent and Lifeline Domestic by 7.1 percent.

The new electricity tariffs are M0.2928 and M0.3175 for high and low voltage consumers, M1.9624 for General Purpose, M1.745 for Domestic, M1.024 for street lighting and M0.8511 for Lifeline Domestic.

Table 5: Approved Energy Charges in Maloti per Kilowatt-hour (M/kWh) - 2018/2019 to 2022/2023

Customer Category	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
Industrial HV	0.2559	0.2559	0.2559	0.276	0.2928
Industrial LV	0.2767	0.2767	0.2767	0.2989	0.3175
Commercial HV	0.2559	0.2559	0.2559	0.276	0.2928
Commercial LV	0.2767	0.2767	0.2767	0.2989	0.3175
General Purpose	1.6608	1.6608	1.6608	1.8251	1.9624
Domestic	1.4782	1.4782	1.4782	1.6235	1.745
Street Lighting	0.8325	0.8725	0.8725	0.955	1.024
Lifeline Domestic		0.7273	0.7273	0.7947	0.8511
Effective date	**01-Aug-18**	**01-May-19**	**01-May-19**	**01-Oct-21**	**01-Oct-21**

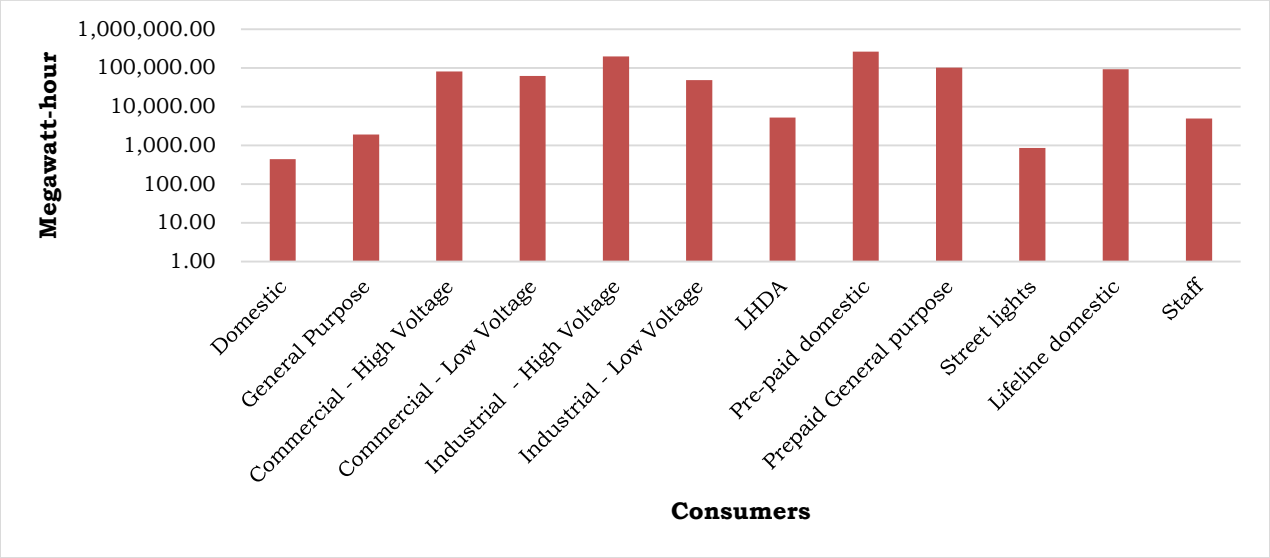
Source: Lesotho Electricity Company

3.6.2 Electricity Consumed

Electricity consumed is the actual amount of electricity that is availed by LEC to its consumers. It includes electricity purchased locally and imported from other countries**.**

Figure 4 shows electricity consumed by LEC consumers in Megawatt-hours (MWh) for the year 2022. Prepaid Domestic consumers were the most consuming with 260,384.98MWh followed by Industrial High Voltage (195,450.33MWh). It is further observed that the least consuming was Domestic Consumers with 480.88MWh.

Figure 4: Electricity Consumed by LEC Consumers in Megawatt-hours - 2022



Source: Lesotho Electricity Company

Table 6 further illustrates electricity consumer category by average consumption and number for the year 2022. It is observed that Industrial High Voltage consumers were the most consuming (5,282,2441.41KWh) as opposed to their number (37). Pre-paid Consumers and Lifeline Domestic are observed to be higher (278,486) than their average consumption (935.00KWh and 330.54 KWh).

Table 6: Electricity Consumer Category by Average Consumption and Number – 2022

	Average	
Consumers	**Number**	**Consumption**
Domestic	4	110,219.72
General Purpose	23	83,186.18
Commercial - HV	41	1,966,549.94
Commercial - LV	213	291,121.96
Industrial - HV	37	5,282,441.41
Industrial - LV	167	290,389.11
LHDA	12	437,361.21
Pre-paid dom.	278,486	935.00
Prep. Gp.	16,235	6,254.46
Street lights	133	6,439.38
Lifeline	278,486	330.54
Staff	533	9,287.36
Total	**574,370**	**8,484,516.29**

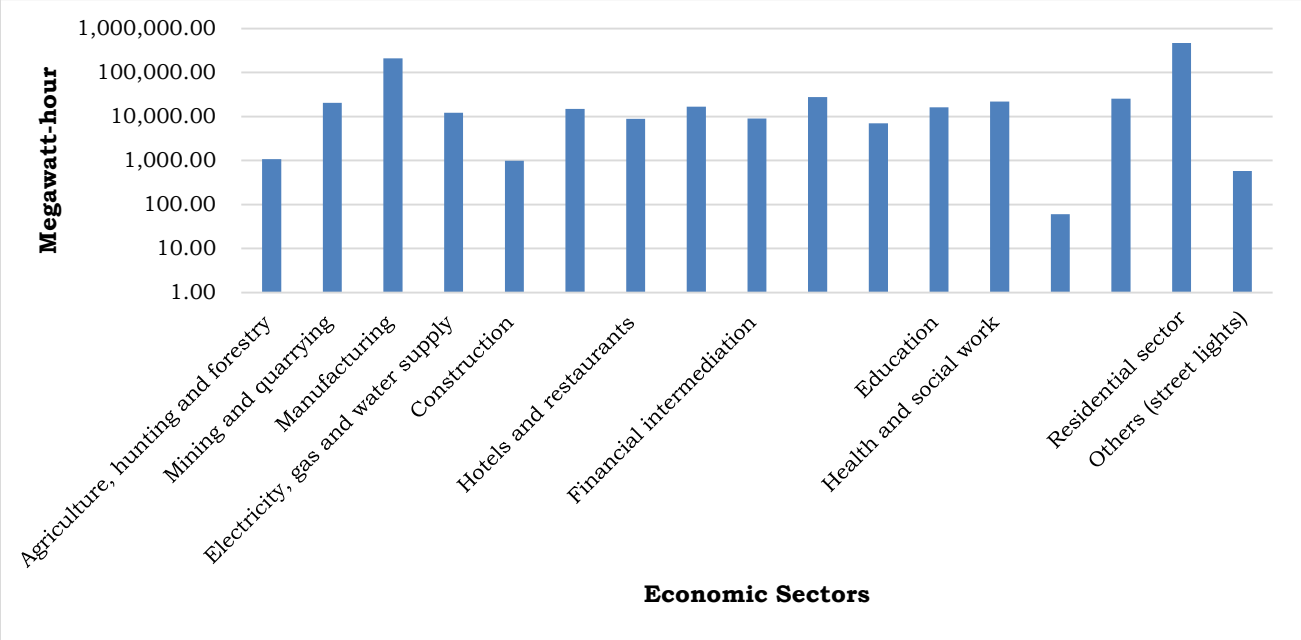
Source: Lesotho Electricity Company

3.6.3 Economic Sectors Consumption

A sector is an area of the economy in which businesses share the same or related business activity, product, or service. Sectors represent a large grouping of companies with similar business activities, such as the extraction of natural resources and agriculture.. What Is an Economic Sector and How Do the 4 Main Types Work? (investopedia.com) This section comprises consumption of electricity by different sectors of the economy.

Figure 5 portrays quantity of electricity consumed by economic sectors in megawatt hours for the year 2022. Residential sector consumed more electricity than other sectors with 464,280.79MWh followed by Manufacturing sector (208,189.57MWh). The least consuming sector was “Other community, social and personal service activities” with 60.15MWh.

Figure 5: Quantity of Electricity Consumed by Economic Sectors in Megawatt-hours (MWh) - 2022



Source: Lesotho Electricity Company

3.6.4 Semonkong Electricity Sales

"Estimates show that to achieve universal access to electricity by 2030, 40 percent of all installed capacity will have to come from mini grids". Mini Grids for Half a Billion People: Market Outlook and Handbook for Decision Makers (worldbank.org)

Table 7 shows electricity sales by Semonkong in Kilowatt-hour (KWh) from 2020 to 2022. Generally, electricity sales in Semonkong increased by 1.74 percent from 503,545.6KWh in 2021 to 512,284.9KWh in 2022. The highest electricity sales in 2022 was recorded in June with 73,332.0KWh and the lowest in April with 41,060.5KWh.

Table 7: Electricity Sales by Semonkong in Kilowatt-hour- 2020 to 2022

Months	2020	2021	2022
January		39,366.4	44,682.0
February		37,207.0	54,068.0
march		70,094.1	70,094.1
April	31,287.5	54,668.5	41,060.5
May	42,982.7	45,816.6	66,873.0
June	53,498.4	88,481.7	73,332.0
July	53,411.7	51,924.6	60,070.7
August	46,331.3	67,567.5	56,367.5
September	41,272.1	58,503.5	47,895.3
October	62,234.1	37,211.7	55,579.0
November	53,015.4	46,271.7	52,656.0
December	57,630.6	530,99.8	58,450.9
Total	**441,663.8**	**503,545.6**	**512,284.9**

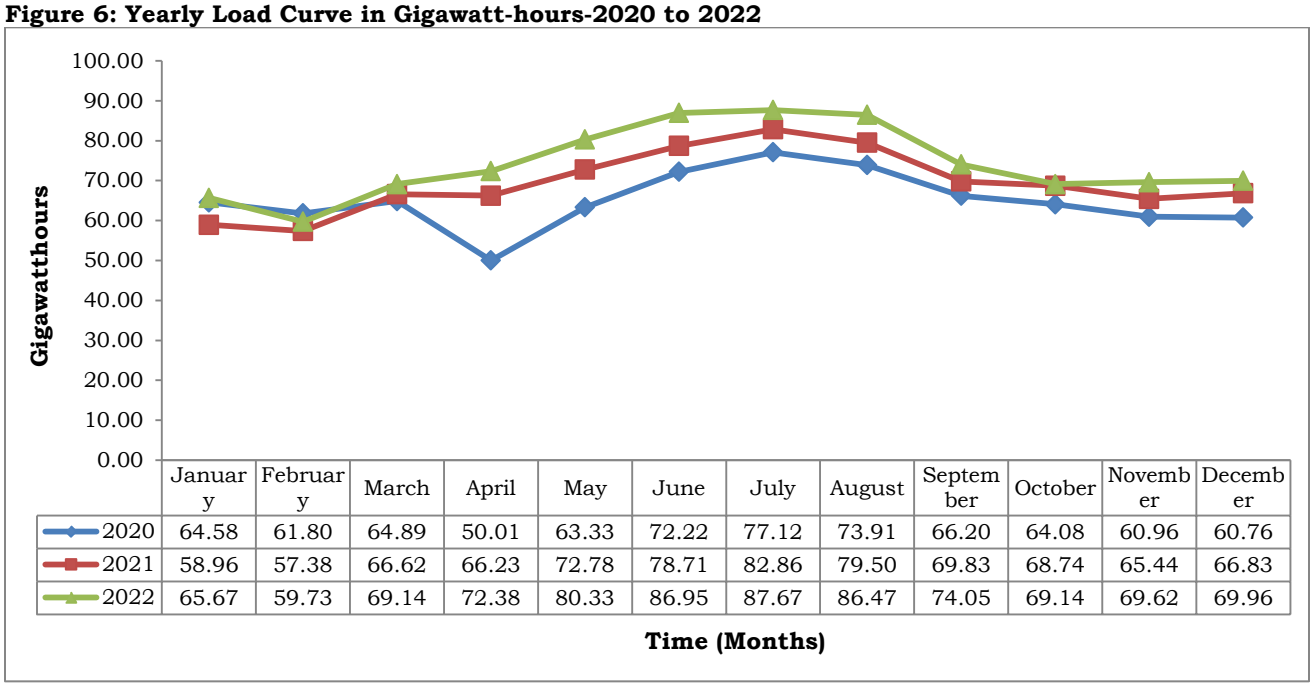
Source: Lesotho Electricity Company

3.7 Lesotho Load

"Load is the amount of electricity on the grid at any given time, as it makes its journey from the power source to all the homes, businesses and industries within a utility's territory", https://www.directenergy.com/blog/what-is-electricity-load/

Figure 6 demonstrates yearly load curve in Gigawatt-hours from 2020 to 2022. Most of the load was experienced in July with 77.12GWh in 2020, 82.86GWh in 2021 and 87.67GWh in 2022. Minimum load was observed in April (50.01GWh) for 2020, 57.38GWh in February 2021 and 59.73GWh in February 2022.

Figure 6: Yearly Load Curve in Gigawatt-hours-2020 to 2022



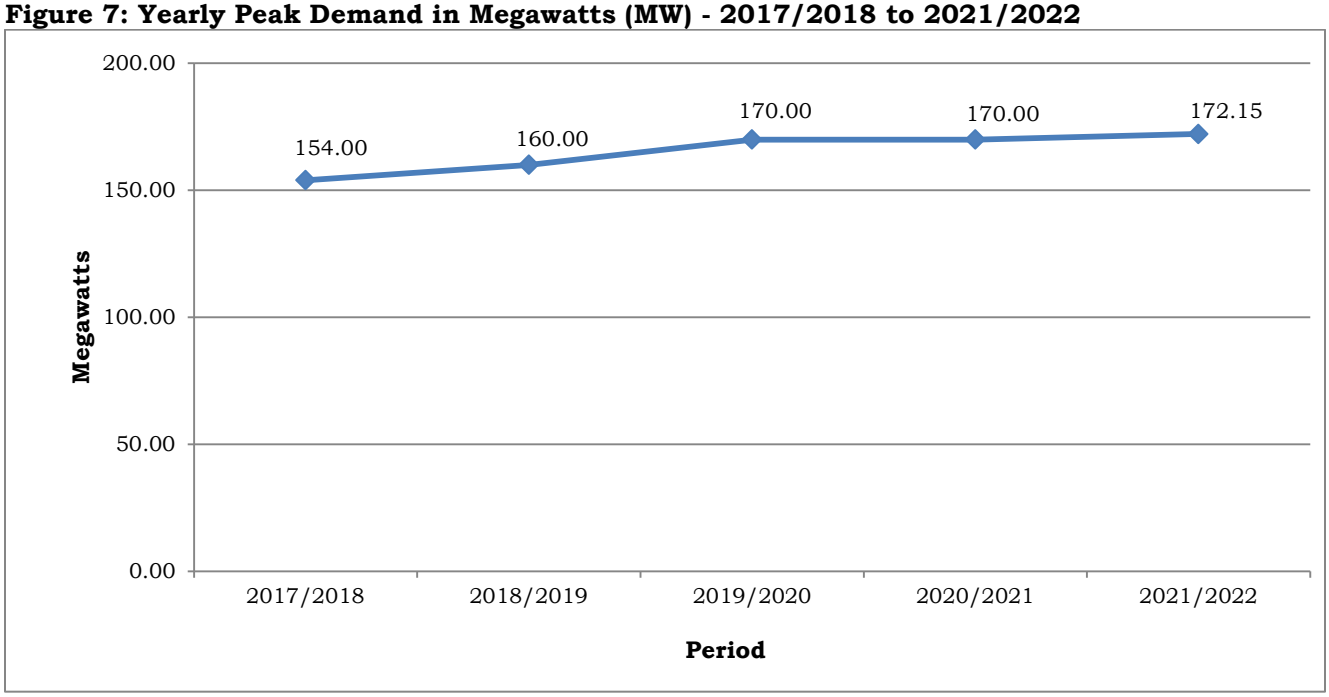
	January	February	March	April	May	June	July	August	September	October	November	December
2020	64.58	61.80	64.89	50.01	63.33	72.22	77.12	73.91	66.20	64.08	60.96	60.76
2021	58.96	57.38	66.62	66.23	72.78	78.71	82.86	79.50	69.83	68.74	65.44	66.83
2022	65.67	59.73	69.14	72.38	80.33	86.95	87.67	86.47	74.05	69.14	69.62	69.96

3.8 Peak Demand

This is the time when the electricity consumption is at its highest. It is the time when everyone needs more energy especially during very hot or cold weather when everyone reaches home from work and switches their air conditioners or heaters in order to cool or warm their households.

Figure 7 depicts yearly peak demand in megawatts (MW) for the years 2017/2018 to 2021/2022. The upward trend is observed from 2018/2019 to 2021/2022 in relation to peak demand. The peak demand increased from 170.00MW in 2020/2021 to 172.15MW in 2021/2022 constituting an increase of 1.3 percent.

Figure 7: Yearly Peak Demand in Megawatts (MW) - 2017/2018 to 2021/2022



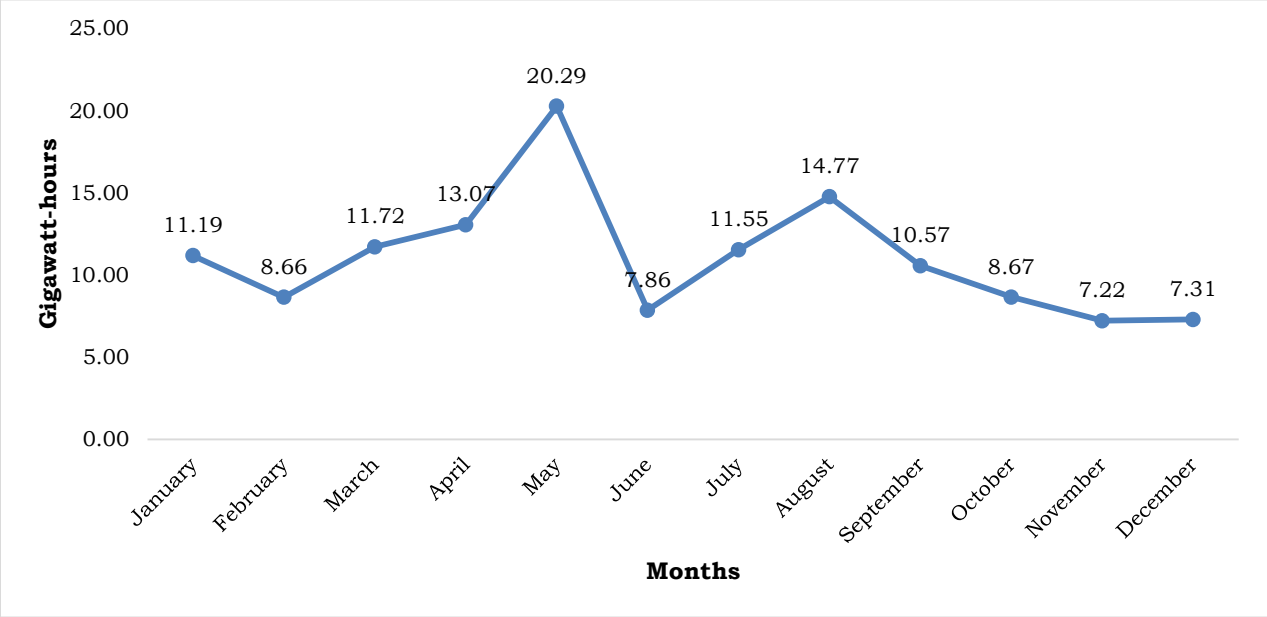
Source: Lesotho Electricity Company

3.9 Losses

These are technical and non-technical electricity losses incurred by LEC in the transmission and distribution of electricity to its consumers. Technical losses are due to energy dissipated in the conductors, equipment used for transmission line, transformer, sub-transmission line and distribution line and magnetic losses in transformers. Non-technical losses are losses due to unidentified misallocation or inaccurate energy flows. They are thought of as electricity used but not billed.

Figure 8 portrays transmission and distribution losses in Gigawatt-hours by months for 2022. Most losses were incurred in May with 20.29GWh. There was a decline of 61.3 percent (20.29GWh to 7.86GWh) of distribution losses from May to June. The minimum losses were incurred in November with 7.22GWh.

Figure 8: Transmission and Distribution Losses in GWh by Months- 2022



Source: Lesotho Electricity Company

4.0 Petroleum Fuel

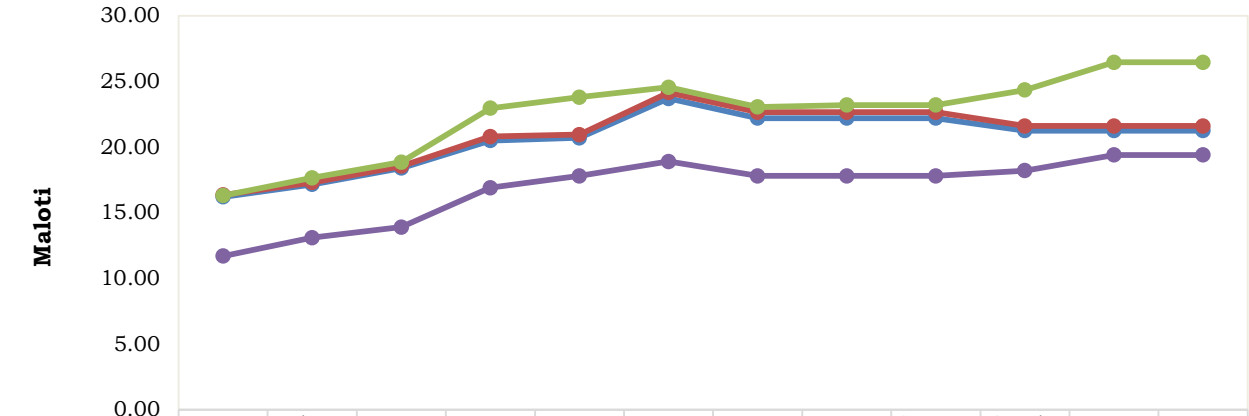
Petroleum is a thick, flammable, yellow to black mixture of gaseous, liquid and solid hydrocarbons that occurs naturally beneath the earth's surface, can be separated into fractions including natural gas, gasoline, naphtha, kerosene, fuel and lubricating oils, paraffin wax and asphalt and is used as raw material for a wide variety of derivatives products, http://www.thefreedictionary.com/Petroleum-based+fuel

4.1 Petroleum Fuel Costs

Lesotho does not produce any crude oil, or any fossil fuel which makes it over dependent on imported fossil fuels. Petroleum fuels imported include Unleaded Petrol 93 (ULP 93) and 95 (ULP 95), Diesel 50ppm and Illuminating Paraffin (IP).

Figure 9 portrays petroleum fuel costs in Maloti per litre for the year 2022. The highest price of Diesel 50ppm and Illuminating Paraffin (IP) were observed in November and December with M26.45 and M19.40 respectively. Petrol 93 and 95 prices were highest in June (M23.70 and M24.15). The table further reveals that all fuel prices were lowest in January with Petrol 95 (M16.35), Diesel 50ppm (M16.30), Petrol 93 (M16.20) and IP with M11.70.

Figure 9: Petroleum Fuel Costs in Maloti per Litre by Months- 2022



	January	February	March	April	May	June	July	August	September	October	November	December
Petrol 93	16.20	17.15	18.40	20.50	20.70	23.70	22.20	22.20	22.20	21.25	21.25	21.25
Petrol 95	16.35	17.30	18.55	20.80	20.95	24.15	22.65	22.65	22.65	21.60	21.60	21.60
Diesel 50	16.30	17.65	18.85	22.95	23.80	24.55	23.05	23.20	23.20	24.35	26.45	26.45
IP	11.70	13.10	13.90	16.90	17.80	18.90	17.80	17.80	17.80	18.20	19.40	19.40

Source: Petroleum Fund

4.2 Petroleum Fuel Imports

All Lesotho's imported oil products come from South Africa, with three multi-national companies operating in Lesotho in that field, as they import and store the products in bulk storage facilities before they redistribute them throughout the country. https://energypedia.info/wiki/Lesotho_Energy_Situation

Table 8 shows petroleum fuel imports in mega-litres (Ml) for the year 2022. The mostly imported fuel was Diesel 50ppm (120.59Ml) followed by IP with 118.38Ml. The least imported petroleum fuel was Petrol 93 amounting to 42.82Ml. ULP 93 was mostly imported in December (7.18Ml) and less in February (2.11Ml). ULP 95 imports were higher in March and lower in November with 8.35Ml and 3.53Ml correspondingly. Diesel 50ppm was mostly imported in September (12.39Ml) and less imports were observed in June and July with 8.53Ml each. IP imports were high in November and low in February with 10.83Ml and 8.63Ml respectively.

Table 8: Petroleum Fuel Imports in Mega-litres (Ml) by Months- 2022

	Petroleum			
Months	**ULP 93**	**ULP 95**	**Diesel 50ppm**	**IP**
January	2.67	8.14	10.81	10.04
February	2.11	7.32	9.43	8.63
March	2.68	8.35	11.03	10.56
April	2.37	7.14	9.51	8.93
May	2.57	7.57	10.14	9.59
June	2.94	5.59	8.53	9.26
July	2.94	5.59	8.53	9.26
August	3.26	7.49	10.74	10.49
September	5.80	6.60	12.39	10.44
October	2.54	6.89	9.43	10.35
November	5.76	3.53	9.30	10.83
December	7.18	3.57	10.75	10.01
Total	**42.82**	**77.77**	**120.59**	**118.38**

Source: Department of Energy

4.3 Aviation Fuel Imports

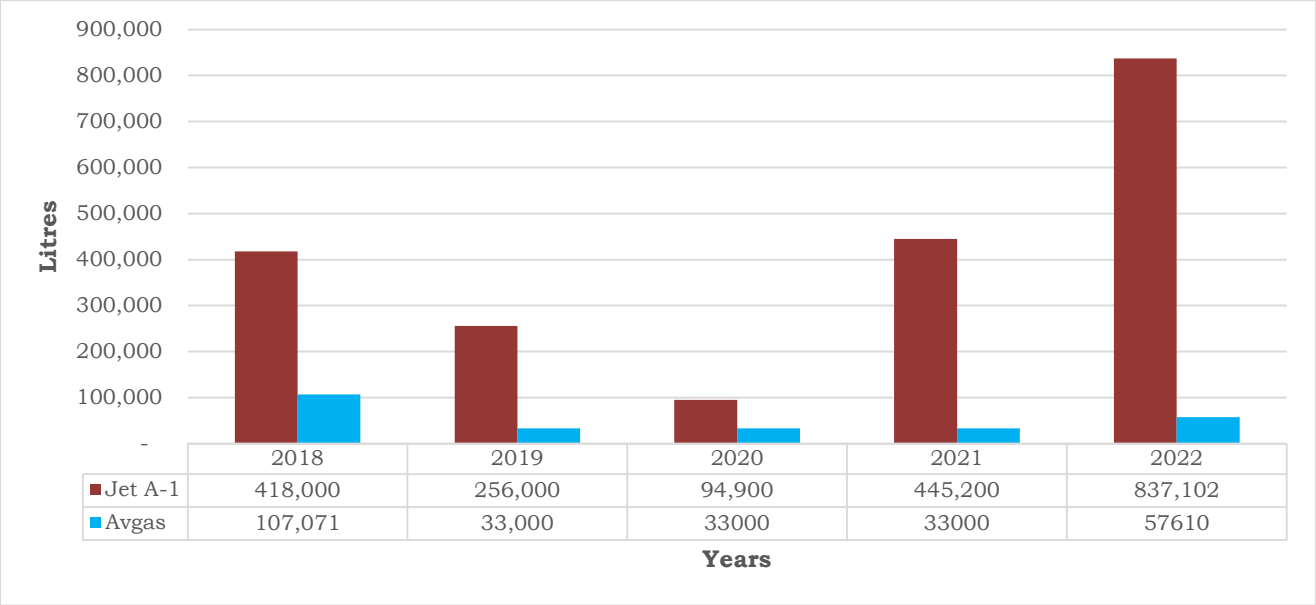
Aviation fuels are petroleum-based fuels, or petroleum and synthetic fuel blends, used to power aircraft. https://en.m.wikipedia.org/wiki/Aviation_fuel. In Lesotho the mostly used fuels are Jet A-1 and Avgas.

JET A-1 is a kerosene-type fuel. It is compatible with most jet aircraft, both civil and military, helicopter turbine engines, turboprops and compression-ignition piston engines. https://aviation.totalenergies.com/en/fuels-and-services-aviation/aviation-fuels/jet-a1.

"Avgas (**aviation gasoline**, also known as **aviation** spirit in the UK) is an aviation fuel used in spark-ignited internal-combustion engines to propel aircraft" (*en.wikipedia.org/wiki/Aviation fuel)*

Figure 10 depicts aviation fuel imports in litres for the years 2018 to 2022. Most of Jet A-1 imports were observed in 2022 with 837,102 litres. Jet A-1 imports were lowest in 2020 with 94,900 litres. Avgas was mostly imported in 2018 (107,071 litres). The least imports of Avgas were 33,000 litres in 2019, 2020 and 2021. Avgas imports were 57,610 litres in 2022.

Figure 10: Aviation Fuel Imports in Litres - 2018 to 2022



Source: Mission Aviation Fellowship, Lesotho Defense Force, Matekane Group of companies

4.4 Aviation Fuel Consumption

Lesotho imports all its aviation fuel to power locally used aircraft.

Table 9 demonstrates aviation fuel consumption in litres by type and month for the year 2022. Maximum consumption was observed in December under Jet A-1 category with 36,902 litres. Consumption was minimal in September amounting to 200 litres. There were no records for Jet A-1 fuel in May and October. On the other hand, Avgas was mostly used in June (6,123 litres) and less consumption was observed in March with 2,503 litres.

Table 9: Aviation Fuel Consumption in Litres by Type and Month - 2022

	Litres	
Months	**Jet A-1**	**Avgas**
January	12,540	4,440
February	4,210	4,186
March	5,500	2,503
April	6,504	3,887
May	-	4,368
June	3,674	6,123
July	19,129	5,129
August	3,515	5,031
September	200	4,108
October	-	4,277
November	31,170	4,277
December	36,902	4,316

Total	123,344	52,644

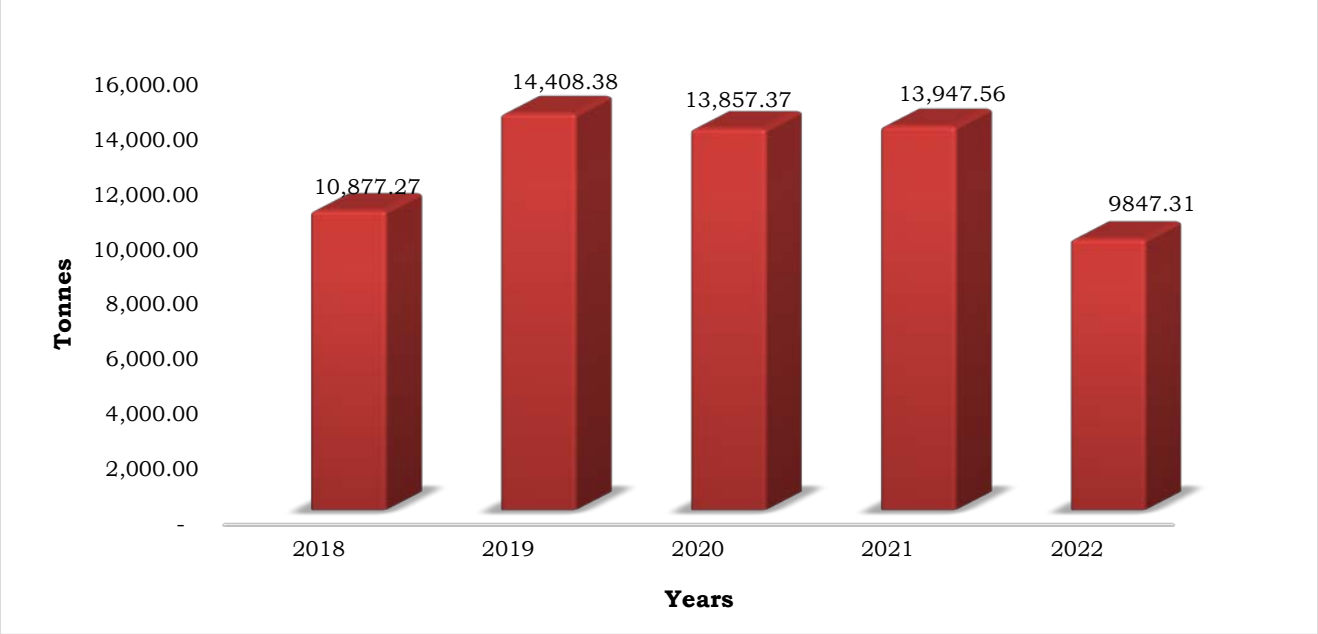
Source: Mission Aviation Fellowship, Matekane Group of companies

4.5 Liquefied Petroleum Gas

Liquefied Petroleum Gas (LPG) is light paraffinic hydrocarbon derived from the refinery processes, crude oil stabilization and natural gas processing plants, (Energy Statistics manual, 2010).

Figure 11 illustrates volumes of LPG imports in tonnes for the years 2018 to 2022. LPG imports increased from 10,877.27tonnes in 2018 to 14,408.38tonnes in 2019. It was almost steady for the years 2020 and 2021. LPG imports declined by 29.4 percent from 13,947.56tonnes in 2021 to 9,847.31tonnes in 2022.

Figure 11: Volumes of LPG Imports in Tonnes - 2018 to 2022



5.0 Charcoal Production

Charcoal is the solid residue of the destructive distillation and pyrolysis of wood and other vegetal material (Energy Statistics manual, 2010). It is produced by heating of wood or other organic materials in the absence of oxygen.

Table 10 shows quantity of charcoal and briquettes produced by month in kilograms (kg) for the years 2020 to 2022. It is observed that charcoal production was highest in 2022 (21,800 kg) and lowest in 2020 (4,385 kg). In 2022, maximum production was achieved in September (6,560kg) and minimum production was in April with 600kg. There was no production reported on the blank spaces. Briquettes were mostly produced in October (600kg) in 2022 and for the other reported months production was 400kg. Most briquettes production was in 2022 with 1,400kg and the least production was in 2020 (600kg).

Table 10: Quantity of Charcoal and Briquettes Produced by Month in Kilograms (kg)- 2020 to 2022

	2020		2021		2022	
Months	**Charcoal**	**Briquettes**	**Charcoal**	**Briquettes**	**Charcoal**	**Briquettes**
January			715		750	
February			775		1,000	
March	440		775		1,050	
April	420		650		600	
May	335		500		900	
June	295				800	
July	235				855	
August	225		700		5,250	
September	285		850		6,560	400
October	765		750		2,050	600
November	750	400	850	400	790	
December	635	200	800	400	1195	400
Total	**4,385**	**600**	**7,365**	**800**	**21,800**	**1,400**

6.0 Summary

The largest capacity of electricity installed is that of 'Muela with 72MW. In 2022 'Muela produced 480.3GWh of electricity and sold 479.5GWh to Lesotho Electricity Company. There was a 9 percent decline in electricity produced from 2021 to 2022. Electricity sales from 'Muela to LEC declined by 9.6 percent from 2021 to 2022. Semonkong mini-grid generation was 521,720.1 kWh in 2022. The largest quantity of diesel was used in June 2020 for electricity generation with 30,364 litres. Most electricity purchases by LEC were from ' Muela with 479.52GWh in 2022. LEC imported 507.71GWh of electricity from Eskom and EDM. Electricity exports stood at 0.74GWh in 2022.

Domestic tariff was M1.745 per kilowatt-hour in 2022. Households which purchase electricity of M30 and below (Lifeline Domestic) pay M0.8511 per kilowatt-hour. The most consuming sector of electricity was Prepaid Domestic with 260,384.98MWh in 2022. Petrol 93 and 95 prices were highest in June with M23.70 and M24.15 per litre respectively. The mostly imported aviation fuel was Jet A-1 with 837,102 litres in 2022. LPG imports were 9,847.31 litres in 2022. About 21,800kg of charcoal was produced in 2022.

ANNEX 1

Table 11: Installed Capacity of Electricity Power Stations in Lesotho in Megawatts (MW)

Areas	Units	Number
Semonkong	Hydro (MW)	0.18
Semonkong	Diesel (kVA)	500
Mantsonyane	Hydro (MW)	2
Muela	Hydro (MW)	72
Moshoeshoe 1	Solar (MW)	0.28

Table 12: Electricity Generation and Sales to LEC in Gigawatt Hours – 2014 to 2018

Year	Generation	Sales to LEC
2014	520.1	517.4
2015	532.2	527.8
2016	507.7	505.1
2017	501.0	500.2
2018	515.8	512.9

Source: Lesotho Highlands Development Authority

Table 13: Electricity Purchases by LEC in GWh from 'Muela, Eskom and EDM - 2014/2015 to 2018/2019

GWh	Muela	Eskom	EDM	Total
2014/2015	515.15	229.29	41.93	786.36
2015/2016	520.81	203.01	80.37	804.18
2016/2017	512.05	268.36	105.18	885.59
2017/2018	518.28	275.83	98.06	892.17
2018/2019	494.43	296.61	99.08	890.11

Source: Lesotho Electricity Company

Table 14: Electricity Produced by Mantsonyane and Semonkong Power Plants in Kilowatt Hours - 2018/2019

	Mantsonyane	Semonkong			
Months	Hydro	Hydro	Diesel	Total	Total
April	-	33.21	40.15	73.36	73.36
May	-	10.66	53.43	64.09	64.09
June	-	18.10	50.59	68.69	68.69
July	9.67	-	59.49	59.49	69.16
August	39.44	-	58.46	58.46	97.90
September	32.54	-	57.45	57.45	89.99
October	23.65	-	55.16	55.16	78.81
November	-	-	55.06	55.06	55.06
December	-	-	55.37	55.37	55.37
January	-	-	39.20	39.20	39.20
February	-	-	44.34	44.34	44.34

March	-	-	51.37	51.37	51.37
Total	**105.29**	**61.97**	**620.05**	**682.02**	**787.31**

Source: Lesotho Electricity Company

Table 15: Electricity Generated from 'Muela, Semonkong and Mantsonyane in MWh - 2018/2019

Months	Mantsonyane	Semonkong	Muela	Total
January	61.36	58.70	40,061	40,181.06
February	438.10	62.21	37,774	38,274.31
March	135.11	68.66	48,006	48,209.77
April	-	73.36	50,911	50,984.36
May	-	64.09	52,284	52,348.09
June	-	68.69	50,433	50,501.69
July	9.67	59.49	51,543	51,612.16
August	39.44	58.46	46,239	46,336.90
September	32.54	57.45	40,745	40,834.99
October	23.65	55.16	34,254	34,332.81
November	-	55.06	32,214	32,269.06
December	-	55.37	31,326	31,381.37
Total	**739.87**	**736.69**	**515,790**	**517,266.56**

Table 16: Total Electricity Imports and Exports - 2014 to 2018

Year	Imports (GWh)	Exports (GWh)
2014	335.5	2.8
2015	260.6	4.4
2016	372.6	2.6
2017	386.9	0.8
2018	396.7	2.9
Total	**1752.3**	**13.4**

Source: Lesotho Highlands Development Authority

Table 17: Number of LEC Consumers by Sector - 2018/2019

Months	Domestic Consumers	General Purpose	Commercial HV	Commercial LV	Industrial HV	Industrial LV	LHDA	Pre-Paid Domestic	Pre-Paid General Purpose	Street Lights
April	4	23	42	193	48	171	11	222,896	12,253	133
May	4	23	42	194	49	171	11	223,194	12,266	133
June	4	23	42	194	49	171	11	223,376	12,271	133
July	4	23	42	194	49	171	11	225,251	12,390	133
August	4	23	42	194	49	171	11	227,324	12,495	133
September	4	23	42	194	49	171	11	228,336	12,547	133
October	4	23	42	194	49	171	11	229,763	12,656	133
November	4	23	42	194	49	171	11	231,097	12,741	133
December	4	23	42	194	49	171	11	233,053	12,902	133
January	4	23	42	194	49	171	11	234,161	12,974	133
February	4	23	42	198	49	171	11	235,430	13,082	133
March	4	23	42	198	49	171	11	236,388	13,150	133

Source: Lesotho Electricity Company

Table 18: Consumption of LEC Consumers in Megawatt hours - 2014/2015 to 2018/2019

Sector	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Domestic Consumers	0.70	0.57	0.60	0.53	0.53
General Purpose	2.38	1.82	2.12	1.84	1.93
Commercial HV	77.63	82.44	78.68	82.95	84.02
Commercial LV	56.47	54.96	57.15	58.35	61.23
Industrial HV	187.32	189.23	212.84	241.83	231.10
Industrial LV	38.70	44.54	43.41	41.06	43.43
LHDA	6.93	7.58	7.49	7.22	7.04
Pre-Paid Domestic	227.74	232.31	239.61	247.63	258.95
Pre-Paid General Purpose	75.41	77.97	87.64	89.44	92.79
Street Lights	1.50	1.65	2.34	2.10	3.69
Total	**674.78**	**693.07**	**731.87**	**772.95**	**784.70**

Source: Lesotho Electricity Company

Table 19: Quantity of Electricity Consumed by Economic Sectors in Megawatt hours (MWh) - 2017/2018 and 2018/2019

Economic Sectors	2017/2018	2018/2019
A - Agriculture, hunting and forestry	1,445.70	1,493.56
C - Mining and quarrying	27,288.08	28,191.31
D - Manufacturing	280,395.97	289,676.99
E - Electricity, gas and water supply	16,422.93	16,966.53
F - Construction	1,323.43	1,367.24
G - Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	19,874.34	20,532.17
H - Hotels and restaurants	11,835.63	12,227.39
I - Transport, storage and communications	22,391.29	23,132.43
J - Financial intermediation	12,072.51	12,472.11
K - Real estate, renting and business activities	36,872.16	38,092.62
L - Public administration and defense; compulsory social security	9,396.30	9,707.31
M - Education	21,684.86	22,402.62
N - Health and social work	29,490.48	30,466.61
O - Other community, social and personal service activities	81.01	83.69
Q - Extraterritorial organizations and bodies	33,993.41	35,118.58
Total	**524,568.12**	**541,931.16**

Source: Lesotho Electricity Company

Table 20: Distribution Losses in Gigawatt Hours - 2013/2014 to 2018/2019

Period	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Gigawatt hours	92.86	121.77	112.77	153.72	119.22	105.41

Source: Lesotho Electricity Company

Table 21: Lesotho Electricity Load - 2017 and 2018

Months	2017	2018
January	59.02	61.05
February	54.63	54.15
March	61.27	61.81
April	63.03	64.16
May	71.17	71.90
June	72.83	74.78
July	74.71	79.00
August	75.37	74.58
September	63.58	67.36
October	64.67	60.50
November	61.68	56.38
December	59.07	54.98
Total	**781.03**	**780.64**

Table 22: Yearly Peak Demand in Megawatts (MW) - 2014/2015 to 2018/2019

Period	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Peak Demand	144.12	154.2	161	154	160

Table 23: Petroleum Fuel Cost in Maloti per litre - 2018

Months	ULP	Diesel 500 ppm	Diesel 50ppm	IP
January	11.15	11.40	11.65	8.15
February	11.10	11.40	11.65	8.10
March	11.10	11.40	11.65	8.10
April	11.00	11.35	11.60	7.95
May	11.60	12.15	12.40	8.65
June	12.35	12.80	13.05	9.05
July	12.55	13.05	13.30	9.30
August	12.55	12.95	13.20	9.30
September	12.55	13.60	14.00	9.75
October	13.20	14.65	14.90	10.55
November	13.95	14.90	15.20	10.70
December	11.95	13.00	13.30	9.15
Average price	**12.09**	**12.72**	**12.99**	**9.06**

Source: Petroleum Fund

Table 24: Petroleum Fuel Consumption in Kilolitres - 2018

Months	Petrol 93	Diesel 500ppm	Diesel 50ppm	IP	Total
January	11,345.16	4,500.62	3,047.70	1,212.69	20,106.17
February	10,267.12	4,379.02	2,605.17	1,777.75	19,029.07
March	11,449.83	4,495.21	3,707.77	2,344.96	21,997.75
April	11,598.57	2,570.09	5,508.28	3,316.69	22,993.63
May	11,817.41	2,939.95	5,583.75	4,544.70	24,885.81
June	11,133.88	2,350.16	6,031.63	4,620.12	24,135.79
July	11,539.56	2,182.94	6,454.90	4,567.81	24,745.21
August	11,881.29	2,103.35	6,364.93	4,052.50	24,402.05
September	10,446.39	1,889.27	5,738.99	3,019.62	21,094.26
October	12,419.42	2,274.67	6,896.94	1,821.68	23,412.71
November	10,776.40	1,812.15	6,528.21	1,235.84	20,352.60
December	13,871.85	468.46	8,921.49	1,443.27	24,705.06
Total	**138,546.87**	**31,965.88**	**67,389.75**	**33,957.62**	**271,860.12**

Source: Petroleum Fund

Table 25: Aviation Fuel Purchase and Consumption by MAF in Litres - 2018

Months	Purchase	Consumption
January		4,907.50
February		5,746.00
March		4,244.50
April	33,000.00	4,290.00
May		4,407.00
June		4,660.50
July		4,296.50
August		5,167.50
September		3,711.50
October		4,946.50
November	34,071.00	4,595.50
December		5,499.00
Total	**67,071.00**	**56,472.00**

Mission Aviation Fellowship

Table 26: Volumes of LPG Imports in Tonnes - 2014 to 2018

Months	2014	2015	2016	2017	2018	Total
January	386.51	678.68	404.45	589.90	877.41	2,936.95
February	404.82	766.22	540.46	575.48	768.57	3,055.55
March	393.41	778.16	350.69	572.42	913.24	3,007.92
April	141.45	582.25	519.21	740.23	952.03	2,935.16
May	797.43	463.98	402.49	579.61	752.19	2,995.69
June	852.27	406.87	954.81	756.84	916.78	3,887.56
July	607.91	578.07	602.22	714.00	1,017.68	3,519.88
August	775.81	508.80	704.60	950.50	852.72	3,792.43
September	486.72	544.58	752.00	843.98	869.72	3,497.00
October	482.88	695.26	821.76	738.68	831.95	3,570.52
November	517.00	340.95	584.32	569.84	685.79	2,697.89
December	837.07	313.72	837.83	967.00	752.71	3,708.32
Total	**6,683.28**	**6,657.51**	**7,474.84**	**8,598.47**	**10,190.79**	**39,604.89**

Table 27: Quantity of Charcoal Produced in Kilograms - 2015 to 2018

Months	2015	2016	2017	2018	Total
January		3,528			3,528
February		3,528			3,528
march		3,528			3,528
April		3,528			3,528
May		3,528			3,528
June		3,528			3,528
July		3,528	3,456		6,984
August	6,550	3,528	3,456		13,534
September	6,550		3,456	2,592	12,598
October	6,550		3,456	2,592	12,598
November	6,550		3,456		10,006
December	6,550				6,550
Total	**32,750**	**28,224**	**17,280**	**5,184**	**50,688**

REFERENCES

1. IEA, Energy Statistics Manual, December 2010
2. https://en.wikipedia.org/wiki/Energy_statistics
3. http://www.mbendi.com/notices/copyright.htm.
4. http://www.lewa.org.ls/sectors/default.php
5. https://www.usaid.gov/powerafrica/lesotho
6. https://circuitglobe.com/electricity-tariffs.html
7. https://www.lec.co.ls/generation
8. https://energypedia.info/wiki/Lesotho_Energy_Situation
9. http://www.thefreedictionary.com/Petroleum-based+fuel.
10. http://www.thepriceoffuel.com/).
11. en.wikipedia.org/wiki/Aviation fuel
12. https://www.directenergy.com/blog/what-is-electricityload/
13. https://www.dictionary.com