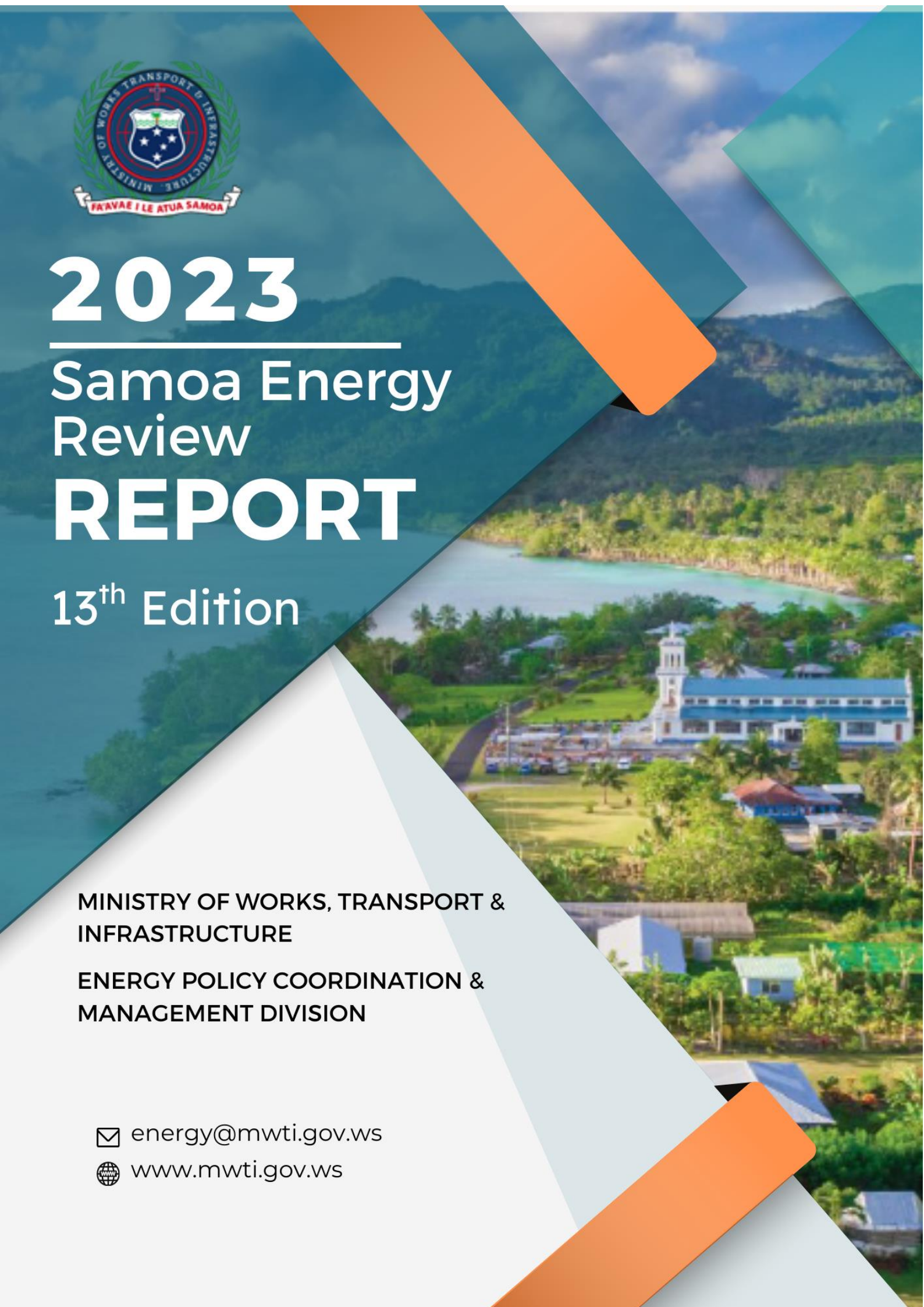
2023

Samoa Energy Review REPORT

13th Edition



MINISTRY OF WORKS, TRANSPORT & INFRASTRUCTURE

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This is the thirteenth review covering January to December of 2023.

Acknowledgments

The preparation of the Samoa Energy Review Report 2023 has been a collaborative effort, made possible through the active participation and support of various stakeholders across the energy sector. We extend our sincere gratitude to all individuals and organizations who contributed their time, expertise, and data toward the successful completion of this report.

Special thanks are extended to the relevant government ministries, state-owned enterprises, corporations, authorities, private sector entities, non-governmental organizations (NGOs), and community members who participated in data sharing and consultation processes. Your continued cooperation and commitment play a vital role in strengthening Samoa's energy planning, monitoring, and decision-making frameworks.

We gratefully acknowledge the support of the **United Nations Development Programme** (UNDP), the **Pacific Centre for Renewable Energy and Energy Efficiency** (PCREEE), the **University of Waikato**, and the **AHUORA** research group, whose assistance has been instrumental in the printing and publication of this report.

FOREWORD

The Samoa Energy Review 2023 was analysed and compiled by the Energy Policy Coordination & Management Division of the Ministry of Works, Transport and Infrastructure to provide the Government of Samoa, businesses, communities, and the general public with a better understanding of energy data trends, key milestones, and sectoral relationships.

Each annual edition introduces updated data (in this case, for the year 2023) with the aim of fostering a better understanding of Samoa's energy landscape. It also highlights the evolving nature of energy statistics, as revisions to previous years' data are made when improved or more complete information becomes available in the future.

The primary purpose of this report is to document Samoa's energy history, offer insights into past and present energy supply and demand, and support evidence-based policymaking. Moreover, it enables monitoring and evaluation of national energy goals and targets, contributing meaningfully to the successful implementation of Samoa's overarching energy strategies and development frameworks.

1. Sustainable Development Goal 7: ***"To ensure access to affordable, reliable, sustainable and modern energy for all"***.
2. 2nd Nationally Determined Contribution: **"reduce greenhouse gas (GHG) in the energy Sector by 30% by 2030 compared to 2007 levels"**
3. Pathway for the Development of Samoa 2021/22-2025/26: ***"To foster social harmony, safety, and freedom for all"***.
4. Samoa Energy Sector Plan 2023/24-2027/28: ***"Sustainable and affordable energy supply for all"***.

Earlier editions and publications of the Samoa Energy Review Reports can be accessed on the Samoa Ministry of Works, Transport & Infrastructure website at:

Energy - Ministry of Works, Transport Infrastructure

1.0 Table of Contents

2.0 Abbreviations & Acronyms

ADO	:	Automotive Diesel Oil
bbl.	:	Barrels
CO	:	Coconut Oil
DPK	:	Dual Purpose Kerosene
EPC	:	Electric Power Corporation
EPCMD	:	Energy Policy Coordination and Management Division
EV	:	Electric Vehicle
GWh	:	Gigawatt hour
IMPRESS	:	Improving Performance and Reliability of Renewable Energy Systems in Samoa
IPP	:	Independent Power Producer
ktoe	:	Kilotonne of oil equivalent
kW	:	Kilowatt
kWh		Kilowatts-hour
LPG	:	Liquefied Petroleum Gas
ML	:	Million Litres
MOPS	:	Mean of Platt's Singapore
MVA	:	Megavolt-Ampere
MW	:	Megawatt
NDC	:	Nationally Determined Contributions
NECC	:	National Energy Coordination Committee
NRSE	:	New Renewable Source of Energy
OFID	:	OPEC Fund International Developments
OPEC	:	Organization of the Petroleum Exporting Countries
PAWES	:	Pacific Adoption of Waste to Energy Solutions
PPS	:	Petroleum Products Supply
PSEP	:	Power Sector Expansion Project
PV	:	Photovoltaic
RE	:	Renewable Energy
RET	:	Renewable Energy Technology
SFA	:	Samoa Farmers Association

SIDS	:	Small Island Developing States
SPREP	:	Secretariat of the Pacific Regional Environment Programme
SROS	:	Scientific Research Organization of Samoa
TPES	:	Total Primary Energy Supply
toe	:	tonnes of oil equivalent
ULP	:	Unleaded Petrol

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5.0 GLOSSARY

biogas	Energy is produced from the anaerobic digestion of sewage and industrial waste. Includes landfill (garbage tip) gas and sewage gas. Also referred to as biomass gas.
biomass	Material that is derived from nature (trees, grasses, agriculture crops) that can be used for energy conversion, including biofuel. In Samoa biomass is mainly derived from coconut residue (husks and shells).
end-use energy	The amount of energy consumed by final users. Excludes energy used or lost in the process of transforming energy into other forms and in bringing the energy to the final consumers.
conversion	The process of transforming one form of energy into another (derived) form before final end use. Energy used in conversion is the energy content of fuels consumed as well as transformed by energy-producing industries. Examples include the generation of electricity from diesel fuel. Energy used in conversion also includes energy lost in the production, conversion and transport of fuels plus net energy consumed by pumped storage after allowance for the energy produced.
crude oil	Naturally occurring mixture of liquid hydrocarbons under normal temperature and pressure.
domestic	Used in the sense of national (as opposed to foreign) rather than residential.
domestic transport	Includes coastal shipping and national air transport. Excludes international transport.
electricity capacity	The maximum amount of power that an electrical device, circuit, or generator can produce or handle at any given moment
liquid fuel	All liquid hydrocarbons, including crude oil, condensate, liquefied petroleum gas and other refined petroleum products, and liquid biofuel.
joule	Standard unit of energy in general scientific applications. One joule is the equivalent of one watt of power radiated or dissipated for one second.
non-energy use	These are petroleum products that do not produce energy (e.g. bitumen for roads).
petroleum	Generic term for all hydrocarbon oils and gases, including refined petroleum products.
petroleum products	All hydrocarbons are used directly as fuel. These include liquefied petroleum gas, refined products used as fuel (aviation gasoline products, automotive gasoline, dual-purpose kerosene, and automotive diesel oil), and refined products used in non-fuel applications, bitumen and lubricants as included in the energy balance even if not used as fuel.
primary fuels	Forms of energy obtained directly from nature. They also include non-renewable fuels such as crude oil; naturally occurring liquefied petroleum gas; methane; and renewable fuels such as wood, wind power and solar energy.
Production	The amount of energy generated or extracted from domestic sources. In the context of Samoa, this includes energy derived from traditional biomass (e.g., firewood), solar photovoltaic (PV) systems, and hydropower. Samoa does not produce fossil fuels, so its energy production is limited to these renewable sources.
Imports	The quantities of energy products that have physically crossed Samoa's national

	territorial boundaries, regardless of whether customs clearance has occurred. For Samoa, this primarily includes petroleum fuel products such as Automotive Diesel Oil (ADO), Unleaded Petrol (ULP), Dual Purpose Kerosene (DPK), Aviation Gasoline (AVGAS), Liquefied Petroleum Gas (LPG), and lubricants.
Exports	Energy products that have physically crossed Samoa's national territorial boundaries to another country or territory, regardless of whether customs clearance has taken place.
Stock changes	This represent the difference between the opening stock levels (on January 1st) and closing stock levels (on December 31st) of energy products held within the national territory by producers, importers, and major consumers.This excludes stock movements in pipelines. *A stock build (increase in inventory) is shown as a negative number.A stock draw (decrease in inventory) is shown as a positive number.*
Domestic supply	Production + Imports − Exports ± Stock Changes This represents the total amount of energy available for use within the country. A stock build (increase in stocks) is subtracted. A stock draw (decrease in stocks) is added.
Transfer	The reclassification of energy products resulting from changes in product specifications or blending activities. For example, a transfer may occur when lubricant oil is blended with gasoline for use in two-stroke engines, such as outboard motors or grass cutters. These transfers adjust quantities between product categories but do not affect the overall energy balance. The net balance of interproduct transfers is zero.
Statistical differences	Defined as Final consumption + Transformation use + Energy sector own use + Distribution losses − Domestic supply − Transfers These differences arise because the components of the energy balance are often compiled from varied and independent data sources, leading to discrepancies. Additionally, the inclusion of stock changes held by large consumers on the supply side can introduce further inconsistencies. While statistical differences should ideally be close to zero, they are a common feature of energy balances and serve as an indicator of data quality and consistency.
Conversion	
Conversion Sector	This includes all activities where primary energy sources are transformed into secondary energy products, or where secondary energy is further transformed into other usable energy forms.
Auto-producer electricity plants	These are facilities that generate electricity primarily for the producer's own use, rather than for sale to the public or the national grid. These plants may be privately or publicly owned, and the electricity generated is typically used to meet the internal energy needs of a business, institution, or industrial operation.
Distribution Losses	
Distribution losses	This refer to the amount of energy lost during the transmission and distribution of energy products from the point of production or import to the point of final use. These losses occur due to technical inefficiencies such as heat loss, leaks, or evaporation.

TOTAL FINAL ENERGY CONSUMPTION	
Total final energy consumption is equal to the sum of the consumption in the end-use sectors. Energy used for transformation and for own use of the energy-producing industries is excluded. Final consumption reflects for the most part deliveries to consumers. International marine bunkers are not included in final consumption at the country level neither is international air transport.	
Agriculture and forestry	Covers deliveries to users associated with the agriculture and forestry sectors. For Samoa, energy consumption in these sectors is not applicable as Samoa lacks large-scale forestry and agriculture activities.
Fishing	Covers coastal and deep-sea fishing. Also covers fuels delivered to ships of all flags that have refuelled in the country (including international fishing) as well as energy used in the fishing industry
Industrial sector	Covers the manufacturing, construction, and quarrying sectors.
Public sector	Covers users mainly from the government, including government-owned and government-rented buildings, government hospitals, and the public works sector. Categorised energy use from the public sector includes electricity consumption in buildings, oil company sales to the government for power generation in selected areas (hospital, water, and off-grid power supply), and quarrying
Industrial sector	Based on the Samoa Energy Balance, this sector primarily uses electricity and petroleum products (especially diesel) for activities such as manufacturing, food processing, and construction.
Government Sector	The government sector in Samoa is a significant consumer of energy, primarily through the operation of public buildings, street lighting, government fleets, hospitals, and schools.
Commercial sector	Covers users from wholesale/retail and recreation, finance, insurance, real estate and other commercial-type services. Categorised energy use from the commercial sector includes electricity consumption in buildings, and direct sales by oil companies to the commercial sector
Community and Social Sectors	Mainly covers schools, religious organisations and NGOs. Categorised energy use from the community and social services sector covers electricity consumption in buildings, and fuel use (LPG, biomass and DPK) for cooking and lighting.
Residential Sector	Generally covers users from households. Categorised energy use from the residential sector includes electricity consumption in buildings, and fuel (LPG, biomass and DPK) use for cooking and lighting.
Transport sector	Covers all transport activity (in mobile engines) regardless of the economic sector to which it is contributing. The transport sector is broken up into road, marine, and air (domestic flights only) transport.

Executive Summary

This report presents the Samoa Energy Review 2023 and consists of five chapters namely, the energy overview, renewable energy, electricity, petroleum and end-use sector.

Chapter one presents Samoa's energy overview, covering the Energy Balance for 2023, estimating Samoa's Total Primary Energy Supply (TPES) has reached 5,787.93 terajoules (TJ), indicating a 16% increase from 2022 (4,995.2 TJ). The Final Energy Supply after removing the losses which is estimated at 4852.63 TJ. This sharp growth was driven by rising national energy demand across all sectors following the full resumption of economic and social activities after COVID-19 restrictions.

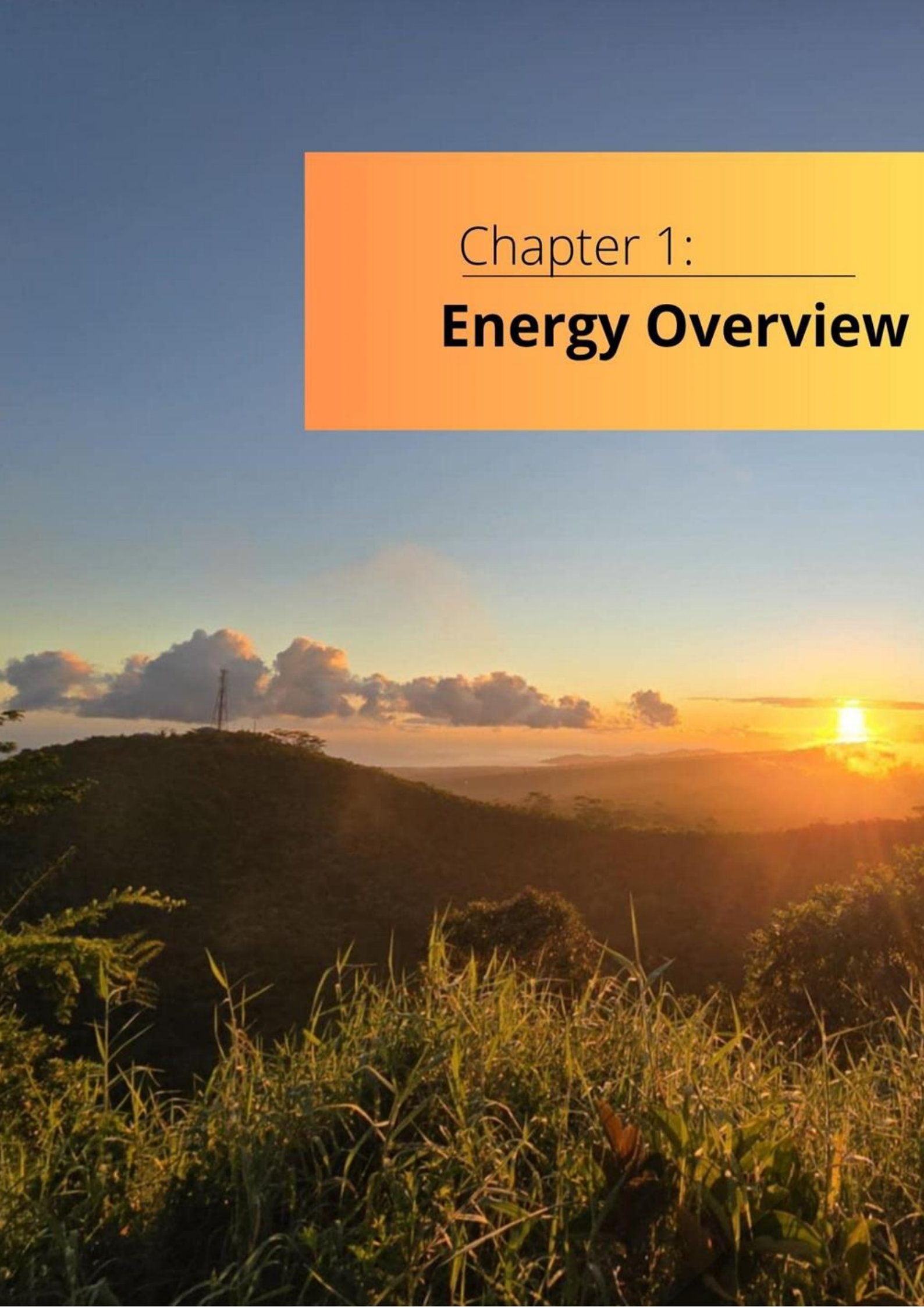
The second chapter is based on Samoa's renewable energy contribution for 2023 which is estimated at 1342.8 TJ, accounting for approximately 23% of the overall total energy supply of the country. Biomass remains to be the biggest renewable energy contributor for heating and cooking, estimated at 1103.1TJ, whereas 3.01 TJ were produced from solar water heating systems, while 0.224TJ is supplied from biogas systems, both fixed domes and portable home biogas systems. In addition, 236.48 TJ is a combined contribution from renewable electricity, both grid and off-grid, from the three main renewable energy sources (hydro, solar, and wind).

Chapter three dives into electricity, giving a clear detail of generation from petroleum fuels and renewable resources such as hydro power, solar energy, and wind. Samoa's total electricity generation was approximately 191.35 GWh, with renewable energy contributing about 34%. A significant increase from 2022 was mainly due to hydropower, which produced 57% more this year, while contributions from solar and biomass have declined. After accounting for losses, the total grid power from mixed sources was 169.71 GWh. Diesel remains Samoa's main electricity source, providing 66% (125.7 GWh) of the total, while hydropower accounts for 24% (46 GWh) and solar power for 10%. Wind and biomass together contribute only 0.1% (189,300 kWh). Electricity demand from the end-use sector rose to 181.295 GWh, a 21% increase from last year's 149.609 GWh. Additionally, all end-use sectors have increased their consumption from the previous year (2022).

The fourth chapter focuses on Samoa's petroleum sector. The stable petrol (ULP) prices, significant mid-year declines in diesel (ADO) and kerosene (DPK), and a sharp rebound in the last quarter due to global crude price increases. Diesel remained the largest import (67M litres consumed), peaking in Qtr 2, while petrol followed with strong demand in Qtr 4 (47M litres). Jet fuel imports peaked in Qtr 3 in line with tourism, and LPG remained steady at 5.1M litres. Transport–Land remains the dominant consuming sector, followed by electricity, with seasonal fluctuations in marine and commercial use.

Lastly, chapter five highlights the End-use sector, including Transport, Residential, Community and Social, Government, Fisheries, Commercial and Industrial Sectors. Land transport consumed an estimated 2157.9 TJ or 86% of the petroleum products, leaving 14% for Marine Transport (361.39 TJ). Both end-users have increased due to post-COVID

impacts, where transportation is returning to normal operations. Residential, Community, Social, and Government Sectors reached 1680.19 TJ, reflecting a constructive increase of 6.4% compared to the previous year, 2022. Analysing the monthly trends, we observe a consistent rise in energy consumption starting from April and continuing toward the end of the year. Notably, the use of petroleum and LPG products has gradually increased throughout this period, while solid fuels, specifically fuel wood and coconut residues, have maintained a steady and significant share of energy consumption. Samoa's fishing sector relied predominantly on Unleaded Petrol (ULP), maintaining stable consumption of 0.22 ktoe from Qtr 2 to Qtr 4, up from 0.20 ktoe in Qtr 1. Diesel (ADO) use was variable, starting at 0.11 ktoe in Qtr 1, dropping to zero in Qtr 3, and rebounding slightly in Qtr 4, reflecting seasonal fluctuations in fishing activity. The Commercial and Industrial energy consumption increased overall. Grid electricity remains the dominant source at 277.03 TJ, showing its central role, while diesel (ADO) is close behind at 266.86 TJ, indicating heavy reliance for transport and industrial purposes. LPG use dropped in Qtr 2–Qtr 4 but totals 45 TJ, likely for cooking and some industrial applications. Unleaded Petrol consumption declined across all quarters, kerosene remained low and stable, and off-grid electricity stayed negligible. Biomass energy—fuel wood, wood residues, and coconut residues—doubled compared to 2022 but remains a small share, totalling around 7.2 TJ. Overall, 2023 shows higher energy demand, with electricity and diesel driving most of the consumption growth.



Chapter 1:
Energy Overview

Opportunities and Developments

We have recorded five energy efficiency and renewable energy related projects in 2023. The details of these developments are presented in Table 1.

Project/Company	Location	Technology	Operators	Installed Capacity	Plan year of Implimentation	Year Commissioned	Status
Asian Develoment Bank	Alaoa	Multi-pupose Flood control Dam	MWTI	600kW	still under discussion	-	-
Fale o le Fee (FOF) Hydro Plant – Power transformer replacement & commissioning	Magiagi	Hydropower (plant asset replacement)	Electric Power Corporation (EPC)	1.74 MW (plant rating)	2022	2023 (Jan)	Completed & in operation.
33 kV Line Relocation – East Coast	East Coast, Upolu	Transmission (33 kV network)	EPC	-	2023	2023	Completed (to improve access/maintenance and reliability).
CAP-IT "Driving Samoa towards a green energy transport system" (EV charging & e-mobility rollout)	Upolu & Savai'i (national rollout)	e-Mobility / EV charging infrastructure	Gov. of Samoa & UNDP (with partners)	— (plan includes ~80 EV chargers)	2023	-	Launched/Initiated (Oct 2023); implementation ongoing.
Community & Residential Biogas System	Aleisa, Magiagi,Aai o Fiti, Safotu	Homebiogas System	MNRE	20.0 cubic(m)^2	-	2023	Completed & in operation.
Stand-alone Solar PV Systems	Upolu & Savaii	Solar PV systems	EPC	1kW/house	-	2023	Completed

Table 1: Renewable energy and energy-efficient developments

Samoa Energy Balance 2023

The national energy balance has been presented in previous reviews similarly as Table 2. We also have provided a Sankey diagram in Figure 2 to highlight the volume of both the energy supply and end use.

Table 2: Samoa Energy Balance for 2023

Samoa Energy Balance 2023 Unit Tera Joules	Coconut Residues	Fuelwood & Wood Waste	Total Biomass	ADO	ULP	DPK	AVGAS	LPG	Solvents, Lubricants & Bitumen	Total Petroleum	Electricity Grid	Electricity off grid	Hydro Electricity	Solar Electricity	Wind Electricity	Biomass Gasification	Solar water heaters	Biogas	TOTAL ENERGY
ENERGY PRODUCTION AND SUPPLY																			
Indigenous Production	285.5	817.6	1,103.1							0.0		-0.07	164.16	71.56	0.68	0.00	3.01	0.224	1,342.6
plus Imports			0.0	2,352.6	1,804.9	404.3	0.0	135.7	60.06	4,757.5									4,757.5
minus Re-exports			0.0	51.6	8.3	0.0	0.0	0.3	1.45	61.7									61.7
minus International aviation			0.0			414.1	0.0		0.00	414.1									414.1
minus International marine bunkering			0.0	392.9	0.0				0.00	392.9									392.9
minus Stock Changes [A]			0.0	-694.9	140.7	-20.5	0.0	19.3	-1.05	-556.4									-556.4
+/- Statistical Discrepancy			0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.0									0.0
= TOTAL PRIMARY ENERGY SUPPLY	285.5	817.6	1,103.08	2,602.9	1,655.9	10.7	0.0	116.1	59.65	4,445.2	0.0	-0.07	164.16	71.56	0.68	0.00	3.01	0.224	5,787.9
minus CONVERSION SECTOR																			
Petroleum Refining			0.0							0.0									0.00
Electricity Generation [B]			0.0	1,350.29	0.0				1.73	1,352.0	-688.87	-0.07	164.16	71.56	0.68	0.00			899.48
Co-generation Industries [C]			0.0							0.0									0.00
Own Fuel Use & Losses [D]			0.0							0.0	35.75								35.75
= NET OR FINAL ENERGY SUPPLY	285.5	817.6	1,103.1	1,252.6	1,655.9	10.7	0.0	116.1	57.92	3,093.2	653.1	0.0	0.0	0.0	0.0	0.0	3.0	0.224	4,852.63
for END-USE SECTOR CONSUMPTION																			
Agriculture and Forestry	0.0	0.0	0.0	0.00						0.0		0.0						0.035	0.03
Fishing	0.00	0.00	0.00	11.03	35.60	0.17				46.80								0.00	46.80
Commercial	0.78	3.39	4.16	266.86	4.89	2.11		38.69	0.00	312.56	241.7	0.0					2.98	0.00	561.43
Industrial - Manfacturing, Construction etc	0.00	3.04	3.04	0.00	0.00	0.01		0.00	0.00	0.01	35.3	0.0					0.0	0.00	38.35
Road Transport			0.0	613.33	1,500.4	0.0			44.2	2,157.9								0.000	2,157.92
Sea Transport			0.0	361.39	0.0				0.0	361.4								0.000	361.39
Air Transport						0.0	0.0		0.0										
Community, Social Services & Government	0.000	0.000	0.000		0.000	0.000		0.000	0.000	0.000	161.9	0.024					0.0198	0.182	162.14
Residential	284.72	811.16	1095.88		115.01	8.37		76.93		200.31	213.7	0.044					0.0119	0.01	1,509.98
Solvents, Lubricants & Bitumen									13.7	13.7									13.71
= FINAL ENERGY CONSUMPTION	285.5	817.6	1,103.1	1,252.6	1,655.9	10.7	0.0	115.6	57.9	3,092.7	652.7	0.1	0.0	0.0	0.0	0.0	3.0	0.224	4,851.75

Figure 1: Waterfall chart of Samoa's Energy Overview

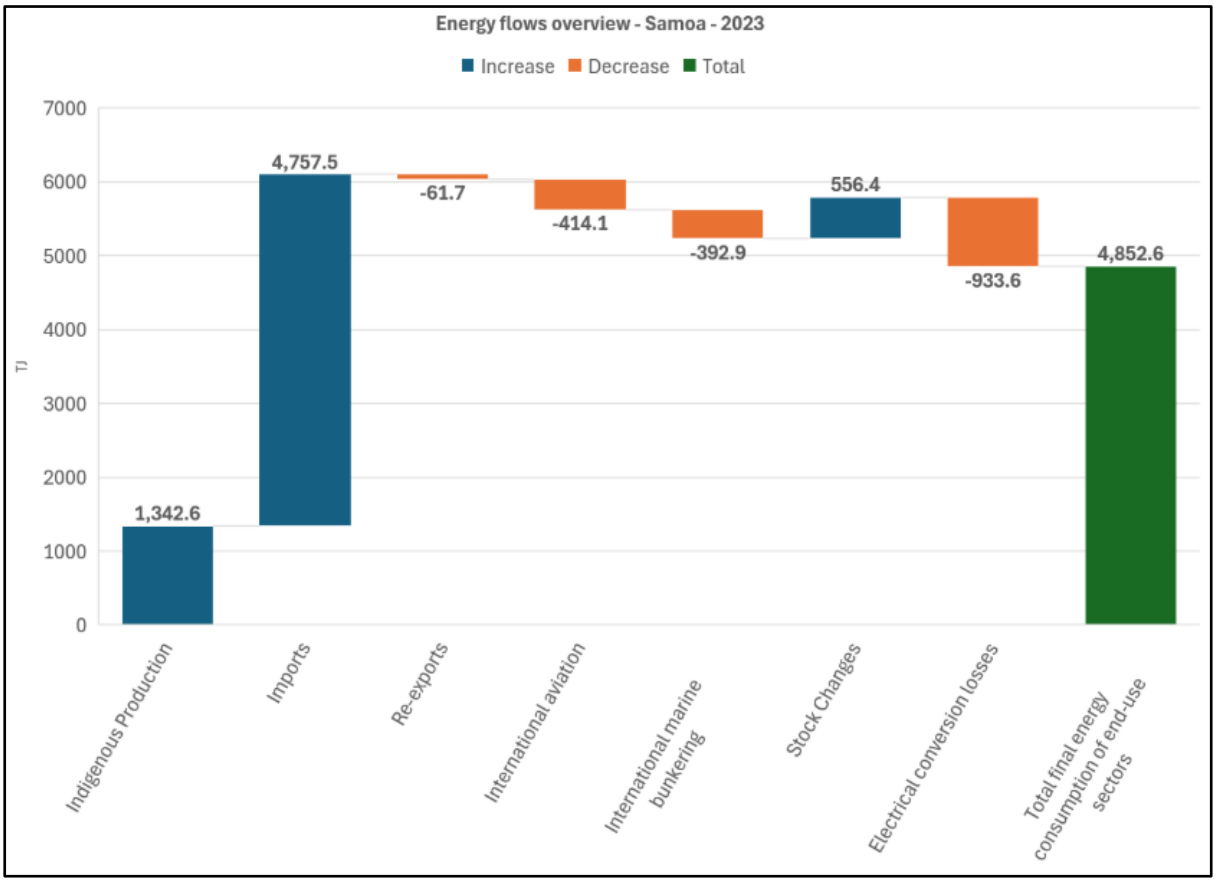
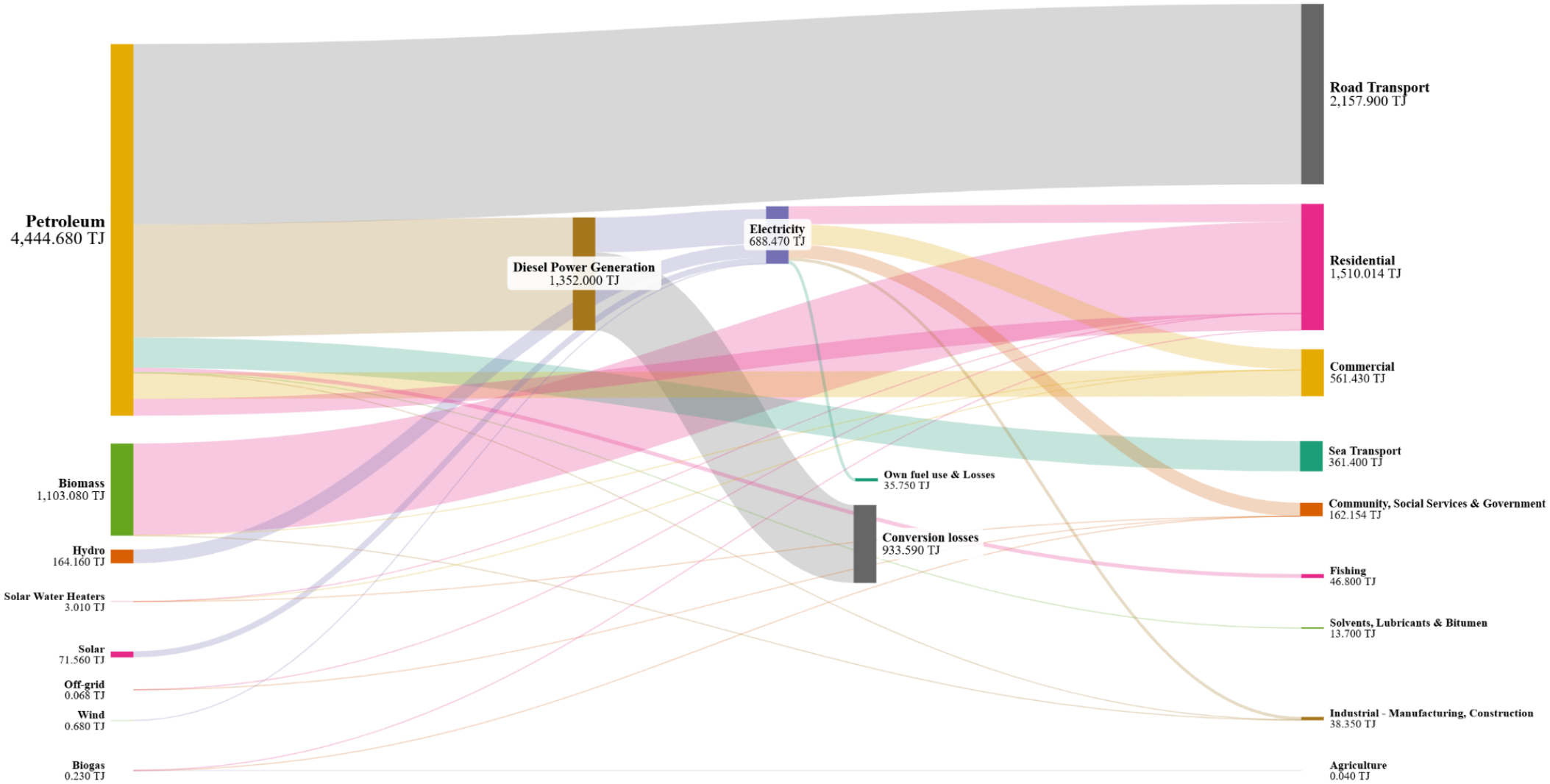


Figure 1 illustrates the Energy Production and Supply given in Table 1: Energy balance, the indigenous production is the energy produced from Renewable Energy sources, and imports are petroleum products (ADO, ULP, and DPK). The energy that is not being used domestically, stock changes and losses are subtracted from the combination of Indigenous production and Imports, hence the final energy supply is **4,852.63 TJ.**

Samoa Energy Sankey diagram 2023

Figure 2: Sankey diagram of energy flows in Samoa for 2023



Total Primary Energy Supply (TPES) 2023

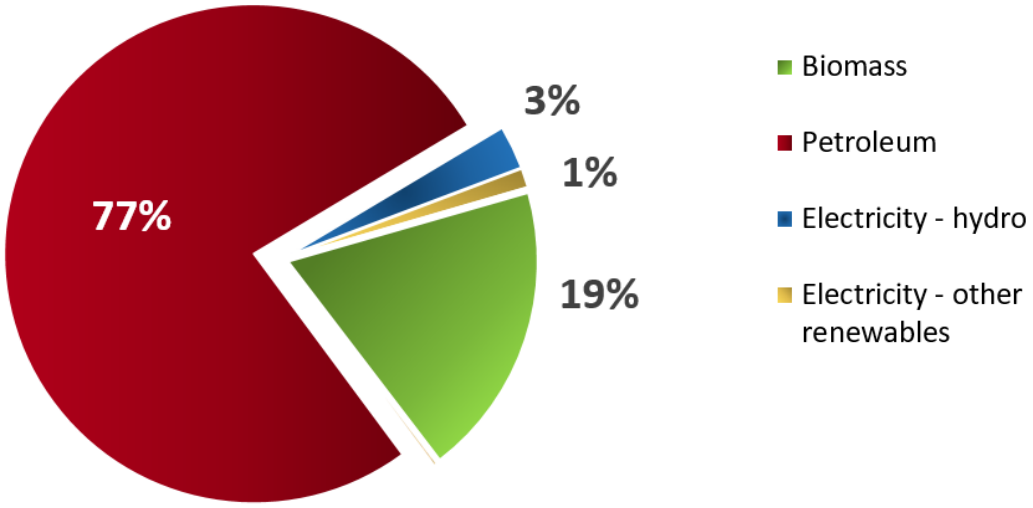


Figure 3: Total Primary Energy Supply for 2023

In 2023, Samoa's Total Primary Energy Supply (TPES) was estimated at approximately 5,787.93 terajoules (TJ), marking a sharp increase from 4,995.2 TJ in 2022. This notable growth reflects rising national energy demand across all sectors, largely driven by the lifting of COVID-19 restrictions and the full resumption of economic and social activities.

Petroleum continues to dominate Samoa's energy mix, with its share rising from 74% in 2022 (SERR 2022) to 77% in 2023, highlighting an increasing use of imported fossil fuels. This trend underscores the urgent need to accelerate the adoption of renewable energy and energy efficiency initiatives to enhance energy security and reduce carbon emissions.

Total Energy from Renewable Energy

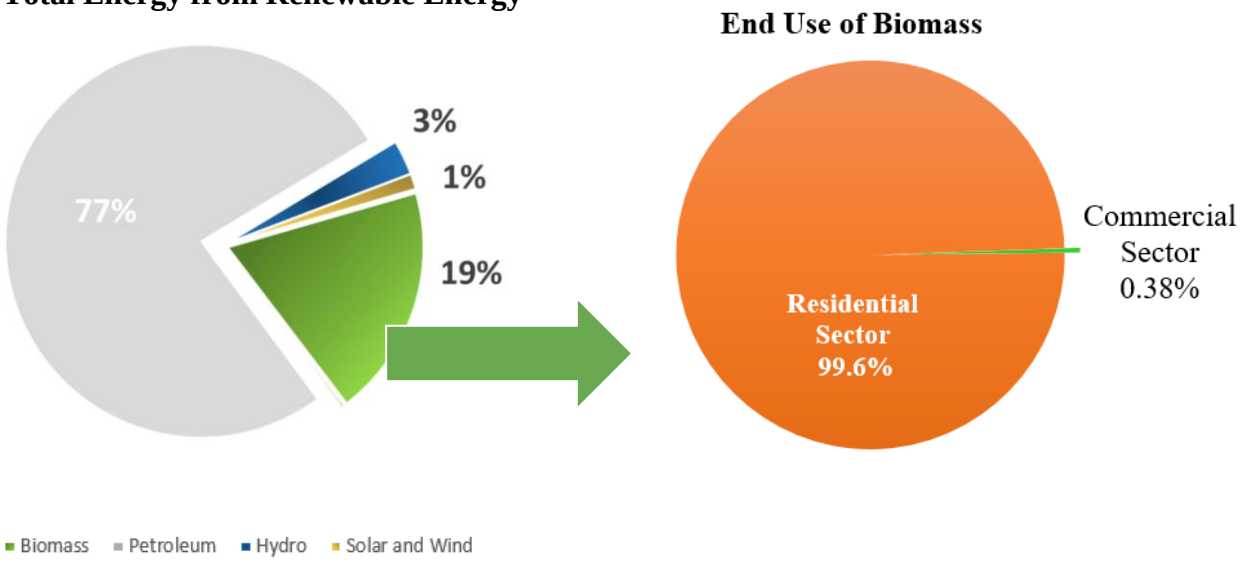


Figure 4: Total Energy from Renewable Energy

The Total Renewable Energy Supply for Samoa in 2023 is estimated at 1342.72TJ (23%) of the total, biomass (energy used for heating and cooking) is approximated at 19% or

1103.08TJ, where the majority is being consumed by residential sector and about 0.07% is utilized within the commercial sector. Renewable electricity accounts for 4% where 3% is produced from Hydro and 1% is a combination of Solar and Wind generation.

Total Energy from Petroleum

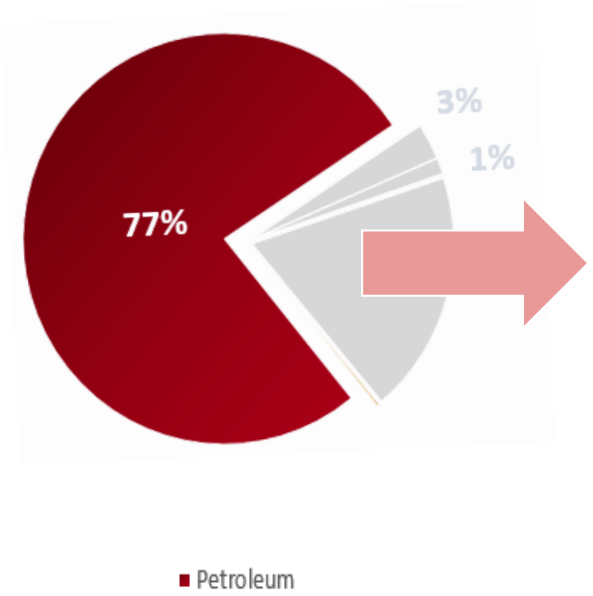
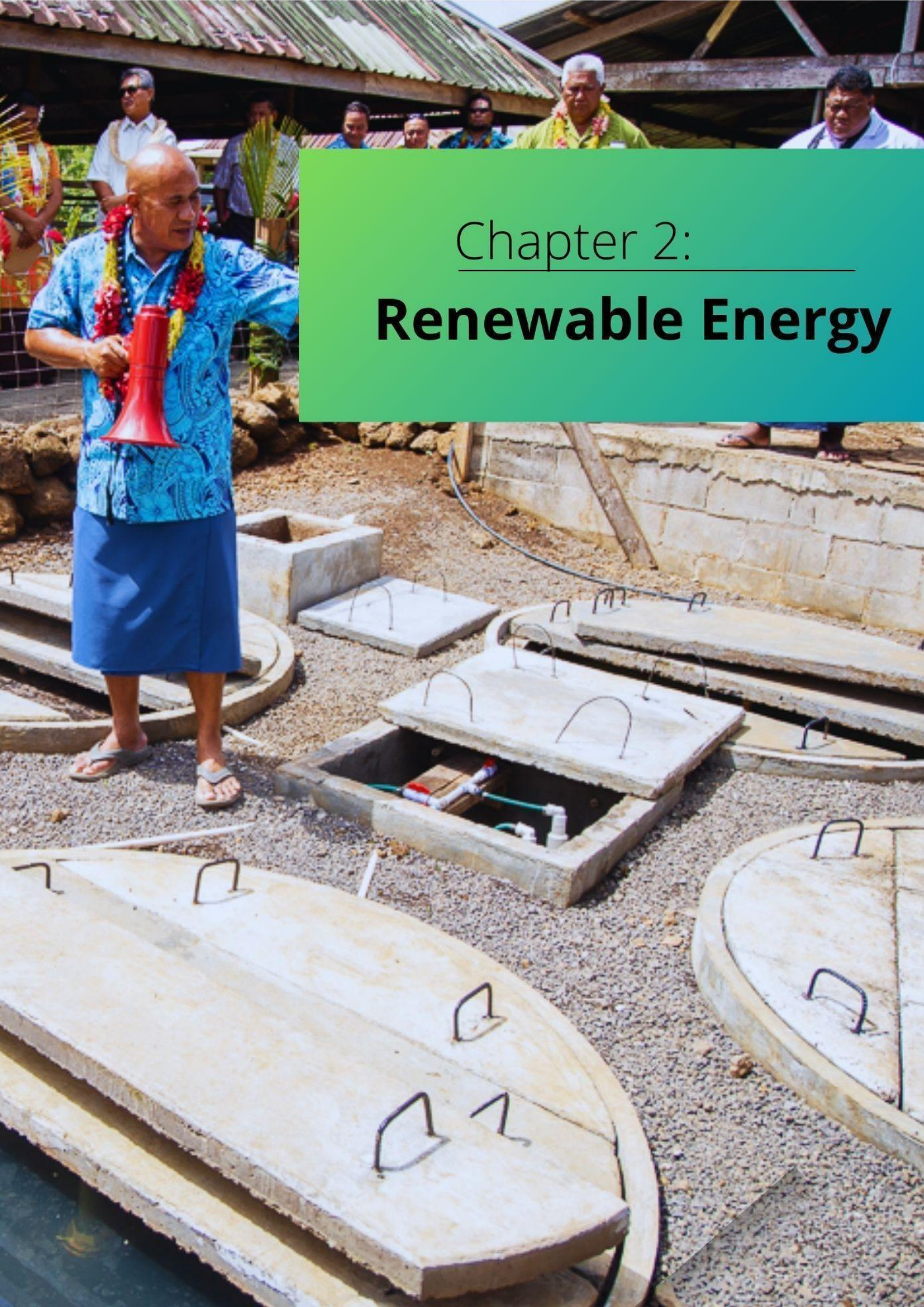


Figure 5: Total Energy from Petroleum

Breakdown of Petroleum Energy Supply by Sector	
Electricity Generation	1352.01 (TJ)
Transport (Land & Marine)	2519.31 (TJ)
Commercial & industrial Sector	312.57 (TJ)
Residential Sector	200.31 (TJ)
Fishing	46.8 (TJ)
Lubricants & Grease	13.71 (TJ)

Table 3: Petroleum Energy Supply by Sector 2023

Petroleum products accounted for approximately 77% (4,445 TJ) of Samoa's Total Primary Energy Supply (TPES). With respect to the 77%, about 44% was supplied to the transport sector, 23% was used for electricity generation, 5% supplied the commercial and industrial sector, 4% served the residential sector, and 1% was allocated to the fishing sector.



Chapter 2:

Renewable Energy

Chapter 2: Renewable Energy

Samoa's renewable energy sources include solar, hydro, and wind, which are naturally replenished and primarily used for electricity generation. These sources are measured in terms of energy output (kW, MW, GW) depending if there is hourly is considered. In addition, biomass and biogas are also utilized, particularly in off-grid and rural areas. Unlike electricity-only sources, these can be stored and reported as physical stock due to their tangible nature.

Renewable Energy that exists in Samoa:

Hydro Energy:

Hydropower, is a form of renewable energy that generates electricity by utilizing the kinetic energy of flowing or falling water. This is typically achieved through infrastructure such as dams or diversion structures, which channel water to drive turbines.

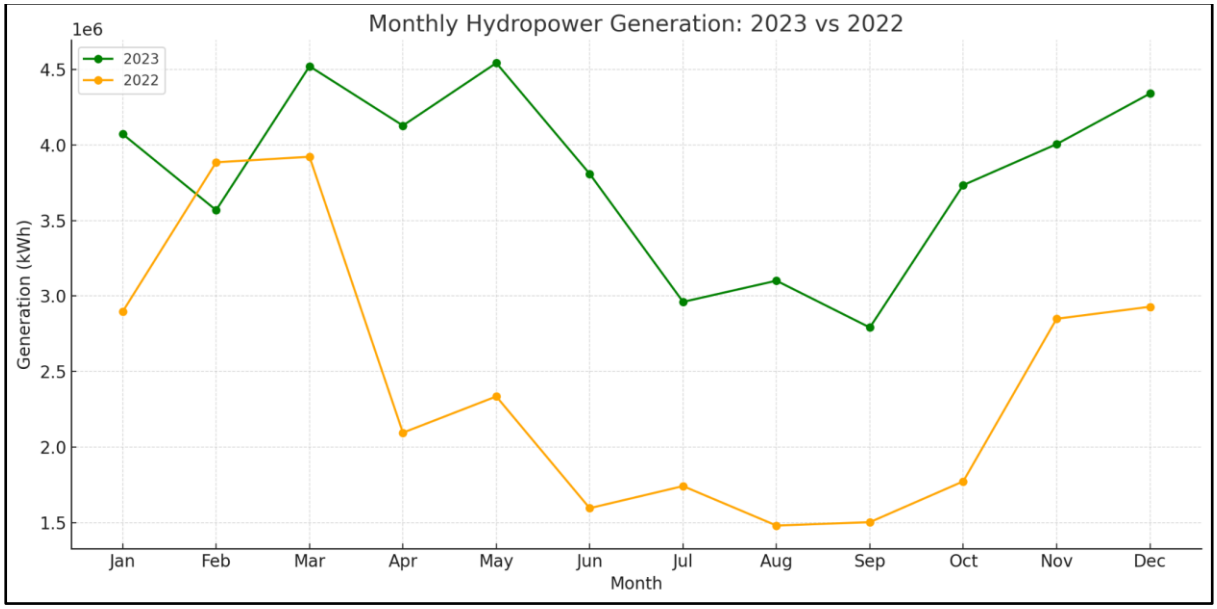


Figure 6: Hydro Generation Trend

Samoa's hydropower generation in 2023 reached a total of approximately 45,601,055.26 kWh, showing a modest increase compared to 29,004,930.75 kWh in 2022. This reflects strong year-round performance possible contributing factor are improved rainfall patterns and upkeep of maintenance in 2023.

- Strong Growth: Every month in 2023 (except February) outperformed 2022, with the biggest gains in May–October.
- Peak Month: May 2023 saw the highest generation at 4.54 GWh.
- Dramatic Increases: Several months recorded more than double the generation compared to 2022, especially Jun–Oct.
- February 2023 was the only month with a slight dip (-8.2%), likely due to temporary maintenance.

Hydropower in 2023 rebounded strongly, reinforcing its critical role in Samoa's renewable energy mix. This growth suggests improved infrastructure reliability and favourable hydrological conditions.

Solar Energy:

Solar photovoltaic (PV) systems harness sunlight by converting solar energy—produced by nuclear fusion in the sun—into electricity using semiconductor materials. These systems are increasingly used across the country for both electricity generation and solar water heating, supporting efforts to reduce reliance on imported fossil fuels and enhance energy security.

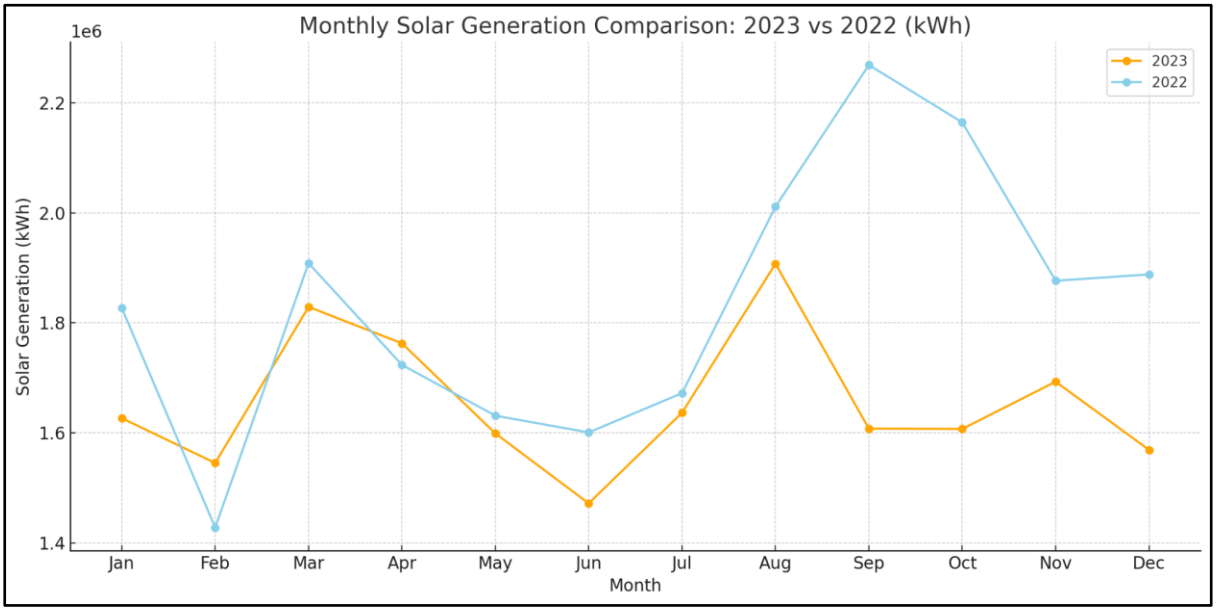


Figure 7: Solar Generation Trend

In 2023, Samoa generated approximately 19,726,733.12 kWh of solar electricity, a decline of 11.6% compared to 21,856,604.82 kWh in 2022. The reduction in output was noticeable across most months, wit significant drops observed in September (-29.2%) and October (-25.8%)

- Positive Growth: Only February and April showed slight increases in generation compared to 2022.
- Peak Generation: The highest monthly output in 2023 was in August (1.91 million kWh).
- Notable Decline: The biggest year-on-year decline occurred in September, with a reduction of over 660,000 kWh.

This decline may be attributed to weather variability (e.g., increased cloudiness), system maintenance, aging infrastructure, or temporary outages.

Wind Energy:

Wind power or wind energy is a form of renewable energy that harnesses the power of the wind to generate electricity. It involves using wind turbines to convert the turning motion of blades, pushed by moving air (kinetic energy) into electrical energy (electricity).

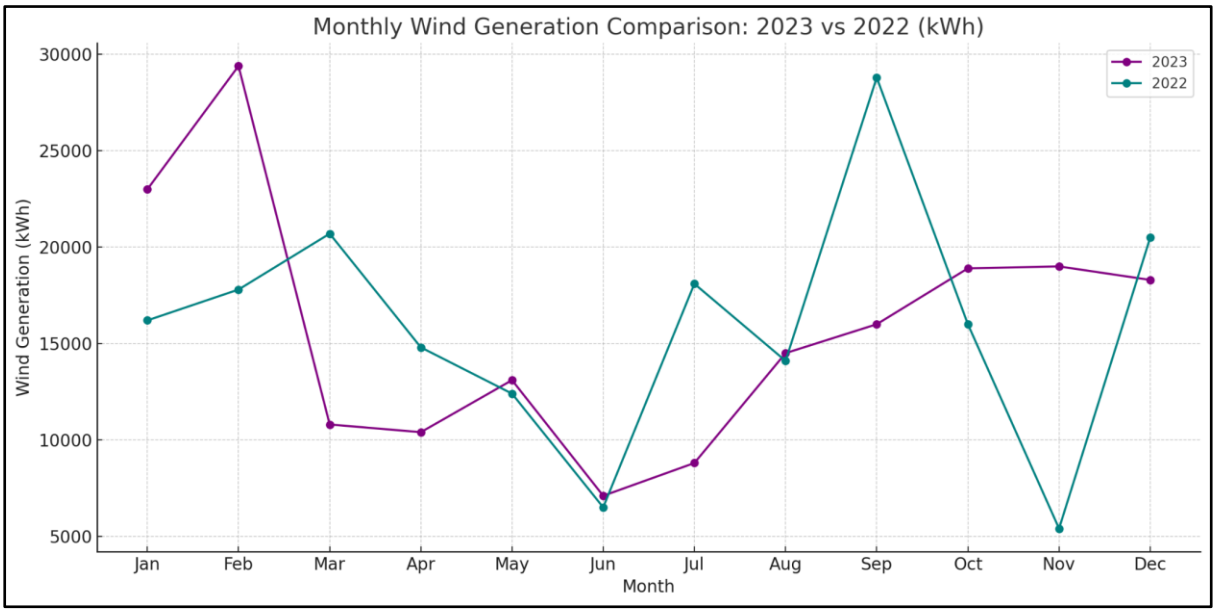


Figure 8: Wind Generation Trend

In 2023, Samoa generated a total of 189,300 kWh from wind, showing a slight decrease compared to 191,300 kWh in 2022. Wind energy remains the smallest contributor among the renewable sources in Samoa's energy mix.

- Stable Output: Monthly wind generation fluctuated slightly but remained under 30,000 kWh each month.
- Peak Output: Highest generation occurred in February 2023 (29,400 kWh).
- Year-on-Year Comparison: Wind output remained largely consistent with 2022, with marginal monthly variances.

While wind contributes minimally to total generation, it remains a useful supplementary resource. Variability in output is expected due to wind pattern fluctuations.

Biomass Energy:

Biomass is organic material derived from plants and animals, such as wood, crop residues, and animal waste. In Samoa, biomass is primarily used as a source of energy for cooking and heating predominately in rural households. Firewood remains the most common form of biomass fuel, often collected locally and used in traditional open-fire stoves called umu. Despite the availability of modern energy sources, biomass continues to play a vital role in meeting basic energy needs, especially in communities with limited access to electricity or alternative fuels.

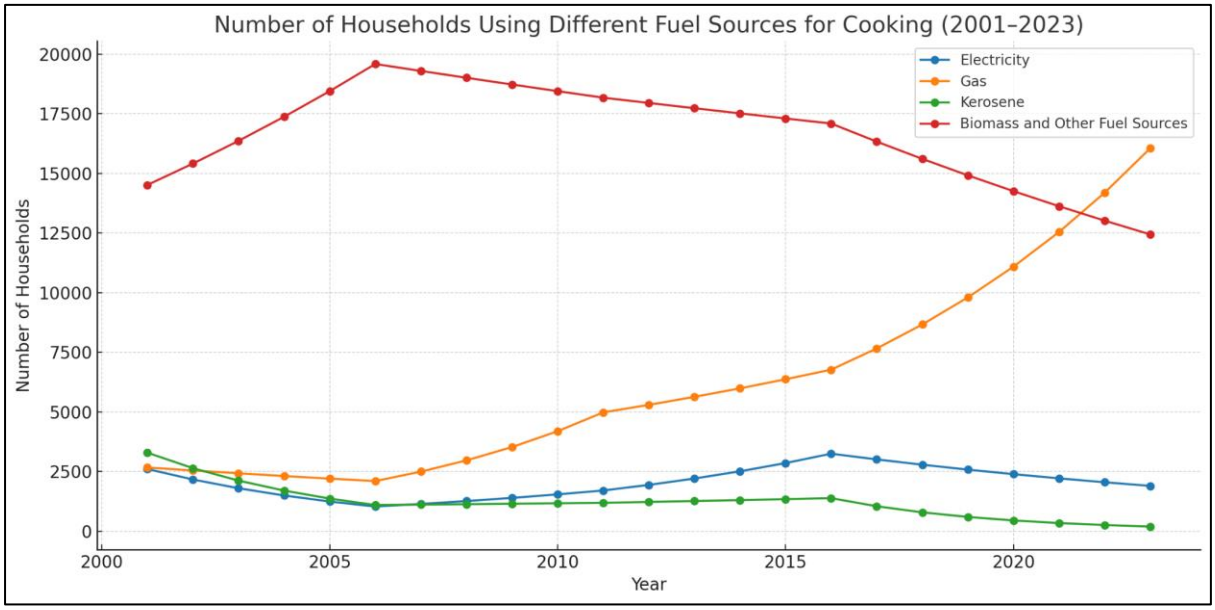


Figure 9: Number of households cooking fuel projection

Biomass energy is the main contributer for renewable energy, however it has decrease from 1,117.8 TJ in 2022 to 1,103.1 in 2023. Based on the SBS census, data shows a significant reduction of household utilizing Biomass & Other fuel sources (*others fuel sources include wood, sawdust, coconuts shells or charcoal*) for heating and cooking, due to households transitions toward the use of LPG which is not renewable given its a petroleum product but is a cleaner form of cooking compare to fire wood.

Table 4: Number of households that use biomass for comparison

Time Period	Biomass Use	% change
2001	14513.0	
2010	18446.0	↑ 27% (from 2001)
2023	**12446**	↓ 33% (from 2010)

Sharp Decline (2010–2023):

- From 18,446 in 2010 →12,440 in 2023 (↓ 6,006 households or 33%)
- Reflects a significant transition away from traditional biomass fuel use.

Recent Stability:

- Between 2022 (13,017) and 2023 (12,440) biomass decreased by ~4.4%.
- Decline continues but at a slower pace, possibly reaching a baseline of essential biomass use.

Biogas Energy:

Biogas is a renewable energy source primarily used for cooking and heating. It is produced through the anaerobic digestion of organic materials—mainly organic waste. This process breaks down the waste and releases a mixture of gases, primarily methane (CH_4). The methane content makes biogas a valuable fuel for household and small-scale energy applications, supporting waste-to-energy initiatives and contributing to sustainable energy development.

Table 5: Newly installed biogas projects for 2023

Site	Island	Year of Completion	Funded	Model Type
Aleisa	Upolu	2023	WSCU/Impress	HomeBiogas 7.0
Magiagi	Upolu	2023	WSCU/Impress	HomeBiogas 4.0
Aai a Fiti	Upolu	2023	WSCU/Impress	HomeBiogas 2.0
Safotu	Savaii	2023	IMPRESS	HomeBiogas 7.0

Biogas Energy for the year 2023

As of 2023, the total revised energy contribution from biogas is estimated at approximately 225.4 MJ. This increase was supported through initiatives funded by the IMPRESS project. The additional 11,180 MJ recorded in 2023 represents a significant increase from the 2,150.8 MJ reported in 2022, highlighting the growing role of biogas in Samoa's renewable energy mix.

Opportunities & Developments 2023

Hydro Expansion: Tafitoala-Fausaga Scheme

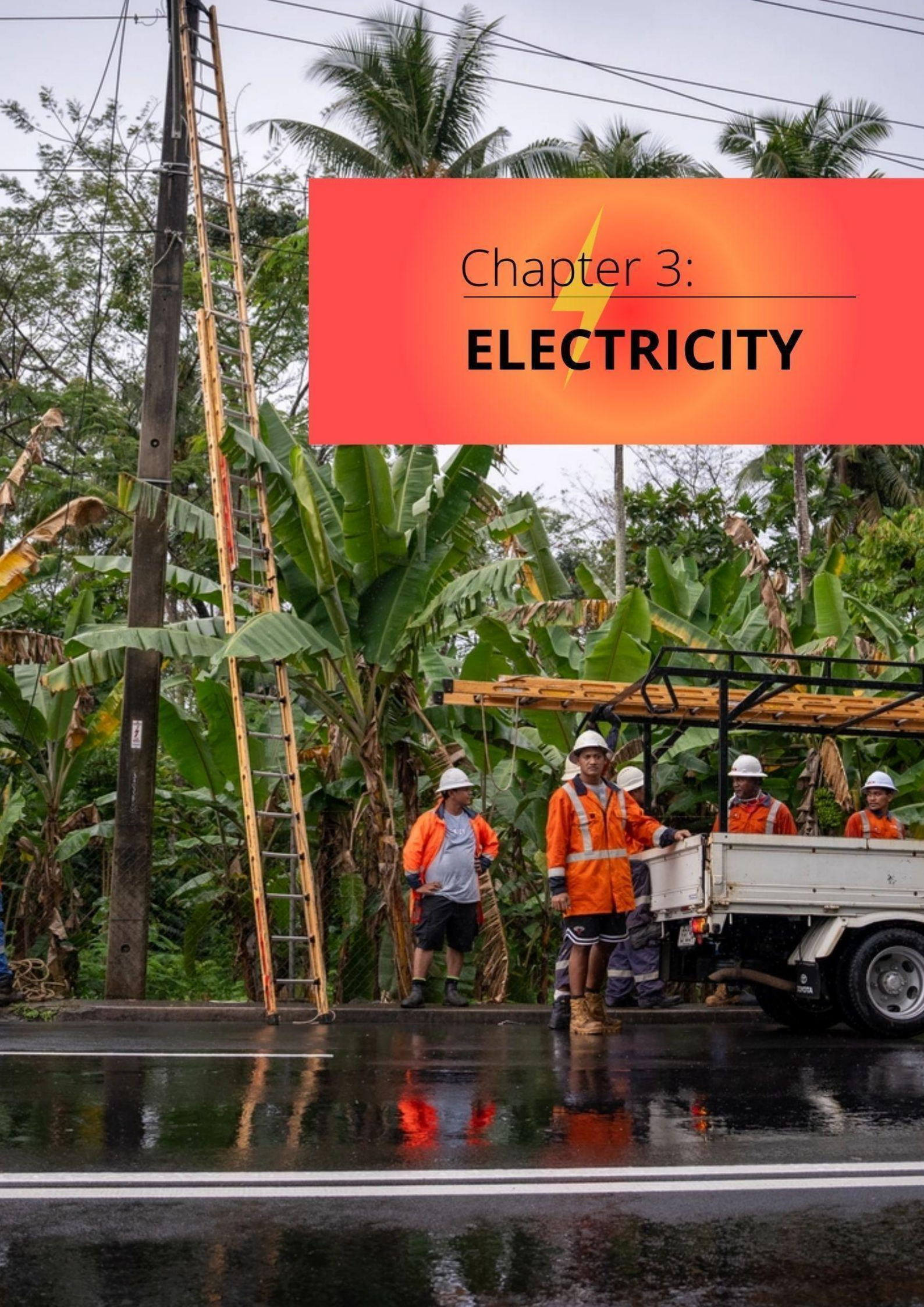
The Tafitoala-Fausaga hydropower plant, integrated into the national grid in 2023, contributed approximately 1,820 MWh of clean electricity—equivalent to a ~2 % increase in hydro's share in Samoa's energy mix.

Solar Storage & Energy Resilience

The Scientific Research Organisation of Samoa (SROS) is developing a nickel-iron solar battery prototype, based on Edison's design, to store solar energy efficiently. This is also reflected in the *Samoa Energy Sector Plan 2023/24-2027/28*

Biogas System Technical Trial

Also under IMPRESS, the government-led Biogas Compression Trials project (funded by UNDP and MNRE) began in early 2023, aiming to compress and store biogas in tanks—potentially creating commercial and micro-enterprise use cases.



Chapter 3:

ELECTRICITY

Chapter 3: Electricity

Electricity is a secondary energy form produced by converting primary sources such as petroleum fuels, hydro, solar radiation, wind, and biomass. The Electric Power Corporation (EPC), a state-owned entity, is responsible for all aspects of electricity generation, transmission, and distribution. The utility is backed by solar IPPs and currently partners with five IPPs and prosumers (through rooftop solar panels). According to the Samoa Bureau of Statistics' Census 2021, electricity access is available to approximately 99% of the population.

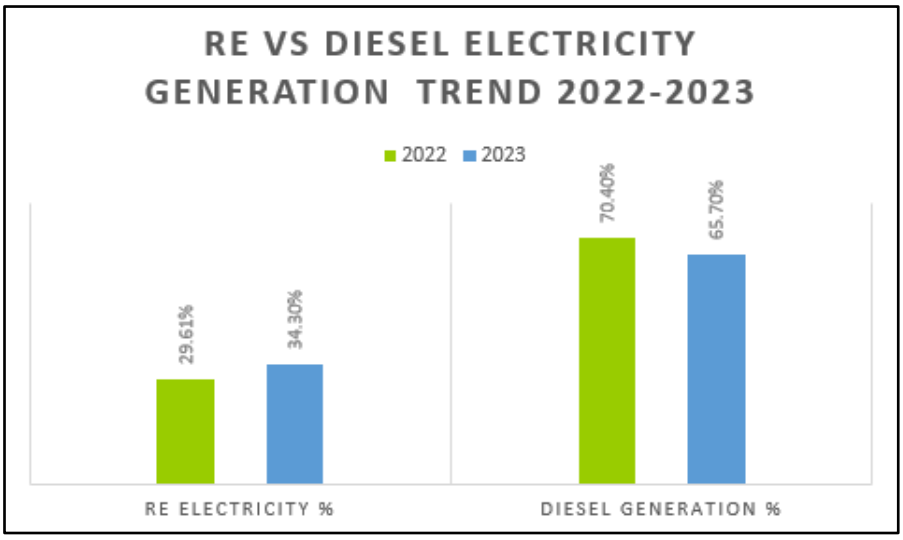
Electricity contribution for 2023:

Table 6: Electricity Generation Overview

Annual Electricity Generation			
		2022	2023
Power generated by Diesel (thermal)	GWh	120.83	136.30
Power generated by Hydro	GWh	28.69	45.60
Power Generated by Solar (EPC)	GWh	2.92	3.10
Power Generated by Wind	GWh	0.19	0.19
IPP - Solar	GWh	18.88	16.63
Net-metering Solar (SPREP)	GWh	0.15	0.13
Biomass Gasification - Afolau	GWh	0.01	0.0
Total power into Grid (GWh)		**171.67**	**191.35**
RE Electricity %		**29.61%**	**34.30%**
Hydro		16.70%	23.80%
EPC Solar PVs		1.70%	1.60%
Wind		0.10%	0.10%
IPP - Solar		11.00%	8.70%
Net-metering Solar (SPREP)		0.08%	0.07%
Biomass Gasification - Afolau		0.00%	0.00%
Diesel Generation %		**70.40%**	**65.70%**

The table presents the yearly electricity output by source for 2022 and 2023. In 2023, renewable energy (RE) contributed 34.3% to the total electricity produced. Compared to 2022, there is a substantial rise in the share of RE in electricity generation for 2023. In addition, the overall power injected into the grid in 2023 has increased by approximately 11% compared to 2022 (171 GWh) due to an increase in hydro generation.

Figure 10: RE Generation vs Diesel Generation 2022-2023



Renewable Energy generation has increased in 2023 compared to 2022 generation

Electricity Generation:

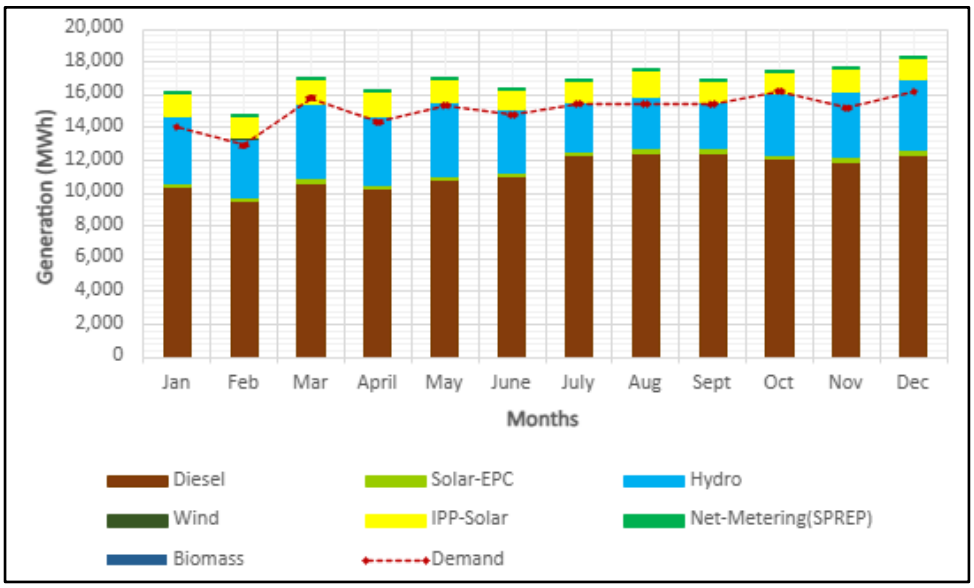
Gross Generation:

Gross generation refers to the total electricity generation, including losses and the station's own uses, for each energy source. These losses are due to the generation, transmission, and distribution of electricity, as well as energy for a power station or plant's various uses.

Gross-Generation 2023:

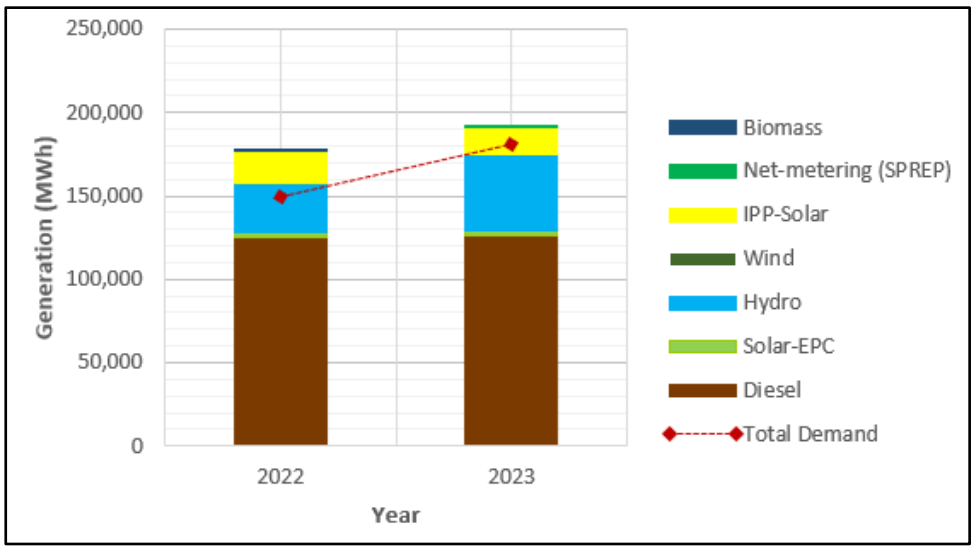
The total gross generation for 2023 from all sources was recorded at 191.35 GWh, which indicates an increase of 8.3% from 2022 (176.76 GWh). Diesel generators generated about 125.7 GWh, and generation from renewable sources accounted for about 65.64 GWh of the total electricity generated in 2023.

Figure 11: Monthly Gross Generation vs Total Consumption 2023



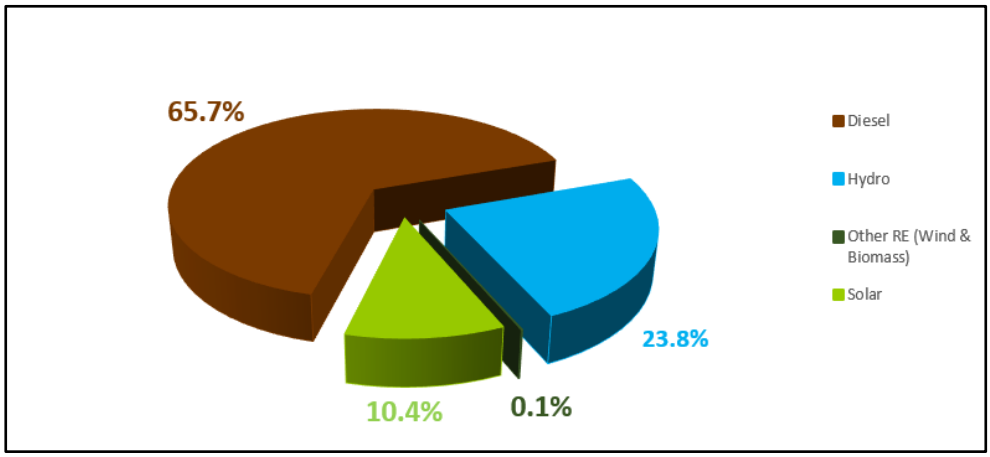
The monthly trend shows a consistent increase in both gross generation from various energy sources and electricity demand throughout 2023. Diesel is a dominant energy source, with its peak generation in September and its lowest in February. The peak demand is most pronounced in March, indicating possible higher usage due to seasonal and economic factors.

Figure 12: Annual Gross Generation vs Total Demand 2022-2025



The annual comparison highlighted the increase in both Generation and Demand for 2023 compared to 2022. The growth in gross generation is largely due to hydro stations' peak generation. In 2022, most hydro stations were offline due to maintenance operations and spare parts installation, hence the huge drop in hydropower generation and peak this year. However, the rise in demand indicates the increased population and economic growth, urban development, etc.

Figure 13: Breakdown of Gross Generation by Source

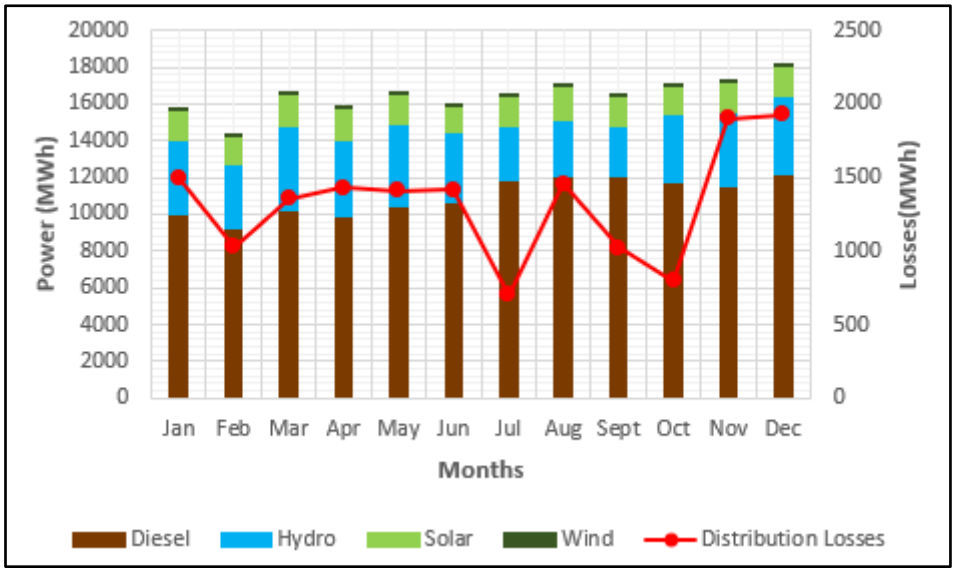


Diesel remains dominant in electricity generation in Samoa, accounting for about 66% (125.7 GWh) of the total gross generation, while hydro is the leading renewable source, producing roughly 24% (46 GWh) of the total electricity and solar power at 10% (. The least contributing RE sources are wind and biomass, which make up only 0.1% (189,300 kWh) of the total gross generation.

Total Power into the Grid (Grid Power):

The total power into the grid refers to the combined amount of electricity supplied to the transmission network from various sources, including diesel power plants and renewable sources (solar, hydro, wind, etc.). It is the total power fed into the grid after subtracting station losses and consumption for each source.

Figure 14: Breakdown of Grid Power by Source vs. Transmission & Distribution losses 2023



The Grid Power monthly trend shows that February has the lowest power input, and December has the highest, approaching 20 GWh. The second half of the year (Jul-Dec) generally had higher power injected into the grid compared to the first half. Thus, the annual power fed into the grid totals 169.71 GWh from all generating sources, and transmission losses totaled at 15.93 GWh

Electricity Generation by Sources:

The country's generators include diesel power plants, hydropower stations, solar farms, as well as smaller wind facilities, ensuring a mix of both conventional and renewable electricity sources.

Petroleum power plants:

(Photo by: Samoa Observer, Fiaga Power Station)

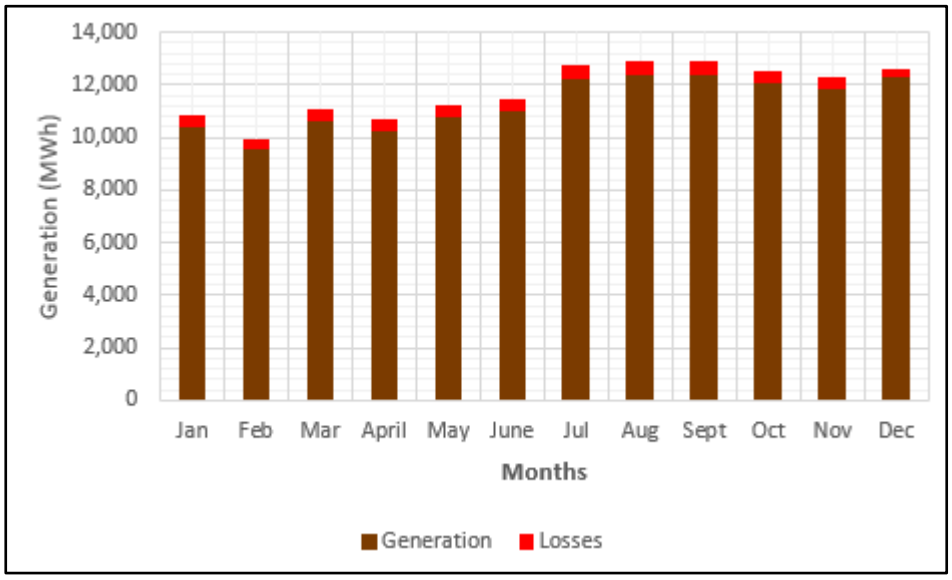
Installed Capacity by Island

As of 2023, the total installed capacity of diesel generators on the island of Upolu is 30.32 MW, with a derated or available capacity of 24.8 MW. This island is served by two main diesel generator stations located in Tanugamanono and Fiaga. In contrast, the island of Savaii is powered by a single diesel generator station in Salelologa, which has a total installed capacity of 8,927 kW and an available capacity of 6,700 kW.

National Diesel Generation

Diesel (thermal) produced about 125.70 GWh in 2023, a slight rise from 125.55 GWh of the previous year (2022). After subtracting losses and station uses, the total electricity from diesel fed into the grid is 121.2 GWh. Diesel supplies roughly 66% of the country's total electricity, making it the main source of power.

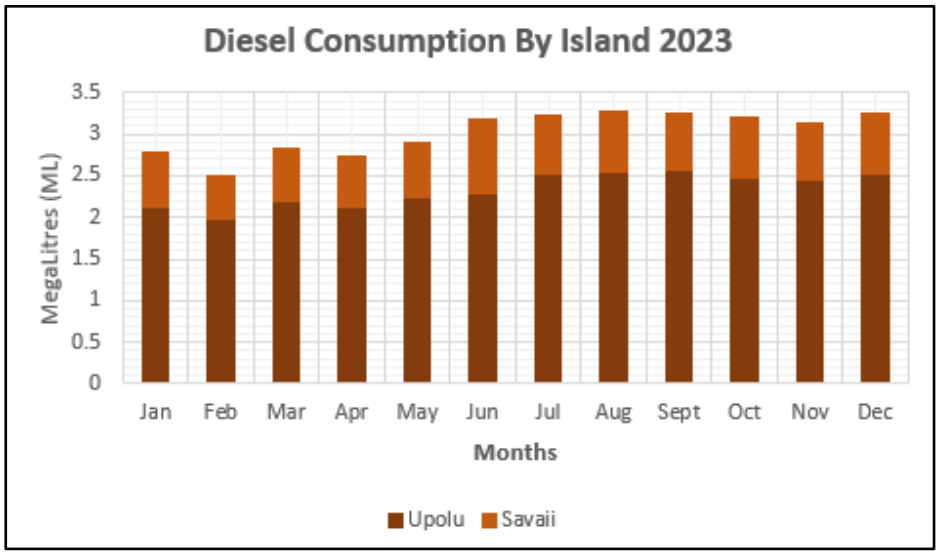
Figure 15: Monthly Diesel Generation vs Own Station Uses & Losses 2023



Diesel generation typically rises throughout the year, with significant increases observed between June and July, as well as between November and December. The peak generation occurs in December, which is the festive season, while the lowest levels are recorded in February. According to EPC, the peak in diesel generation is due to a drop from other sources such as hydro, solar, and wind. Therefore, when diesel generation is low, other electricity sources' generation is high. The total generation losses and station uses is recorded at 4,496 MWh, which is 4% of the total diesel generation.

Fuel Consumption for Generation:

Figure 16: Monthly Fuel Consumed in Generation by Island



Fuel consumption for diesel generators is categorized by island. Diesel use is high during the first month and around July, towards the end of the year. The fuel supplies two main diesel generator stations in Upolu and one on the big island of Savaii. The total fuel consumption of Upolu accounts for about 28.08 MLitres, and for the island of Savaii, with 8.20 MLitres of diesel consumption.

Renewable Sources

Renewable sources of electricity in Samoa include hydropower, solar, wind, and biomass. These sources are naturally replenished and considered sustainable due to their low or zero carbon footprint, making them key components in the transition to cleaner energy systems.

Hydro Electricity

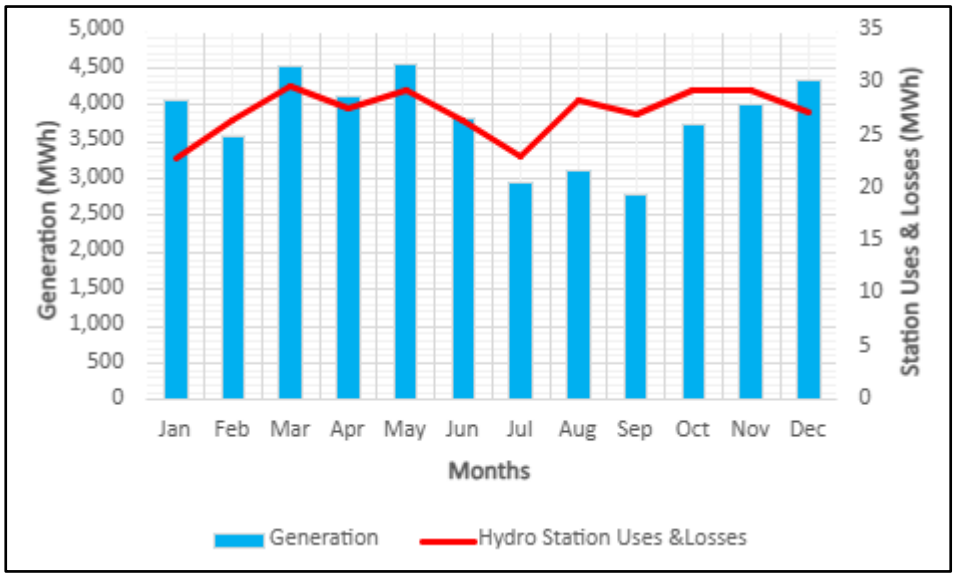
Total Installed Capacity

For the year 2023, the total installed capacity of hydro stations in Upolu is 15,440 kW, with an available capacity (derated capacity) of 15,203 kW. As for Savaii Island, the total installed capacity is 200 kW, with an available capacity of 150 kW.

National Hydro Generation

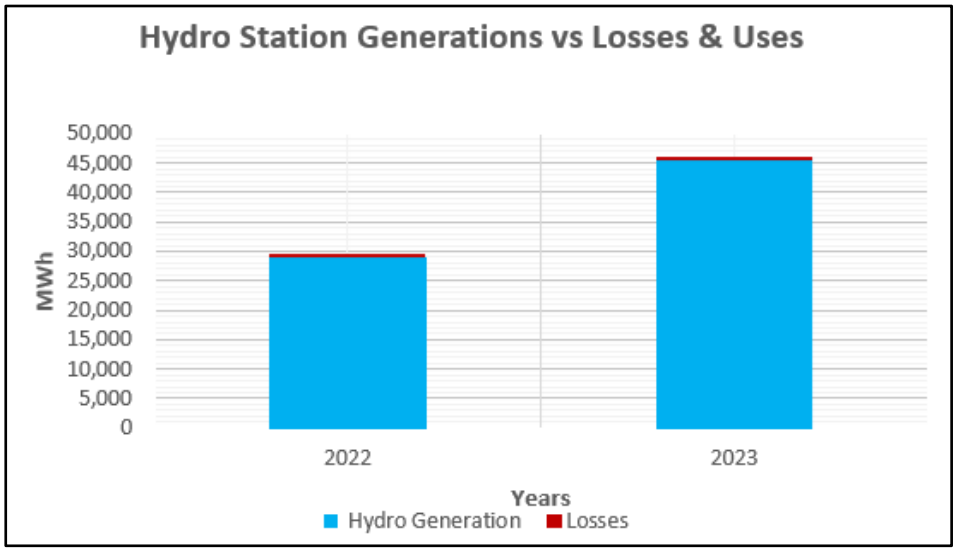
Hydro stations generated approximately 45.6 GWh, which is 57% more than the previous year's generation (2022). After deducting losses and the station's uses, the total hydropower injected into the grid is approximately 45.2 GWh.

Figure 17: Monthly generation vs Station Uses & losses of Hydropower 2023



In 2023, monthly hydropower output peaked in March and May, each exceeding 4,500 MWh. The lowest outputs occurred in July (2,960 MWh) and September (2,790 MWh)**.** This is due to wet (Nov-Apr) and dry (May-Oct) seasons. Losses remained relatively stable across the year, mostly between 26 and 30 MWh, with a peak in March**.**

Figure 18: Annual Hydro Generation vs Losses 2023



The significant increase in hydropower generation, rising over 57% from 2022 to 2023, amounts to more than 16,596 MWh. Despite this surge, losses grew by only 3% compared to the previous year's (2022) losses, reflecting enhanced system efficiency. Also, most hydro stations were back online after 2022's maintenance and transformer replacement operations.

Solar Electricity

Total Installed Capacity for EPC Solar PV systems

In 2023, the total installed capacity of EPC's solar PV panels in Upolu is 2,920 kW, which is also the available capacity. Thus, this is a constant capacity since the installation of EPC-owned solar PV systems. For Savaii, the installed capacity is 250 kW, but its available capacity (de-rated) is 200 kW.

Total Installed Capacity for IPPs and Solar Net Metering &Prosumers

The total installed capacity for all Solar IPPs in Upolu is 10,220 kW for 2023, a decrease from 11,000 kW in 2022. Additionally, SPREP's net-metering system has an installed capacity of 100 kW, which is also its available capacity. The 100 kW rooftop solar PV system at SPREP sells surplus electricity to the national grid.

National Solar Generation

The total generated solar electricity in 2023 is recorded at 19.85 GWh, which is an 11% decrease from the 2022 generation (22 GWh). The decline in solar generation is due to IPPs' solar farms' expansion and maintenance operations. According to EPC, when solar farms are under expansion and maintenance, they would be offline for a while which reflects in the drop of generation. Solar IPPs generated the majority of solar power monthly, ranging from 1.26 GWh to 1.59 GWh. The EPC-owned solars share appears to supplement IPP power with moderate monthly contributions, while SPREP's net metering generates a relatively small amount of about 125.05 MWh.

Figure 19: Monthly National Solar Generation 2023

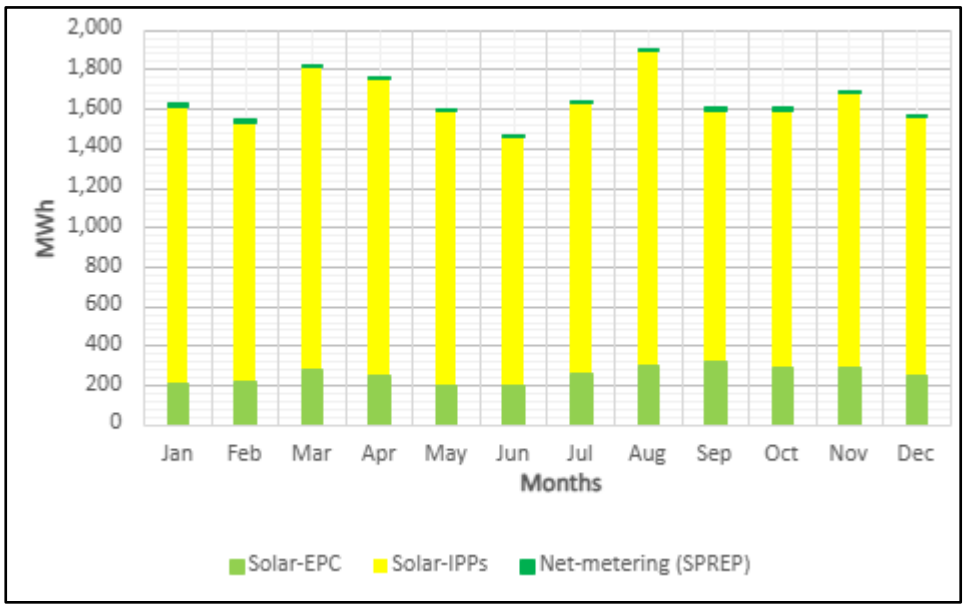


Figure 20: EPC-Solar Monthly Generation vs Station Uses & losses 2023

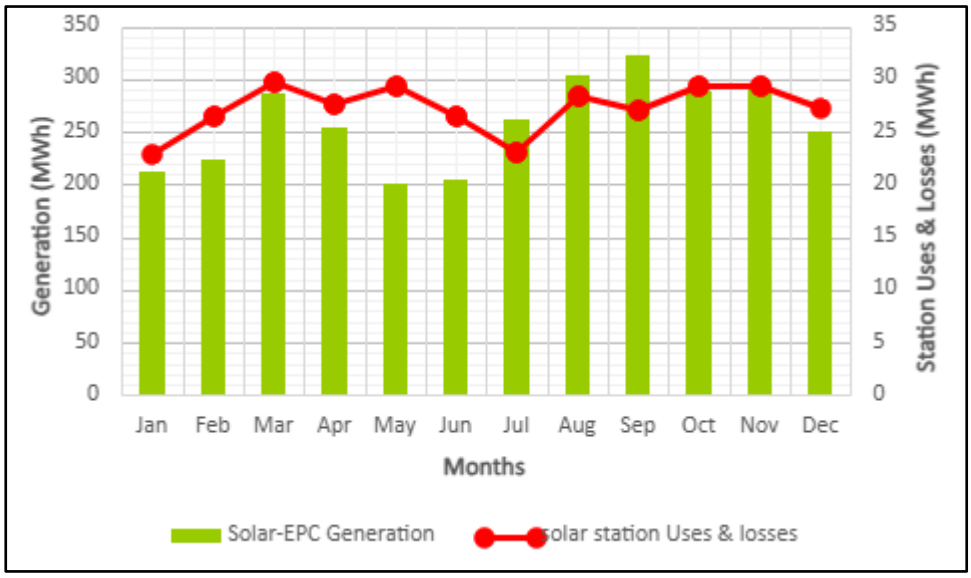
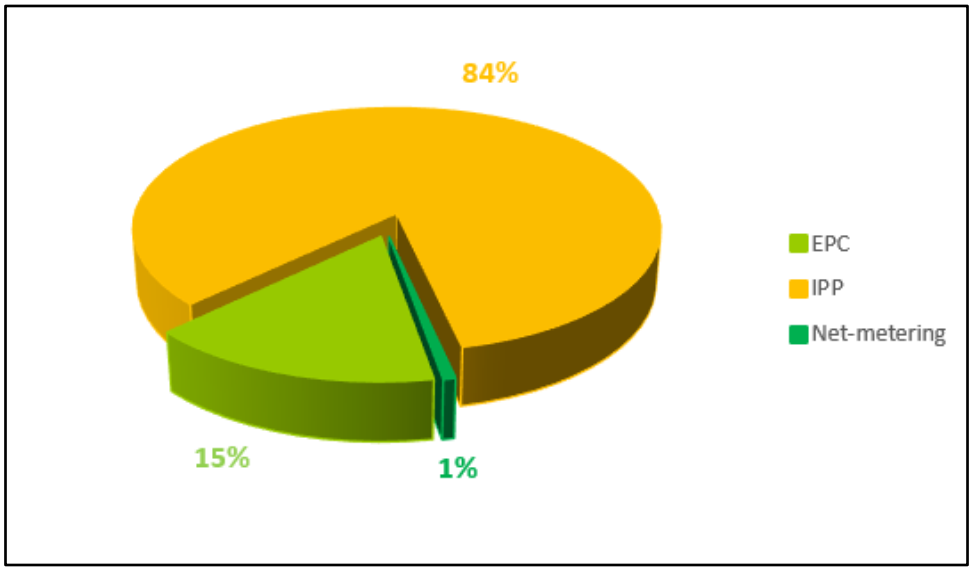


Figure 21: Breakdown of Grid Power Generated by Solar 2023



EPC continues to outsource electricity from IPPs, and it accounts for about 84% of the total solar generation of electricity. The net-metering technology accounts for about 1% of the total, and the rest of the solar generation systems are owned by EPC.

Wind Electricity

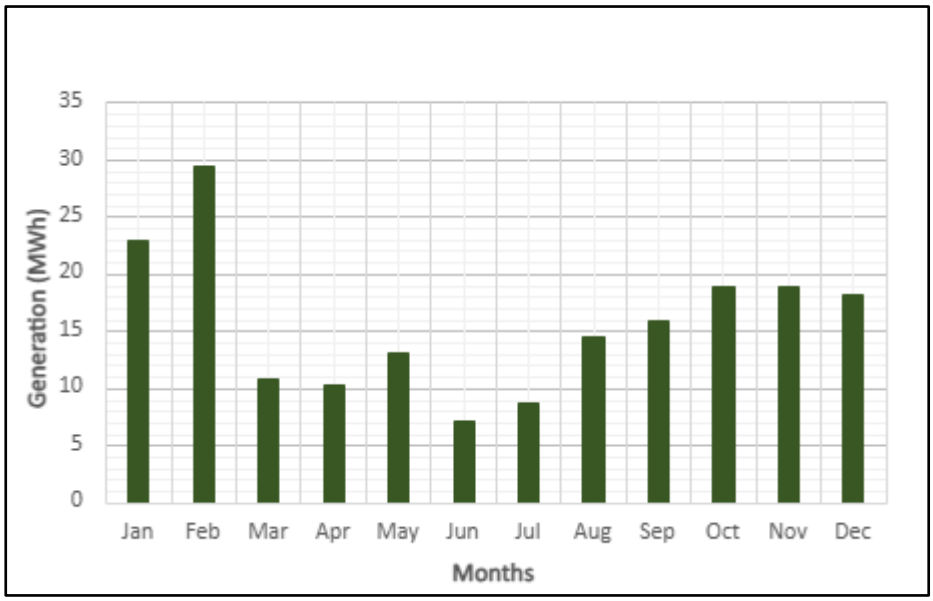
Total Installed Capacity

Samoa's only wind farm on Upolu was installed in 2014, with a total capacity of 550 kW, which has been derated over the years to the current available capacity of 275 kW.

National Generation

The total wind power generated in 2023 is recorded at 189.30 MWh, which is a 1% decline from 2022 generation. There are various causes of the decrease in generation compared to 2022, caused by variation in wind speed throughout the year, seasonal, and climate change.

Figure 22: Monthly Wind Power Generation 2023



Wind power generation is not evenly distributed throughout the year. There are noticeable peaks in the first two months, suggesting a windy or wet season from November to April. Conversely, the lowest generation occurs in mid-year, specifically in June and July, which may be attributed to the dry season and operational downtime. Additionally, there were instances when wind power production was limited due to extended maintenance periods and delays in receiving spare parts from overseas. While wind power production was anticipated to be high during the wet season (November to April) and windy weather, the data reflect otherwise, with only two months showing significant peaks in generation.

Electricity Consumption 2023:

The total electricity demand from the end-use sector reached 181.295 GWh, representing a 21% increase from last year's consumption of 149.609 GWh. The highest electricity consumption is observed in the residential sector, which accounts for approximately 59.36 GWh, just slightly higher than the commercial sector at 58.46 GWh. The sectors with the lowest consumption are schools and hotels. Overall, all end-use sectors have increased their electricity consumption since 2022, highlighting a significant dependence on electricity.

Figure 23: Electricity Consumption Trend 2022-2023

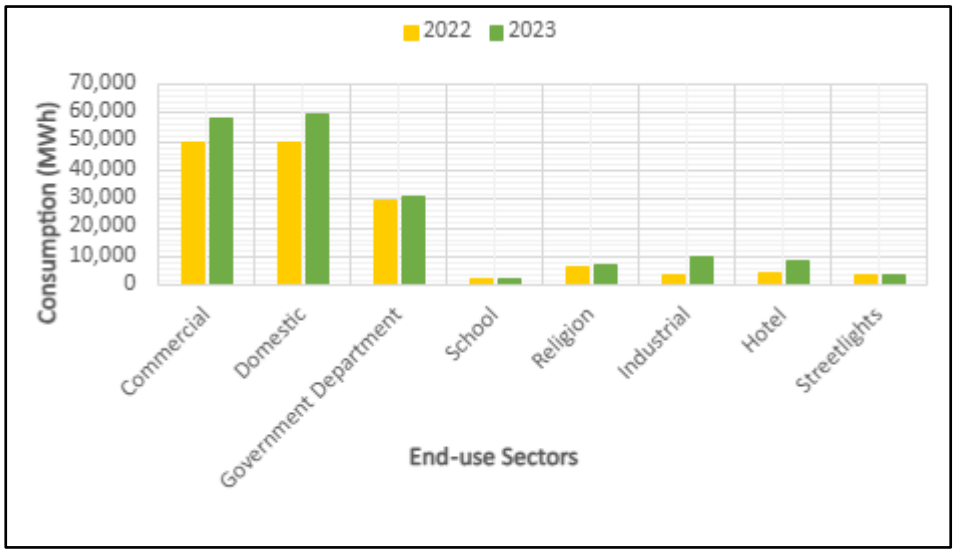
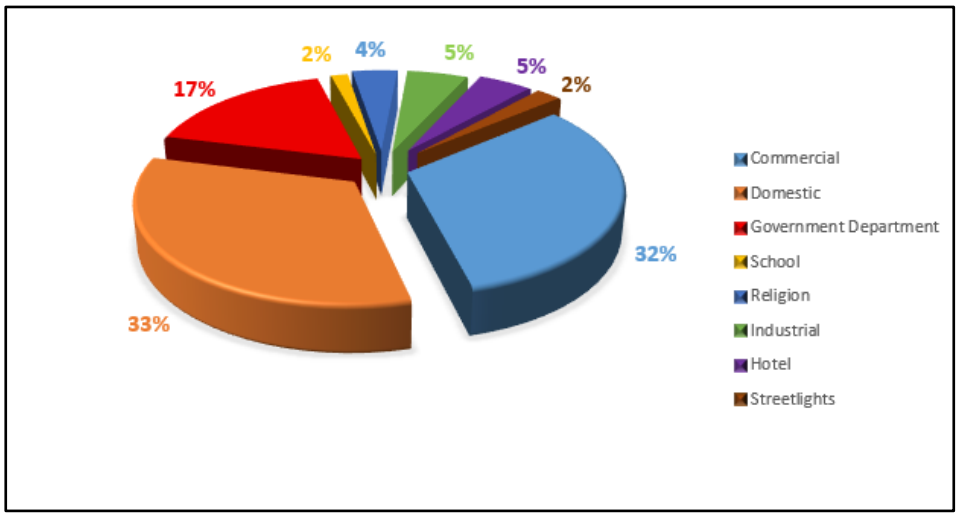


Figure 24: Breakdown of Grid Electricity Consumption by End-use Sector

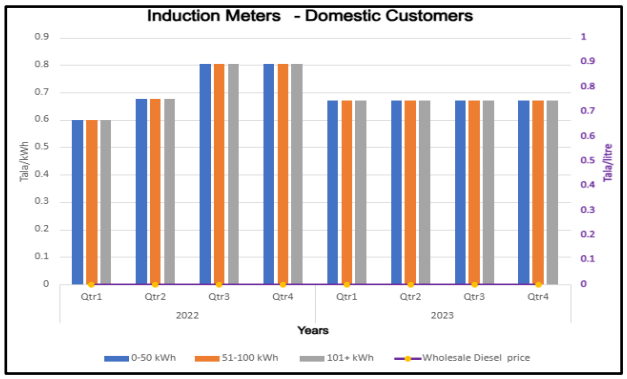


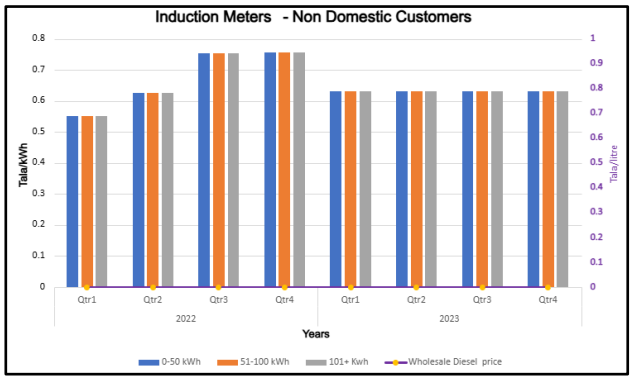
Tariff Rates & Fuel Surcharges

According to EPC, electricity tariff rates generally fluctuate based on changes in fuel costs. However, in 2021, a 20% reduction in tariffs was implemented following a Cabinet directive effective from November 10th. In 2023, this 20% reduction for government ministries, state-owned enterprises, and the private sector was lifted. Nevertheless, domestic customers continue to benefit from the 20% reduction, which remains unchanged for them. Additionally, the Cabinet order states that tariffs will remain fixed unless reviewed; therefore, all electricity users are currently paying a fixed tariff. The tariffs for both domestic and non-domestic customers, categorized by meter types (Induction and Prepayment) for 2023, are detailed in Annex 2.

Induction Meters

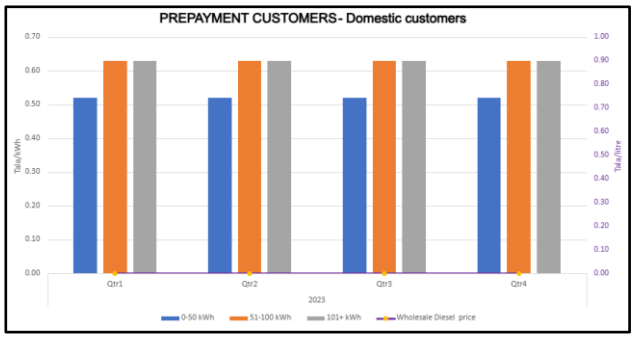
Figure 25: Induction Meters Tariff rates (Domestic &Non-Domestic) 2022-2023

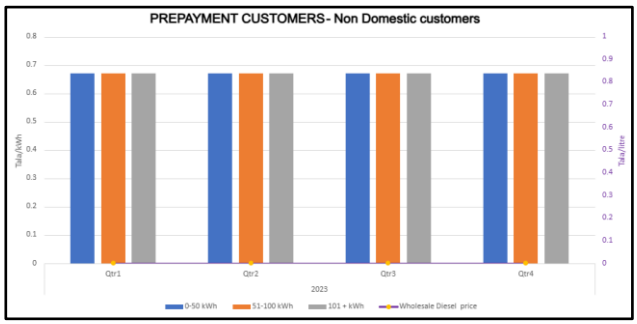




Prepaid Meters

Figure 26: Prepayment Meters Tariff Rates (Domestic & Non-Domestic) 2023





Opportunities & Developments 2023

- **Renewable Developments:**
  - Hydro plant expansion: Tafitoala-Fausaga Scheme: Ongoing enhancements to hydro plants are aimed at increasing efficiency and capacity.
  - Wind mast installation for Assessment: Wind masts have been installed at Mt. Lepue as part of a wind assessment initiative. This includes additional masts at various sites, such as the Afulilo hydro site, to collect data at different heights. The goal is to better understand the potential for wind energy.
  - Electric vehicles Assessments & Initiatives: Under the CAP-IT project, funded by the Government of Japan and implemented by UNDP in collaboration with the Government of Samoa, efforts are underway to establish EV charging infrastructure. This project includes public awareness campaigns, capacity building, and the upgrading of selected automotive workshops for electric vehicle maintenance.
  - Installation of Stand-alone solar PV systems: The Electric Power Corporation (EPC) initiated the installation of stand-alone solar photovoltaic systems to provide electricity to low-income families in rural areas and off-grid homes. Each installed system has a capacity of 1 kW.

- **Infrastructure development & Grid upgrades**
  - Installation, Commissioning, and Replacement of the Fale o le Fee (FOF) Hydro Plant Power Transformer: Operations started in 2022 and were completed in early 2023
  - Battery Storage Project: A significant battery storage project, with a capacity of 196 million MWh, is being developed to enhance grid flexibility and provide reliable backup power.

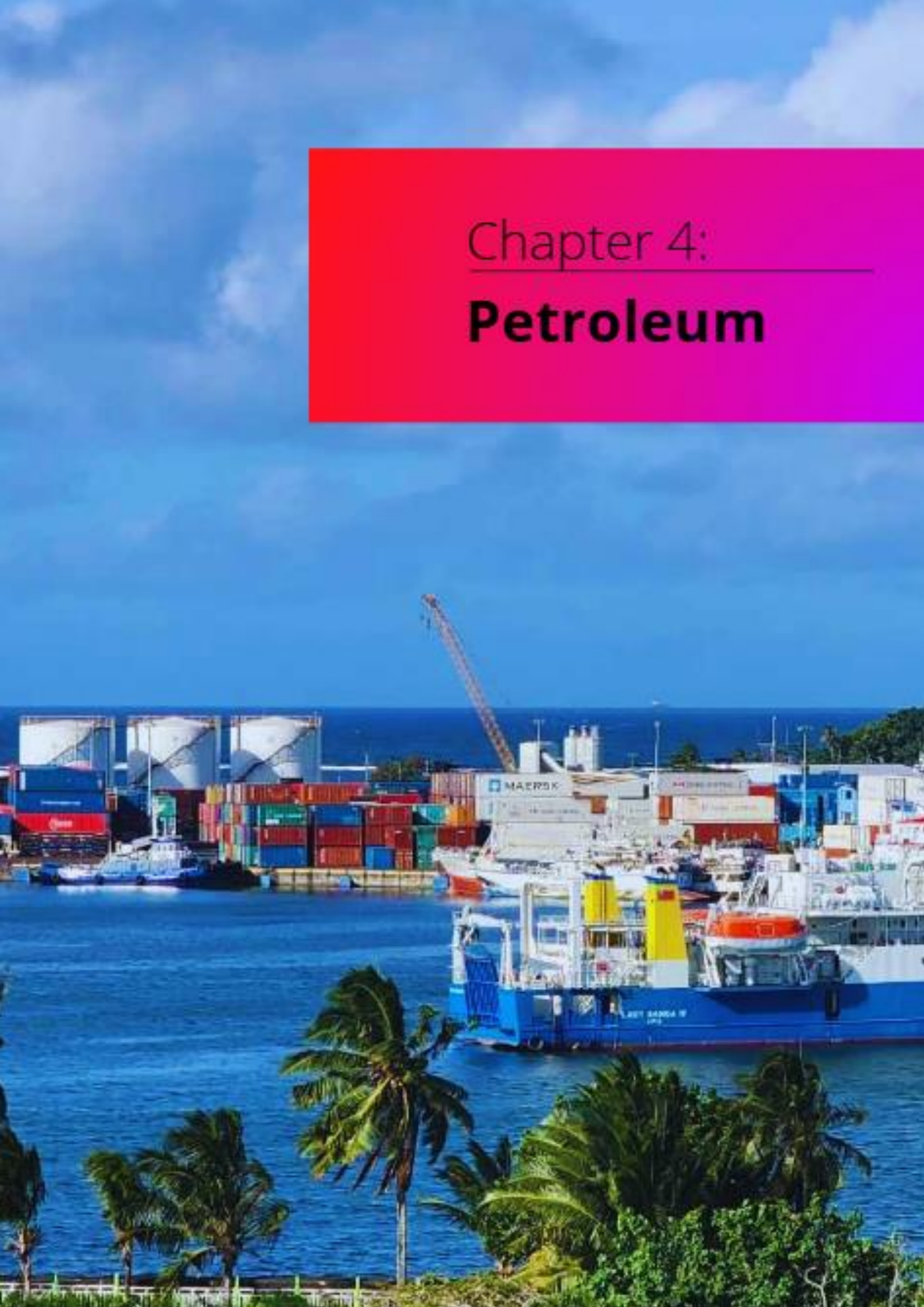
- **Tariff rate Adjustments:**
  - A 20% reduction in tariff rates was lifted, applying to all non-domestic consumers. Domestic Consumers will continue benefiting from a 20% reduction, and all consumers will pay fixed rates that commenced on November 1st, 2023.

- **Internship & Apprenticeship Scheme:**
  - This ongoing program focuses on providing internships for scholarship students during breaks at universities and other educational institutions. It also partners with local and international universities to enhance research and professional development opportunities.

- **Partnership with APTC for training Opportunities:**
  - An MOU was signed on March 17th, 2023, as part of a broader initiative involving other government institutions. This partnership aims to provide training for EPC staff members in various areas, including construction, work health and safety, and digital literacy, to enhance their skill sets.

Chapter 4:

Petroleum



Chapter 4: Petroleum

Petroleum remains the primary source of energy in Samoa, meeting the country's fuel demand despite logistical and cost-related challenges associated with its remote geographic location. The range of imported petroleum products includes Unleaded Petrol (ULP), Automotive Diesel Oil (ADO), Dual-Purpose Kerosene (DPK), Liquefied Petroleum Gas (LPG); which consists of propane, butane, and LPG mixed, as well as lubricants and greases to support various transport and industrial activities.

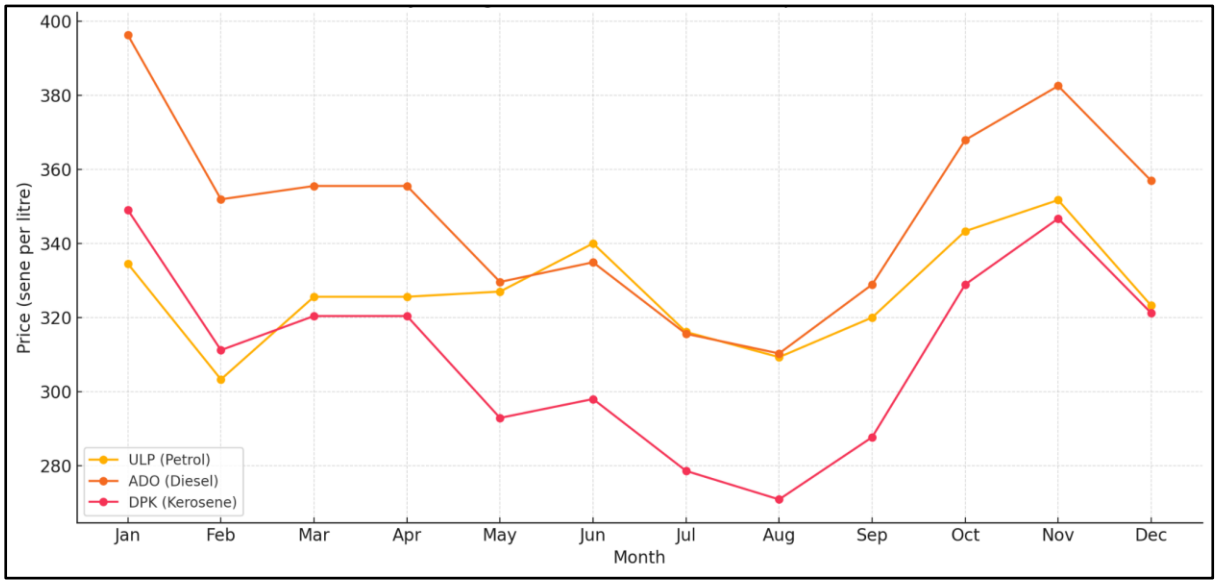
Petroleum Prices

Table 7: Price Summary for 2023

Fuel	Average Price (sene/liter)	Highest Price (Month)	Lowest Price (Month)
ULP	326.1	351.7 (Nov)	303.3 (Feb)
ADO	347.6	396.2 (Jan)	310.3 (Aug)
DPK	312.7	349.0 (Jan)	270.9 (Aug)

- ULP (Unleaded Petrol) prices remained relatively stable throughout the year, fluctuating between 303–352 sene/litre.
- ADO (Diesel) showed a notable price drop from January (396.2) to mid-year (August low of 310.3), indicating a 22% decrease before climbing again toward year-end.
- DPK (Kerosene) followed a similar trend to diesel, with its highest price in January and lowest in August, showing a gradual decline in the first 8 months before rebounding.

Figure 27: Trend of Samoa's monthly fuel prices in 2023



ULP (Petrol) stayed fairly stable with a slight mid-year dip, while ADO (Diesel) peaked in January, then dropped significantly by August before recovering. For DPK (Kerosene) followed a similar downward trend as diesel, with the lowest point in August.

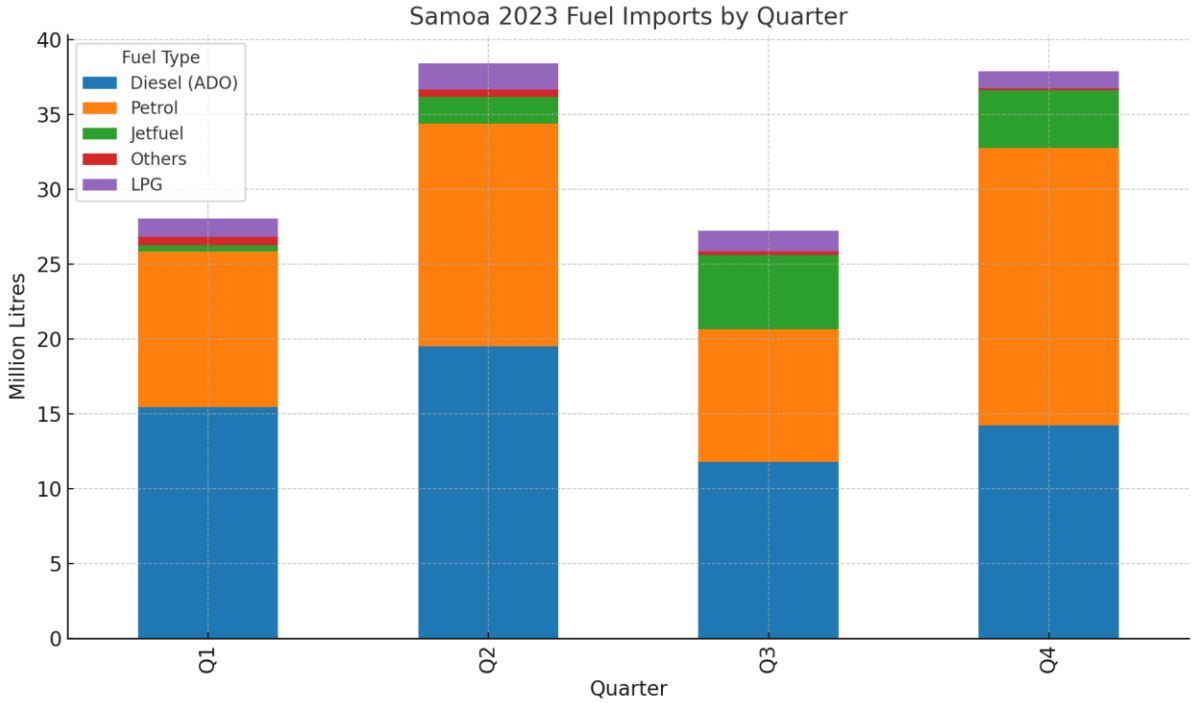
Possible Causes for the spike in petroleum prices from October to December 2023 was primarily caused by:

- Rising global crude and refined product prices, as reflected in Singapore's MOPS data
- Supply constraints from OPEC+, pushing international rates upward
- Local cost pressures: rising shipping and freight costs, as well as currency depreciation, which are increasing the expenses associated with imports.

Imports

Samoa's petroleum storage infrastructure has the capacity to hold up to two months' worth of fuel supply, providing critical flexibility to manage variations in tanker arrival schedules. The Petroleum Product Supplies (PPS) typically places fuel orders three months in advance, with shipment details reviewed and confirmed prior to loading. However, fuel tanker arrivals are not fixed to a set number of days per month. As a result, some months may see two shipments, while others may receive none, depending on supply logistics and shipping schedules.

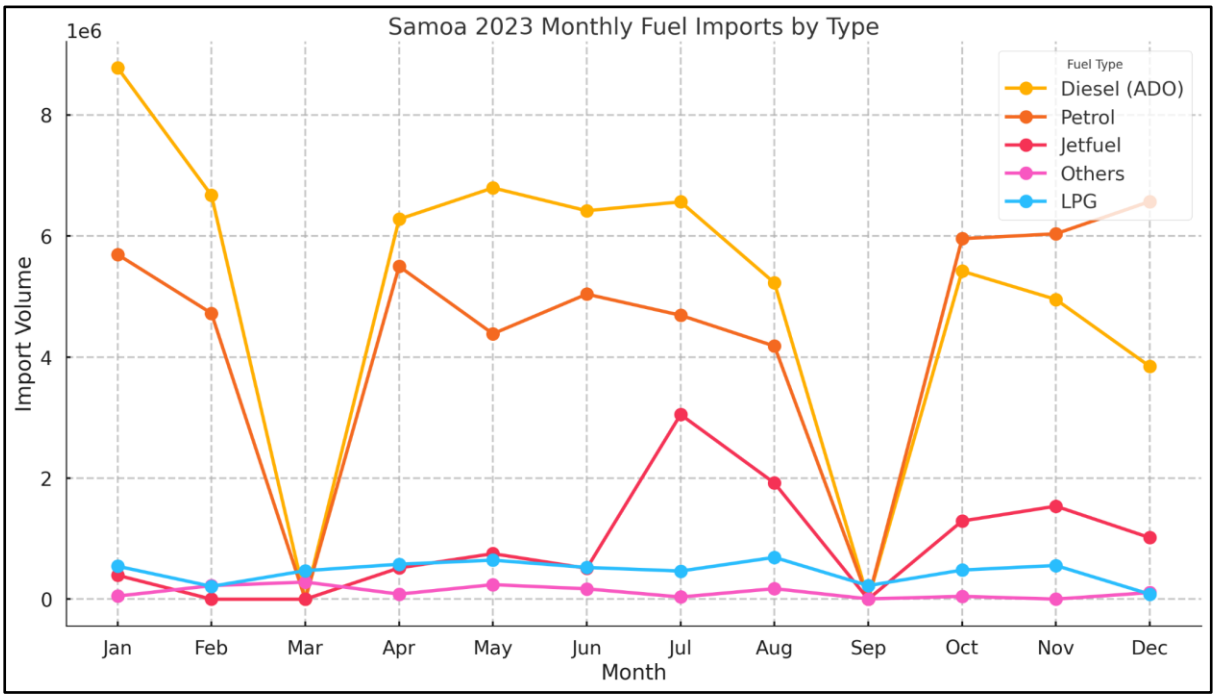
Figure 28: Samoa's Fuel Imports by quarter



- Diesel (ADO) is consistently the largest fuel import, the peak is observed in Q2 (19.49M), followed by Q4 (14.2ML).
- Unleaded Petrol (ULP) saw its highest spike in Q4 (18.56ML) — likely driven by end-of-year activities; however, the first quarter was the lowest (10.4ML).
- For Dual Purpose Kerosene (DPK) or Jet fuel there is a notably peaked in 3rd Qtr (4.97ML), aligning with the travel or tourism season, but nearly absent in Q1 (only ~395,000L).
- Liquid Petroleum Gas (LPG) Fairly steady across quarters, highest in 2nd Qtr (1.75M), possibly due to seasonal demand (e.g. cooking/festive preparations). Slight decline in Q4 (1.12ML).

- Others are petroleum products but non-energy (e.g. lubricant oil, Bitumen and etc) however it has very minor share overall, the highest is recorded in 1st Qtr, then declines each quarter.

Figure 29: Trends of Samoa's Fuel Imports 2023



- Diesel and Petrol follow similar patterns, with drops in March and September (no imports recorded).
- Jet Fuel peaks in July and August, indicating high aviation activity.
  LPG remains relatively stable with minor fluctuations.
- Others category is minimal across all months.

Re-exports

In 2023, Samoa continued its vital role as a regional supplier by re-exporting various petroleum products to Tokelau. The total volume re-exported reached approximately 1.64 million litres, covering a range of fuel types including diesel, petrol, LPG, and specialized products like bitumen.

Table 8: Samoa 2023 Re-exports to Tokelau

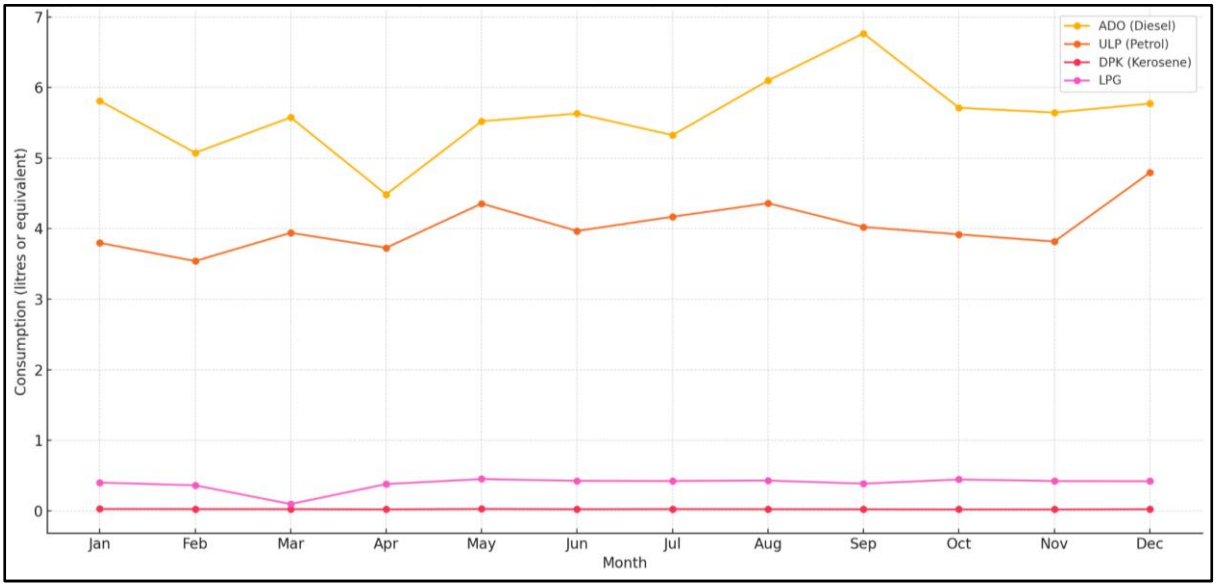
Fuel Type	Re-export Volume
Diesel (ADO)	1,338,000.0
Petrol (ULP)	242,000.0
LPG	9,835.1
Others (non-energy use)	25,093.4
Bitumen	24,485.5

The dominant fuel type was Diesel (ADO), making up over 80% of total re-export volumes, highlighting its critical use for Tokelau's electricity generation and maritime transport. Re-exports of Petrol (ULP) remained consistent throughout the year, peaking slightly in the fourth quarter, likely aligned with increased mobility or seasonal demand in Tokelau.

LPG continued to be re-exported in small but consistent quantities for household and cooking needs. Additionally, the "Others" category — representing non-energy use fuels and bitumen showed regular shipments, indicating ongoing support for Tokelau's infrastructure development and industrial applications.

Consumption by Fuel Type:

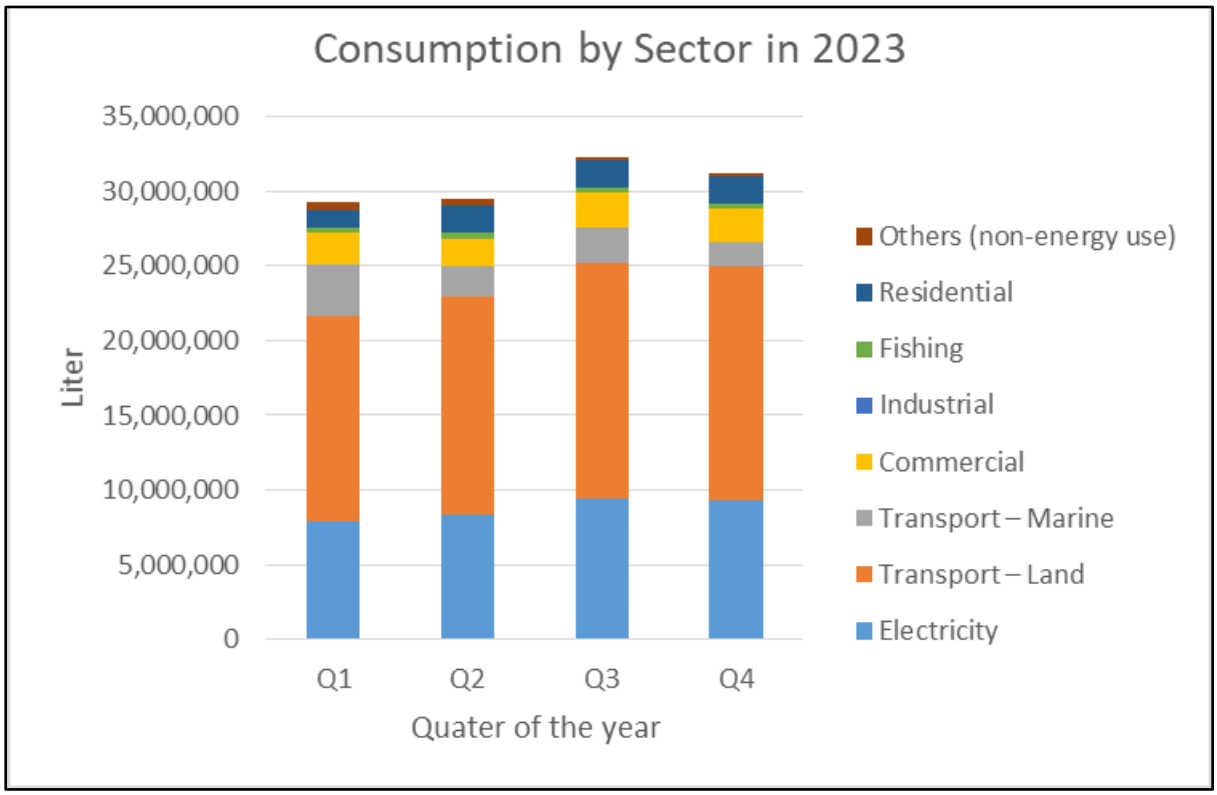
Figure 30: Monthly Petroleum Consumption by Fuel Type in Samoa 2023



In 2023, Diesel (ADO) was the dominant fuel type consumed in Samoa, totalling over 67 million litres. Consumption peaked in September, aligning with higher activity periods across transport and industrial sectors, while the lowest was in April. Petrol (ULP) ranked second, with an annual total of over 47 million litres, driven by its use in private vehicles and light commercial transport. The highest consumption was recorded in December, suggesting increased fuel use during the festive period, with the lowest in February. Kerosene (DPK) usage was relatively low and stable, totalling just under 300,000 litres for the year. May saw the highest demand, while October recorded the lowest. LPG consumption reached over 5.1 million litres, supporting household and commercial cooking needs. While May marked the peak in usage, March saw a significant dip—likely influenced by shipment timing or supply gaps.

Consumption By End-Use Sector:

Figure 31: Quarterly Energy Consumption by Sector in Samoa (2023)



In 2023, Transport – Land remained the largest energy-consuming sector across all four quarters, reflecting Samoa's continued reliance on road transport for the movement of goods and people. Energy consumption in this sector peaked in Q3 at over 15.7 million liters.

The Electricity sector was the second-highest consumer of energy, with relatively stable consumption throughout the year. It recorded a gradual increase from 7.9 million liters in Q1 to a peak of 9.4 million liters in Q3, indicating growing electricity demand across residential, commercial, and institutional users.

Transport – Marine energy use fluctuated more significantly, with the highest consumption in Q1 and Q3, corresponding with seasonal shipping and fishing patterns, and dropping notably in Q4 to its lowest level for the year.

The Commercial sector also demonstrated variable consumption, peaking in Q3 at around 2.4 million liters, suggesting increased business or tourism-related activity during this quarter. The Residential sector showed steady consumption, averaging approximately 1.65 to 1.84 million liters per quarter. This consistency indicates ongoing household reliance on LPG, kerosene, and electricity for cooking, lighting, and small appliances. Fishing and Others (non-energy use) maintained smaller but consistent consumption levels, while Industrial use was negligible, with only minor activity recorded in Q1 and Q3.

Opportunities and Developments:

Developments of 2023:

- **November 1, 2023:** Samoa commenced a Bulk Fuel Supply Agreement with **ExxonMobil**

Infrastructure:

- Sogi Tank 7 construction (in-progress) In progress

Enhanced Petroleum Governance:

Oversight by the Ministry of Finance's Petroleum Management Unit the Petroleum Taskforce ensures improved monitoring of petroleum pricing, HSSE standards, and energy efficiency protocols across fuel operations

Petrol Station Compliance & Capacity:

Compliance with health, safety, security and environment (HSSE) standards among petrol stations reach up to 70% compliance overall.

Chapter 5:
End-Use Sector

Chapter 5: End-use Sector

The end-use energy sector in Samoa encompasses the final consumption of energy by various users, including Transport, Commercial & Industries, Residential, Community & Social Sector and Fisheries. Understanding energy use at this level is essential for identifying consumption patterns, improving efficiency, and supporting sustainable development goals.

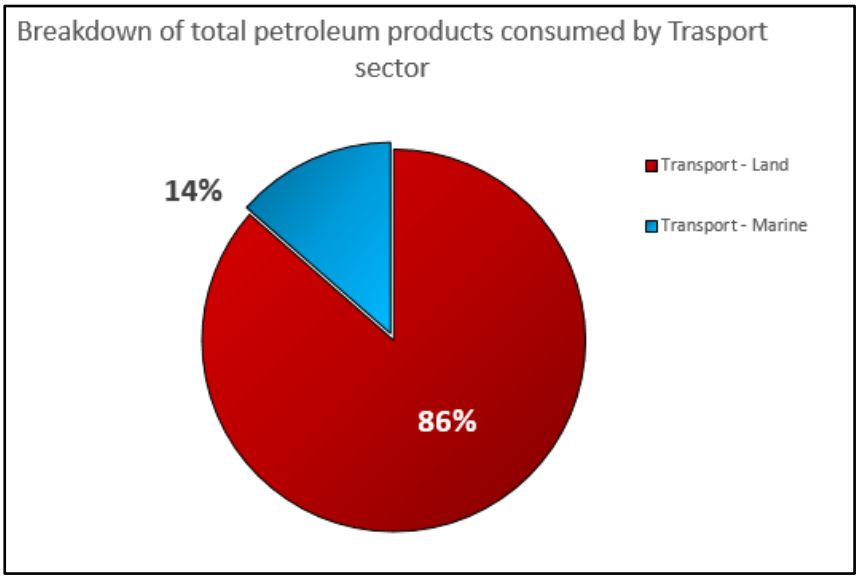
Transport sector:

In Samoa, transportation is essential for enabling the efficient and reliable movement of people and goods across the islands. Samoa's transport sector is primarily made up of land transport—comprising light and heavy vehicles used for public and private purposes and Marine Transport inter-island ferry services, which are crucial for maintaining connectivity between Upolu, Savai'i, and other smaller islands. Lastly, if the are domestic flight between Upolu and Savaii.

Transport consumption:

The data reflects solely Samoa's domestic energy consumption. According to official frameworks like the Samoa Energy Sector Plan, international air and sea transport are excluded from the domestic transport sub-sector as they occur outside Samoa's borders

Figure 32: Petroleum Consumption by Transport Sector



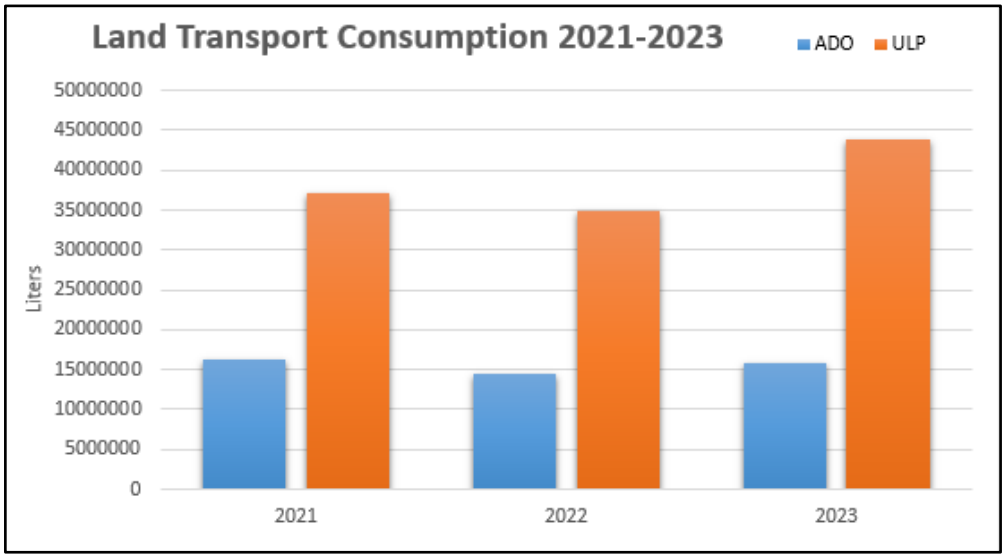
The pie chart shows the 2023 petroleum consumption by the transport sector in Samoa. It clearly illustrates the following

- Land transport dominates fuel use, consuming nearly six times more than marine transport.
- This reflects Samoa's heavy reliance on road vehicles (cars, trucks, buses) for domestic movement of people and goods.
- Marine transport usage includes fuel for small inter-island ferries, fishing vessels, and private boats.

Land Transport: Consumption

Overall, by 2023, land transport fuel consumption increased significantly, especially in ULP, indicating heightened mobility and possibly increased dependence on private vehicles.

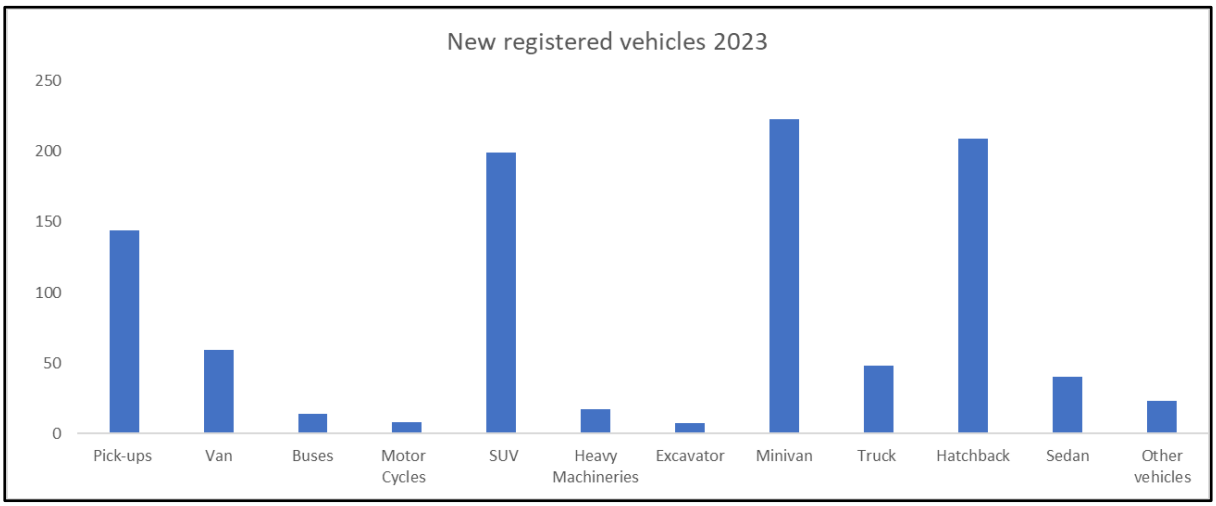
Figure 33: Land Transport Consumption trend by fuel 2021 to 2023



The land transport sector in Samoa has consistently relied on two primary fuel types: Automotive Diesel Oil (ADO) and Unleaded Petrol (ULP). Over the three years from 2021 to 2023, notable fluctuations in consumption reflect changes in vehicle activity, economic conditions, and possibly improvements in fuel efficiency or the impact of policy changes.

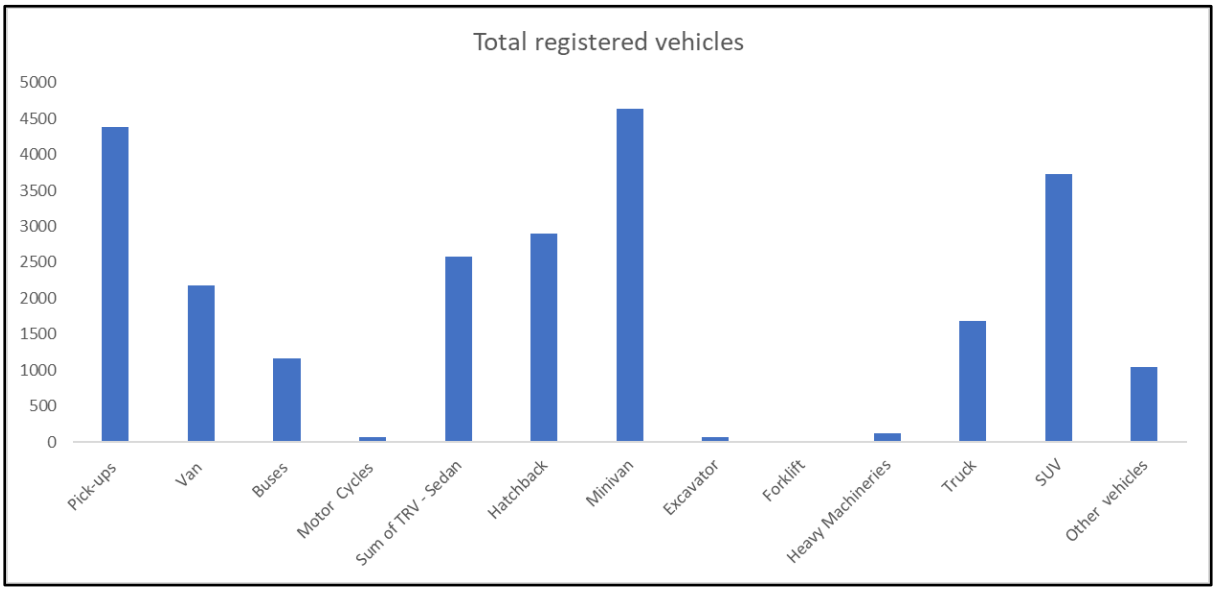
- ADO Consumption saw a decline in 2022 from 16.4 million litres in 2021 to 14.4 million litres, before rising again to 15.9 million litres in 2023. This dip in 2022 may be attributed to pandemic-related disruptions or shifts in transport patterns.
- ULP Consumption showed a more pronounced increase, from 37.3 million litres in 2021 to 43.9 million litres in 2023. The steady growth suggests a rising number of petrol-fueled vehicles or increased travel activity, particularly in the post-COVID recovery period.

Figure 34: New Registered Vehicles by Type in 2023



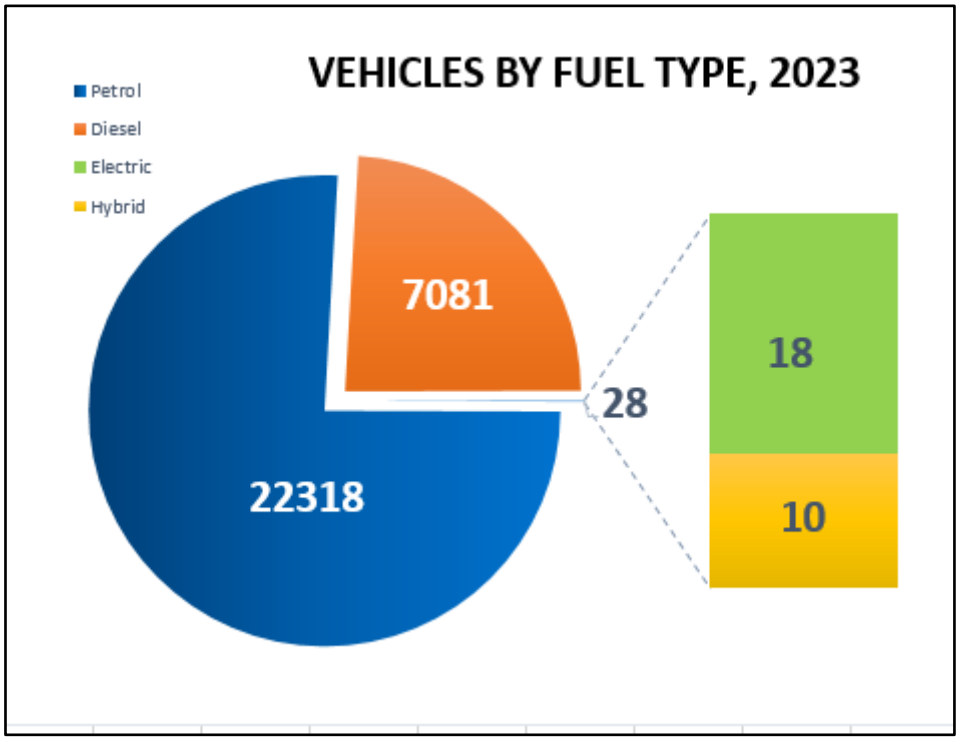
The data suggests a consumer preference toward compact family vehicles (Minivans, Hatchbacks, SUVs & pick-ups). Commercial and industrial vehicles (like trucks, heavy machinery) form a smaller proportion. The near-zero registrations for taxis and private cars may reflect a shift in mobility trends or gaps in the dataset.

Figure 35: Total Registered Vehicles by Type in 2023



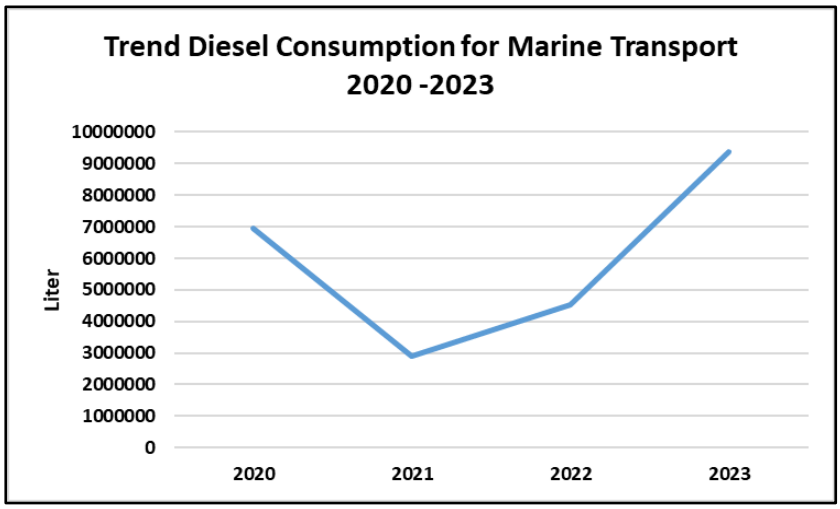
The most common vehicle types are Minivans (14.4%), Pickups (13.6%), and SUVs (11.6%), which are the most popular vehicle Categories; these types reflect Samoa's demand for versatile family or utility vehicles. Passenger Vehicles Dominate: Combined Sedans, Hatchbacks, SUVs, and Minivans make up 43% of all registered vehicles, showing a preference for private and family transport.

Figure 36: Total Registered Vehicles by Fuel Type in 2023



Marine Transport: Consumption

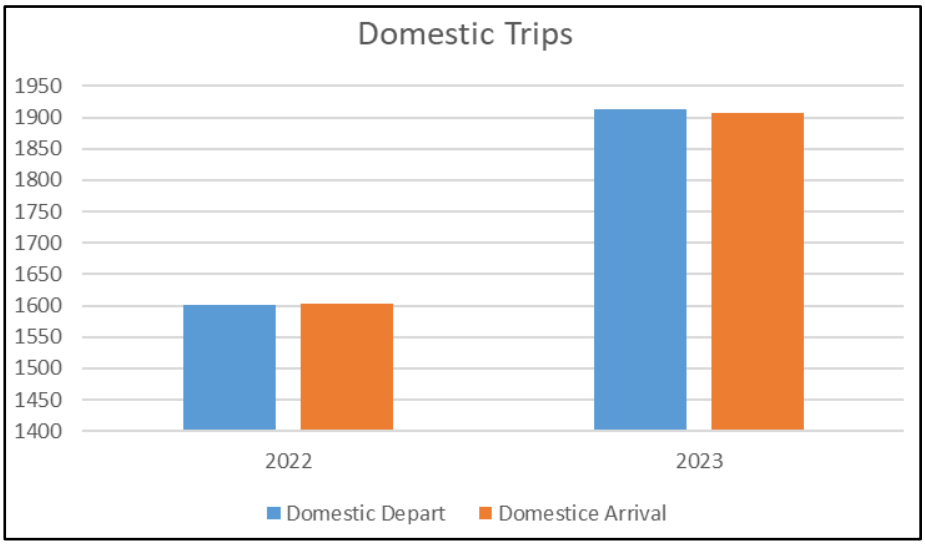
Figure 37: Total Diesel Consumption from Marine Transport



Total consumption: 9,362,373 litres of diesel were used by the marine transport sector in 2023. This represents a doubling of fuel use compared to 2022, and more than triple the usage in 2021.

In Summary, 2021 marked a significant dip, possibly due to the pandemic's impact on travel and trade. A strong recovery followed, peaking in 2023 at the highest level in the 4-year period.

Figure 38: Number of Domestic Inter-Island Trips 2022-2023



The data in the chart represents the arrival and departure of domestic vessels at the Mulifanua wharf only, note that a vessel arrives from Savai'i, while the other vessel stationed at Mulifanua departs. This explains the slight difference between domestic arrivals and departures.

Possible drivers of the increase could include:

- Expansion of fishing or inter-island shipping activities,
- Resumption of full marine operations post-COVID-19,
- Increased freight or transport services due to economic rebound.

Opportunities and Developments 2023:

- **World Bank Climate-Resilient Road Upgrades**
  Upgraded West Coast Road under the Pacific Climate Resilient Transport Program, including sea-wall protection and improved drainage for cyclone resilience and community access.

- **Green Port Initiative Launched**
  In November 2023, Samoa, supported by the ADB and Royal HaskoningDHV, launched the Green Port Initiative at Apia Port to boost sustainability, energy efficiency, disaster preparedness, and gender inclusion. A notable milestone: Ioana Paulo Avefua became Samoa's first female tugboat captain.

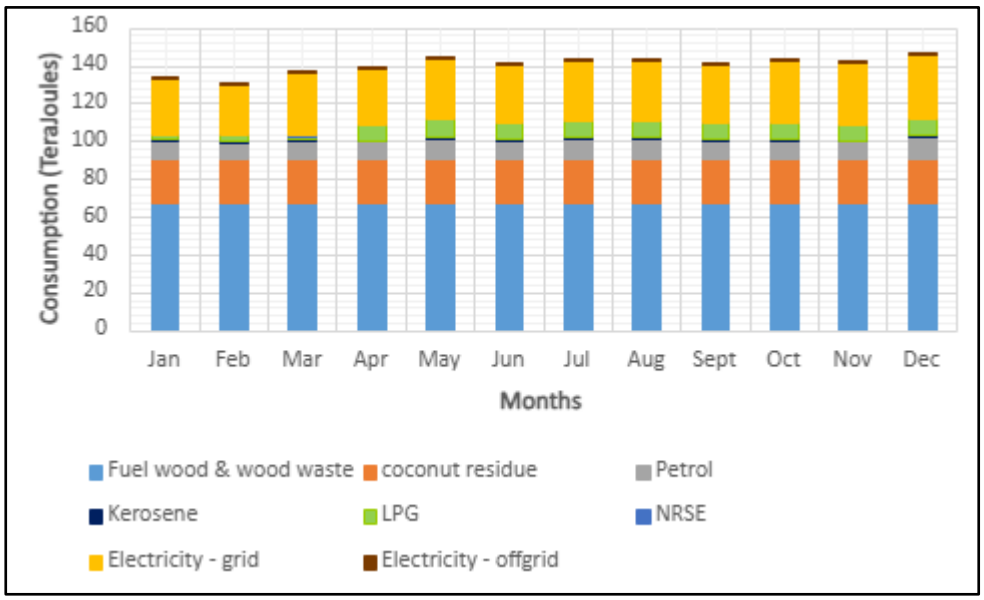
- **CAP-IT Project Initiated**
  The UNDP and Japanese-funded CAP-IT project launched in April–June 2023, with US $15.5 M allocated to Samoa, aiming to electrify land and maritime transport sectors. Site assessments and feasibility studies began, targeting EVs, charging infrastructure, and electric boats. By mid-2023, Samoa received its first 19 electric vehicles, with 60 more expected in 2024, initially deployed for government operations and the upcoming Commonwealth Heads of Government Meeting.

Residential, Community, Social & Government Sector:

The residential, Community, social, and government sector focuses on electricity consumption and fuel (DPK, LPGs & biomass) use in domestic households for cooking and lighting. Additionally, this sector targets school buildings, churches, streetlights, and NGOs' electricity consumption. The government sector covers the energy consumption in government ministries, such as electricity for buildings & fuel use for transportation.

Overall Consumption of Residential, Community, Social & Government Sector 2023

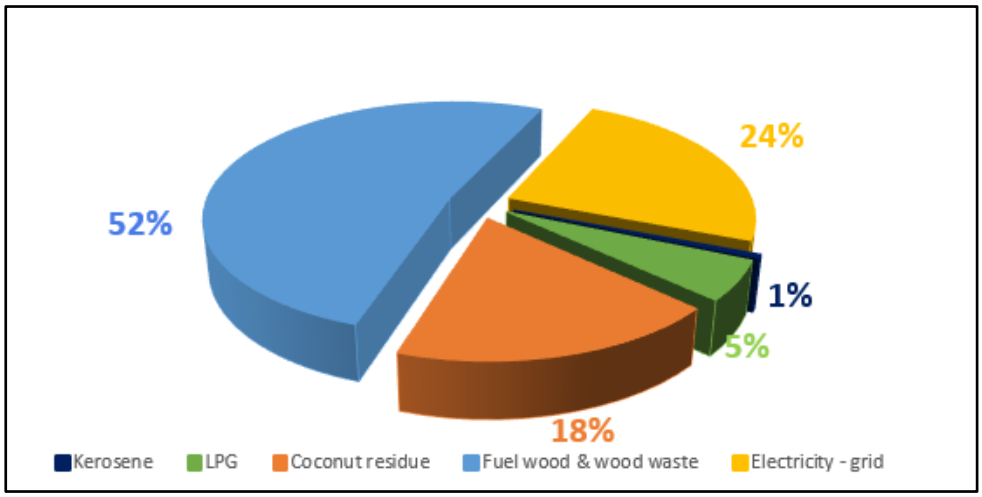
Figure 39: Monthly Trend of Energy Consumption in Residential, Community & Social sector 2023



In 2023, the overall energy consumption in the residential, community, social, and government sectors reached 1680.19 TJ, reflecting a constructive increase of 6.4% compared to the previous year, 2022. Analysing the monthly trends, we observe a consistent rise in energy consumption starting from April and continuing toward the end of the year. Notably, the use of petroleum and LPG products has gradually increased throughout this period, while solid fuels, specifically fuel wood and coconut residues, have maintained a steady and significant share of energy consumption.

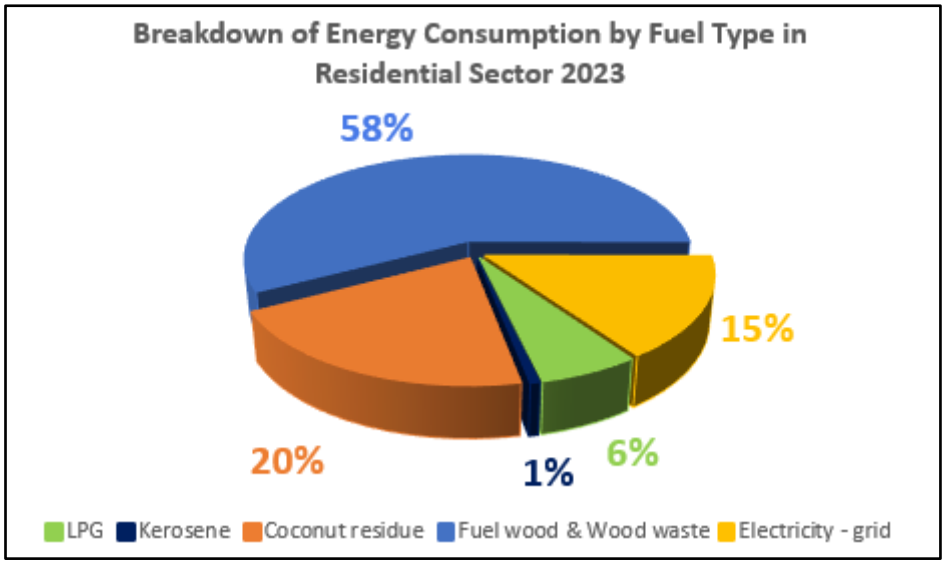
Among the various fuel types utilized in this sector, biomass—comprising fuel wood and coconut residues—has emerged as the most consumed resource.

Figure 40: Breakdown of Energy Consumption in Residential, Community, Social Services & Government by Fuel Source



Energy Consumption by Fuel Type in the Residential Sector

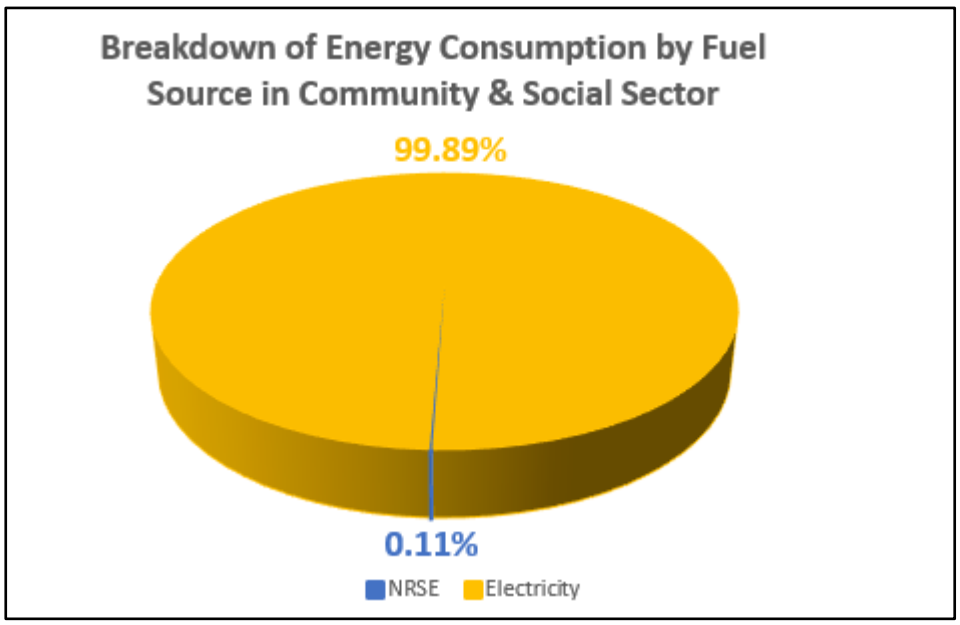
Figure 41: Breakdown of Energy Consumption in Residential by Fuel Source



In Samoa domestic households, the most commonly used fuel type is biomass (fuel wood and coconut residue) for cooking and heating. The electricity consumption accounts for 15%, covering cooking and heating, lighting, cooling, and other household activities that rely on electricity. LPG is a growing energy source for cooking and heating that will soon replace biomass, given its rapidly increasing use in the residential sector. Kerosene (DPK), on the other hand, is the least consumed energy in residential homes, and its consumption has kept decreasing over the past years, according to previous reviews.

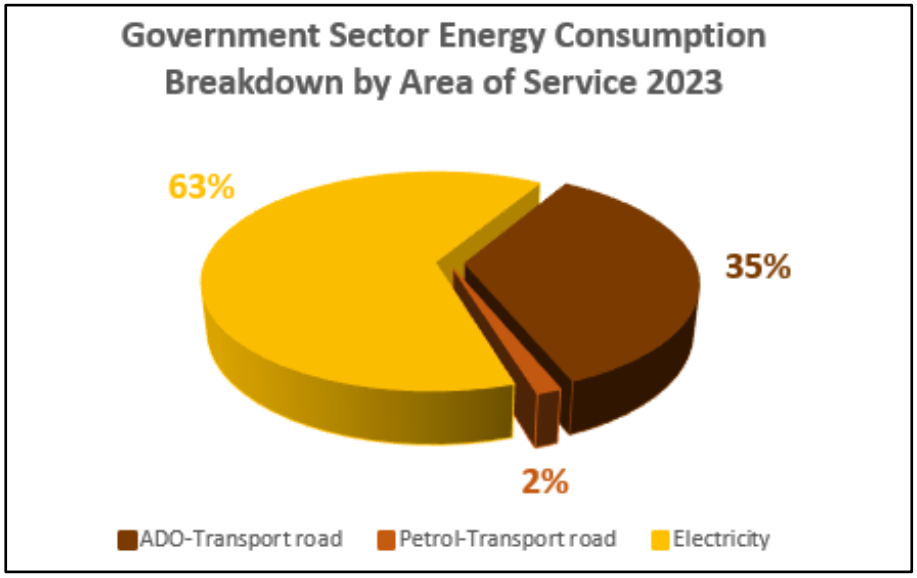
Energy Consumption in Community & Social sector by Fuel type

Figure 42: Breakdown of Energy Consumption in Community & Social Sector



Samoa's Community & Social sector focuses on schools, churches, streetlights, and other community-related activities that consume any form of energy. Thus, this sector relies mostly on grid electricity; hence, 99.9% of the energy used is electricity for school and church buildings and community services such as streetlights. The small percentage of NRSE results from small RE projects in the community, such as biogas systems, solar streetlights & etc.

Figure 43: Breakdown Energy Consumption by Area of Service in the Government Sector



For the government sector, the area of service with the highest consumption is electricity for government buildings, which accounts for around 63% of the sector's total energy consumption, an increase of 3% from the previous year's review.

Fisheries Sector:

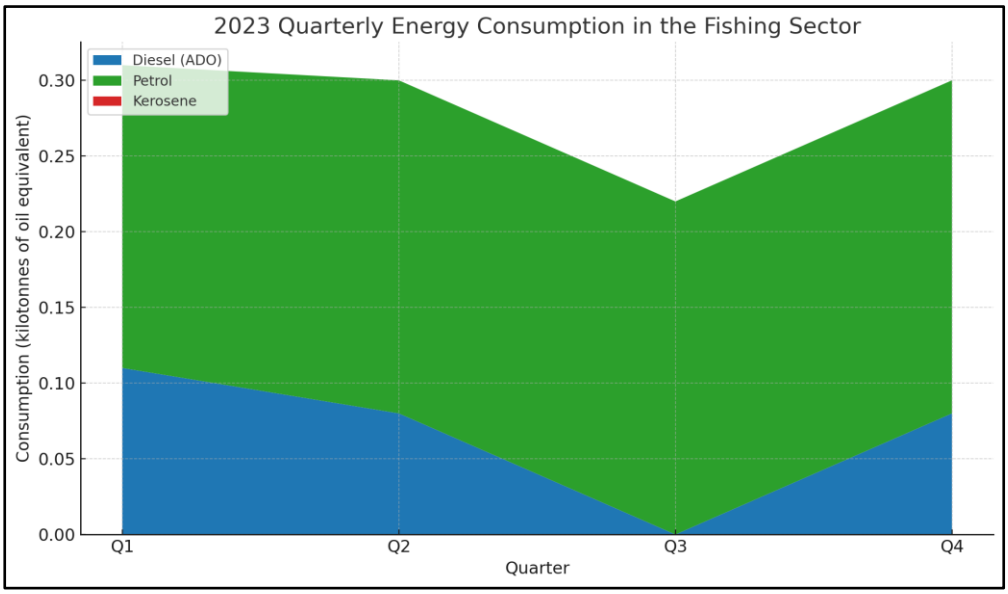
The fishing sector encompasses both coastal and deep-sea fishing activities within Samoa's Exclusive Economic Zone (EEZ). It includes fuel supplied to all fishing vessels—regardless of flag—that refuel in Samoa, as well as fuel used by Samoa's domestic fishing fleet.

Table 9: Vessel Registration by Class

Class	Description	Total Registered
Class A	≤ 11m (small-scale artisanal boats)	53
Class B	11m–12.5m	0
Class C	12.5m–15m	1
Class D	15m–20.5m	2
Class E	≥ 20.5m	3
Class F	Locally based foreign fishing vessels	12
Total		71

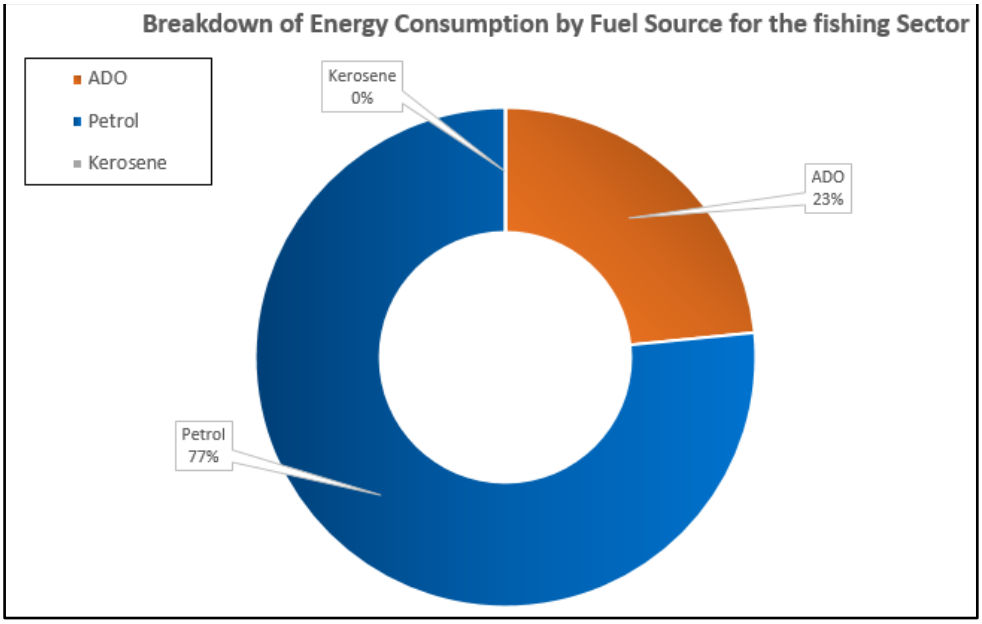
Class A vessels dominate Samoa's fishing fleet, making up ~75% (53 out of 71) of all licensed vessels in 2023. No Class B vessels were registered in 2023; however, only 6 vessels (Classes C, D, E) fall under larger local commercial categories, making up less than 9% of total vessels lastly the Foreign-based locally licensed vessels (Class F) represent 17% of the total.

Figure 44: Energy Consumption in Fishing Sector in 2023



The fishing sector's energy consumption in 2023 was primarily dominated by Unleaded Petrol (ULP), with consistent usage of 0.22 ktoe from the 2nd quarter through the 4th quarter, following a slight increase from 0.20 ktoe in the 1st quarter. This stability indicates a strong reliance on petrol-powered equipment or vessels throughout the year. Diesel (ADO) consumption showed variability: it started at 0.11 ktoe in Q1, dipped slightly to 0.08 ktoe in Q2, dropped to zero in Q3, and returned to 0.08 ktoe in Q4. The decline in Q3 could suggest seasonal activity changes or reduced use of diesel-powered boats. Kerosene (DKP) consumption was absent across all four quarters, indicating it is not used within the fishing sector for energy purposes.

Figure 45: Breakdown of Energy Consumption by Fuel Source for the fishing Sector

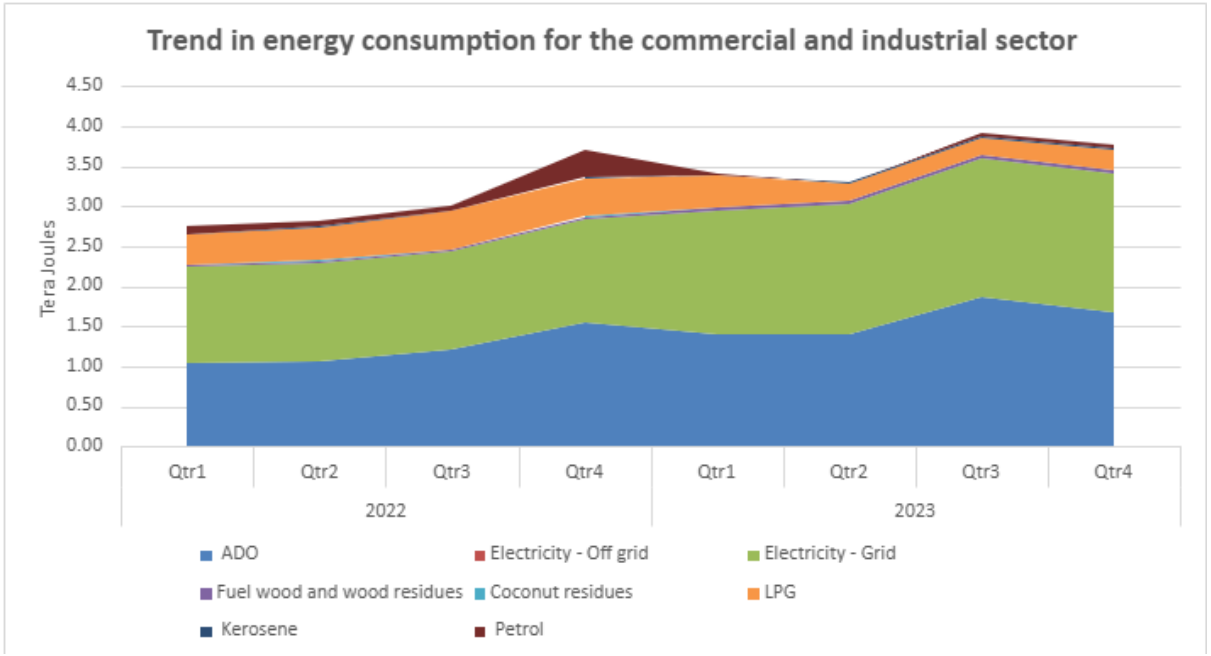


The fishing sector in 2023 was heavily reliant on petrol, with diesel playing a supportive role. The fuel mix reflects technological choices and operational practices within the industry. Going forward, any transitions to cleaner fuels or renewable technologies would need to account for this strong dependence on petrol.

Commercial & Industry:

The Commercial and Industrial sectors play an important role in Samoa's economy. The Industrial sector includes businesses like manufacturing, building construction, and quarrying, while the Commercial sector covers shops, hotels, banks, real estate, and other services.

Figure 46: Consumption for the commercial and industrial Sector

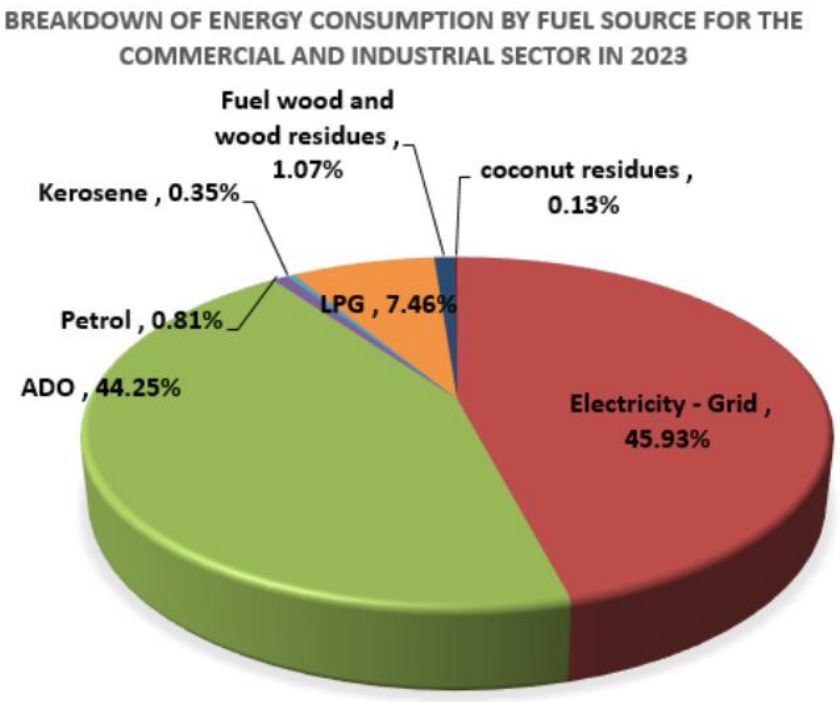


With both years' quarterly data for 2022 and 2023, the comparison and trend analysis of energy consumption for the commercial and industrial sectors are as given:

- ADO (Diesel Oil) and Electricity - Grid consumption increased significantly in all quarters in 2023 compared to 2022, indicating a higher reliance or demand.

- Fuel wood and wood residues doubled in 2023 (0.02 to 0.04), but still a small overall share. LPG consumption decreased notably in 2023 in Q2, Q3, and Q4 (almost halved or more), showing reduced usage.
- Petrol consumption dropped sharply across all quarters, possibly reflecting changes in transport fuel mix or efficiency.
- Electricity - Off grid and Coconut residues remained negligible/zero both years.
- Kerosene use remained stable and very low.

Figure 47: Breakdown of Energy Consumption by Fuel Source



The data reflects the energy consumption levels of various fuel sources for Commercial and Industrial Sector in 2023.

- Electricity from the Grid is the highest consumed energy source, at 277.03TJ, showing the significant role of electrical power in the energy mix.
- Automotive Diesel Oil (ADO) closely follows at 266.86 TJ, indicating a heavy reliance on diesel fuel, likely for transportation and industrial use.
- Liquefied Petroleum Gas (LPG) consumption stands at 45.00TJ, which is a moderate share, likely used in residential, commercial cooking, or some industrial applications.
- Fuel wood and wood residues and coconut residues are low but still notable at 6.42 TJ and 0.78 TJ respectively, showing a small contribution from biomass energy sources.
- Unleaded Petrol and kerosene have minimal consumption values, 4.89 TJ and 2.13 TJ, respectively.

Challenges

The compilation of the 2023 Energy Review Report faced several persistent challenges, particularly regarding data collection and quality assurance. Although data was collected every quarter, subsequent validation revealed inaccuracies and gaps in both newly submitted and existing datasets. These discrepancies continue to hinder the integrity and reliability of national energy reporting.

A key issue was the lack of timely and complete data submissions, particularly from some private sector providers, with certain entities failing to supply the required information altogether. This ongoing challenge underscores the need for stronger collaboration with data providers, supported by the National Energy Coordination Committee (NECC) to ensure compliance and reinforce the importance of data contributions to national planning.

Additionally, the current methodology for estimating biomass consumption relies on a household energy survey conducted in the 1990s, which is likely outdated and no longer reflective of current usage patterns. There is an urgent need to conduct a new, nationally representative biomass survey to ensure more accurate assessments of Samoa's energy profile.

ANNEXURE

Annex 1: ENERGY CONVERSION UNITS & COMMODITIES

Energy Conversion Factors

1. Liquid fuels

	Mega joules per litre	Mega joules per gallon	Litres per tonne	Gigajoules per tonne
LPG (Propane)	25.3	95.8	1960	49.6
LPG(Butane)	27.7	104.9	1730	49.0
Aviation gasoline (avgas)	33.2	125.7	1410	46.8
Motor/automotive gasoline(mogas)	34.6	131.0	1340	46.4
Dual-purpose kerosene (DPK)	36.8	139.3	1260	46.4
Automotive Diesel Oil (ADO)	38.6	146.1	1182	45.6
Industrial diesel Oil (IDO)	39.0	147.6	1150	44.9
Fuel oil- high sulphur (FO)	40.8	154.4	1050	42.9
Lubricants and Greases	38.8	146.9	1120	43.4
Bitumen	44.0	166.6	980	42.7
Crude Oil	35.9	135.9	1249	44.9
Coconut oil	34.9	132.1	1100	38.4

2. Solid fuels

	Gigajoules per tonne	Gigajoules per tonne
Charcoal	30.0	27.2
Fuelwood/woodwaste (40% mcwb)[1]	10.8	9.8
Fuelwood/woodwaste (13% mcwb)[2]	17.1	15.5
Coconut-palm wood	11.5	10.4
Coconut residues:[3]		
Shell (15% mcwb	14.6	13.2
Husk (30% mcwb	12.0	10.9
Average (air dry)[4]	14.0	12.7

3. Gaseous fuels

	Megajoules per Cubic Metre	Megajoules per Cubic Foot
Natural Gas	39.0	1.1
Methane	37.7	1.1

4. Electricity

	Megajoules per kWh
Electricity	3.6

Annex 2: Electricity Tariff Rates 2023

Electricity Rates

Non-Domestic Consumers on Prepaid Meters will be charged with the following tariff:

kWh/units	Total Cost per Unit
All Units	$1.02

Non-Domestic Consumers on Post-paid Meters will be charged with the following tariff:

kWh/units	Total Cost per Unit
All Units	$1.05

Tariff for 100 Largest Consumers

Fixed Rate Category	Daily Fixed Charge	Energy Charge	Debt Charge	Usage Charge
FR1	1520	0.67	0.02	0.08
FR2	1140	0.67	0.02	0.08
FR3	840	0.67	0.02	0.08
FR4	380	0.67	0.04	0.16
FR5	240	0.67	0.04	0.16
FR6	130	0.67	0.04	0.16

Domestic Consumers on Prepaid Meters will be charged with the following tariff:

kWh/units	Total Cost per Unit
1 - 50	$0.52
51 and over	$0.63

Domestic Consumers on Post-paid Meters will be charged with the following tariff:

kWh/units	Total Cost per Unit
All Units	$0.67


MINISTRY OF WORKS TRANSPORT & INFRASTRUCTURE
FA'AVAE I LE ATUA SAMOA


From
the People of Japan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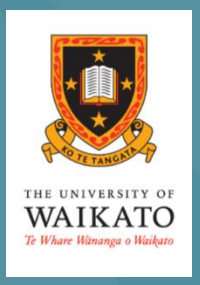
Pacific
Community
Communauté
du Pacifique


PCREEE
Pacific Centre for Renewable Energy and Energy Efficiency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