ENERGY REVIEW

The "Energy Review" is published by the Economic Policy and Planning Division of the Ministry of Finance. The analysis provides an overview of Samoa's Energy Sector and is intended to provide the Government of Samoa, business community and the general public with a better understanding of the energy sector.

This is the first review and it is envisaged that this will be published on a biannual basis.

MINISTRY OF FINANCE

Issue No 1:
Jan - December 2007
April 2007

REVIEW TOPICS

Contact: Economic Policy and Planning Division, Ministry of Finance, Apia, SAMOA

Telephone: (+685) 34 - 333/34341
Fax: (+685) 21-312/24779
E-mail:eppd@mof.gov.ws
Website:www.mof.gov.ws

1. Executive Summary

Key Features for 2000 to 2007 Performance

Renewable Energy

- Energy consumption is mainly dominated by demand for biomass which still remains the number one cooking fuel. Biomass usage has declined by 31.7% between 2000 and 2007.
- Solar energy technology is still insignificant by comparison to national consumption but continual growth in imports of solar energy technologies was recorded between 2002 and 2007.

Petroleum

- Consumption continues to grow at an annual average rate of 4.0% between 2000 and 2007.
- Transport sector consumption increased by 78.8% between 2000 and 2007.
- Commercial sector consumption declined by 48.5%% between 2000 and 2007.
- Electricity sector consumption increased by 30.1% between 2000 and 2007.
- Residential sector consumption increased by 71.5% between 2000 and 2007.

Transport

- Petroleum consumption demand by transport continues to grow at an annual average growth rate of 9.3% between 2000 and 2007.
- Land transport demand for petroleum increased by 119.6% between 2000 and 2007.
- Air transport demand for petroleum increased by 55.6% between 2000 and 2007.
- Marine transport demand for petroleum decreased by 11.9% between 2000 and 2007.
- Composition of petroleum consumption in the transport sector for 2007 accounted 67.0% to land transport, 25.0% to air transport and 8.0% to Marine transport.

Electricity

- Generation grew by 35.6% between 2000 and 2007 with diesel generation supplying more than 50% since 2001.
- Consumption grew at an annual average growth rate of 4.8% per annum between 2000 and 2007.
- Commercial and manufacturing sector demand increased by 83.4% between 2000 and 2007.

2. **Renewable Energy**

These are sustainable sources of energy that are obtained from locally available natural resources. Those that are currently utilised in Samoa include biomass, solar and hydro-power. Biomass use in Samoa consists of firewood, coconut shells and husks which are mainly utilised in domestic cooking. Solar technology use mainly consists of Solar Photovoltaics and Solar Hot Water Systems. Hydro-power over the past decade has been used extensively in Samoa and currently supplies around 40% of electricity to the main grid in Upolu. Other high potentials for renewable energy in Samoa include harnessing energy from the wind, biogas, biofuels (coconut oil), waste and geothermal sources.

Summary:
Status of renewable energy consumption for the years 2000 to 2007 has seen a growth in the utilisation of solar energy and a decline in biomass consumption. Total biomass consumption in 2007 is estimated at 36.6 kilo-tones of oil equivalent. This is a decrease of 17.0 kilo tones of oil equivalent from 2000 (53.6 ktoe). Solar technology by comparison to national consumption is very insignificant but it is interesting to note the growth (114.4%) in solar energy consumption from 2002 (1.3 TOE) to 2007 (42.5 TOE). In summation excluding hydro energy, total renewable energy consumption in Samoa for 2007 is estimated at 36.6 kilo tones of oil equivalent. *(Hydro power due to its major association with supplying electricity to Samoa has been categorized under the electricity sector. The total renewable energy consumption in Samoa including energy consumption from hydro sourced power is around 40 kilo tones of oil equivalent).*

Types of renewable energy available in Samoa:

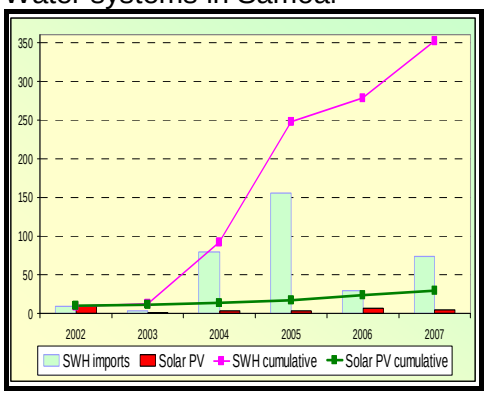
Solar Energy: Solar Photovoltaic (PV) and Solar Hot Water Systems.

Solar technology imports continue to grow from 2002 (19 systems) to 2007(79 systems). The notable increased interest in solar technology is mainly reflected on its use in hotels. Within 2000 to 2007 new hotels have been built in Samoa to cater for the growing tourism industries. Due to the high electricity costs from supplying services (hot water bathes, air conditioners etc) to guests, hotel owners have been pursuing solar energy technologies for its cost saving potentials in electricity use. For instance, it was reported in 2005 that Aggie Grey's Hotel imported more than 100 Solar water heater systems for its use in providing this services at its new resort development.

To other sectors, Solar technology use is limited mainly, high income earners and small businesses. This is due mainly to the high initial costs of importing the appliances in to the country and also considering that there are no known solar technology retailers in Samoa.

Solar PV imports grew at an annual average rate of 43.0% from 2002 to 2007. This gave an accumulative sum of 29

Records of Solar PV and Solar Hot Water systems in Samoa.



systems since 2002 with an estimated generation capacity of 28.7 GJ or 0.7 tonnes of oil equivalent. Year 2007 also saw the commencement and operation of a 24-hour electricity supply in Apolima by solar PV with a peak rated output of 13.8 kW. By estimation, the 86 PV panels used in Apolima have a generation capacity of 78.0 GJ or 1.8 tonnes of oil equivalent.
In summary, by estimation 106.6 GJ or 2.5 tonnes of oil equivalent were generated by solar PV in 2007. This grew by 2.3 tonnes of oil equivalent from 2002 to 2007.

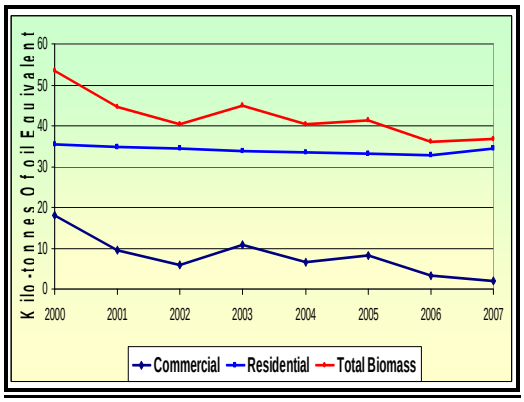
Solar water heaters are widely used in hotels and private homes and other small businesses

Solar hot water system imports for 2007 were 146.7% higher than that obtained in 2006. Cumulative growth of imports from 2002 to 2007 grew at an annual average rate of 181.7% with a total number of 352 systems imported throughout selected years. This sees an estimated generated energy for water heating grew from 44.0 GJ (1.0 TOE) in 2002 to 1,703.3 GJ (40.0 TOE) in 2007. Highest SWH imports were recorded in 2005 with an estimated 762.6 GJ (17.89 TOE) of energy generated. Of the total SWH imports in 2005, a high proportion of it was reportedly installed at the new Aggie Greys Resort at Mulifanua.

<u>Comparison on the number of households by main source of cooking fuel.</u>

Biomass: *Firewood, coconut shells and husks, and wood charcoal.*
Biomass is used mainly in the residential sector for household cooking and drying purposes. Consumption in the commercial and manufacturing sector has decreased considerably over the years following the closure of 3 sawmills including the only mill that uses biomass to produce its own electricity in Samoa. Commercial and manufacturing consumption of biomass further declined following the abandonment of gassifiers that were set up in the 1980's and the total ceasing of copra production in 2006. In addition, biomass consumption in the residential sector have also been decreasing slightly over the years from 2000 to 2007. Overall total biomass consumption declined by 31.8% since 2000.

<u>Comparison of Biomass consumption between commercial and residential Sector.</u>



In 2007 residential sector accounted for 94% of total biomass consumption and recorded an estimated decrease of 2.8% from 2000. Decrease in biomass consumption from the residential sector is the result of the increasing number of households using more than one type of fuel source for domestic cooking (biomass with kerosene, biomass with LPG, Biomass with electricity or a combination of more than two cookeries) seeing the consumption pattern change from high[1] biomass consumption to moderate[2] biomass

[1] High Biomass consumers refer to households who use only biomass for domestic cooking and usually consume around 2kg of biomass per person per day.

consumption. This change in consumption pattern to some extent is driven by increasing fuel prices which sees biomass consumption in the residential sector decline at an annual rate of 0.4% from 2000 (35.5 kTOE) to 2007 (34.5 kTOE). Of interest biomass consumption in the residential sector begins to increase from 2006(32.7 kTOE) to 2007(34.5 kTOE) and is highly likely to increase in years to come. Firewood trade for domestic cooking is commercialised mainly in Apia where they are sold at ST$7.00 to ST$8 a basket. Sawmills also were reported to sell firewood at ST$150 per truck load.

Commercial and manufacturing sector consumption by estimation accounts for 6.0% of all biomass consumption in 2007. This remarkable drop of 27.8% from 2000 (33.8%) is the result of the continual decline or closure of major operators (Copra production, saw mills & coconut oil industry). By estimation, the average annual decline rate of biomass consumption in the commercial and manufacturing sector fell by 16.7% per year from 2000 (18.1 kTOE) to 2007 (2.1 kTOE).

Remaining reported cases of coconut processing centers around coconut oil and copra meal production which are occurring at a small scale. One known group that is still in operation includes the virgin coconut oil project undertaken by Women in Business Development Incorporated.

Recycling waste through a bio-digester to produce a renewable energy source known as biogas is one of the areas the Government of Samoa intends to look into in future.

Policies.

Research and development of renewable energies in Samoa hold a lot of interest and commitment by the government which resulted in the establishment of the Research and Development Institute with Renewable Energy as one of its two major research areas. This follows the events of the recent high oil prices which started to climb in 2004. Taking into consideration the fact that fossil fuels will be exhausted within the next century, the Government of Samoa through recent studies have identified potential renewable energy sources (hydro, solar, wind, geothermal, Biomass, Bio-fuel, Biogas and Waste) as the next attractive substitute for fossil fuels in future. It is anticipated that more resources will be allocated into exploring these area under the enacted Samoa National Energy Policy

A recent survey was carried out in Savaii to explore the feasibility of coconut resource for power generation. This is part of the Samoa National Energy Policy action plans to assess the viability on the use of coconut oil for electricity generation. *Report is yet to be released*.

[2] Moderate Biomass Consumers refer to households who use more than one source of fuel for domestic cooking. These include sources such as biomass and kerosene, biomass and LPG among others. It is assumed that households of this category consumes around 1.3kg of biomass per person per day .

3. Petroleum

Samoa imports six petroleum products, namely Unleaded Petrol (ULP), Automotive Diesel Oil (ADO), Dual Purpose Kerosene (DPK), Aviation gasoline (Avgas), Lubricants & Greases and Liquid Petroleum Gas (LPG). Main Petroleum imports (ADO, DPK, ULP and Avgas) are solely supplied and distributed by Petroleum Products Supplies (PPS). In 1998 the Government of Samoa introduced and controlled effectively a new supply and pricing arrangements by owning all the petroleum storage facilities and tendering out operation to supplier every 5 years. This arrangement allows the control of domestic petroleum prices to be reflective of international market prices. LPG imports and sales are mainly operated by BOC Gas and ORIGIN Gas which are foreign owned firms with part local ownership. Price regulations are controlled by the Ministry of Commerce, Industry and Labour (MCIL), Price Control Board that sets LPG ceiling price range. Other products are brought in by different private companies.

Summary:

In 2007 petroleum consumption totaled 86,429 kl, seeing a growth of 30.4% from 2000 (66,264 kl). Transport sector continue to dominate petroleum demand accounting for 65% of total petroleum consumption in 2007. This high fuel consumption is the result of increased registered vehicles, and an increase in the number of international flights. Electricity sector consumption grew by 30.1% from 2000 (13,587 kl) to 2007 (17,672 kl). Growth signifies the increasing dependence of EPC on diesel generators to cater for the increasing power demand in Samoa. The Commercial and Manufacturing sectors recorded an interesting decline in petroleum consumption, by 48.5% from 2000 (19,893 kl) to 2007 (10,247 kl). Decline is attributed to the phasing out of petroleum dominated machineries in Industries. Residential sector recorded an increasing consumption rate of 71.5% from 2000 (1,473 kl) to 2007 (2,527 kl). This growth reflects on the increasing use of petroleum products (LPG) in domestic cooking.

Petroleum Prices:

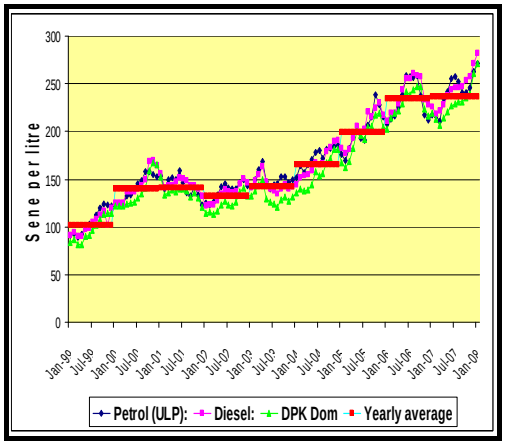
Petroleum products sales considered in analysis are Dual Purpose Kerosene, Automotive Diesel Oil and Unleaded Petrol. Additional information on petroleum prices could be obtained from the Quarterly Economic Review also produced by the Economic Policy & Planning Division.

Retail prices continue to increase and grew more significantly from January 2004. Yearly average retail sales increased from below SAT$1.50 per litre in 2002 to above SAT$2.25 per liter in 2007. This in comparison showed a notable average percentage increase of 78.3%.

Growth in fuel prices is beyond Samoa's control as price increases are influenced by international wholesale prices. Samoa's new fuel arrangements with operators and suppliers allows the control of domestic prices to be reflective of international market prices making Samoa one of the countries in the region with the lowest wholesale fuel prices.

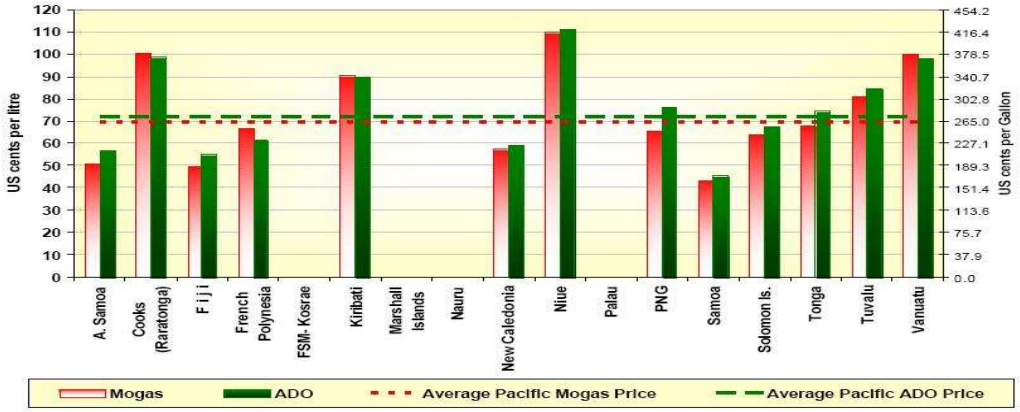
Samoa Petroleum Fuel Prices

1999-2008



1. REGIONAL WHOLESALE FUEL PRICES (*excluding duty and tax*- Jan/Feb)

Figure 01: Regional Wholesale Prices (excluding Tax & Duty) - January/February 07



[1] All surveyed PICs (excluding Australia, NZ and Hawaii and Niue). Note: Report was not compiled for Sep/Oct prices even though data was collected from the FICs.

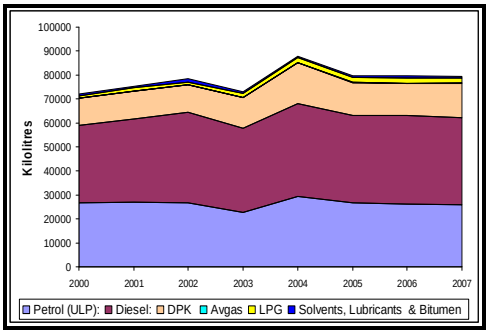
Imports

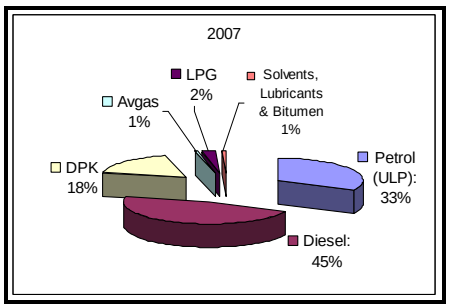
Total fuel Imports steadily grew at an annual average rate of 2.2% from 2000 (71990 kl) to 2007 (79373 kl). Decline in fuel imports occurred in 2003 and 2005. This being for significant drop in ADO and ULP consumption. Noticeably drop in fuel imports comes after a significant increase/ hike in fuel price that occurred in 2002 and 2004. (*Average retail sales recorded a cumulative growth of 33% within 13 months from March 2002 to April 2003 and a growth of 24% within 9 months in 2004)*

In 2007 ADO recorded 45% of total oil import with 36279 kl, ULP 33% with 25886 kl, DPK 18% with 14152 kl, LPG 2% with 1845 kl and the balance of 2% between Avgas, Solvents, lubricants and grease.

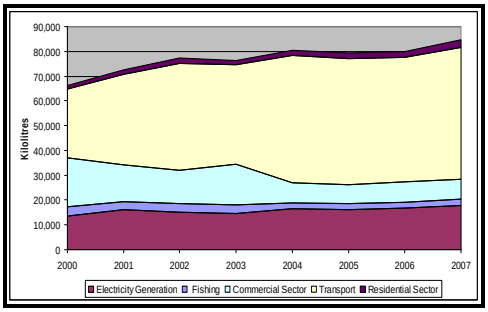
LPG imports have been increasing remarkably over the years with an annual average growth rate of 15.5 % from 2000 (885 kl) to 2007 (1845 kl). ADO and ULP continue to dominate total petroleum imports – a reflection of their extensive use in the transport, commercial and power sector. DPK import records an annual average growth rate of 4.5% from 2000 (11,191 kl) to 2007 (14,152 kl).

Petroleum Imports by products:





Total Oil Consumption by Sector



Consumption

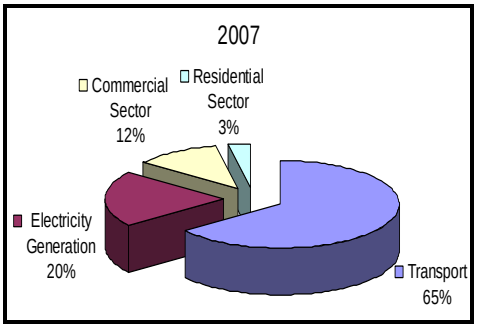
Total petroleum consumption grew at an annual average rate of 4.0 % from 2000 (66,264 kl) to 2007(86,429kl).

The composition of petroleum demand is dominated by the transport sector, which accounts for around 65% (55,983 kl in 2007) of total petroleum imports. Commercial and Electricity sectors account for 12% (10,247kl) and 20% (17672 kl) respectively with Residential sector accounting for 3% (2,527 kl) in 2007. Petroleum consumption grew from 2000 to 2007 at an annual average rate of 4.0%. Noticeably transport consumption from 2004 to 2007 remained above 52,500 kl. High petroleum consumption from the transport sector is the result of recorded growth in registered vehicles,

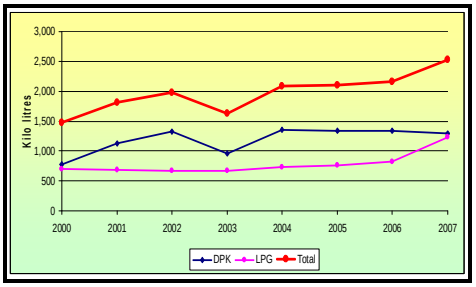
and an increase in the number of international flights signified by the growth in tourism.

Growth from the residential sector increased significantly with LPG consumption recording an annual average growth rate of 9.7% from 2000 (700 kl) to 2007 (1236 kl). This is the result of increase interest in LPG for household cooking and that the use of LPG for domestic cooking is considered cheaper than kerosene. Domestic use of kerosene grew at an annual average rate of 10.2% from 2000 (774 kl) to 2007 (1,291 kl). Noticeably domestic use of kerosene has been on the decline since 2004 at an annual average rate of 1.6%. In summation, consumption from the residential sector grew at an annual average rate of 9.0% from 2000 (1,473 kl) to 2007 (2,527 kl).

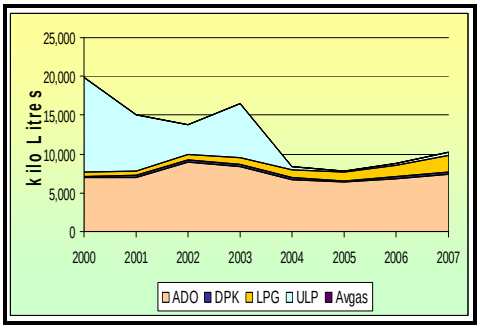
Commercial and manufacturing sector consumption has been on the decline since 2000 which further acerbated in 2004. This saw an annual average decline rate of 5.7% from 2000 (19,893 kl) to 2007 (10,247 kl). Reasonably, this decline is the result of the dying copra industry which to a high extent is reflected on the ULP consumption in vehicles used by the coconut industries to transport their goods. On the other hand, ADO consumption in Industries has been increasing slightly at an annual rate of 1.9% from 2000(6,935kl) to 2007(7,410kl). This growth is also noticeable from the GDP contribution of Industries. In addition commercial use of LPG in hotels and restaurants has been on the increase, recording an annual average rate of 21.8% from 2000(608 kl) to 2007(2253 kl). Such increase is reflected on the growth in tourism.



Petroleum Consumption in the residential Sector.



Petroleum Consumption in the Commercial Sector.



Policies

Samoa is highly dependent on imported petroleum for transportation and electricity generation. The recent high fuel prices has significantly increased the vulnerability of the economy hence efficient fuel use are part of the activities targeted under the enacted Samoa National Energy Policy 2007. The Petroleum Act 1984 also states safety and petroleum standards for terminals and service stations operators to comply with.

Laying the Petroleum oil pipeline – Pipe line is to connect from Wharf to storage tanks. This pipeline is intended to increase fuel delivery efficiency and decrease oil spillage to the environment.

4. Transport

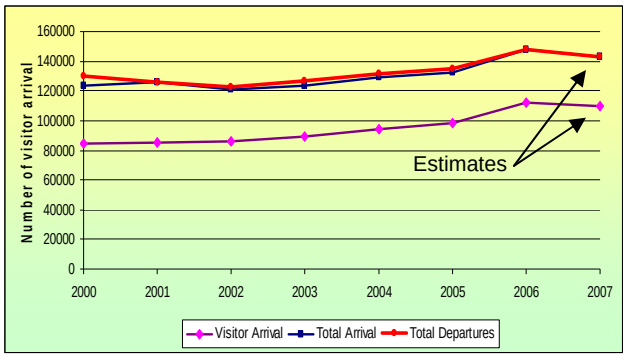
Transportation has direct links to the advancements in other sectors of the economy. It is the medium that enables the movement of goods and services both domestically and abroad. The transport sector in Samoa consist mainly of land transport referring only to vehicles, Air transport mainly with reference to international flights and Sea transport as in fishing vessels and ferries.

Summary

Petroleum consumption in the transport sector has been increasing significantly seeing a growth of 78.8% from 2000(31,310kl) to 2007(55,983kl). Land transport recorded the highest growth of 119.6% from 2000(16,949 kl) to 2007(37,219kl). Air transport consumption in 2007 (14,086 kl) recorded a growth of 55.6% from 2000 (9,052 kl). Attributed increase in petroleum consumption in the transport sector is the result of the growth in registered vehicles and an increase in international flights. Marine transport accounts for 8 % (4,678 kl) of total transport consumption in 2007 recording a decline of 11.9% from 2000 (5,310 kl).

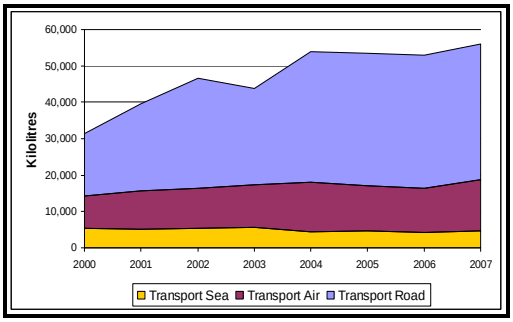
Petroleum consumption in **Air Transport sector** refers mainly to DPK jet fuel *(Avgas is also used but there are no consumption records. Considering import data, Avgas consumption with comparison to DPK Jet fuel are considered negligible*). From 2000(9,052kl) to 2007(14,086kl), petroleum consumption due to air transport accounted an annual average growth rate of 6.9% with consumption above 12,000 kl for the years 2004 to 2007. Increasing petroleum consumption from Air transport is the result of increased international flights – a reflection on the growing tourism industry.

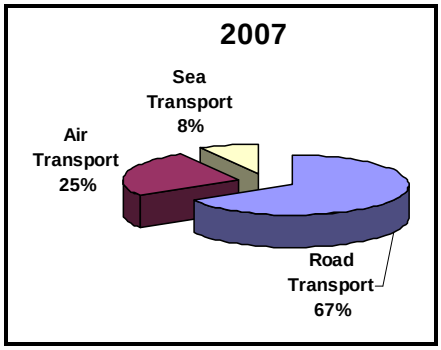
Record of visitor arrivals and departures to Samoa.



Land Transport fuel consumption grew at an annual average rate of 13.5% from 2000 (16,949 kl) to 2007 (37,219 kl). ADO consumption in transport sector grew at an annual average rate of 16.3%

Transport petroleum consumption by sub sectors.



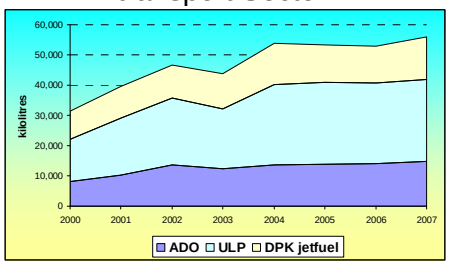


from 2000 (8,204 kl) to 2007 (14,843 kl) recording consumptions above 13,600 kl from 2004 to 2007. Noticeably, considerable drop in land transport petroleum consumption was observed in 2003. This drop was significantly noticeable in ULP consumption that year as petroleum retail prices increased significantly during this time resulting in motorists spending less on fuel. Interestingly consumption from 2004(26,449 kl) increased by 22.4% from 2003(19.683 kl) which continued at consumption above 26,449 kl from 2004 to 2007 (27,012). This high increase was the result of the decline and closure in the copra industries seeing vehicle consumption that used to be classified under commercial sector being absorbed in to the transport sector.

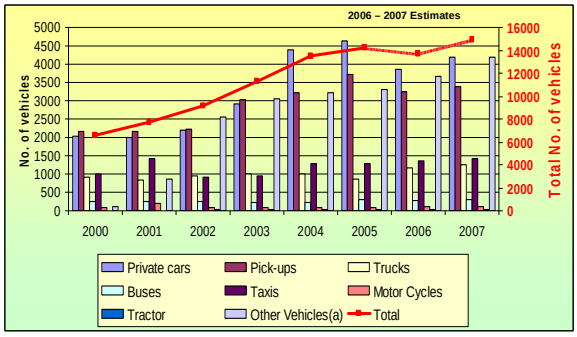
In addition the continual growth in the demand for fuel consumption in the transport sector are also reflected on the increasing number of vehicles used in Samoa as verified by the increasing trend of vehicle registration in Samoa (7.8%, 2000 to 2007).

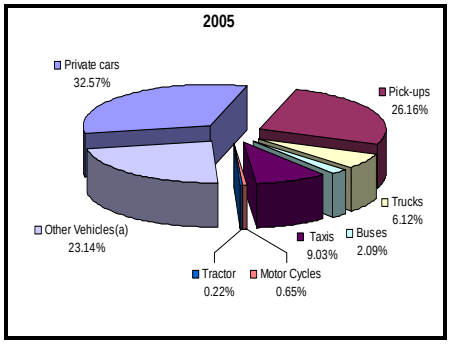
Data records on **marine transport** were not available. By reasonable assumptions, consumption in marine transport which included petroleum consumption from fishing vessels was estimated to consume 8% (4,678 kl) of total transport consumption in 2007. This recorded a decline of -11.9% from 2000 with an annual average decline rate of 1.1% from 2000 (5,310 kl) to 2007(4,678). This decrease in petroleum consumption was also noticeable on the GDP contribution of fisheries which has decreased during this time (Tariff Review Report - 2008)

Petroleum consumption by fuel types in transport Sector:



Registered Vehicles 2000 - 2007





Plans are in place to upgrade standards and conditions of existing and new service stations as part of petroleum licence requirements.

Policies

Petroleum Consumption by the transport sector is one of the main areas of concern in Samoa, especially in trying to reduce energy by-products that are detrimental to the environment. The relationship between transport and the environment forms the bulk of the transport sector's concerns. It calls for a review of the national laws, rules and regulations to reflect upon such issues as the protection of the atmosphere and energy efficiency. The Samoa National Energy Policy 2007 has a dedicated chapter with specific strategies on improving the energy efficiency in the transport sector.

5. Electricity

Electricity is classified as secondary energy sources that are generated from primary sources such as petroleum, hydro and solar. Currently around 40% of total electricity production in Samoa is generated from hydro and the rest from diesel. This percentage varies accordingly during the wet and dry seasons. Solar power is only providing electricity to Apolima Island. Electricity generation, transmission and distribution are exclusively under the authority of the Electric Power Corporation which is a monopolised government owned company. The 2006 Population Census identified that 96% of the whole population in Samoa is electrified.

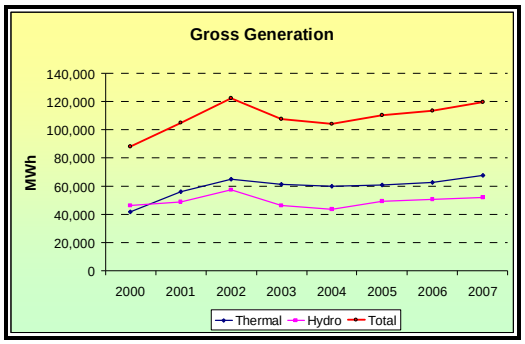
Summary

Gross electricity generation in 2007 accounted to 119.6 GWh. This gives an increase of 35.6% from 2000 (88.2 GWh). The composition of electricity generation in 2007 recorded 43% to hydro and 57% to diesel. Of the total power generation in Samoa, diesel has supplied more than 50% since 2001. Electricity demand for consumption accounted to 98.2 GWh in 2007 recording an increase of 37.6% from 2000 (71.4 GWh). Commercial and manufacturing sector demand accounted for 56% of total consumption in 2007 with a recorded growth of 83.4% from 2000. Other sub-sectors which make up the 44% of total consumption in 2007 include government departments (9%), schools (3%), religious organisations (6%) and the residential users (26%).

Generation

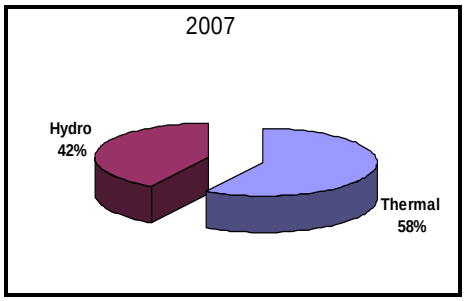
Gross generation grew at an annual average rate of 4.9% from 2000(88.2 GWh) to 2007 (119.6 GWh). Of the two major sources of energy for power generation, diesel sourced fuel has been supplying more than 50% of total since 2001. Last hydro power installation was carried out in the last decade with no recorded increase in installed capacity ever since. This saw the generation from hydro power source fluctuate and declined from 52% in 2000 to 42% in 2007. Increase demand in electricity consumption from 2000 to 2007 was catered by diesel generation which resulted in increased petroleum consumption from the power sector. Rising fuel prices and the feasibility of continuously providing electricity has resulted in EPC increasing their electricity tariffs. The latest tariff rate was implemented in February 1st of 2008 by increasing the fuel surcharges. Surcharges in subsequent months will vary in accordance with fuel price changes.

Gross generation



Available data for the years 2003 to 2005 were estimated. This was estimated based on data available – mainly from fiscal years.

Electricity Users (Readable and Prepayment Meter) *Kilowatt used/Month*	Base Tariff Rate remains the same (ST$/kWh)	Additional cost of fuel surcharge (22.3%).
Domestic Users		
1 - 50 units	0.58	0.13
51 units and upwards	0.69	0.15
Other Electricity Users		
1 unit and upwards	0.69	0.15

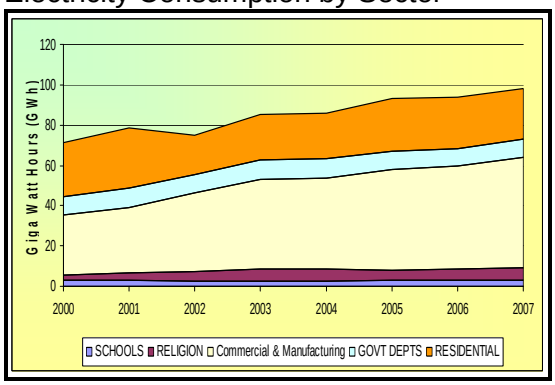


Consumption

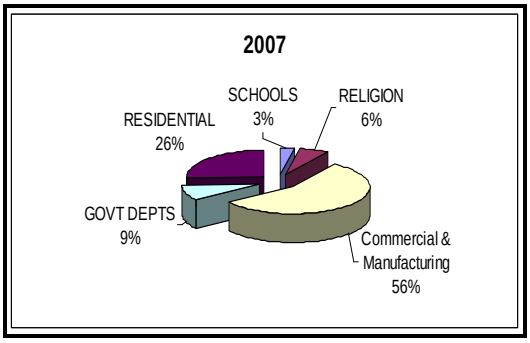
Electricity consumption from 2000 (71.4 GWh) to 2007 (98.2 GWh) grew at an annual average rate of 4.8%. This recorded an increase in demand of 26.8 GWh in seven years.

The commercial and manufacturing sector recorded a gradual increase with an annual average rate of 9.2% from 2000 (30.1GWh) to 2007 (55.2 GWh). Growth in commercial & manufacturing consumption reflects on the expansion and growth of the economy which has been recording increased GDP growth since 2000.

Electricity Consumption by Sector



Consumption from the residential sector has been increasing slightly at an annual rate of 0.6% since 2000. Interestingly recorded decrease in electricity consumption occurred in 2006. This decrease in consumption to a certain extent is the result of increasing tariff rates. Other sectors namely Schools, religious organisations and government departments recorded consumption trend at annual average rates of 1.4%, 14.6% and -0.5% respectively from 2000 to 2007. Electricity demands in these sectors are mainly for lighting, cooking (domestic), cooling and other mechanical processors.



Policies:

The current trend in catering for the growing electricity demand with diesel generators puts Samoa's power sector in turmoil with the current high fuel prices. In enabling sustainable operation, EPC has increased tariff rates. Continual dependence on diesel generators increases the likelihood of seeing increases in tariff rates. Exploring other solutions (EPC is currently expanding development of solar power to electrify unelectrified homes and exploring the feasibility of coconut oil biodiesel as a source of fuel for their power generators) and opportunities are within the enacted Samoa National Energy Policy 2007.

Since 2000 hydro power has been providing around 40 - 45% of electricity generation. As part of the Samoa National Energy Policy Action Plan activities - mini hydro potential sites will be explored and assessed.

OVERVIEW OF SAMOA'S ENERGY SECTOR: 2000 - 2007

In the last seven years, Samoa has undergone a rapid transformation seeing the continual decline of biomass consumption towards a commercial energy supply based on imported petroleum and hydropower-generated electricity. The transformation has been driven primarily by rapidly increasing demand for electricity as well as transport. Total energy demand for Samoa is met by 3 main sources – biomass, fossil fuels and hydro. Other sources (solar) though still negligible are gaining increased interest. The estimated final consumption of energy with all sources combined was equivalent to around 113.9 kilo-tonnes of oil equivalent in 2007 which declined by 0.7% from 2000. Of the 2007 demand, 32% is met by biomass, 65% by petroleum products while the remaining 3% was supplied by hydropower. Biomass consumption is used mainly in the residential sector for domestic cooking whereas the major part of petroleum products is used by the transport sector and electricity generation. Of the total energy consumed in 2007, the largest energy consuming categories are transport (land, sea and air) and residential, consuming 42% and 32%, respectively. Electricity generation accounts for around 17% of total energy consumption and around 20% of total petroleum consumption. Fuel consumption for electricity generation will continue to increase considering that there is no new installation of hydropower stations over the last decade.

Major causes in fluctuation of petroleum consumption are influenced by rising fuel prices which directly affects the transport and electricity sector. Additional causes to fluctuation of petroleum consumption is affected by demands from EPC during the dry season where EPC consumes a lot more fuel when there is insufficient water to run the hydro stations.

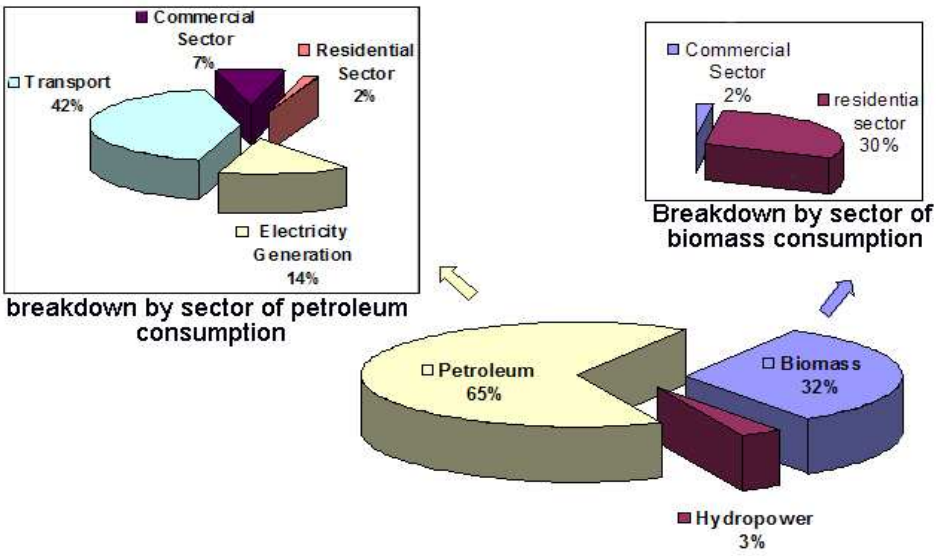
Table of total energy Consumption in Samoa

		Total energy consumption (Kilo-tonnes of oil equivalent).	
		2000	**2007**
Biomass	Commercial Sector	18.1	2.1
	residential sector	35.5	34.5
Petroleum	Electricity sector	12.3	16.0
	Transport	26.5	47.3
	Commercial Sector	16.5	8.5
	Residential Sector	1.1	1.9
Electricity	Hydro power	3.2	3.6
Others		0	0.04
Total		113.2	113.9

Commercial and manufacturing demand for electricity and petroleum is expected to increase over the next 10 to 20 years factored by the trend in growth in economy over the years as reflected in GDP earnings. Residential energy demand for petroleum and electricity at the current trend is beginning to be affected by high fuel prices. Considering the trend in global fuel prices, it is expected that the coming years will see more people switching to biomass for domestic cooking as the current trend shows that more people

are using more than two sources of fuel for cooking. Transport sector demand for petroleum will continue to increase in future considering the continual growth in vehicle registration in Samoa. Continual growth in fuel prices will likely see the introduction of coconut oil biodiesel into the transport sector within the coming years. Increased interest in coconut oil development and research is underway by a recently established company – Pacific Oil which is currently exploring avenues in focusing its production of coconut oil for transportation and also in collaboration with EPC to supply coconut biodiesel for power generation. In addition EPC is also assessing the viability on the use of coconut oil for electricity generation.

Continuous increase in fuel prices and Samoa's heavy reliance on fossil fuel to cater its demand, has pushed and pledged the government to renewable energy and indigenous energy sources with the establishment of the Research and Development Institute of Samoa which has Renewable Energy as one of its two main research areas. Increased renewable energy technology installations are expected over the next 10 to 20 years.



Recommendation:

The analysis undertaken in this review report is based on data available. Judging fully on the outcomes and expectation is something this review newsletter will be better placed at in years to come. However what this review report presents is the best current estimates of Samoa's energy consumption scenario which shows the increasing reliance of economic sectors on petroleum products for their energy consumption. It is recommended that more stakeholders be involved (by providing their yearly petroleum consumption data) in assisting with the building of a proper and better data information systems that reflects the 'true' energy consumption scenario of Samoa. This in turn will assist planners and relevant authorities to be better equipped to address the pressing issues of energy consumption in a sustainable constructive manner. At the current trend Samoa is heavily dependent on petroleum products for development exposing the high vulnerability of the economy to fuel price shocks. Samoa has launched its Samoa National Energy Policy in 2007 which has laid the roadmap for future energy development activities in Samoa and it is anticipated that with the development of this coherent energy database system - more tangible projects for the development of sustainable energy supply would follow.