ENERGY REVIEW

MINISTRY OF FINANCE

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REVIEW TOPICS

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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 third review and covers the period from January to December 2009 The next review for the period January to December 2010 is envisaged to be released in July 2011.

1. Executive Summary

Key Features for 2009 Performance

Renewable Energy

- Total renewable energy consumption in 2009 is estimated at 40700 tonnes of oil equivalent (TOE).
- Biomass consumption recorded a decrease in consumption from the commercial and manufacturing sector. The residential sector recorded an increase in consumption.
- Solar Energy technology contributes to a minute portion of the national consumption accounting for 0.13% of total renewable energy produced in 2009.
- Energy consumption from hydro power in 2009 remained the same and stood at 3800 TOE.

Petroleum

- Prices of unleaded petrol and diesel fluctuated throughout 2009 and peaked in December with recorded increases since January of 23% and 0.3% respectively.
- Average Petrol and diesel prices for 2009 recorded $2.22 and $2.25 respectively; and in comparison to 2008, average prices decreased by 25% and 31% for the two products.
- Price of dual purpose kerosene (DPK domestic) fluctuated between $1.93 and $2.30 per litre and also peaked in December.
- Total petroleum consumption increased by 6.19% from 2008.
- Fuels consumption by different types of products were roughly the same for 2008 and 2009, recording 45% for diesel, 31% for unleaded petrol and the rest to dual purpose kerosene.
- By sector consumption, the transport sector accounted for 70%, Power sector 20%, and the rest to the commercial, agriculture, forestry and fishery, and residential sectors.

Transport

- Petroleum consumption in the transport sector increased by 14% in 2009 over 2008.
- Land and marine transport demand for petroleum increased by 10% and 57% respectively between 2008 and 2009.
- Composition of petroleum usage in the transport sector for 2009 was similar to 2008 giving a breakdown of 62.0% to land transport, 27.0% to air transport and 11% to Marine transport.

Electricity

- Generation decreased by 2% between 2008 and 2009 with diesel generation supplying about 58%, hydro 41% and coconut oil Biofuel 1%.
- Contribution from Solar was negligible contributing to 0.01% in 2009.
- Consumption drop at an annual average growth rate 3.4% per annum between 2008 and 2009.
- Commercial and Manufacturing sector demand decreased by 15.4% between 2008 and 2009

Conversion Factors - Annex 1

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, bio fuel (coconut oil) 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 (PV) and Solar Hot Water Systems (SHW). Hydro-power over the past 2 decades has been used extensively in Samoa and currently supplies around 40% - 45% of electricity to the main grid in Upolu. Other high potentials for renewable energy in Samoa include harnessing energy from the wind, biogas, waste and geothermal sources.

Summary:
Total energy consumption from the Renewable Energy sources in Samoa for 2009 is estimated at 40700 tonnes of oil equivalent (TOE). Of this, biomass accounted 36700 TOE, Hydro 3800 TOE, CNO 200 TOE, and the remaining 60 TOE to Solar Energy. Generally, not much significant changes were estimated for 2009 consumption when compared to 2008.

Types of renewable energy available in Samoa:

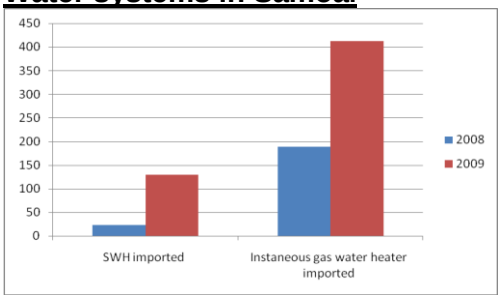
Solar Energy: *Solar Photovoltaic and Solar Water Heaters:*

Developments in solar energy technologies in Samoa represent a very small part of the total energy generated or consumed per year. For 2009 estimated energy capacity of solar products imported into the country totaled around 636.26 GJ or 14.93 TOE.

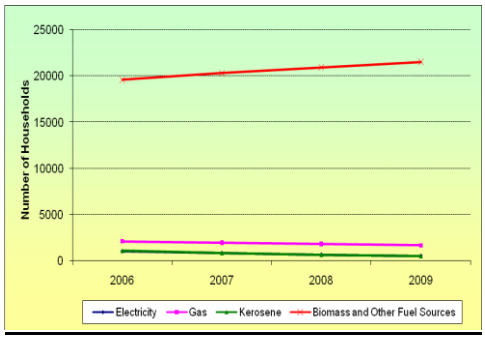
Solar hot water heaters accounted mainly for solar product import with a yearly energy production estimate of 2482 GJ (58 TOE). In 2009, there were a total of 130 SWH systems imported compared to 23 in 2008 (465% increase). Solar PV imports for 2009 accounted only for 1 unit. The Solar product market in Samoa is majorly driven by the hotel sector, where new developments and growth in the tourism infrastructure sector will correlate to the growth and importation of solar products. The rest of the commercial and the residential sector are covered by grid connected power. For 2009, average landed price of Solar PV systems were in the vicinity of $1,400 tala. Likewise, Solar water heaters in 2009 had an average landed cost of $1,891 tala. In 2009, Samoa imported solar products from New Zealand, Australia and Malaysia.

The current for Samoa shows a preference for SWH compared to gas water heaters in replacement for electric water heaters and boosters in hotels and residential homes. For 2009, there were a total of 419 instantaneous gas water heaters units imported, an increase of 129% from 2008 (183 units) with an average landed cost of $424.00 tala.

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



Comparison estimate on the number of households by main source of cooking fuel.



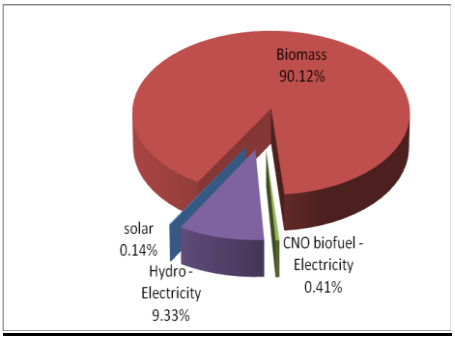
Bio-energy: *Biomass (Firewood, coconut shells, coconut husks, plant waste residues, wood charcoal etc), liquid biofuels (coconut oil biofuel, biodiesel, ethanol) and biogas.*

Commodity exports and agriculture survey report the total biomass consumption in Samoa was in the vicinity of 36.7 kilo tonnes of oil equivalent with the Residential Sector accounting for 96% of the total biomass consumption (35,400 TOE).

In 2009, EPC was employing a 3 - 5% coconut oil (CNO) 9- -97% diesel blend for electricity generation. No concrete data were provided by EPC as yet but an estimated 234,000 litres were consumed in 2009. This is equivalent to 200 TOE.

Hydro-Power:
Energy from Hydro power in 2009 accounted for 3.8 kTOE or 159 TJ of energy. Detailed description of Hydro power is provided under the Electricity section.

Comparison of Renewable Energy Consumption by sources



Opportunities and Developments:
Energy from Biogas for cooking and lighting is scarcely used in Samoa. Remaining units are reported to be used in Alafua campus. Though not much use is identified with this energy source, Samoa holds a significant percentage to develop biogas technology. Based on the 2005 Agriculture survey report, a total of around 6000 households in Samoa have enclosed piggery systems. Taking 3% of this, points to a total of 197 bio-gas digesters that could be developed in Samoa. The standard digester come in sizes 4, 8 and 15 cubic meters.

The biofuel trials by the Scientific Research Organisation of Samoa (SROS) aims to support the electricity and transport sectors substitute diesel and reduce dependency on fossil fuel. Working in parallel are the Pacific Oil and Paradise Oil companies who also work closely with the communities to supply coconuts to produce biofuel for electricity and transport sectors with excess volumes being exported.

SROS proposes to replace diesel generation of electricity in Savaii through the purchase of equipment to generate electricity by biodiesel. Coconut and jatropha will be the feedstock for this initiative.

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 by Exxon Mobil and distributed by Petroleum Products Supplies (PPS). In 1998 the Government of Samoa introduced and controlled effectively new supply and pricing arrangements by owning all the petroleum storage facilities and tendering out operation to a supplier every 5 years. This arrangement allows the control of domestic petroleum prices to be reflective of international market prices. The Ministry of Finance controls and manages this arrangement. LPG imports and sales are mainly operated by BOC Gas and ORIGIN Gas which are international firms with part local ownership. The Price Control Board which operates under the Ministry of Commerce, Industry and Labour (MCIL), sets LPG ceiling price range. Other products such as lubricants and Greases can be brought in by private companies.

Summary:

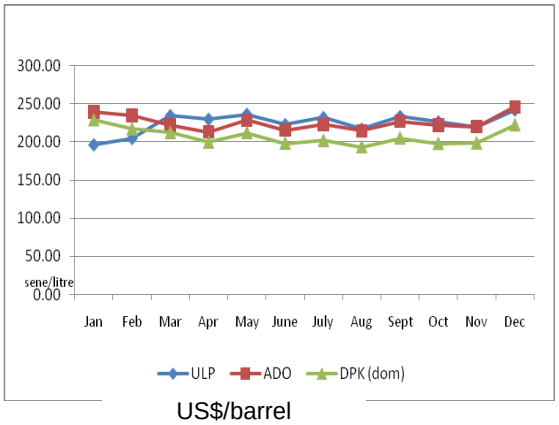
In 2009 petroleum consumption totaled 85.2 million litres, seeing an increase of 6.19 % from 2008 (80.3 million litres). The Transport sector accounted for 70% in 2009 of total petroleum consumption compared to 66% in 2008. The Electricity sector takes 20% of total consumption and the rest (10%) to commercial, agriculture, forestry, fishery and residential sectors. Prices peaked in December at $2.43 per litre for unleaded petrol and $2.46 for diesel. Average prices in 2009 decreased by 25% and 31% for unleaded petrol and diesel respectively compared to 2008.

Petroleum Prices:

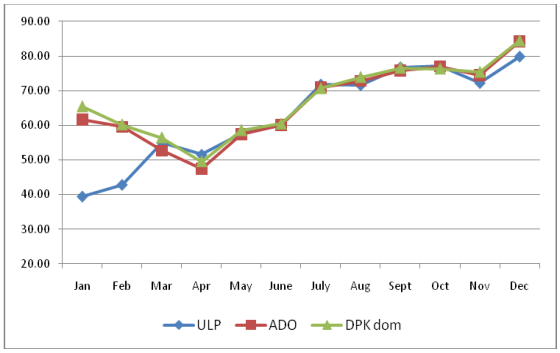
Retail prices of unleaded petroleum and diesel fluctuated throughout 2009 and peaked in December ($2.42/litre and $2.46/litre) with recorded increases since January of 23% and 0.3% respectively. Unleaded petroleum prices moved between $1.96 and $2.43 per litre while diesel prices fluctuated between $2.13 and $2.46 per litre. Average prices for 2009 were $2.22 and $2.25 for petrol and diesel; and in comparison to 2008, average prices decreased by 25% and 31% for the two products. Dual purpose kerosene (DPK domestic) fluctuated between $1.93 and $2.30 per litre and also peaked in December. Average price for DPK in 2009 was $2.07 per litre.

While the international price of the barrel increased by more than 100% and 35% for petrol and diesel from January to December 2009, the relatively low freight costs and strengthening of the Tala against the US dollar in the last eight months of the year kept prices down. Lowest average price for a barrel was in August at US $50, a decrease of 24% from January and then increasing by 70% to peak at US $84 a barrel.

2009 Retail Prices



US$/barrel



AVERAGE MONTHLY EXCHANGE RATES 2009 (USD$1 = SAT)	
JANUARY	3.064
FEBRUARY	3.145
MARCH	3.123
APRIL	3.165
MAY	3.014
JUNE	2.957
JULY	2.756
AUGUST	2.780
SEPTEMBER	2.706
OCTOBER	2.658
NOVEMBER	2.567
DECEMBER	2.513

Imports

Total fuel Imports for 2009 stood at 88.2 million litres in total compared to 84.5 million litres in 2008. An increase of about 4%. No fuel was discharged and recorded during the month of September. However, there were two fuel discharged in the month of August which was sufficient to cover for the demand in September.

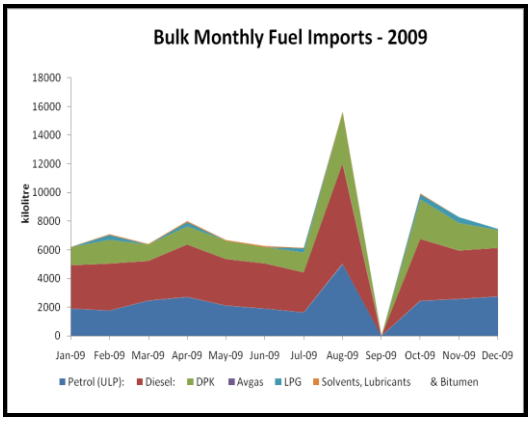
For the period under review, ADO recorded 45% of total oil imports with 39.97million litres, ULP 31% with 27.26 million litres, DPK 21% with 18.59 million litres, LPG 2% with 1.81 million litres and the balance of 1% for Avgas, Solvents, lubricants and grease.

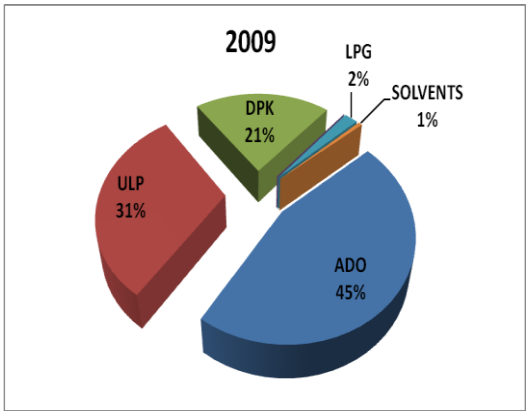
LPG total imports for 2009 recorded a decrease by around 53% from 2008. Imports were only undertaken for a number of months in 2009. ADO and ULP like previous years dominate the total petroleum imports reflecting an increase of 6.6% and 4.9% respectively from 2008. DPK imports recorded an increase of 14.6% from 2008 (16.21million litres) to 2009 (18.59 million litres) which is interestingly the same % increase for DPK recorded in 2008 over 2007.

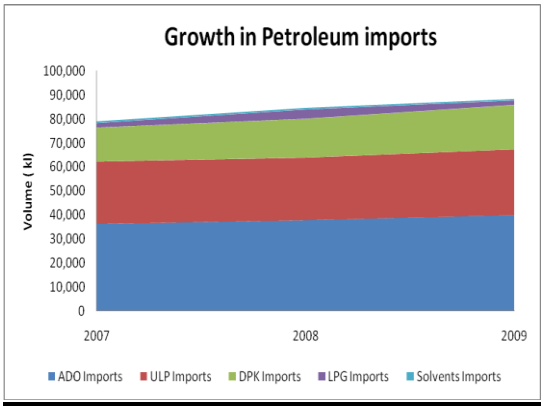
Re-exports:

For 2009, Samoa recorded re-export sales totaling 0.8 million litres, a decline by 11% from 2008. Of this amount ADO accounted for 0.66 million litres, DPK for 0.14 million litres and ULP accounting for 25 thousand litres. The main country that Samoa re-exports its fuel to is Tokelau. In this analysis, sales to yachts are also classified as re-exports as this fuel does not contribute to the fuel consumption in Samoa.

Petroleum Imports by products:

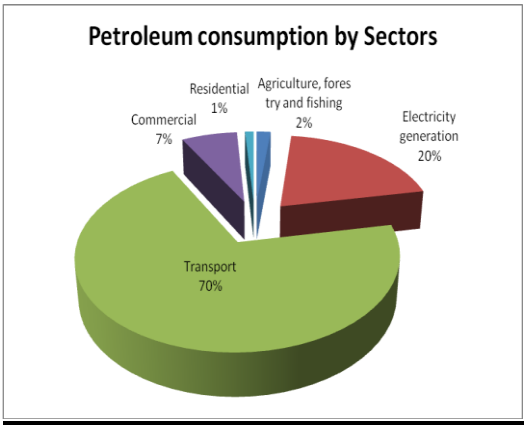






Consumption

Total petroleum consumption for 2009 stood at 85.2 million litres, an increase of 6.19% from 2008. While consumption for petroleum showed a slight increase in quantity compared to 2008, total value decreased reflecting the reduction in oil prices. Fuels consumption by different types of products were roughly the same for 2008 and 2009, 47% of which was diesel, 32% unleaded petrol and the rest for dual purpose kerosene. By sector, the largest user of petroleum products is the transport sector, with 70% of total consumption accounting for 59.8 million litres. The Power sector at 20% of total petroleum consumed in 2009 accounted for 17.9 million litres for electricity generation, and the remaining 10% to the commercial, agriculture, forestry and fishery, and residential sectors. Detail of consumption trend by sector is shown in the illustration on the right.



Developments:

Under the Greenhouse Gas Abatement through Energy Efficiency and Biofuel Applications in the Land Transport Sector Project, coconut oil was successfully trialed to run diesel engines by the SROS. In addition, energy efficiency is being promoted in the land transport sector to reduce greenhouse gas emissions and in turn reduce dependency on fossil fuels. Jatropha will also be researched to produce biodiesel as an alternative fuel in the generation of electricity. This will be extended to Savaii in the near future.

The Electric Power Corporation (EPC) runs some of its Upolu diesel engines on a 95% diesel 5% coconut oil blend. EPC is also investigating ways to increase the blend percentage of coconut oil to reduce dependency on diesel.

The Ministry of Finance conducted initial consultations with service station operators to introduce them to Health, Safety, Security and Environmental Standards. This initiative is in support of the ministry's efforts in reviewing the current process for issuance of petroleum license with the intention to implement this initiative as a pre-requisite to renewal of petroleum license to ensure compliance to these set standards.

4. Transport

Transportation has direct links to the advancements of 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 consists 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

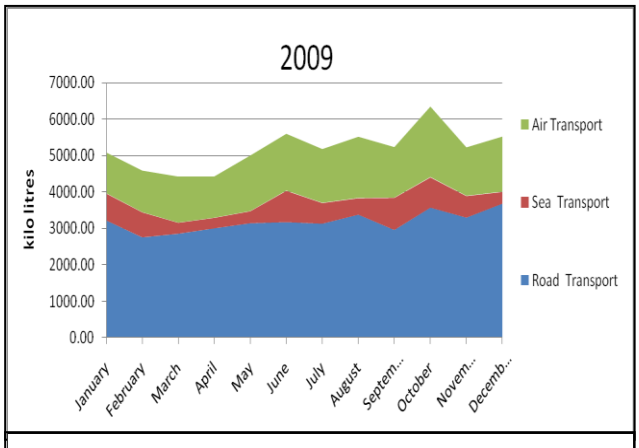
Petroleum Consumption in the Transport sector increased by 14% from 53.84 million litres in 2008 to 61.28 million litres in 2009 This increase was driven mainly by a 57% increase in Sea Transport consumption however, an increase was also observed in Land and Air transport consumption increasing by 10% and 14% respectively. The significant peak for 2009 was in October illustrating the hike in consumption as a result of the tsunami relief efforts of the period which showed levels of consumption for bunkers (sea transport), service stations (land transport) as well as airlines (air transport) exhibiting 182%, 27% and 63% increases respectively over the same month in 2008.

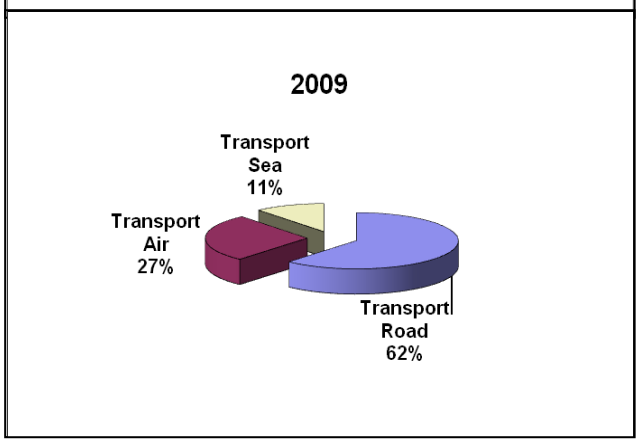
Assisting the 16% increase for 2009 is the significant falls in petroleum retail prices as a result of falling demands around the globe due to the global economic crisis. In addition, increases in national prices were minimized and drops were attributed to the strengthening of the Tala over the US Dollar from April to December, complemented by reduced shipping costs of distribution to Samoa (freight) as a result of lower market rates.

Petroleum consumption in the **Air Transport sector** refers mainly to DPK jet fuel. DPK jet fuel consumption for 2009 was around 17 million litres, 14% higher than 2008 (14.97 million litres). The increases in consumption illustrates an increase in flights with the re-opening of the Fagalii Airport as well as extended flight routes for Air Pacific and Poly Blue now flying Hawaii and LA. October 2009 showed a 60% increase over the same month of 2008 indicating the increase in consumption due to the influx of relief from Australia, New Zealand and USA following the Tsunami of September 2009.

Land Transport fuel consumption increased by 10% over 2008 from 34.62 million litres to 38.15 million litres, with ADO demand increasing by 75% (from 9.97 million litres in 2008 to 17.85 million litres).ULP also increased by 12% (to 27.54 million litres from 24. 65 million litres in 2008). The significant increase in fuel consumption for land transport can be attributed solely to lower petroleum prices in 2009 compared to 2008 price levels and the influx of Right Hand Drive (RHD) vehicles as a result of the road switch. With the Global Economic Crisis taking effect around the world, demand for fuel dropped dramatically causing slight falls in the prices. Furthermore, feeding these lower

Transport petroleum consumption by sub sectors.



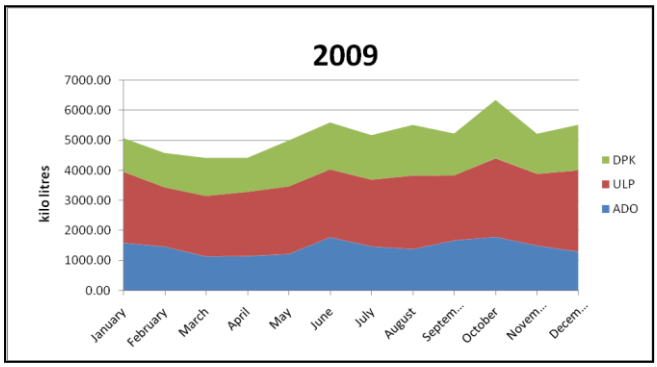


petroleum prices despite volatile Singapore prices was the depreciating the US Dollar against the Samoan Tala for most of 2009.

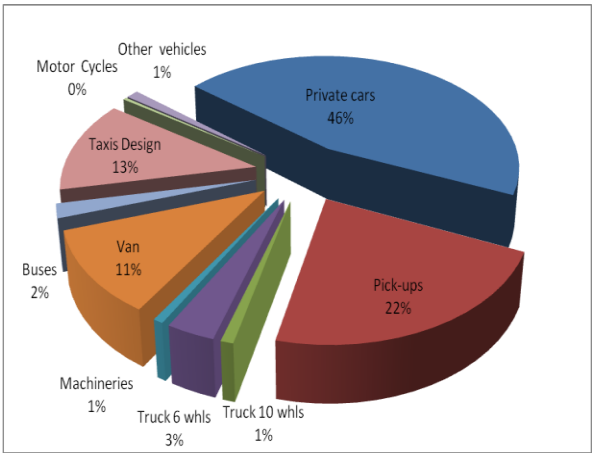
Total registered vehicles for 2009 was around 11,252 with a total number of newly registered vehicles to be 1,907 exhibiting the influx of RHD vehicles as the country transitioned through the road switch of September 2009.

Consumption for **Sea transport**, as previously mentioned, is the main contributor to the increase in Transport Consumption for 2009 recording an increase of 57% from 3.89 million litres in 2008 to 6.11 million litres in 2009. Contributing to these increases are the recorded hikes in fishing activity for the first half of 2009 whilst bunker activity was noticeably high throughout the year. Due to lower market rates for freight to the Pacific as a result of the Global Economic Crisis, distributions to Samoa became cheaper causing the increase in freight traffic for the year and hence bunker activity. The September 2009 tsunami was the main cause of the hike in sea transport for the month of October, recording a 182% increase in consumption over the same month of 2008.

Petroleum consumption by fuel types in transport Sector:



Registered Vehicles 2009



Developments:

Following the establishment of the Land Transport Authority which came into effect 1 July 2009 and the Road Switch that commenced in September 2009, a lot of new business ventures especially in second hand vehicles were established. This has increased the number of imported vehicles and hence the petroleum consumption in land transport. This calls for continuous efforts to explore substitutes to reduce dependency in imported fuel and associated effects on the environment.

The energy efficiency in land transportation project implemented by the MNRE has provided support to LTA through the procurement of emission control equipment to test vehicles during registration with the aim to reduce greenhouse gas emissions. This project has also successfully trialled (as mentioned in the Petroleum section developments) and procured a biodiesel plant for SROS to produce biodiesel with the aim to substitute diesel for transportation and electricity generation thus reducing dependency on imported diesel.

5. Electricity

Electricity is classified as a secondary energy source that is generated from primary sources such as petroleum, hydro, solar and biofuel. Percentage of contribution from each source varies during the wet and dry seasons. Electricity generation, transmission and distribution are exclusively under the authority of the Electric Power Corporation which is a government owned monopoly. The 2006 Population Census identified that 96% of the whole population in Samoa is electrified.

Summary

Gross electricity generation in 2009 totaled 107.8 GWh which is a decrease of 2% from 2008 (109.9 GWh). The composition of electricity generation in 2009 recorded 41% to hydro, Coconut oil bio-fuel 1% and 58% to diesel. Contribution from Solar power in Apolima amounts to 0.01% of total electricity generation. Electricity consumption accounted for 69.9 GWh in 2009 recording a decrease of 18.2% from 2008 (85.5 GWh). Commercial and manufacturing sector demand accounted for 58% of total consumption in 2009 recording an increase of 3% from 2008. Other sub-sectors which make up the 42% of total consumption in 2009 include government departments (11%), schools (3%), religious organisations (6%) and the residential users (22%).

Generation

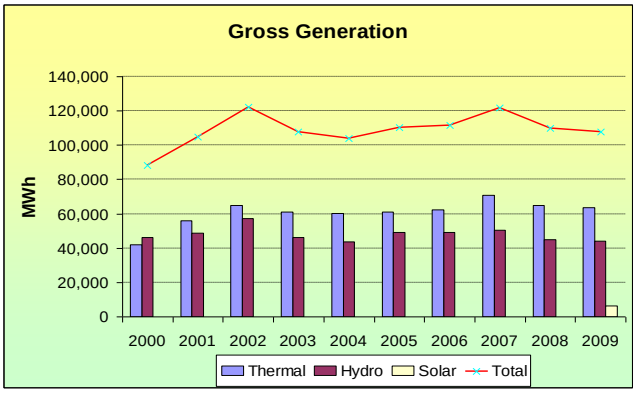
Gross generation decreased by 2% from 2008(109.9 GWh) to 2009 (107.8 GWh). This is due to the reduction in power generation from Hydro as a result of the ongoing dry conditions Samoa has been facing due to El Nino event that developed in the central and eastern pacific region.

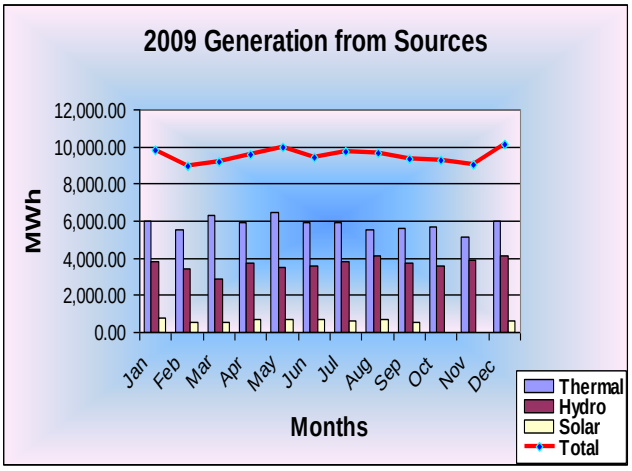
The low percentage of electricity generated by hydro has led EPC to continue utilising more diesel to generate electricity despite the diesel price levels. 3-5% of coconut biofuel blends have been employed by EPC in 2009 which accounts for 1% of total electricity generation. In addition, around 7.7 MWh of electricity has been generated from Solar for Apolima Island with total, contribution from Solar accounting for 0.01% of total electricity generation.

The table in the next page shows the effect of the price of diesel on the electricity base tariff. The current monthly surcharge rate is calculated from the diesel price of the previous month.

EPC aims to generate and distribute electricity to its customers in the most cost effective manner however the movement in international trends of diesel prices is beyond their control. Therefore, EPC continues to explore other alternative sources such as grid connected wind power generation, stand alone solar home systems, grid connected solar power generation, biomass gasifiers, increased percentage of coconut oil biofuel and additional hydro development to substitute for diesel thus anticipating cost effective measures for electricity supply in the

Gross generation 2000 - 2009

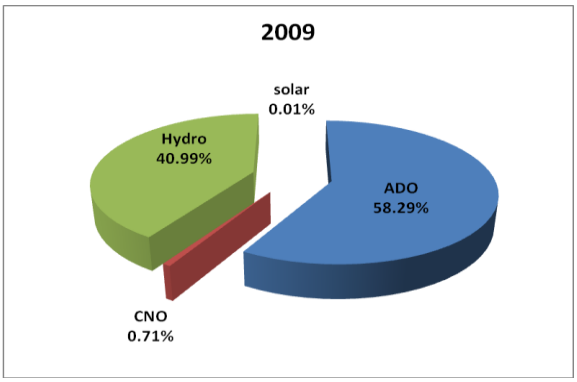




long run although initial capital investments for such technologies may be high.

Consumption

Electricity consumption also dropped from 2008 (85.5 GWh) to 2009 (69.9 GWh) recording a decline of about 18.2%. This drop in consumption is reflected across all subsectors recording a 13.2% drop in commercial and manufacturing sector, 30.8% drop in the residential sector and 15.4%, 19.6% and 13.6% drop in schools, religious organisations and government agencies respectively.

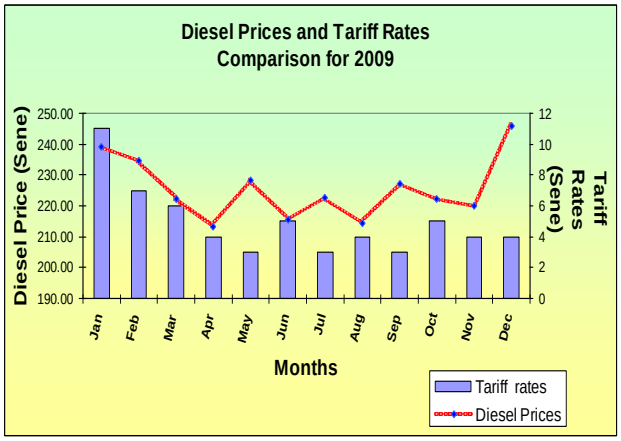


TARIFF SURCHARGE

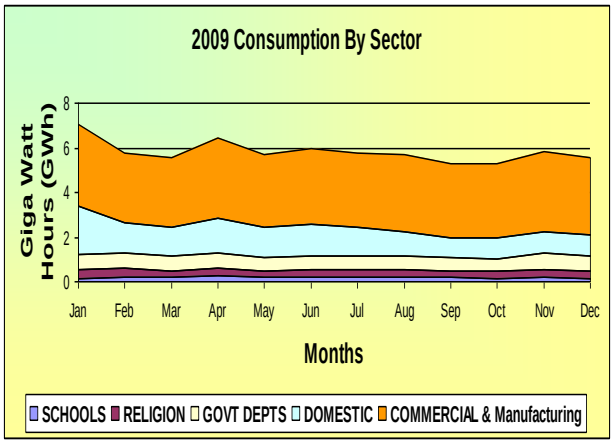
Effective Date	Base Tariff	Tariff	Cost per unit, 1 - 50 units	50 upwards
1-Jan-09	64sene	17.01%	75 sene	89 sene
1-Feb-09	64sene	10.35%	71 sene	84 sene
1-Mar-09	64sene	9.52%	70 sene	83 sene
1-Apr-09	64sene	6.97%	68 sene	81 sene
1-May-09	64sene	5.11%	67 sene	80 sene
1-Jun-09	64sene	8.21%	69 sene	82 sene
1-Jul-09	64sene	5.60%	67 sene	80 sene
1-Aug-09	64sene	7.08%	68 sene	81 sene
1-Sept-09	64sene	5.41%	67 sene	80 sene
1-Oct-09	64sene	7.95%	69 sene	81 sene
1-Nov-09	64sene	6.97%	68 sene	81 sene
1-Dec-09	64sene	6.53%	68 sene	81 sene

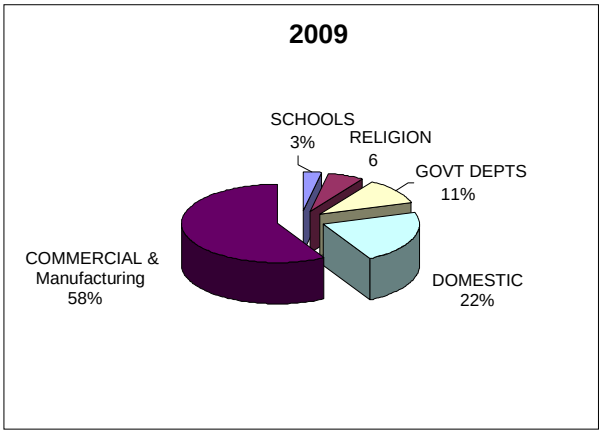
By comparison per sector, the commercial and manufacturing sector recorded a decrease of 13.2% from 2008 (46.9 GWh) to 2009 (40.7 GWh). However, commercial and manufacturing sector has increased its portion of the total consumption from 55% in 2008 to 58% in 2009 (3%).

Consumption from the residential sector recorded a decrease of 30.8% from 22.1 GWh (2008) to 15.3 GWh (2009). Residental sector consumption accounted for 22% of the total consumption and reflected a 4% drop for 2009 compared to 2008. The contributing factor is attributed to the change from post paid meters to prepaid meters which has provided a conscious means of enabling the consumers to monitor and manage their daily usage and conserve energy and money. About 14,531 prepaid meters were installed by 2009 since the commencement of the project and it accounts for about 38% of total electricity consumers.



Electricity Consumption by Sector





Other sectors namely Schools, religious organisations and government departments also show a decrease in consumption of electricity. Schools decreased their consumption by 15.4% from 2.6 GWh (2008) to 2.2GWh (2009) but maintains 3% of total consumption.

Religious organisations consumption also dropped to 4.1GWh in 2009 from 5.1 GWh in 2008, a decrease of 19.6% but still contributes to 6% of total consumption. The Government sector also showed a drop of 13.6% from 8.8 GWh in 2008 to 7.6GWh in 2009. Government accounts for 10% of total consumption which is 1% more than 2008.

The fall in consumption in 2009 attributed to the global financial crisis affecting the purchasing power and customers prioritising their expendutires. The installation of prepaid meters also contributes to this drop in consumption with consumers employing more efficiency and conservation measures.

Developments:

The Power Sector Expansion project is in its third year of implementation and about 38% of the total customers have already changed to prepaid meters in 2009.

EPC also continues to explore opportunities on Renewable Energy Technologies. EPC has completed a survey to identify the population without access to electricity including identification of those closer to the grid and those that are remotely located. EPC plans to electrify the remaining parts of the country that are remotely located through solar and solar panels have recently being distributed to most of these households with EPC providing support for installation and maintenance.

Wind monitoring continues for Savaii however, for Upolu after four (4) years of monitoring, a feasibility study will be conducted before end of 2010 under the Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP) and EPC is looking into piloting this technology by using a single turbine to confirm the viability of this source.

The biodiesel initiative trialled by SROS is anticipating benefits for electricity generation in regard to diesel substitution and reduction in fuel dependency and costs.

The Standards and Appliance Labelling project looking at Minimum Energy Performance Standards (MEPS) for electrical appliances such as refrigerators, air conditions and lighting. A feasibility study on the impact of this initiative is currently underway. Results from this study will determine the direction of this initiative.

Promoting Energy Efficiency in the Pacific is another new regional initiative in 2010 will undertake energy auditing of buildings and street lighting and had already assisted EPC on the Power Factor Correction activity.

Progress updates of these new 2010 developments will be reflected in the next review.

6. OVERVIEW OF SAMOA'S ENERGY SECTOR:– 2008 to 2009

In 2009, Samoa was estimated to have consumed around 118.09 kilo-tonnes of oil equivalent, an increase of 9% from 2008(108.1 kTOE). Of the total energy consumed, 31% was met by biomass, 66% by petroleum products while the remaining 3% was met by hydropower, coconut oil bio fuel and solar. This total consumption when broken down by sectors shows that the transport (land, sea and air) and residential sectors were the major energy consumers, consuming 44% and 30% of total energy in Samoa, respectively. Electricity generation accounts for around 19.4% of total energy consumption in Samoa. The commercial and manufacturing sector accounted for 6% of total energy consumption.

Table of total energy Consumption in Samoa

		Total Energy Consumption.		
			(Kilo tonne of Oil Equivalent)	
		2009	**2008**	**2009**
Biomass	Commercial Sector	1300 TOE	2.2	1.3
	residential sector	3540 TOE	34.3	35.4
Petroleum	Electricity Generation	17.2 million litres	15.8	18.92
	Transport	59.8 million litres	44.0	51.69
	Commercial Sector	5.85 million litres	6.7	5.36
	Residential Sector	0.9 million litres	1.2	0.01
	Agriculture, forestry and fishing	1.48 million litres		1.36
Electricity	Hydropower	44.1 GWh	3.8	3.8
	CNO Bio-fuel	0.76 GWh		0.2
	Solar	7.7MWh	0.001	0.001
Others	Solar		0.04	0.06

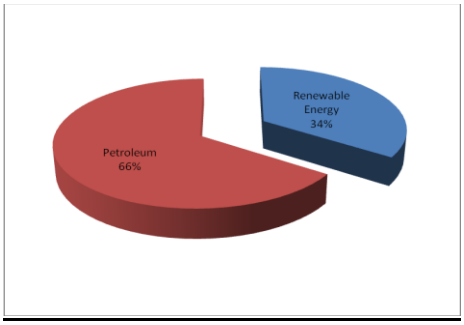
Comparison from 2007 to date, Renewable energy share of the total country consumption stands at a constant level at 35% in 2007 to 34% in 2009. The slight reduction in renewable energy share from 2007 to 2009 is attributed to the reduction in hydro power generation – a result of the drought which Samoa continues to face since 2008. Comparison of the overall percentage breakdown for renewable energy, biomass consumption as firewood and hydro for electricity generation, the major contributors, fairly remained the same from 2007 to 2009 accounting for an average of 31% and 3% respectively. For the period from 2007 to 2009, the increase in the share of renewable energy for Samoa is around 0.22% (Solar – 0.05% and CNO Biofuel - 0.17%).

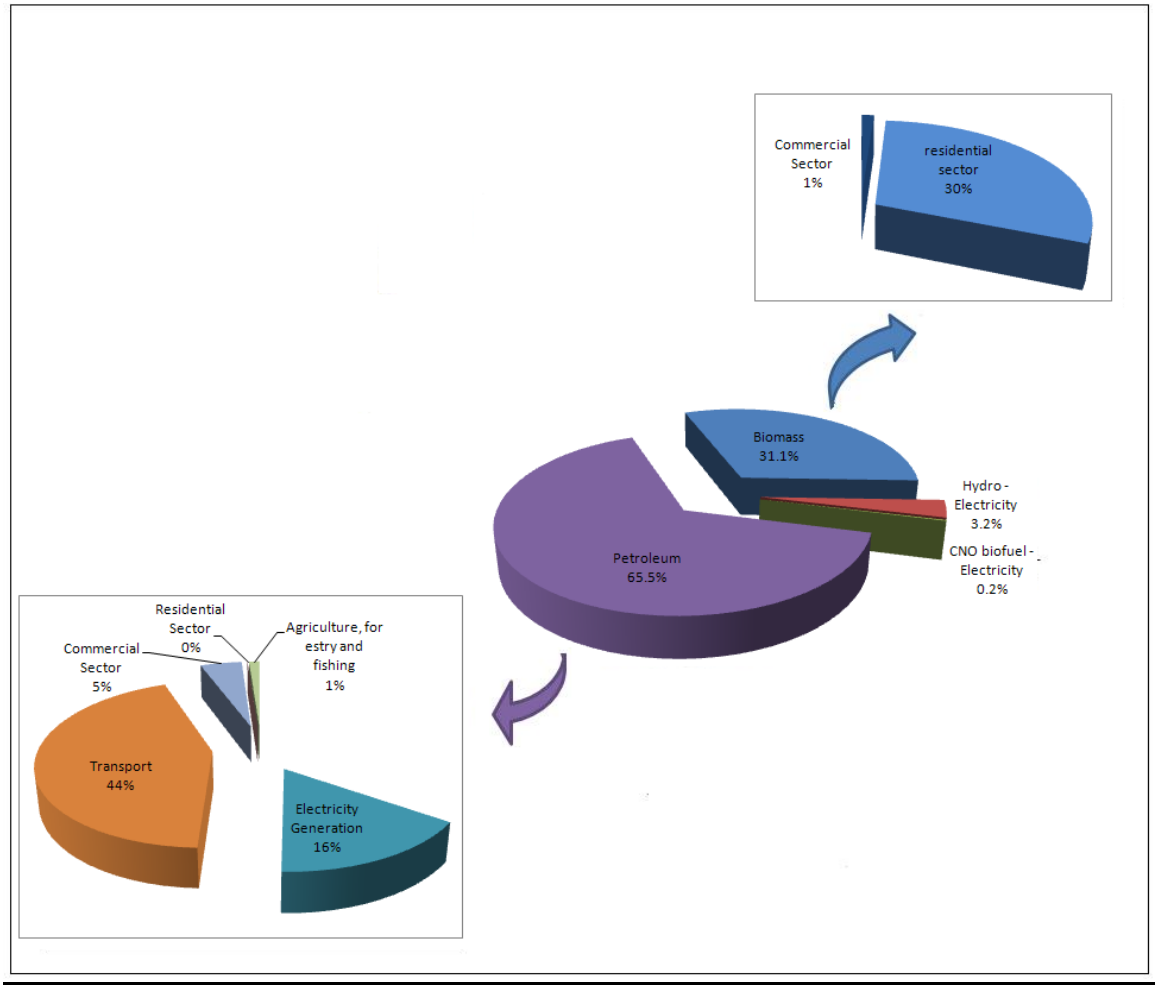
Samoa's energy goal is to increase the share of mass production from renewable sources to 20% and to increase the contribution of RE for energy services and supply by 20% by year 2030. Since 2007, contribution of renewable energy share fairly remained the same or decreased slightly despite new recorded increases from Solar and coconut oil bio-fuel accounting for 0.22%. The impact of the drought on hydro power generation has resulted in the fairly same share of renewable energy since 2007.

At the current trend the following are some of the identified areas where renewable energy could be explored to increase their share in overall energy consumption:

1. Petroleum consumption in the transport sector stands at 44%. This could be explored through the introduction of biofuel blending for land and sea transport;
2. Petroleum consumption for electricity generation accounts for 18%. The introduction of the additional hydro power stations, increasing the volume of coconut oil blend for generation and efforts on harvesting solar and wind sources could be enhanced to increase the contribution of these sources.
3. Promoting of energy efficiency and conservation activities to target the transport and electricity sectors can result in reduction of fuel consumption.

2009 Energy Consumption





118.09 kilo tonnes of Oil Equivalent

Annex 1: Conversion Factors

Energy conversion units

Unit for Energy – joules and can also be expressed as watt hours or oil equivalent.
Unit for power – Watts

1 joule (J) = 0.238846 calories (IT)
1 kilo joule (kJ) = 1000 joules
1 megajoule (MJ) = 1000kJ
= 1,000,000 joules (J)
= 277.778 watt hours (Wh)
= 0.0238846 kilograms of oil equivalent (Koe)

1 kilogram of oil equivalent (koe) = 41.868 megajoules (MJ)

1 tonne of oil equivalent (toe) = 41.868 gigajoules (GJ)

1 kilowatt hour (kWh) = 3.6 megajoules (MJ)
= 0.09 kilograms of oil equivalent (koe)

1 megawatt hour (MWh) = 1000 kilowatt hour (kWh)

Mass conversion units

1 kilogram (kg) = 1000 grams (g)
= 0.001 tonne (te)

1 American (short) ton
= 0.907185 tonnes (te)

1 tonne (te) = 1,000 kilograms (kg)

Indicative Fuel specification and Energy Content:

The energy factors measure the gross energy content of the fuel.

1. Liquid Fuels

	Litres per Tonne	Gigajoules per Tonne	Megajoules per Litre	Kilogram of Oil equivalent per litre
LPG (Propane)	1960	49.6	25.3	0.60
LPG (Butane)	1730	49.0	27.7	0.66
Aviation Gasoline (Av Gas)	1410	46.8	33.2	0.79
Motor/Automotive Gasoline (Mogas)	1340	46.4	34.6	0.83
Dual Purpose Kerosene (DPK)	1260	46.4	36.8	0.88
Automotive Diesel Oil (ADO)	1180	45.6	38.6	0.92
Industrial Diesel Oil (IDO)	1150	44.9	39.0	0.93
Fuel Oil - high sulphur (FO)	1050	42.9	40.8	0.97
Ethanol (PNG only)	1266	29.6	23.4	0.56
Solvents/White Benzene	1420	48.1	34.0	0.81
Lubricants and Greases	1120	43.4	38.8	0.93
Bitumen	980	42.7	44.0	1.05
Crude Oil (PNG Kutubu Light)	1249	44.9	35.9	0.86
Coconut Oil	1100	38.4	34.9	0.83

3. Solid Fuels

		Gigajoules per Tonne
Fuelwood/Woodwaste (40% mcwb)[1]		10.8
Fuelwood/Woodwaste (13% mcwb)[2]		17.1
Coconut Palm Wood		11.5
Coconut Residues[3]:		
	Shell (15%	14.6
	Husk (30%	12.0
	Average (air	14.0

1. Typical moisture content of undried sawmill residue and timber merchant fuelwood.
2. Typical moisture content of air dried fuelwood and residue.
3. Average yield of 2.93 air dry tonnes of residue per tonne of copra produced.

4. Gaseous Fuels

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

* Approximate figures at 15°C.

5. Electricity

	Megajoules per kWh	Kilogram of Oil equivalent per kWh
Electricity	3.6	0.09