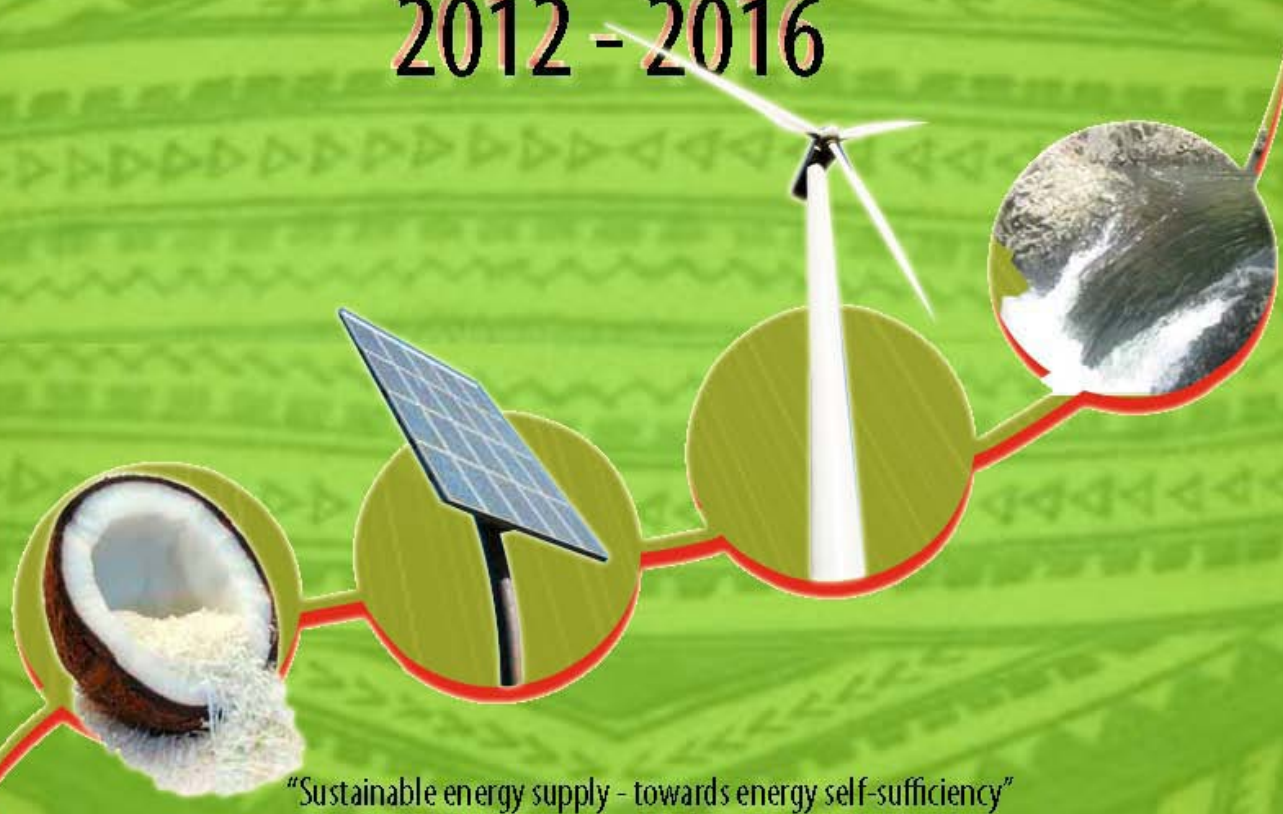


# SAMOA ENERGY SECTOR PLAN 2012 - 2016



"Sustainable energy supply - towards energy self-sufficiency"

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Ministry of Finance  
Energy Policy Coordination and Management Division  
Private Mail Bag  
Apia  
SAMOA  
Tel: 34-333 Fax: 21-312  
E-Mail: [energy@mof.gov.ws](mailto:energy@mof.gov.ws)  
Website: [www.mof.gov.ws](http://www.mof.gov.ws)

## FOREWORD



It is my pleasure to present the Energy Sector Plan 2012-16.

The energy sector is important to all aspects of Samoa's development. Energy enables our children to get to school, our businesses to thrive and our mobile phones to work. The sources of supply of energy remain relatively constant but the way energy is transformed into useable forms and the appliances we use are changing rapidly, offering significant opportunities to become better prepared for our future

generations.

It is a time to move towards improved efficiency in energy use, increased consumption of renewable energy sources, as well as taking an end user focused delivery energy services to achieve energy self-sufficiency.

An initial effort through the passing by Parliament of the Electricity Act 2010 became the platform for enabling private sector investment in electricity networks and generation. Improvements in technology and reducing costs of solar photovoltaic panels and inverters mean these can now be installed at home, on buildings and elsewhere with potential savings in electricity costs.

It is envisioned that focus will also be directed to increasing efforts on the transport part of our energy use to prepare for the introduction of biofuels and renewable fuels in the future, to consider the types of vehicles we use and the design of our transport system to gain the benefits of improvements in efficiency and new technologies.

This Energy Sector Plan has a vision of *Sustainable Energy* for Samoa and is guided by the theme of "... *Sustainable Energy towards Energy Self Sufficiency...*" highlighting not only the Government's commitment to raising renewable energy initiatives but also to reduce reliance on imported fossil fuels.

To meet Samoa's needs and ensure that the support of our development partners is aligned to address these, leadership of the energy sector will be strengthened within the Sector Plan timeframe.

Samoa has many renewable energy options including solar, hydro, biomass and wind however the challenge remains in identifying the best and most feasible option given Samoa's context. The underlying principles in the successful identification and implementation of these options include ensuring that vulnerable groups benefit from these efforts, that climate change consideration has been taken and that these strategies will contribute to achieving the national vision of "...*An Improved Quality of Life for All*".

  
.....  
(HON. FAUMUINĀ TIATIA FAAOLATANE LIUGA)  
MINISTER OF FINANCE

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## ACRONYMS

ADO	Automotive Diesel Oil
BNPL	Basic Needs Poverty Lines
CDM	Clean Development Mechanism
CEF	Clean Energy Fund
DPK	Dual Purpose Kerosene
DSM	Demand Side Management
EOI	Expression of Interest
EPC	Electric Power Corporation
EPCMD	Energy Policy Coordination and Management Division
GHG	Greenhouse Gas
HIES	Household Income and Expenditure Survey
HRC	Human Resource Capability
HRCNA	Human Resource Capability Needs Assessment'
HSSE	Health Safety & Security Environment
IPP	Independent Power Producer
kTOE	Kilo tones of Oil equivalent
LPG	Liquid Petroleum Gas
LTA	Land Transport Authority
MAF	Ministry of Agriculture & Fisheries
MNRE	Ministry of Natural Resources and Environment
MOF	Ministry of Finance
MWCSD	Ministry of Women, Community and Social Development
MWTI	Ministry of Works, Transport and Infrastructure
NECC	National Energy Coordinating Committee
NISP	National Infrastructure Strategic Plan
OOTR	Office of the Regulator
PPA	Power Purchase Agreement
PPS	Petroleum Products Supply Limited
PSEP	Power Sector Expansion Project
PTF	Petroleum Task Force
PV	Photo Voltaic
RE	Renewable Energy
RFP	Request For Proposal
SDS	Strategy for the Development of Samoa
SIA	Standard Interconnection Agreement
SROS	Scientific Research Organisation of Samoa
STEC	Samoa Trust Estate Corporation
ULP	Unleaded Petrol
YWAM	Youth With A Mission

## EXECUTIVE SUMMARY

The energy sector is important to Samoa's economic, social, infrastructure and environmental composition. This plan has therefore been developed using extensive consultation with many groups.

The purpose of the Energy Sector Plan is to provide a comprehensive plan for the energy sector to deliver outcomes consistent with the overarching Strategy for the Development of Samoa (SDS) 2012-2016, with due regard for cross-cutting issues including emphasising the importance of raising living standards, increasing resilience and boosting productivity for sustainable development. It provides a resourcing framework to support implementation of the plan.

The SDS 2012-2016 vision of "Improved Quality of Life for All" is supported by fourteen (14) key national outcomes within the four (4) broad sectors of economic, social, infrastructure and environment.

All of these national outcomes are influenced by the availability, affordability, safety and environmental impacts of energy. Total demand for energy has grown substantially over recent decades, principally driven by increased demand for fossil fuelled vehicles and electrical appliances. This increase in demand has mainly been met by increased importation of petroleum products for transportation, electricity generation and to a lesser extent cooking. The increase in energy demand was accompanied by a gradual shift from indigenous energy sources such as biomass and hydropower to more convenient and readily accessible sources such as diesel, petrol, liquid petroleum gas (LPG) and kerosene. There is an abundance of biomass available as well as other forms of renewable energy, hence energy diversification based on indigenous energy sources is being encouraged and promoted for electricity generation immediately and for transportation in the future as it becomes economical.

The Government publishes annual energy review reports, which provide an overview of Samoa's energy sector including indigenous energy sources. These reports are intended to provide the Government of Samoa, business and the community with a better understanding of the energy sector. It is crucial that the data that informs these reports is accurate and provided in a timely manner. The adage that "you manage what you measure" is so important in this context.

Energy used in Samoa is derived from three main sources – petroleum products, biomass and hydropower. Due to the high and growing proportion of petroleum products, the renewable energy component of Samoa's energy sources has reduced from 25% to less than 20% since 2000.

The Samoan energy sector has been categorised into the following three sub-sectors in this plan because of their distinctive and contrasting characteristics:

- **Transport (~54% of total primary energy)** comprises the land vehicles and domestic shipping fleets<sup>1</sup> powered by imported petroleum fuels (petrol, diesel) and currently a minute fraction of biodiesel; hence this sub-sector includes essentially no renewable energy at this time;
- **Electricity (~27% of total primary energy)** is currently sourced from hydro and diesel generation with a very small solar component, and delivered for residential, commercial, institutional and industrial users. The renewable proportion of this sub-sector energy sources is estimated at 13% for 2011 (lower than the trend estimate of 16% due to well below average rainfall in 2011); and

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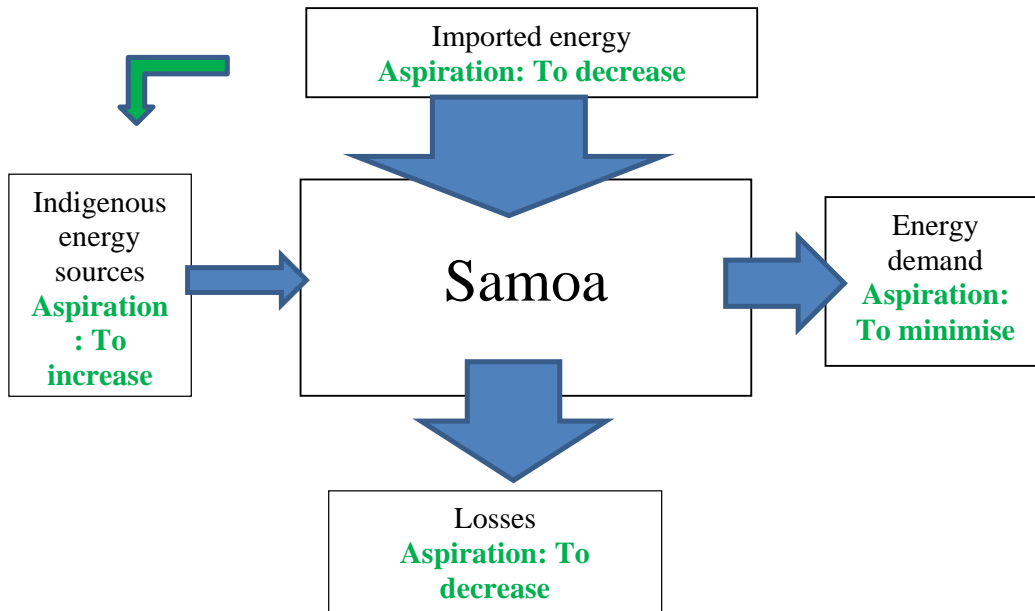
<sup>1</sup> International air and sea transport is excluded from the transport sub-sector as it occurs essentially outside Samoa.



- **Heating (~19% of total primary energy)** comprises predominantly biomass (firewood, charcoal) with lesser amounts of LPG (gas), kerosene and a very small solar water heating component, with the renewable energy portion currently estimated at 86%.

Samoa’s total energy supply and demand is simply depicted in the following diagram and presented in greater detail in Section 3.4 Samoa Energy Flow Chart. The scale of the blue arrows is indicative of energy flows in 2011:

**Figure 1: Samoa’s Total Energy Supply and Demand**



This Energy Sector Plan drives towards the Aspirational goals in green above.

For the Energy Sector Plan period of 2012 to 2016 the key strategies and targeted outcomes for the sector as a whole and for Transport, Electricity and Heating are set out in the Energy Sector Logical Framework in **Appendix 2**.

# 1. INTRODUCTION

## 1.1 Background

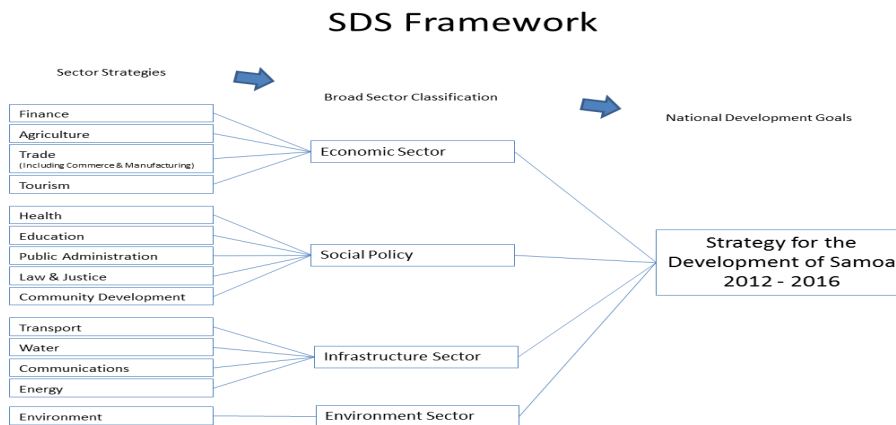
In the early to mid 2000’s Samoa experienced high levels of economic and social development driven primarily by its Infrastructure and Commerce Industries. However, the Global Economic Crisis of 2008/09 revealed the country’s vulnerability to exogenous factors as fuel and food price increases were seen to have large detrimental effects on the local economy. Real GDP growth for 2008/09 was recorded at -5.1% whilst inflation skyrocketed to 13.9% pushed up by imported inflation. Although import cover was within the 4 – 6 month fiscal target (at 5month) for the year mentioned, total imports illustrates an average increase of around 8% per annum for the past 4 years since the Global Economic Crisis. Of total imports, about 21% are petroleum products and according to the Central Bank of Samoa, percentage change in the value of petroleum imports from the 4Q11/12 over 4Q10/11 was an approximate 30% increase.

In light of this heavy reliance, the Government of Samoa is committed to reducing this through raising the country’s energy self sufficiency through the promotion of RE investment, Energy Efficiency and Conservation.

The Energy Sector Plan outlines the strategic directions and sets of targets that the Energy Sector in collaboration with its key stakeholders, intend to achieve within the period 2012 – 2016 and is closely linked to the priority areas of the Strategy for the Development of Samoa 2012 – 2016.

The SDS 2012 - 2016 sets the National Development Goals, with the Energy Sector Plan interacting strongly with all other sectors, as set out in the diagram below. All other sectors are dependent on the energy sector for reliable, dependable, safe, high quality, environmentally sound and cost effective delivery of energy.

**Figure 2: Strategy for the Development of Samoa Framework**



*Source: Economic Policy and Planning Division, Ministry of Finance*

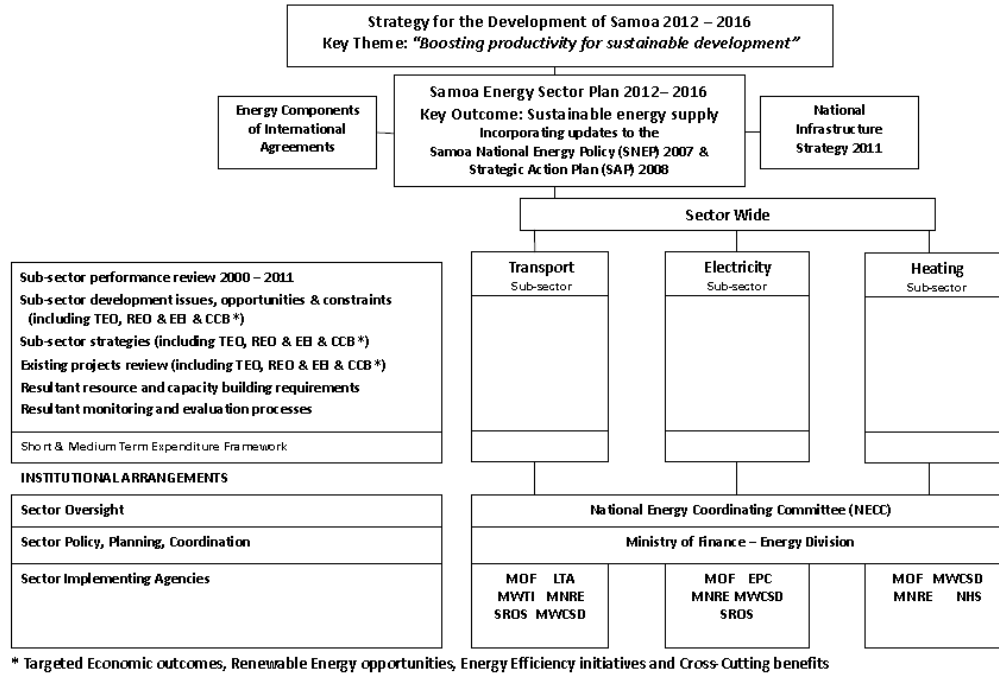
The national planning framework is now set over a four year period of realistic resource projections. Accordingly, the Energy Sector Plan is for the years 2012 – 2016 and it includes key outputs and performance measures, including measurable indicators as well as mechanisms for annual sector reviews that are linked to the budget process.

## 1.2 Methodology

The Energy Sector Plan has been compiled through a highly consultative process as well as reviews of existing literatures as a result of past research and studies for the Energy Sector. A list of stakeholders consulted can be found in **Appendix 1**. The formulation of the Energy Sector Plan is based on the overarching SDS 2012 - 2016, and this plan supersedes the Strategic Action Plan 2008 developed in response to the Samoa National Energy Policy 2007.

The conceptual framework designed and used to develop this plan is shown in the diagram below.

**Figure 3: Conceptual Framework**



### 1.3 Purpose of this Plan

The purpose of the Energy Sector Plan is to provide a comprehensive plan for the energy sector to deliver outcomes consistent with the overarching SDS 2012 - 2016, with due regard for cross-cutting areas such as emphasising the importance of raising living standards. It provides a resourcing framework to support implementation of the plan. The Plan also reviews existing institutional and monitoring arrangements with the aim of improving coordination, management and implementation of the plan.

## 2. ENERGY SECTOR REVIEW

### 2.1 Energy and the Economy

The Strategy for the Development of Samoa (SDS) 2012–2016 details the Government’s commitment to enhancing people’s choices with its theme “Boosting productivity for Sustainable Development” and the vision continuing to be the longer term goal of “Improved Quality of Life for All”.

The SDS 2012-2016 is supported by fourteen (14) key national outcomes within four (4) broad sectors:

#### **Priority Area 1: Economic Sector**

- Key Outcome 1: Macroeconomic Stability
- Key Outcome 2: Re-invigorate Agriculture
- Key Outcome 3: Revitalised Exports
- Key Outcome 4: Sustainable Tourism
- Key Outcome 5: Enabling Environment for Business Development

#### **Priority Area 2: Social Policies**

- Key Outcome 6: A Healthy Samoa
- Key Outcome 7: Improved Focus on Access to Education, Training and Learning Outcome
- Key Outcome 8: Social Cohesion

#### **Priority Area 3: Infrastructure Sector**

- Key Outcome 9: Sustainable Access to Safe Drinking Water and Basic Sanitation
- Key Outcome 10: Efficient, Safe and Sustainable Transport System and Networks
- Key Outcome 11: Universal Access to Reliable and Affordable ICT Services
- Key Outcome 12: Sustainability Energy Supply

#### **Priority Area 4: Environment Sector**

- Key Outcome 13: Environment Sustainability
- Key Outcome 14: Climate and Disaster Resilience

All of the priority areas are influenced by the availability, affordability, safety and environmental impacts of energy. Total demand for energy has grown over the last 20 years along with a preference for electricity and fossil fuelled equipment and appliances. This increase in demand is mainly in petroleum products for transportation, electricity generation and to a lesser extent cooking. Essentially, there has been a gradual shift from indigenous energy sources such as biomass to more convenient sources such as petroleum and liquid petroleum gas (LPG). Between 1981 and 2001, the percentage of household cooking with wood dropped from 73% to 62% of households in Samoa<sup>2</sup> a trend expected to continue when this year’s census results are released. There is an abundance of biomass available as well as other forms of energy, hence energy diversification based on indigenous energy sources will be encouraged and promoted in a more sustainable manner.

Fuel imports by both government and the private sector continue to increase. In Samoa’s First National Communication to the United Nations Framework Convention in 1999, it specifies that in spite of Samoa’s relatively small greenhouse gas (GHG) emissions, there were parallel increasing trends in each of the greenhouse gases examined. These trends will continue if they were not addressed properly and promptly. A priority list of technology transfer is also provided in that document and energy interventions compose 50% of these. Samoa’s World Summit on Sustainable Development Assessment Report in 2002 also emphasised the promotion of viable renewable energy as one of the key priorities to be addressed in the energy sector.

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<sup>2</sup> Population census 2001.

Reliable, affordable, safe and environmentally sound energy supply and services are crucial to meeting the increased demand. Energy efficiency and conservation plus demand side management are available to encourage end users to use energy wisely and efficiently resulting in energy savings. These measures will contribute to sustainable energy development improving quality of life for all by minimising environmentally adverse effects and maximising benefits. Sustainable development in its narrowest form will always be associated with efficient and reliable supporting services, such as electricity, transportation, communication and other services.

Energy suppliers and distributors currently active in Samoa are Electric Power Corporation



**Public Transport in Samoa**

(EPC), Petroleum Products Supply (PPS), BOC Samoa and Origin Energy. EPC is a Government-owned corporation and the main producer and supplier of electricity in Samoa. Under contract to the Samoan Government, PPS receives and distributes petroleum products throughout Samoa, the products largely being purchased directly by the government under a Request for Proposal tendering process every 5 years. Mobil Oil Ltd won the first tender and supplied petroleum products to Samoa from 1998 to 2003, followed by

Government sets and monitors fuel prices every month based on international fuel prices, the application of excise and other taxes, plus a distributor's and retailer's margin.

The transport sector is a critical part of the national economy, underpinning a myriad of other industries and reflecting directly upon the value of everyday activity in terms of time and access.

Electricity availability, reliability and price are important to the economic well-being of existing consumers and can potentially attract new industry and commercial development.

## 2.2 Primary Energy Sources

Samoa has undergone a transformation towards a society relying on commercial energy supply based on imported petroleum products, driven primarily by increasing demand for road vehicles and electrical appliances. Total energy demand for Samoa is met by 3 main sources, petroleum products (diesel, petrol, kerosene and LPG), biomass and hydropower.



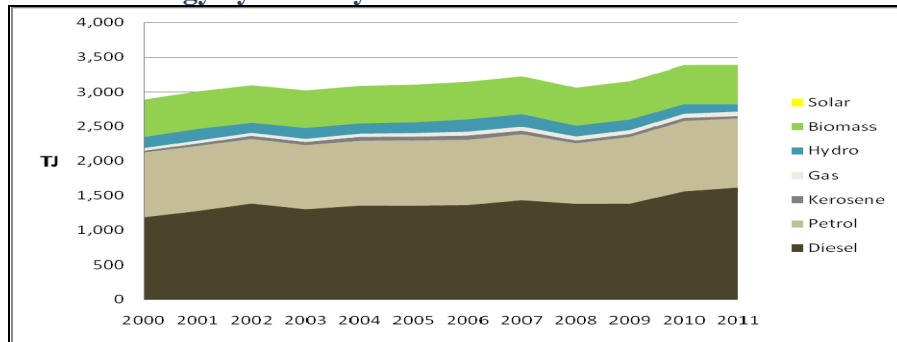
**Solar water heating**

Currently approximately 80% of the total energy used is derived from petroleum products, 17% from biomass and 3% from hydropower. The contribution of solar energy to Samoa's current energy mix is extremely small with rapidly increasing uptake.<sup>3</sup>

The following graph shows the various sources of energy in Samoa between 2000 and 2011.

<sup>3</sup> This assessment ignores petroleum liquids used for both international air and sea transportation as they are essentially all consumed outside of Samoa.

**Figure 4: Samoa Energy by Primary Source 2000-2011**



Source: Energy Database, Energy Policy Coordination and Management Division, Ministry of Finance

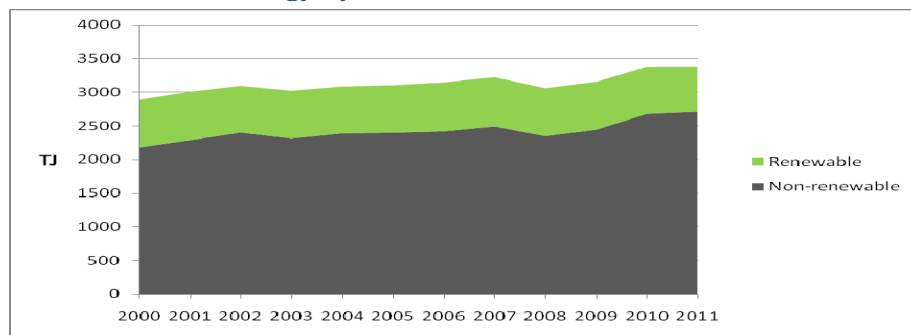
Petrol and diesel are used in transport, diesel and hydro are used in electricity generation, and biomass, LPG and kerosene are used in heating, predominantly cooking.

New information can be expected shortly with results of the 2011 Census, but the 2001 Household Income and Expenditure Survey (HIES) indicated that 91% of all households used electricity for lighting compared to less than 9% using kerosene. In contrast, only 3% used electricity for cooking and most of these households are in Apia. Biomass was the dominating cooking fuel, especially in rural areas with 74% of all households cooking with biomass compared to only 37% of Apia households. Around 9% of all households used LPG for cooking which was cheaper than electricity and easier to use than biomass.

Renewable energy sources, currently estimated at 20% of Samoa’s total energy market are comprised of biomass (firewood) for cooking, hydro, which constitutes approximately 13% of the energy required for generation of electricity<sup>4</sup>, and a very small but expanding solar energy component.

The resultant renewable energy content of Samoa’s total energy since 2000 is shown in the graph below. It is notable that the renewable share is low and diminishing as the non-renewable component grows.

**Figure 5: Samoa Annual Energy by Source 2000-2011**



Source: Energy Database, Energy Policy Coordination and Management Division, Ministry of Finance

<sup>4</sup> The energy required for electricity generation reflects the conversion efficiencies of the technology used. For hydro and solar generation, the conversion efficiency approaches 100% whereas for reciprocating diesel generators, the conversion efficiency is approximately 30%. Thus, while the renewable energy component of fuel for electricity generation is currently approximately 13%, the share of electricity generated that is renewable is currently approximately 37%.

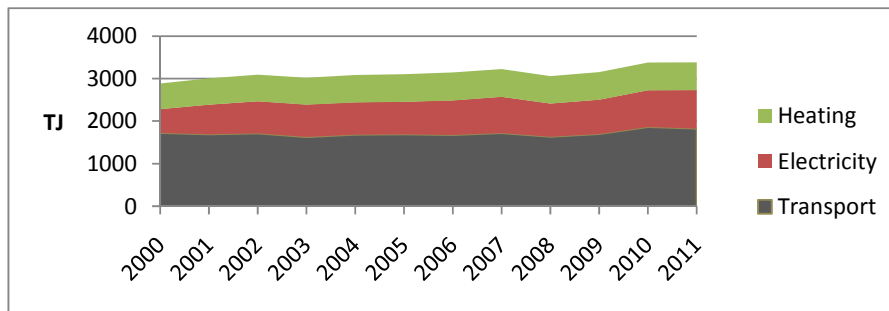
### 2.3 Sector Categorisation

The Samoan energy sector is most easily analysed by segregating the sector into three sub-sectors, of transport, electricity and heating. This classification ensures a relatively limited mix of energy sources by sub-sector, with:

- **Transport** (54% of total primary energy) comprising of petrol and diesel not used for electricity (with a very small biofuels component), and essentially 0% renewable energy;
- **Electricity** (27% of total primary energy) comprising of non-transport diesel, all hydro and a very small solar component, with renewable energy sources for the sub-sector estimated at 13% of total but declining;
- **Heating** (19% of total primary energy) comprising predominantly biomass (firewood) with lesser amounts of LPG, kerosene and a very small solar water heating component, with renewable energy for the sub-sector estimated at 86%.

The split of Samoa’s energy since 2000 by sub-sector is given in the graph below. The high proportion of transport fuels is apparent.

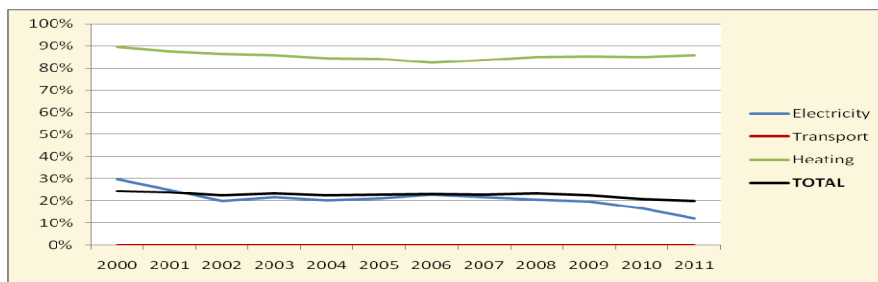
**Figure 6: Samoa Annual Energy by Sub-Sector 2000-2011**



Source: Energy Database, Energy Policy Coordination and Management Division, Ministry of Finance

The renewable energy component of each energy sub-sector since 2000 is shown in the graph below. The overall level has declined from 25% to less than 20% since 2000.

**Figure 7: Estimated Renewable Energy % by Sub-sector**



Source: Energy Database, Energy Policy Coordination and Management Division, Ministry of Finance

Categorising the 3 sub-sectors that make up the sub-sector permits broad assessments and comparisons to be made on the applicability of renewable energy technologies and energy efficiency initiatives to be made for comparison purposes, as summarised below.

Figure 8: Sub-sector Categorisation

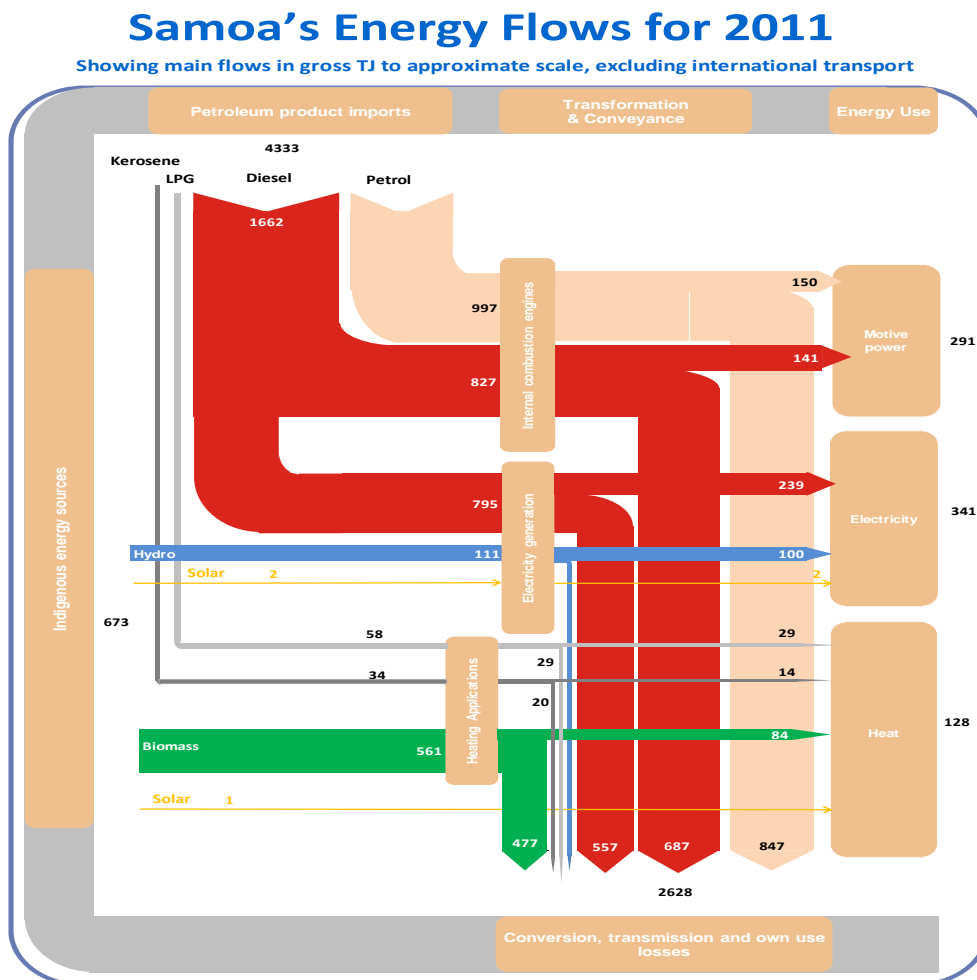
	ENERGY SUB-SECTOR		
	Transport Fuels	Electricity	Heating Fuels
Estimated share of primary energy	~54%	~27%	~19%
Estimated % renewable energy source	~0% increasing	12% declining	86% static
Economic / employment / capacity building opportunities	MEDIUM	HIGH	MEDIUM
Renewable energy options	MEDIUM	HIGH	LOW
Energy efficiency options	MEDIUM	HIGH	LOW

Source: Energy Database, Energy Policy Coordination and Management Division, Ministry of Finance

## 2.4 Samoa Energy Flow Chart

The following diagram depicts Samoa’s energy flows for 2011, with imported petroleum products (top entry) dominating indigenous energy sources (left side entry), which when combined yield energy uses (right side exit) after accounting for energy loss (bottom exit).

Figure 9: Samoa’s Energy Flows for 2011



The aspirational goal for Samoa’s energy future, subject to economic, social and environmental constraints, is to substantially reduce energy imports (top entry), maximise indigenous energy sources (left side entry), and minimise energy losses (bottom exit) thereby optimising energy self-sufficiency.



## 2.5 Cross-cutting Issues

The important cross-cutting issues to be considered when formulating policy for each Sub-sector are:

1. Hardship;
2. Climate Change;
3. Human and Institutional Capacity;
4. Promotion and Dissemination of Information; and
5. Resilience

These are addressed where appropriate throughout this Plan. This section explains each of the cross-cutting issues in greater detail.

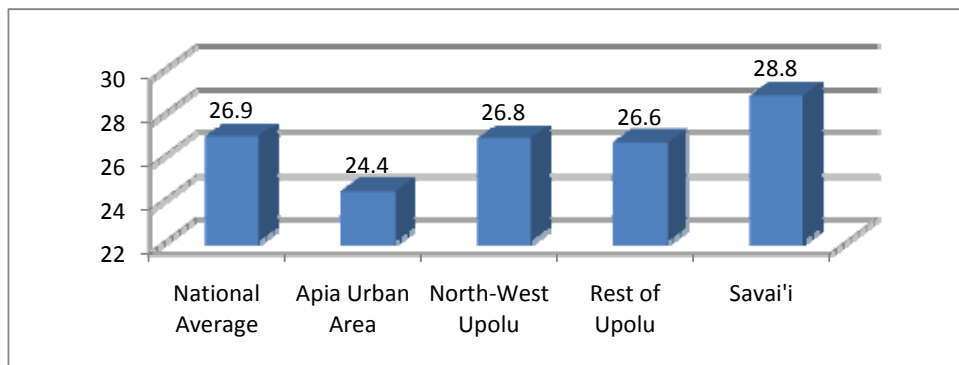
### *Hardship*

In general, Samoa has performed well in terms of human development. However there have been concerns expressed over inequality in income distribution, hardship amongst vulnerable groups, and the lack of formal employment and income generating opportunities (especially for school leavers).

Based on a recent Poverty Report developed by the Samoa Bureau of Statistics with United Nations Development Program assistance in 2010, the analysis of hardship and poverty in Samoa used 2008 Household Income and Expenditure Survey (HIES) data to estimate food and Basic Needs Poverty Lines (BNPL). In terms of food and BNPL, the per capita costs have been estimated as a national average household expenditure of SAT\$53.60 per capita per week with the Apia Urban Area having the highest at SAT\$60.00, and the Rest of Upolu having the lowest at SAT\$49.50.

The level of serious poverty, as measured by the proportion of households in the population falling below the food poverty line is very low; only about 3% of households and 5% of the population. The average incidence of basic needs poverty among all households nationally is estimated at 20% accounting for 27% of the population. Within this national average, Savai'i had the highest proportion of the population (29%), followed by north-west Upolu (27%) and Rest of Upolu (27%) as shown in the following graph.

**Figure 10: Incidence of Poverty: % of Population**



*Source: Poverty Report 2010 – Samoa Bureau of Statistics*

The increase in basic needs poverty that is seen is concentrated in the rural areas. The current policies and actions targeting these areas will need to take into consideration the ability and willingness of customers to pay for service delivery and other initiatives included in the Plan.

### *Climate Change*

Climate change poses a large threat to water security, especially in isolated small island states like Samoa. Regional studies indicate that climate change is affecting temperatures and

precipitation, which will, in turn, impact Samoa's water resources. In the past few years climate change factors have had major effects on the sector in Apia and the rural areas. Dry and drought periods have resulted in water shortages and rationing, whilst heavy rains have brought the problems of flooding and sedimentation which affect the water quality and quantity of clean water available.

Samoa has faced the challenge of a long dry period (drought) from May to October 2011, which resulted in serious water shortages in western Savai'i and southeast Upolu. Conversely, in areas where there is a good amount of rainfall, the clearance of trees and development in watershed areas will also require close monitoring in coming years to ensure protection of the resource.

All of EPC's hydro schemes have been affected with hydro inflows substantially down in the past year and gradual deterioration in the utilisation factor of hydro facilities caused in part by deforestation. Sea level rise and increased rainfall also need to be taken into consideration for all new energy facilities and may also influence the management of existing assets.

Samoa has a "Carbon Neutral by 2020" goal approved by Cabinet in 2010, and there is consideration being given to a carbon neutral energy sector and a NAMA (Nationally Appropriate Mitigation Actions) in the energy sector emerging from Samoa's participation as a member of the Cartagena Dialogue in 2011. These initiatives are currently not well developed, but this Energy Sector Plan is strongly aligned with the general intent, encouraging uptake of renewables, increased distributed sources of energy and increased community involvement in the sector. A watching brief and potential involvement as these evolve is important to the sector.

For the energy sector climate change mitigation and adaptation forms part of overall sector resilience as discussed further below.

#### *Human and Institutional Capacity*

Human and institutional capacity building is an important part of further developing and strengthening the energy sector in Samoa. Lead agencies for each of the sub-sectors are responsible for identifying any resource and capacity building requirements and looking to resolve these.

The Energy Policy Coordination and Management Division, as Energy Sector Co-ordinator, should also be informed and where appropriate may be able to facilitate the shifting of resources across government and possibly with the private sector. At the very least, shortfalls need to be raised at the sector level and included in sector wide resource development.

#### *Promotion and Dissemination of Information*

The Government recognises the importance of disseminating information related to all sub-sectors of the energy sector, in particular promoting public awareness of energy efficiency and conservation, information on vehicle and appliance energy consumption ratings, promoting energy audits and demonstrating ways to minimise electricity usage. These efforts need to be implemented in all three sub-sectors in order to culminate in greater consumer awareness on cost saving measures in terms of household and business energy usage and demand side management. Better coordination of transport data collection will also contribute greatly to public awareness and improve information on energy demand and supply for dissemination.

### *Resilience*

Resilience is a very important part of energy sector management and operations. Resilience encompasses most of the cross-cutting issues and also recognises that the sector is part of the overall infrastructure sector with common characteristics including significant capital invested, long-life assets, and technology based systems delivering service to consumers.

Increasing levels of resilience can be achieved by having redundancy and diversity, but this is only one consideration. It is not always necessary to aim for high levels of resilience throughout an energy system, a good example being the use of fuses in electrical networks and in homes. By introducing a point of weakness (the fuse), any overload can be controlled and remedial measures can be simple and immediate by replacing the fuse. Pressure valves in gas systems are another example.

As the word resilience can be a little vague and everyone has a different understanding of what it refers to, it is useful to establish a common understanding as it applies to Samoa's energy sector and indeed to the infrastructure sector as a whole (which also includes transport, water, and telecommunications).

At the highest level:

“Resilience - National Infrastructure is able to deal with significant disruption and changing circumstances.”

The resilience of infrastructure involves users as well as network providers, management as well as operators, and funding agencies as well as insurers. It includes risk management in advance as well as ability to respond to evolving events over time (rising sea levels, changing demographics) or shock events (flooding, global oil supply restrictions).

For the energy sector resilience embodies the following attributes:

- **Attribute (1) – Service Delivery**

There is a focus on national, business and community needs in the immediate and longer term.

- **Attribute (2) – Adaptation**

Energy infrastructure has the capacity to withstand disruption, absorb disturbance, act effectively in a crisis, and recognises changing conditions over time (eg. climate change).

- **Attribute (3) – Community Preparedness**

Infrastructure users and providers understand the outage risks they face and take steps to mitigate these. Aspects of timing, duration, regularity, intensity, and impact tolerance differ over time and between communities.

- **Attribute (4) – Responsibility**

Individual and collaborative responsibilities are clear between owners, operators, users, policy-makers and regulators. Responsibility gaps are addressed.

- **Attribute (5) – Interdependencies**

A systems approach applies to identification and management of risk (including consideration of interdependencies, supply chain and weakest link vulnerabilities).

- **Attribute (6) – Financial Strength**

There is financial capacity to deal with investment, significant disruption and changing circumstances. This includes; available funds, the awareness of financiers and insurers, continuing capital investment and maintenance expenditure.

- **Attribute (7) – Continuous**

On-going resilience activities provide assurance and draws attention to emerging issues, recognising that infrastructure resilience will always be a work in progress.

- **Attribute (8) – Organisational Performance**

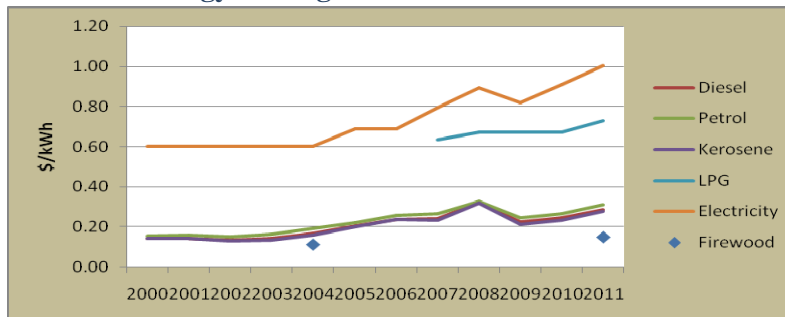
Leadership and culture are conducive to resilience, including; resilience ethos, situational awareness, management of keystone vulnerabilities and adaptive capacity (including future skills requirements).

These attributes of resilience can be applied at the household, the community, the business and the national level with all potentially having a different perspective on the desired levels of resilience. Additional effort is required by all energy stakeholders in Samoa to improve understanding of current levels of resilience and where further effort should be applied. This sector plan begins addressing some of these for example through reducing dependence on imported fuels and encouraging more distributed electricity generation.

## 2.6 Retail Energy Prices

Retail prices (inclusive of Value Added Goods and Services Tax - VAGST) for the various forms of energy since 2000 are shown in the graph below. LPG prices are currently unavailable for earlier years. The firewood price relates to market prices in Apia. Most firewood sourced in rural areas is collected locally by the end user at no monetary cost to the consumer.

Figure 11: Samoa Energy Pricing 2000-2011



Source: Energy Database, Energy Policy Coordination and Management Division, Ministry of Finance

## 2.7 Governance, Policy and Regulatory Framework

The energy sector governance, policy and regulatory settings contribute strongly to a focused and productive sector oriented towards national goals. These 3 topics are covered individually below.

### 2.7.1 Governance

The National Energy Coordination Committee is the key decision making body for the Samoan energy sector. It comprises representatives from all key government ministries and agencies that have input into the sector.

#### *National Energy Coordination Committee*

The National Energy Co-ordination Committee (NECC<sup>5</sup>) was established in 2010 in recognition of the somewhat dispersed nature of decision making in the energy sector, and the need to achieve a co-ordinated pragmatic approach recognising the substantial importance of the energy sector to the future of Samoa.

The objectives of the NECC are:

- Advocating for energy as an essential enabling tool for realising the national development goals as well as to support the sustainable development issues;
- Promoting the mainstreaming of energy into all sectors and decision-making processes at all levels of government and society, including national planning and budgetary processes;

<sup>5</sup> The NECC comprises the Ministers of Finance (Chair), Natural Resources & Environment, and Works, Transport & Infrastructure, CEOs of MOF, MNRE, MWTI, MWCSO, MOA, EPC, LTA, SROS and the Attorney General. It reports directly to Cabinet and meets every 2 months. The NECC Sub-committee, comprising NECC members excluding the three Ministers, meets monthly.

- Advising and contributing to the establishment of a strong governance framework for energy with clear policies, plans and legislations, accountable institutional and organisational arrangements, which are inter-linking all the various levels of government, sectors and communities;



Central Apia

- Promoting evidence and knowledge based decision-making, reflecting a shift away from the traditional ad hoc practices; and
- Creating an environment for sustained, coordinated and harmonised support from regional entities, international organisations and development partners.

Importantly, the NECC is concerned with the entire energy sector. To undertake its role, the NECC needs overall awareness of the sector, and the ability to review and endorse any activities whether in the private or government sector, with or without government or aid funding. It is a clearing house for initiatives and activities that warrant government endorsement. The Energy Policy Coordination and Management Division of the Ministry of Finance acts as the Secretariat for the NECC.

### 2.7.2 Policy Framework

There are a number of key policy documents relevant to the Energy Sector Plan, the most important of which is the overarching Strategy for the Development of Samoa 2012 – 2016.

#### *Strategy for the Development of Samoa (SDS) 2012 - 2016*

The SDS 2012 – 2016 presents Samoa’s development vision, its medium-terms national development goals, and the strategies to be implemented during four financial years 2012 – 2016 in order to achieve those goals. The SDS 2012 – 2016 framework is considered an appropriate basis for the development of the Energy Sector Plan.

#### *Samoa National Energy Policy (SNEP) 2007 and its Strategic Action Plan (SAP) 2008 (Both superseded by this Energy Sector Plan)*

The Samoa National Energy Policy (SNEP) 2007, and its associated Strategic Action Plan (SAP) 2008, constituted the first energy sector policy aimed at providing a clear direction for all energy developments in Samoa. This Energy Sector Plan takes the opportunity to consolidate the SNEP 2007 and SAP 2008 into one document, targeting the strategic areas of: Transport, Electricity, and Heating, and embedding renewable energy and energy efficiency throughout.

#### *National Infrastructure Strategic Plan 2011-2021*

The National Infrastructure Strategic Plan (NISP) 2008 – 2018 outlines the Government’s priorities and strategic directions for major initiatives in the economic infrastructure over the next 5 – 10 years. The NISP is closely linked to the SDS 2012 - 2016 and its vision of “boosting productivity for sustainable development”, in that it recognises that there is a “clear and positive link between infrastructure, social development, community wellbeing and economic growth.”

The four main initiatives identified in the Energy section of the NISP are: the Power Sector Expansion Project; a demand-side strategy; the development of clean energy resources through the establishment of a local Clean Energy Fund; the establishment of Samoa under the global Clean Development Mechanism; and other renewable energy generation including large on-grid solar.

*National Policy of Combating Climate Change 2007, and Greenhouse Gas Abatement Strategy 2008 – 2018*

Both documents refer to greenhouse gas mitigation strategies and objectives that involve energy, including renewable energy and energy efficiency. It is important that these policies are taken into account and considered when formulation and implementing the Energy Sector Plan.

*Towards an Energy Secure Pacific: A Framework for Action on Energy Security in the Pacific 2010*

Regional initiatives and interventions are mentioned as a way of supplementing, enhancing and adding value to national capacity. There may be ways that these and any other regional programs and initiatives such as the Pacific Regional Environment Programme Strategic Plan 2011 – 2015, can assist Samoa with the implementation of its Energy Sector Plan.

*Water & Sanitation Sector Plan 2012 - 2016*

Water is one of the priority sectors in Samoa, as it directly impacts on the quality of life and the overall productivity of the population. A “*sector wide planning approach to planning (SWAP) has been embraced by both government and the water sector development partners for resources mobilisation and implementation of sector plan*”. The main objective of the draft 2012 – 2016 water sector plan is to focus on implementation of key reforms and policies over the 2012 – 2016 timeframe.

Energy is also a utility that cuts across many other sectors, so the water sector governance, institutional arrangements and programmes are useful considerations for the Energy Sector Planning process.

### **2.7.3 Regulatory Framework**

The key Samoan Acts and Regulations applicable to the energy sector are as follows:

1. The Electric Power Corporation Act 1980;
2. The Electricity Act 2010;
3. The Petroleum Act 1984;
4. The Planning and Urban Management Act 2004; and
5. The Land Transport Authority Act 2007.

Relevant considerations in relation to each Act, for the purpose of the Samoan Energy Sector Plan, are set out below.

*The Electric Power Corporation Act 1980*

The purpose of this Act is to consolidate and amend certain enactments relating to the Electric Power Corporation, its functions, operations and other related matters including its role in the generation, supply and use of electricity.

*The Electricity Act 2010*

The purpose of this Act is to provide for a new legislative framework for regulating the electricity sector, the establishment of the post of the Electricity Regulator at the Office of the Regulator, and for related matters. It also enables the setting of tariffs and the licensing of new electricity generators or operators of independent electricity networks.

*The Petroleum Act 1984*

The purpose of this Act is to make provision for the supply, transport and storage of petroleum. Most significantly, this Act is now quite dated and makes no provision for the import, production, sale and use of biofuels. The New Zealand Engine Fuel Specifications Regulations 2011 and the Australian Fuel Quality Standards Regulations 2001 provide useful examples for considering how any fuel oil specification regulations could look in Samoa.

*The Planning and Urban Management Act 2004*

The purpose of this Act is to establish a Planning and Urban Management Agency and to implement a framework for planning the use, development, management and protection of land in Samoa for the present and long-term interests of all Samoans and for related purposes. There appear to be no particular restrictions on the development of renewables and other energy sector initiatives other than those that apply generally to developments.

*Land Transport Authority Act 2007*

This Act outlines the Authority's functions, which involves undertaking necessary planning, design, supervision, construction and maintenance of national roads and land, as well as transport infrastructure throughout Samoa.

## 2.8 Key Stakeholders

Broadly speaking, all suppliers and consumers of energy products and services in Samoa are stakeholders, covering industries, communities, businesses and institutions.



Meeting of the NECC

For the purposes of this plan, the following are the key implementing agencies of the Energy Sector whilst **Appendix 3** provides a Responsibility Matrix highlighting their key roles in the implementation of the Energy Sector Plan:

*Ministry of Finance, Energy Policy Coordination and Management Division (EPCMD)*

Formerly a unit within the Economic Policy and Planning Division of the Ministry of Finance, the Energy Policy Coordination and Management Division (EPCMD) was set up as part of the Public Finance Management Reform Program Phase II. The EPCMD is tasked with overseeing the analysis of petroleum prices on a monthly basis as well as the compilation of annual energy reviews to inform policy decision making. The EPCMD is also the technical arm for the National Energy Coordination Committee (NECC) as well as the Designated National Authority (DNA).

*Electricity Regulator, Office of the Regulator (ER-OOTR)*

This is a newly established division, set up as a consequence of Cabinet's decision to open up the electricity sector to Independent Power Producers (IPP's) and in light of the need to regulate electricity tariffs to not only benefit all producers but to also protect consumers from high electricity prices.

*Ministry of Natural Resources & Environment (MNRE)*

The Ministry of Natural Resource houses the Renewable Energy (RE) Division who is tasked with undertaking feasibility studies and research into RE sources for Samoa whilst ensuring that environmental sustainability is maintained.

*Electric Power Corporation (EPC)*

The EPC is currently the sole provider of electricity for the country and provides insight into the pricing and costing of electricity generation and distribution. Furthermore, EPC currently establishes and maintains all infrastructures for both electricity generation and distribution. In addition to this role, the EPC also houses projects for the testing and piloting of RE technologies that feed into the country's grid.

*Land Transport Authority (LTA)*

The LTA is the lead agency for energy efficiency within the transport sector through regulation and enforcement. Their key role is to ensure the enforcement of tiered registrations for vehicles based on engine size as well as the enforcement of fines on transport practices that are not energy efficient which contributes to reduction in fuel consumption and GHG emissions.

*Scientific Research Organisation of Samoa (SROS)*

In addition to efforts implemented by the MNRE, the SROS also conducts and pilots RE technologies to test their feasibility given Samoa's context. Since 2008, SROS has researched, developed and successfully piloted the use of biodiesel and currently have a total of 8 vehicles running using the RE source.

*Ministry for Revenue (MfR)*

The Customs Department for the Ministry for Revenue at the Apia Wharf plays a key role in the regulating of tariffs on imported vehicles as well as the recording of data on the number of vehicles as well as their engine sizes upon arrival at the Apia Port.

*Ministry of Women, Community and Social Development (MWCSD)*

The MWCSD plays a key role as mediator between all the line agencies mentioned above and the communities. They will be key in ensuring that ownership is developed at the community level when RE and EE projects are established at this level.

*Others*

Other stakeholders with roles in implementing the Energy Sector Plan include the Samoa Bureau of Statistics, Petroleum Products Suppliers and Private Sector in terms of data collection, information dissemination as well as monitoring of all key Energy policy areas.



### 3. ENERGY SECTOR OVERARCHING OBJECTIVES

#### 3.1 Energy Sector Vision

The **vision** for the Energy Sector is derived from the Strategy for the Development of Samoa 2012 – 2016 (SDS):

*Sustainable Energy*

The Energy Sector Plan 2012 – 2016 is guided by the **theme** of:

*Sustainable Energy Supply- towards Energy Self Sufficiency*

This theme highlights the Government of Samoa’s commitment to reducing reliance on imported fuels and to the promotion of research, development and use of alternative RE sources.

#### 3.2 National Development Strategic Areas

As stipulated within the SDS, the national development strategies for the Energy Sector are as follows:

**Strategic Areas**

- Promote and increase renewable energy investment and generation;
- Efficient, affordable and reliable electricity supply;
- Effective management of petroleum supply;
- Promote energy efficiency practices in all sectors particularly the transport sector; and
- Efficient and effective coordination and management of the sector through the implementation of the energy sector plan.

#### 3.3 Energy Sector Overarching Objective and High Level Indicators

Adapted from the vision and the national development strategies, the overall objective and high level indicators for the Energy Sector are as follows:

Overall Sector Goal/Objective:

*To reduce the growth rate in the volume of imported fossil fuels by 10% by 2016*

The high level indicators for this overarching goal/objective are:

- i. *Energy Sector Plan launched and implemented with at least 75% of targets achieved by 2016;*
- ii. *Increase in the contribution of RE to total energy consumption by 10% by 2016;*
- iii. *Increase in the supply of RE for energy services by 10% by 2016;*

#### 3.4 Key Sector Policy Outcomes

Due to its wide scope and crosscutting nature, the Energy Sector Plan has been divided into four key policy areas under the following key outcomes:

**1) Institutional Framework**

Efficient and effective coordination and management of the Energy Sector;

**2) Transport**

Efficient, sustainable, safe and cost effective energy use in the transport sector;

**3) Electricity**

Efficient, reliable, safe, affordable and sustainable electricity services;

**4) Heating and Cooking**

Efficient, reliable, affordable and sustainable heat source supply;

### **3.5 Development Principles and Framework**

Growth in energy demand is expected to continue into the future consistent with the SDS 2012 – 2016 Strategic Areas. The increasing consumption of petroleum fuels poses concerns in terms of environmental impacts not only in terms of emissions but also from poor handling and management of fuel and lubricants. The unloading and storage of petroleum products as well as handling and storage of waste oil and other petroleum by-products needs to be managed properly. Energy efficiency and conservation measures are not actively pursued and should be encouraged as immediate savings are anticipated. This would minimise the strain in meeting energy demand as well as reducing the negative environmental impacts and other adverse effects. Due to the increasing fuel prices and Samoa's heavy reliance on fossil fuel to meet its demand, renewable energy, indigenous energy sources and energy efficiency are promoted and encouraged.

**4. INSTITUTIONAL FRAMEWORK**

<b>Key Policy Outcome 1</b>	<b><i>Efficient and Effective Coordination and Management of the Energy Sector</i></b>
<b>Key Strategies</b>	<ul style="list-style-type: none"> <li>1.1 Ensure strong leadership, with clarity of roles and responsibilities;</li> <li>1.2 Energy Policy Coordination and Management Division has the capacity to coordinate energy sector;</li> <li>1.3 Ensure that the Electricity Regulator has the capacity and sufficient resources to competently undertake responsibilities;</li> <li>1.4 Ensure that a firm legal framework exists;</li> <li>1.5 Improve human resource capacity within the Energy Sector</li> <li>1.6 Effective and reliable database management system and dissemination of information for all key line agencies;</li> <li>1.7 Promote the use of indigenous energy resources and renewable energy technologies;</li> <li>1.8 Promote partnerships with communities and all energy stakeholders;</li> <li>1.9 Promote Clean Development Mechanism (CDM) and Clean Energy Fund</li> <li>1.10 Improve Scientific Research Organisation of Samoa (SROS)'s capacity to undertake RE research and development;</li> <li>1.11 Promote energy efficiency in each of the three sub-sectors</li> </ul>

**4.1 Strategic Direction 2012-2016**

The activities within this component primarily focus on increased governance, leadership and co-ordination across the energy sector plus a number of aspects that encompass all of the sub-sectors such as raising public awareness and energy efficiency initiatives which drive from the consumer end of the system. Importantly, the public should be well informed of the potential negative impacts of fossil fuel on the environment, the cost benefits available from energy efficiency across the sector and the move to more renewable energy. These activities along with their performance targets are outline in the Energy Sector Logical Framework set out in **Appendix 2**.

*Energy Data*

The Government publishes annual energy review reports, which provide an overview of Samoa’s energy sector and are intended to provide the Government of Samoa, business and the community with a better understanding of the energy sector. It is crucial that the data that informs these reports is accurate and provided in a timely manner so that positive advances can be quickly recognised and quick responses are made where divergence from the Energy Sector Plan occurs.

*Expressions of Interest Approach<sup>6</sup>*

A key aspect of this Plan is the need to immediately establish a more robust process to confirm the relative merits of energy proposals which reduce the dependence on imported petroleum products by substituting for diesel fuelled electricity generation and provide locally sourced biofuels, subject to economic viability. The recommended mechanism to achieve this is to seek “Expressions of Interest” from experienced interested parties. This clearly needs to be undertaken in the context of what opportunities actually exist at this time. For transport fuel substitutes, it needs to be recognised that the existing transport fleet will be slow to change and can only tolerate certain levels of fuel substitution.

A significant opportunity exists to progressively establish a commercial biofuel industry, based on existing proven technologies possibly coupled with existing commercial operations in other countries. Bio-diesel (from coconut and from other lower value oil-based crops) and bio-alcohols (ethanol and perhaps methanol) from viable source crops are likely to be dominant candidates for commercial establishment based on international experience. An “Expressions of Interest” approach will result in a range of projects that can be assessed

<sup>6</sup> It is acknowledged that this approach may be subject to the government procurement process under the Public Finance Management Act 2001.

simultaneously and benchmarked against each other to determine projects of best fit with respect to criteria established in the Energy Sector Plan, rather than one-off assessments of proposals that are currently received on an ad-hoc basis.

Accordingly, it is considered essential that, consistent with the direction of the SDS 2012-2016, the Government of Samoa move from a reactive stance (receiver of proposals on an ad-hoc basis) to a proactive stance (seeker of proposals from experienced interested parties) to ensure focus on “*boosting productivity for sustainable development*”. The biofuels industry development opportunity is considered to rank highly as a major economic opportunity for Samoa provided that such industries can be proven to be commercially viable.

A framework for assessing energy sector proposals is currently under development by the NECC. To this end, the assessment of proposals must be based on strict adherence to a process that complies with the direction of the Energy Sector Plan 2012 – 2016 (which in turn must comply with the direction of the SDS 2012 – 2016). This is likely to include:

- All energy sector initiatives, including new policies, plans, investment and divestment proposals, across both the government and private sectors, that may impact on the Energy Sector come within the purview of the NECC;
- Use of technology that is deemed technically and commercially viable;
- The outcomes (production of liquid fuels, generation of electricity, etc) are consistent with the goals and targets of the Energy Sector Plan 2012 – 2016 (and hence the SDS 2012 – 2016);
- The initiative sponsor is assessed as being of good character and of sufficient financial strength to complete the proposed activity;
- Where possible, all risks are the responsibility of the initiative sponsor/s and/or suppliers through long term supply agreements (where this is not possible, the Government of Samoa must not be required to bear unreasonable responsibility for risk);
- The initiative is deemed economically viable based on thorough economic analysis (including meeting acceptable financial assessment criteria such as net present value, internal rate of return and sensitivity analyses for key variable costs and product prices);
- Funding sources are either in place or under a “Heads of Agreement” framework; and
- Maximum use is made of Samoan skills in project development and ongoing operations.

#### *Governance and Regulatory*

The current institutional frameworks for sector governance and sector co-ordination are considered appropriate for the scale of undertaking and the direction required for the sector. Strengthened endeavour and clarity of respective roles and responsibilities is required.

Although the role of the Electricity Regulator has been extended to an Energy Regulator role, the fact that the energy sector is dominated by petroleum fuels with its price and delivery already entirely regulated by Government, call for the need to ensure that the roles and responsibility of the Regulator is clearly articulated. With respect to liquid petroleum gas (LPG) the presence of two suppliers ensures a level of competition, and essentially LPG needs to be price competitive with alternate sources such as electricity and biomass.

Consideration will be given to the merits of developing a new Energy Act to mandate new efforts under the NECC including the terms and conditions for IPP’s, development of PPA’s as well as minor details which are not clearly mandated under existing legislations. Upgrading the Electric Power Corporation Act 1980 and the Petroleum Act 1984, as well as completing the electricity tariff setting regulations under the Electricity Act 2010, will be more cost effective and efficient enabling quicker enactment. Relevant considerations in relation to each of these Acts are set out in more detail for the Transport and Electricity Sub-sector in sections 5 and 6, respectively.

## 5. TRANSPORT SUB-SECTOR

### 5.1 Transport Sub-sector Definition

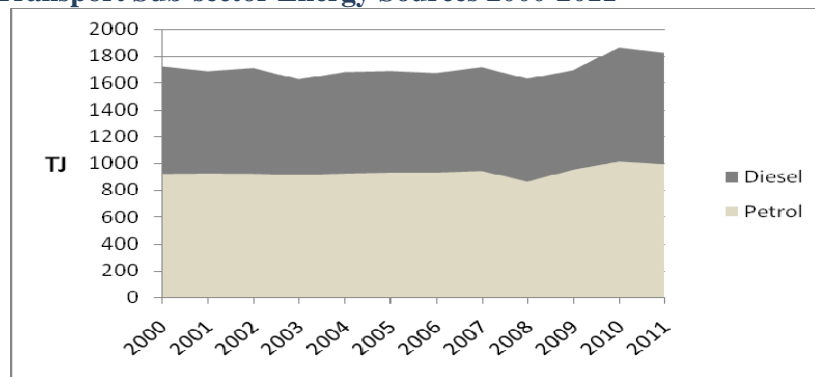
For the purposes of this document, transport refers to the movement of people, goods and services, largely using motorised vehicles, local shipping and machinery, together with their fuels such as petrol and diesel (excluding diesel used for electricity generation), biofuels such as bioethanol, biobutanol and biodiesel and potentially electricity if used in future for motive energy applications. International aviation and international shipping are excluded as the energy is essentially used outside Samoa.

### 5.2 Sub-sector Review

This section incorporates a review of the Transport Sub-sector, its past performance, current status and its resultant potential opportunities, and its composition from energy supply and demand perspectives.

Currently approximately 55% of energy used for transport is derived from petrol, with the balancing 45% derived from diesel. The following graph shows the component energy sources for the transport sub-sector from 2000-2011.

**Figure 12: Transport Sub-sector Energy Sources 2000-2011**



Source: Energy Policy Coordination and Management, Ministry of Finance

#### Transport Overview

Transportation is vital to the social and economic development of Samoa. Development in the transportation sector has direct links to the advancements in other sectors of the economy. It enables the movement of goods and services both domestically and abroad and increases access for non-urban dwellers to markets<sup>7</sup>, employment opportunities and services such as education and health.



Vehicles in central Apia

While it is important to develop the transport sector together with other utilities<sup>8</sup>, they are generally characterised by very costly projects to implement and maintain. However, there are major benefits in having an effective and energy efficient transportation sector, which flows into other sectors of the economy. A better planned and managed public transportation network will significantly improve efficiency in the Transport Sub-sector.

The Transport Sub-sector together with the Electricity Sub-sector consumes a major share of fossil fuel used in Samoa. Unlike electricity, almost all of the energy consumption in the

<sup>7</sup> Mainly for agricultural produce.

<sup>8</sup> Other Utilities include Electricity, Water and Telecommunications.

Transport Sub-sector is sourced from fossil fuel. In 2002, the transport sector consumed over 75% of total fossil fuel and was responsible for a substantial portion of greenhouse gas emissions and air pollutants. By 2005, the transport sector accounted for over 80% of total fossil fuel consumption.

The increasing number of imported cars accounted for most of the increasing demand for fossil fuel. To assist in easing these pressures as well as promoting efficient vehicles, restrictions were imposed on vehicle importations based on model year. To further promote efficient vehicles, engine capacity is used both in determining if an import excise tax is also charged in calculating vehicle registration fees. For instance, vehicles above 2000 cc engines are required to pay an excise tax and car registration fees are levied against engine capacity.

These measures have contributed to improving the efficiencies in land transport but there are other necessary initiatives that would promote renewable energy usage in the sector. The viability of using biodiesel derived from coconut oil to supplement fossil fuel is being explored especially with the abundance of coconuts available in Samoa. In addition, walking and cycling reduce the usage of vehicles and fossil fuel as well as having health benefits.

Passive design features are also effective. Removal of speed bumps, use of electronic technology to manage vehicle speeds, reliance on roundabouts rather than traffic lights and easily maintained roads are some specific examples.



**Apia Wharf and fishing fleet**

Petroleum safety standards and regulations must be adhered to with regard to storage and refuelling of all transport modes. Development of alternative and sustainable modes of transport and upgrading vehicles to curb emissions is encouraged. Emphasis on disseminating information related to air pollution and promoting public awareness of the impact of transport on the environment through the media is also encouraged.

Better coordination of transport data collection will contribute greatly to public awareness and improve energy demand and supply information for dissemination.

### *Transport Fuels*

The Transport Sub-sector comprises petrol and diesel (excluding diesel used for electricity generation). These fuels, along with kerosene, are imported to Samoa under contract to the Samoa Government, with onshore management and distribution the current responsibility of Petroleum Product Supplies Limited (PPS), a private Samoan company. The international supplier is currently Exxon-Mobil with the multi-year contract due for retendering in 2014. The Government sets petrol, diesel and kerosene prices monthly based on a price formula which includes distribution and retail margins.

PPS ensures the Government mandated security-of-supply stored volumes are equal to or exceed 10 days national demand. The products are supplied by tanker vessel and are pumped via single pipeline from the wharf facilities to the PPS managed facility. Tank capacities are currently approximately 6,340kl for diesel, 3,650kl for petrol, and 2,375kl for kerosene (including JetA1 which is transferred to the airport by road tanker). Diesel, petrol and kerosene are distributed by tanker (either PPS operated or sub-contractor owned) to the various major customers (eg EPC) or fuel station outlets. Additional storage capacity is in the process of being installed and consideration needs to be given to a possible increase in the mandated security-of-supply stock levels.

Currently there are low volumes of biofuels being produced in pilot production trials which are being used in fuel blends in some vehicles with no known adverse effects. However, the amount of biofuels used is extremely small compared to the mineral-derived diesel and petrol volumes used. There is considerable potential for expansion of biofuels production in Samoa, subject to economic constraints.

Bioethanol from cassava and biodiesel from coconut oil are proven technologies. Biodiesel from coconut oil, however, is constrained by the high price of coconut oil compared to the price of mineral diesel on global markets. In addition, the cost of coconut oil and in turn biodiesel from coconut oil is highly sensitive to the cost per coconut, currently around 10-30 sene per coconut. Nevertheless, subject to economic constraints, the opportunity to import bioethanol and blend at up to 15% (E15) with imported gasoline, ahead of local commercial bioethanol production, could be considered given the immediate positive impact such an approach would have on renewable energy levels.

In the long run, subject to the transformation of Samoa's electricity generation to renewable energy sources, the advent of electric cars holds considerable prospect for transforming Samoa's transport fuels from non-renewable fossil fuels to largely renewable electricity. To this end, a roadmap for the introduction of electric cars needs to be considered.

#### *Petroleum Fuel Supply*

The rationalisation of supply and distribution of petroleum products, which was initiated in the early 1990s, and came into effect in 1998, has resulted in the government acquiring all storage facilities for petroleum products. A tendering process is carried out every 5 years to appoint an operator for the facilities to be responsible for the supply and distribution of petroleum products in accordance with the Petroleum Act 1984 and petroleum standards and regulations. This rationalisation exercise has resulted in Samoa being one of the countries in the region with the lowest fuel prices. Fuel prices are calculated and released on a monthly basis based on fluctuation in international market fuel prices and an agreed formula to cover other costs. Further refinement is needed to ensure the efficiency and effectiveness in monitoring, management and assessment of petroleum related matters such as pricing, security of supply, tendering process, quality and standards.

In addition, the supply of fuel and gas to rural locations and outer islands is not always reliable and carried out in a safe manner. All these factors gave rise to the need to enhance and enforce the existing legislation.



**Fuel outlet**

#### *Informing the Public*

Above all, the public should be well informed of government initiatives in the petroleum sector and also about the potential negative impacts of fossil fuel on the environment and the move to renewable energy. Furthermore, public awareness programs need to be continued on energy efficiency and conservation including; appliance energy consumption ratings, promoting energy audits, and demonstrating ways to minimise electricity usage.

These efforts will culminate in greater consumer awareness on cost saving measures in terms of household and business kilowatts usage and demand side management.

## 5.4 Regulatory Framework

The regulatory framework for Transport as it relates to energy largely centres on the Petroleum Act 1984, the purpose of which is to make provision for the supply, transport and storage of petroleum, and the Land Transport Act 2007, which relate to the functioning of the Land Transport Authority (LTA).

### *Petroleum Act 1984*

As currently worded the Petroleum Act 1984 defines ‘petroleum’ as “*any gas, liquid, or solid compound, whether used as a fuel or for lubrication purposes, which is derived wholly or in part from the refining and blending of hydrocarbon compounds.*” As such, the Act does not cover ethanol, biodiesel and glycerol.

In order to enable new opportunities such as the ability to import, produce, use and sell ethanol, biodiesel and glycerol in Samoa, the Petroleum Act 1984 would need to be amended to broaden the definition to cover all fuel types. Moreover, amendments would need to cover issues around importing, producing, using and selling to determine the extent of private and Government rights with regard to fuel oils other than petroleum, which the Government already has substantial powers over. For example, any ethanol produced in Samoa is likely to be blended into petroleum in Samoa rather than sold in its pure form, so private rights could exist until point of sale for blending with petroleum in Samoa.

Regarding petroleum safety, the petroleum sector is guided by the Petroleum Act 1984 in issuing petroleum licences for and maintenance of service stations. Petroleum safety standards and regulations for handling and storage of petroleum products are also used to ensure that the supplier is safely and reliably supplying and distributing petroleum products to different destinations including all service stations in the country and storage facilities are well maintained to avoid major damage to the environment. However, enforcement of this Act and related legislation is required to ensure that these products are handled safely in an environmentally sensitive manner. A number of human resource, technological and legislation needs should be addressed to ensure safety and environmental compatibility including the disposal of waste oil and the merits of using alternative fuel sources.

### *Land Transport Authority Act 2007*

The Land Transport Authority Act 2007 outlines the Authority’s functions which involves undertaking “*necessary planning, design, supervision, construction and maintenance of national roads and land transport infrastructure throughout Samoa*”.

Besides this Act, the Road Traffic Ordinance 1960 regulates the registration of vehicles and the Road Traffic Regulations 1961 regulate the emission of smoke and sparks from vehicles.

### *Engine Fuel Specifications*

Regarding importing, using and selling ethanol, biodiesel or other bio-fuels and glycerol, regulations specifying quality standard requirements would be essential. The New Zealand Engine Fuel Specifications Regulations 2011 and the Australian Fuel Quality Standards Regulations 2001 provide useful examples for considering how any fuel oil specification regulations could look in Samoa.

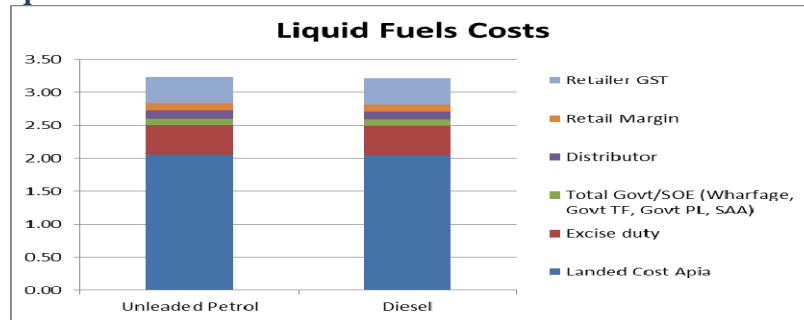
### *Liquid Fuels Pricing*

Liquid fuels pricing is a delicate balancing act globally with countries applying excise tax to achieve funding of infrastructure development and to initiate price based responses by consumers. The following graphs depict the primary components of the final delivered price for both petrol and diesel in Samoa.



These prices reflect those applying during mid-2012. Total prices will vary over time primarily due to volatility in the landed cost component.

**Figure 13: Liquid Fuel Costs**

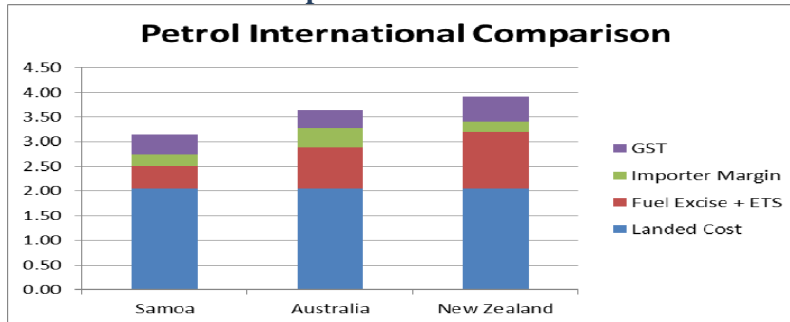


Source: Energy Policy Coordination and Management Division, Ministry of Finance

Important points to be made are that petrol and diesel price components are more or less the same, and that a significant portion of the delivered price (approximately SAT\$1) is distribution, retailer and other charges. For any prospective fuel substitute such as a biofuel, comparison needs to be made with the basic Landed Cost of approximately SAT\$2 per litre.

When comparing petrol and diesel prices globally, Australia and New Zealand tend to be at the cheaper end of the spectrum (see the graph below). When comparing the delivered price in Samoa with these countries it is cheaper again, raising the prospect there may be some merit in reviewing the current level of excise tax in Samoa.

**Figure 14: Petrol International Comparison**



Source: Energy Policy Coordination and Management Division, Ministry of Finance

## 5.5 Key Stakeholders

All key stakeholders have responsibilities to ensure all health and safety standards are adhered to and operational best practice is followed. As set out in the conceptual framework diagram in Section 2.2, the key agencies responsible for implementation of the Transport Sub-sector are the Ministry of Finance, the LTA, the Ministry of Works, Transport and Infrastructure (MWTI), the Ministry of Natural Resources and the Environment (MNRE), and the Scientific Research Organisation of Samoa (SROS).

In particular, this Plan assigns increased responsibilities to the LTA with respect to implementing a range of initiatives related to the transport fleet, fuels used and transport network design, including public transport and cycle ways.

The Ministry of Finance’s Energy Policy Coordination and Management Division has responsibility for the continued ownership of petroleum facilities together with the procurement and distribution of liquid fuels. Currently Exxon-Mobil and PPS are the key stakeholders for supply and distribution. Private owners of petrol stations are other key stakeholders and need to be actively engaged.

## 5.6 Development Opportunities and Constraints

There is considerable international activity seeking alternatives to fossil fuels for transport. The primary endeavours include:

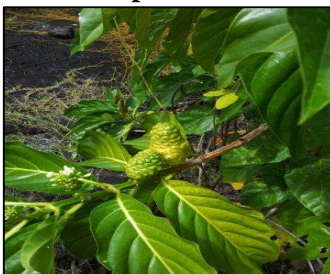
- chemical processes to manufacture liquid fuels to replace diesel or petrol. These renewable fuels are typically bio-alcohols (for blending into petrol) produced from biomass via fermentation processes, or biodiesels (for blending into or replacement of diesel) produced from biomass-sourced oils via a trans-esterification process;
- electric vehicles which source electric power for their batteries from renewable electricity generation sources. This has some real advantages as:
  - The cost of electric vehicles continues to decline;
  - Samoa converts electricity generation to largely renewable sources; and
  - The energy efficiency of electric vehicles is at least 3 times more efficient than petrol engines.

### *Bio-alcohols*

The comments made in this section equally apply to the Electricity and Heating Sub-sectors in so far as bio-alcohols are considered a viable renewable fuel option in those sub-sectors.

Although bioethanol competes with petrol in respect of price, it has some limitations including the following:

- **Storage:** given it is the alcohol source for alcoholic beverages, it needs to be manufactured and stored in a regulated or controlled environment – this can be remedied by adding a component to denature it making it distasteful or causing nauseating effects;
- **Energy content:** significantly lower energy content per litre than petrol;
- **Cost:** relatively high cost of refining due to energy requirements and the occurrence of an azeotrope which limits refinement via distillation to 95%, requiring more expensive chemical treatment to produce anhydrous ethanol;
- **Chemical compound:** it is a hygroscopic compound with high water solubility, which poses issues in tropical environments and in storage tanks where water is present; and
- **Transportation:** it normally requires transportation by tankage as opposed to pipelines.



Nonu plant

Bioethanol importation to Samoa for blending into petrol is not considered commercially viable due to the above issues, logistical constraints, the current world market costs, and the added complexity that would result from this additional imported fuel source. However, subject to critical economic, social and environmental assessment, opportunity exists to evaluate the establishment of a bioethanol manufacturing capability in Samoa derived from local feedstocks such as breadfruit, nonu, cassava and sugar cane. For that purpose, the

biobutanol option (discussed below) may have significant advantages over the bioethanol option for Samoa's future transport fuels needs.

Biobutanol is a relatively new bio-alcohol which has yet to gain status as a fully proven commercially viable biofuel. It is classified by the USA Environmental Protection Agency as an approved Advanced Biofuel. The claimed benefits as adapted from the website [www.butanol.com](http://www.butanol.com) include:

- Biobutanol has many advantages both as a direct biofuel and as a biofuel blend to existing fuels (both petrol and diesel);
- it is a direct 'Drop-In' replacement for petrol;
- it can be blended up to 40% with diesel fuel;

- it has an energy value of 110,000 BTU/Gal, similar to petrol (114,000) and much higher than ethanol (76,100);
- it does not have intoxicating effects when digested so its manufacture and storage does not need to be controlled;
- it is non-corrosive and can be shipped via pipeline rather than in tanks;
- it has lower emissions: reduces hydrocarbon emissions by 95%; carbon monoxide to .01%; and oxides of nitrogen by 37%;
- it can be made from a wide variety of non-food feedstocks such as wood and forest residues, temperate prairie grasses, corn stover, bagasse, and green bio-waste as well as low cost sugar crops such as sweet sorghum or sugar beets;
- it has limited (7.7%) solubility in water, so there is a much less energy intensive method of separating butanol from water, and that is by letting it phase separate; and
- it is 6 times less evaporative than ethanol; and 13.5 times less than petrol, making it inherently safer to use.

A project at Tulane University (USA) is currently confirming the technical and commercial viability of biobutanol. If that investigation proves successful, biobutanol will be a very strong contender as a viable future renewable liquid fuel for Samoa. It is strongly suggested that an active ongoing assessment of this option is maintained.

### 5.6.1 Biodiesels

The section is equally applicable to the Electricity and Heating Sub-sectors in so far as biodiesels are considered a viable renewable fuel option in those sub-sectors. Biodiesel is most commonly produced from relatively low value palm oil in South East Asia and shipped principally to Europe to assist European countries comply with strict environmental laws. An option exists to import this biodiesel to Samoa, provided it:

- is cost competitive with mineral-derived diesel;
- can be incorporated logistically into the liquid fuels facility; and
- will be used in blends that do not void existing equipment warranties.

Biodiesel is currently being produced from coconut oil at the SROS facilities in Apia and is successfully fuelling a number of diesel vehicles. Unfortunately the economics of this process may be unfavourable due to; the high value of coconut oil on commodity markets, the significant cost of methanol and sodium hydroxide required for processing, and the significant energy yield reduction caused by the production of a low value by-product (glycerol).



**Jatropha plant**

However, increasing coconut oil production in Samoa is of considerable strategic value and should be significantly encouraged via the Agriculture Sector Plan and other initiatives. The greatest challenge is not the technology of conversion into either coconut oil or into biodiesel derived from coconut oil, but is in the supply chain logistics for the raw materials. This is where the greatest sensitivity in production costs lie as well as the challenges to motivate and source delivery. The Energy Sector Plan strategy is therefore to strongly support coconut oil production thereby enabling and making available the future option of rapid transition to biodiesel production should global economics change. Biodiesel can also be produced from jatropha, another locally available crop, and further work is currently being undertaken in this area to assess economic viability in the Samoan context.

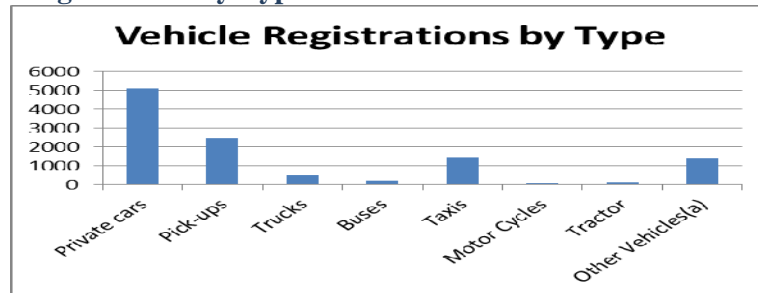
Essentially a watching brief is required across all biodiesel options to monitor their relative merits and better enable a rapid transition should it be deemed beneficial.

### 5.6.2 Energy Efficiency

There is considerable opportunity to expand energy efficiency initiatives in the Transport sub-sector, ranging from incentives to use smaller, more efficient engines and hybrid vehicles, improved traffic management, improved public transport options, improved vehicle maintenance, and so forth. There is a study underway that will look at restricting car imports based on greenhouse gas emissions. Any increase in electricity demand to power electric cars should come from renewable sources.

Good information on vehicle registrations by type is difficult to secure and reflects deterioration in data quality over time. Efforts are being applied to address this extremely important element of transport sector energy use management. The following plot is indicative:

**Figure 15: Vehicle Registrations by Type**



Source: Land Transport Authority

### 5.7 Sub-Sector Policy Outcome

The key outcome for this subsector is to have an efficient, sustainable, safe and cost-effective transport sector.

To reach this outcome, transport needs to be considered in a total system context, the three main components being:

- Transport infrastructure (roads, ports, sea lanes) - good engineering contributes to ensure minimum energy use (eg. well maintained roads, removal of speed bumps)
- Vehicle numbers and type – energy requirements, efficiency and environmental impact (eg. more efficient buses); and
- Users – driver behaviour strongly impacts on energy use, eg. social marketing campaigns to reduce average speed, erratic driving, etc.

### 5.8 Strategic Direction

The Transport Sub-sector Strategic Direction is one of gradual transition and positioning for the future, with certain activities able to be immediately implemented. In the medium and longer term the opportunities available offer considerable economic, employment and capacity building opportunities providing the resources can be mobilised.

There appears little economic merit in advancing biodiesel production from coconut or other sources at this time. Encouragement is given to the increasing production of coconut oil to longer term strategic advantage. Substitutes for petrol deserve some applied research to better determine the potential resource availability and the commercial viability, but are considered unlikely to be economic at this time.

5.8.1 Transport Strategies

Details of the specific Transport Activities along with performance indicators can be found in the Energy Sector Logical Framework in **Appendix 2** for each of the strategies below:

<b>Key Policy Outcome 2</b>	<b>Efficient, Sustainable, Safe and Cost-Effective Energy Use in the Transport Sector</b>
<b>Key Strategies</b>	<p>2.1 Regulate the importation and use of environmentally friendly and energy efficient vessels, motor vehicles and aircrafts;</p> <p>2.2 Promote fuel efficiency in land and sea transport and ensure systems are reliable, efficient and affordable;</p> <p>2.3 Promote the use of bio-fuel as a substitute for imported fossil fuels;</p> <p>2.4 Ensure that energy related Acts and Regulations are enforced to govern supply, use, storage, distribution, disposal and refuelling of fossil fuel and its by-products (sea, land and air transport);</p> <p>2.5 Enforce Waste and oil spillage strategies (Waste Management Plan)</p> <p>2.6 Encourage competition in the supply and distribution of fuel and ensure quality standards exceeded;</p> <p>2.7 Greenhouse gas abatement through energy efficiency and bio-fuel application in the transport sector;</p>

For biodiesel, evidence suggests making it from coconut oil may not be cost effective at this time. However this requires further confirmation through and Expressions of Interest process. Biodiesel supply from coconuts and other sources such as jatropa, and butanol blending options need to be regularly reassessed for economic viability, and a plan needs to be in place for rapid response should development imperatives arise. The commercial viability of biodiesel importation should also be examined.

For bio-alcohols, a watching brief needs to be kept on bio-alcohol technologies mainly focused on blending into petrol (ethanol to 10%, butanol potentially unlimited) and a resource assessment of breadfruit, nonu and cassava (SROS & the Ministry of Agriculture and Fisheries) should be carried out to determine their suitability as bio-alcohol feedstocks. Technical and financial assessment of breadfruit, nonu and cassava for conversion to bio-alcohols need to be made and the commercial viability of de-natured ethanol importation considered.

For the transport fleet, development of a roadmap towards electric vehicles would be useful, along with consideration of other international vehicle technology developments. For owners of fleets of vehicles, active encouragement of fleet turnover for new more efficient vehicles to transition into common use should be encouraged. Lastly, energy efficient designs for road networks should be advanced including for example the removal of speed bumps.

5.8.2 Transport Indicators

The Transport component of the Energy Sector Logical Framework in **Appendix 2** identifies key indicators against specific Activities. By 2016 it is expected that significant advances will have been made across the sector with identifiable improvements. Some slight increase in biofuel use can be expected with Samoa well positioned to adapt to changing circumstances over time.

## 6. ELECTRICITY SUB-SECTOR

### 6.1 Electricity Sub-sector Definition

The Electricity Sub-sector comprises the total electricity supply system from the sourcing of fuels through generation, distribution and delivery to electric appliances and machinery. It includes both network delivered services and private supply of electricity for example through photovoltaic panels and batteries as well as diesel generators.

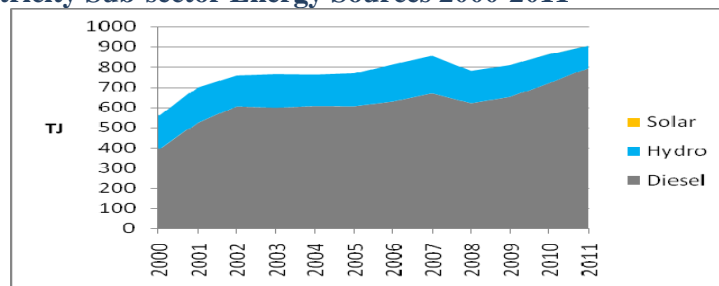
### 6.2 Sub-sector Review

This section incorporates a review of the Electricity Sub-sector, its past performance, current status and its resultant potential opportunities, and its composition from energy supply and demand perspectives.

The Electricity Sub-sector is largely managed by the Electric Power Corporation (EPC), a State Owned Enterprise, which is a combined generator, transmission/distribution network operator, and retailer.

Electricity is generated primarily from reciprocating diesel engine generators from facilities on Upolu (currently close to Apia), Savai'i and Manono Island. In addition, EPC has hydro generation with one major dam-fed generator on the east of Upolu and a number of run-of-river hydro generators, most of which are close to Apia. In 2007, a small (13.5kW) solar PV facility with battery storage was installed as the sole generation source on Apolima Island (approximately 100 residents). Approximately 400kW of solar photovoltaic (PV) generation is currently planned to be installed at five locations across Samoa, with the prospect for up to 7MW of solar PV generation potential planned for the future. Maximum demand on Upolu is currently around 18MW with a minimum current demand of around 8MW. Maximum demand on Savai'i is currently around 2.6MW with a minimum current demand of around 0.6MW.

**Figure 16: Electricity Sub-sector Energy Sources 2000-2011**



*Source: Energy Policy Coordination and Management Division, Ministry of Finance*

Renewable energy currently comprises some 13% of the total energy used to generate electricity, down from 30% in 2000. However, given the high conversion efficiency of hydro and solar electricity generation (approaching 100%) and the low conversion efficiency of electricity generation from reciprocating diesel generators (approximately 30%), the share of electricity generated that is renewable is currently 37%, down from 52% in 2000.

There is considerable potential for expanded renewable electricity generation in Samoa with hydro-electric opportunities, solar PV opportunities due to an abundant solar resource, and some biomass opportunities (via gasification and/or biofuel technologies), being the most advanced. EPC has a power purchase agreement (PPA) with a biomass gasification technology company and also a PPA with a solar company to purchase electricity at a set price from proposed new installations. In addition, there is a largely unassessed geothermal potential given Samoa's volcanic origins, a potential wind resource opportunity and marine opportunities.

Several energy efficiency initiatives exist in the Electricity Sub-sector including benefits associated with distributed generation, improved electricity transmission/distribution networks, and improved energy efficiency of appliances<sup>9</sup> and light bulbs. The electricity transmission network comprises predominantly 33kV and some 22kV circuits on Upolu and Savai'i.

About 98% of the population have been electrified<sup>10</sup> with the EPC seeking alternative energy options to provide electricity to those currently not connected to the grid. The electricity retail operations have focussed in recent years on converting approximately 75% of customers from post-paid accounts to pre-paid meters, with 71% of customers currently converted. Public Awareness programs need to be conducted including; promotion of energy efficiency and conservation, information on appliance energy consumption ratings, promoting energy audits and demonstrating ways to minimise electricity usage. These efforts will culminate in demand side management by developing greater consumer awareness on cost saving measures in terms of household and business kilowatts usage.

The Electricity Act 2010 encourages the participation of the private sector in both generation and provision of electricity networks, with licencing the responsibility of the Electricity Regulator.

In line with the SDS strategic focus on providing reliable utility services, effort will be directed to improve efficiency and effectiveness in the production and management of electricity. Provision of technical assistance for the EPC management and the electricity sector is considered essential in up skilling those involved aiming at improving reliability and efficiency in the electricity service for all customers.

*Electricity Generation*

The total production of electricity generated by the EPC in the 2010/11 financial year<sup>11</sup> was 109million kWh, slightly down on demand in the previous year. It is difficult to predict future demand with a number of planned new building developments and the potential uptake of renewables and energy efficiency by the private sector. The drop in total production is partly attributed to conversion of over 70% of customers to prepayment electricity meters.

**Figure 17: Generation Sources and Contributions**

Location/Source	Generation 2009/10(kWh)	Contribution 2009/10 (%)	Generation 2010/11(kWh)	Contribution 2010/11 (%)
Hydro Upolu	47,737,583	42.9	35,248,194	32.3
Diesel Upolu	51,662,614	46.4	62,709,565	57.5
Coconut Oil Upolu	155,961	0.1	0	0.0
Solar Apolima Island	3,514	0.0	7,826	0.0
Diesel Savai'i	11,794,288	10.6	11,063,970	10.1
<b>TOTAL</b>	<b>111,353,960</b>	<b>100.0</b>	<b>109,029,555</b>	<b>100.0</b>

Electricity supply is reliant on diesel generation which accounts for some 55 to 70% of total generation.

*Cost of Generation*

Hydro generation is the cheapest source of energy with a current direct cost to generate electricity (including repairs, maintenance and operational costs) estimated by



**Hydro generation plant**

<sup>9</sup> For example, analysis of a particular Pacific Island's electricity use revealed that 75% of domestic electricity was used by inefficient refrigerators.

<sup>10</sup> 2001 Population Census.

<sup>11</sup> Source: EPC Annual Reports 2009/10 and 2010/11.

EPC at 14 sene per kWh. The cost to generate does not significantly vary over time. The direct cost to generate electricity from diesel (including cost of diesel, repairs, maintenance and operational costs) is currently estimated by EPC at 82 sene per kWh.

The cost varies significantly due to the change in cost of diesel from month to month as illustrated in the following table. The cost of diesel to EPC in November 2011 was SAT \$0.67 per kWh (excluding VAGST).

**Figure 18: Varying Cost of Generation**

Month	EPC diesel cost (SAT sene per litre excl. VAGST)	Fuel efficiency rate (kWh per litre)	EPC diesel cost to generate electricity (SAT sene per kWh excl. VAGST)
Low – June 05	165	3.80	43
High – August 08	355	3.80	93
Average 2008	277	3.80	73
Average 2009	178	3.80	46
Average 2010	198	3.80	52
November 2011	254	3.80	67

New diesel generators are nearing commissioning on Upolu. The improved fuel efficiency rates of the new generators after commissioning will lower the effective cost of diesel generation. For example, a weighted average increase in fuel efficiency from the current 3.80 to 4.55 kWh per litre would reduce the cost to generate electricity by approximately 20%, assuming operation at close to full load most of the time.

The direct cost of diesel is the “avoided cost of diesel generation” which is an appropriate cost to compare any renewable energy option against. It will continue to fluctuate and therefore introduce risks to the relative commercial viability of any renewable energy option. As of June 2012 the EPC diesel cost is around SAT 260 sene per litre (excluding VAGST) leading to an avoided cost of generation with the new units around 60 sene per kWh. These estimates need to be continually adjusted as fuel prices fluctuate and the effective efficiencies of the new generators are confirmed.

*Structuring investment in renewable energy*

Most investment proposals assume that the current relatively high cost of diesel will continue. This may or may not be the case although it is reasonable to assume that the long term trend of high international oil prices will continue. An investment in renewable energy will produce a hedge against future imported diesel costs as well as contribute to greenhouse gas abatement. However, any contractual arrangements must anticipate the situation that the cost to generate electricity from renewable energy sources may at times exceed the cost to generate electricity from diesel.

In addition, relative movement is expected between the costs to generate electricity from different renewable energy options over the long economic life of a renewable energy investment. For example, the cost to generate electricity from solar photovoltaic installations currently exceeds the cost to generate electricity from biomass. However, the cost of solar photovoltaic continues to drop and may eventually fall below the cost to generate from biomass significantly impacting on the relative commercial viability over the balance of a 15 to 20 year economic life of the respective renewable energy options.

For these reasons, it would seem prudent to spread the risk with a “balanced portfolio” approach investing in a range of renewable energy options in the almost certain knowledge that some investments will ultimately be more attractive than other renewable energy options. EPC are progressing two proposals for private sector investment in generation from renewable energy sources (biomass and photovoltaic). In addition, it may be possible to structure other renewable energy options in a way that attracts further private sector



involvement or funding while at the same time providing for on-going research information. This includes the proposal to establish a demonstration facility for gasification of indigenous biomass; as well as the pilot plant for biodiesel production from coconut oil. Contractual arrangements can be structured to ensure that resources are harvested sustainably with adequate protection to the environment, that independent environmental impact studies form the basis for determining whether new species should be introduced, that research and evaluation of and that information remains in the public domain, while at the same time demonstrating commercial feasibility.

#### *Independent Regulation of electricity tariffs*

Independent regulation of electricity tariff setting becomes more imperative with the increasing diversity of sources of generation through private sector investments by Independent Power Producers. A regulatory regime is required that balances the interests of consumers as far as tariff and service standards are concerned; against the need of EPC and private sector investors to have certainty over earning a fair return on their investment.

The relative movement between the costs of electricity generated from various renewable energy sources and that generated from diesel will have a fundamental impact on the on-going commercial viability and the amount of operational subsidies that may be required unless the costs (or benefits) can be passed through to electricity consumers. The development and negotiation of Power Purchase Agreements which are fair to both the project investors (irrespective of public or private sector funds) and EPC is a key risk in considering any renewable energy investment decision.

#### *Power Purchase Agreements*

It is crucial that adequate due diligence is undertaken during negotiation of contractual arrangements given the commercial implications over the long asset life of any investment. The issues that need to be considered in negotiating a PPA include the term of agreement, payment term, supply conditions including technical specifications and penalties for non-delivery, power quality, and feed in tariff and formula for future changes.

#### *Reducing system losses*

The regulatory regime should encourage EPC to invest in initiatives that improve the efficiency of operations. For example, EPC generated 109m kWh and billed 90m kWh in the financial year ending 30 June 2011. This equated to a total system loss<sup>12</sup> of 17.7%. This level of losses is not untypical of island networks although the most efficient island networks may achieve total system losses of 13%. Work is underway through the power expansion project to reduce the level of losses through initiatives such as the installation of accurate pre-pay meters and distribution network upgrades. Every 1% reduction in system losses would reduce the cost to generate electricity by around 1 sene per kWh billed.

#### *Demand Side Management*

Initiatives such as the replacement of high pressure sodium street lights with new generation light-emitting diode (LED) lanterns will reduce usage by some 600 kWh per annum per lantern<sup>13</sup>. New LED lights last for 50,000 hrs or approximately 13 to 14 years at 10 hours usage a night. Initiatives such as this will reduce the demand to generate electricity from diesel as well as renewable sources.

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<sup>12</sup> System losses measure the difference between kWh that are billed and kWh that are generated; taking into account parasitic losses (amount of electricity used by generators generating electricity, line losses (network losses in distributing electricity) and non technical losses (fraud, meter error, meter reading errors etc).

<sup>13</sup> Based on a 100W LED compared to the equivalent 250W high pressure sodium lantern.

*Supply Side Management*

The current approach of electricity supply management, essentially managing the hydro-generated electricity based on available hydro storage on top of the base load diesel-generated electricity, will need to be expanded and enhanced to effectively maximise the electricity generated from the expanding range of renewable electricity sources.

*Distributed Generation*

Distributed generators are generators located at a home, at a business (often solar panels) or in a community which are capable of generating electricity for own use. They are also increasingly of a capacity that will be capable of supplying electricity back into EPC’s network that is surplus to their own requirement. It is anticipated that the renewable energy available from these distributed systems will increase significantly over the next 5 to 10 years. The increasing capability of this renewable energy option presents two major policy considerations for Government and EPC:

- Whether generation from renewable sources should be encouraged as one option of reducing the dependence on imported diesel generation; and if so, the implications for EPC who will still be expected to provide backup diesel generation capacity when these largely intermittent forms of renewable generation are unable to supply all of the consumer’s own requirements; and
- Should surplus electricity be “purchased” into the EPC network; and if so, on what terms and conditions.

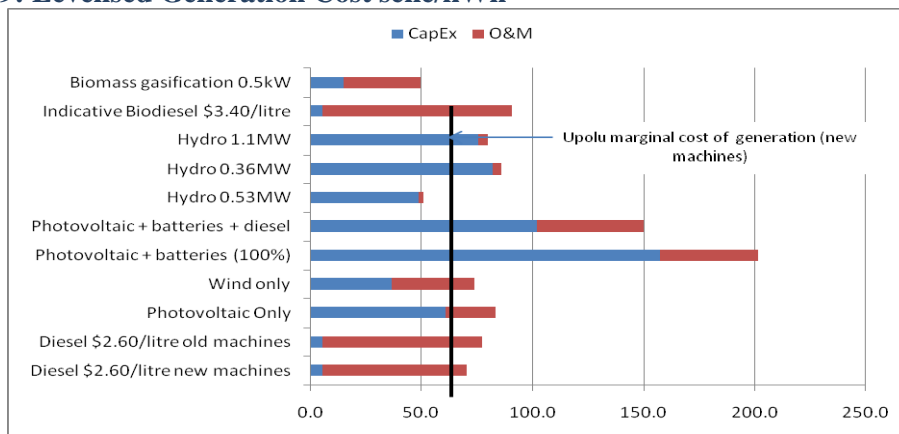
EPC has developed interconnection agreements to allow private consumers to install their own renewable energy generators to meet their own electricity demand. Surplus electricity is fed into EPC system but EPC will not pay for it but allow these consumers to accumulate credits to offset electricity purchased from EPC system.

It is recommended that a Distributed Energy Guide is developed to assist consumers in planning for the installation of Distributed Generation Systems. EPC must also remain aware of what is happening, because the system could be hugely disruptive to the network load requirements in the event that either, the consumer still requires a connection to the grid to supply back up electricity or, arrangements are required for the purchase of surplus electricity into the network.

*Comparative analysis of renewable energy options*

The comparative analysis of each of Samoa’s renewable generation options for electricity generation is indicated in the following figure. It is anticipated that this be updated as new information comes to hand.

**Figure 19: Levelised Generation Cost sene/kWh**



These estimates would be firmed up as part of advancing any of the preferred options.

6.2.1 Electricity Consumption Analysis

EPC has approximately 32,000 electricity customers. The majority of consumers are located on the islands of Upolu, Manono and Apolima (80%) with the balance of consumers located on Savai'i (20%). The majority of customers are domestic consumers (~83%) accounting for 28% of electricity units consumed. Commercial customers (13% of total consumers) account for the majority of unit consumption (47%).

Figure 20: Electricity Consumption Details

Consumer Category	Number of Consumers	Number of Consumers % of Total	Units Consumed kWh	Units consumed % of Total
Domestic	31,791	83.3	25,700,000	28.0
Industrial	55	0.1	4,830,000	5.3
Commercial	4,810	12.6	42,850,000	46.7
Hotels	24	0.1	3,330,000	3.6
Government	184	0.5	8,330,000	9.1
Religious & Charities	1,055	2.8	4,190,000	4.6
Schools	239	0.6	2,460,000	2.7
<b>Total by Users</b>	<b>38,158</b>	<b>100</b>	<b>91,670,000</b>	<b>100</b>
Upolu, Manono and Apolima	30,458	79.8		
Savai'i	7,700	20.2		
<b>Total by Island</b>	<b>38,158</b>	<b>100</b>		

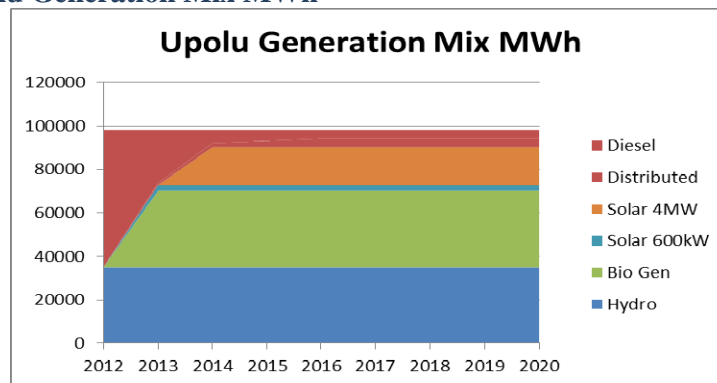
6.2.2 Capacity Considerations

Maximum and minimum demand on Upolu and Savai'i are currently:

	Peak Demand	Minimum Demand
Upolu	18 MW	8 MW
Savai'i	2.6 MW	0.6 MW

It is most significant that should the current new generation proposals be successfully implemented, including the current biomass gasification and solar photovoltaic proposals, this would substantially meet Upolu's current electricity requirements. It should also be noted that, as the planned solar systems are without batteries, this will limit capacity of solar generators to be connected to the electricity grid to 20% of noon peak of 15MW or 3MW.

Figure 21: Upolu Generation Mix MWh



This would lead to the new diesel fuelled generators being required to run as back up to the intermittent generation and these units may not be optimally sized for this operating regime. Some increase in demand is possible with a number of development proposals under discussion. Increased modelling of possible future electricity demand and supply scenarios is necessary to ensure sufficient forward planning.

### 6.3 Regulatory Framework

The two key Acts governing the Electricity Sub-sector are the Electricity Act 2010 and the Electric Power Corporation Act 1980. In addition to the legislation, an Electricity Regulator has been established to regulate the sub-sector. These are described below.

#### *The Electricity Act 2010*

The purpose of this Act is to “provide for a new legislative framework for regulating the electricity sector, the establishment of the post of the Electricity Regulator and the Office of the Regulator, and for related matters”. It also encourages the participation of the private sector in both generation and provision of electricity networks, with licensing the responsibility of the Electricity Regulator. Regulations to be drafted under the Act will determine electricity tariffs.

#### *The Electric Power Corporation Act 1980*

The purpose of the Electric Power Corporation Act 1980 is to “consolidate and amend certain enactments relating to the Electric Power Corporation, its functions, operations and other related matters including its role in the generation, supply and use of electricity”.

At the time of writing this Energy Sector Plan, amendments to the Electric Power Corporation Act 1980 from the Electricity Act 2010 had not yet been incorporated, so the two following points relate to the former Act as it currently stands. Section 25(3) of the Electric Power Corporation Act 1980 requires a licence for the purpose of carrying out electrical wiring work or of generating or distributing electricity, although it is not completely clear whether this is limited to ensuring suitably qualified persons carry out electrical wiring or whether it extends to enabling new generation or distribution opportunities per se.

In the Act, there is no requirement on the Electric Power Corporation to regularly make electricity market data available, including supply and demand data. However, section 51(2)(c) states that regulations may be made to prescribe further records or accounts to be kept by the Corporation. The benefits to the Ministry of Finance and other energy sector stakeholders of regulated data provision would need to be balanced against the onus on the Corporation, and whether the Ministry of Finance or Minister merely asking the Corporation to provide such data regularly (eg weekly, monthly) is sufficient. One option is that the Act could be amended to at least require a minimum level (eg quarterly) of data provision from the Corporation to the Ministry and/or stakeholders in general.



**Samoa’s major hydro storage**

Section 32(2) states that the General Manager ‘shall, where reasonably possible, be a qualified and experienced professional engineer and shall be the Chief Executive Officer of the Corporation’. This requirement of engineering experience, whilst preferable, may not be necessary as the role is essentially one of organisational leadership.

#### *Electricity Regulator*

The role of the Electricity Regulator is established under the Electricity Act 2010 and the Regulator’s Office is in the process of recruiting a full complement of resources. The initial focus of the Electricity Regulator, based in the Office of the Regulator, will be on assessing and approving the electricity tariff. The policy details of the tariff will be developed by the Regulator’s Office in conjunction with the Ministry of Finance’s Energy Policy Coordination and Management Division.

## 6.4 Key Stakeholders

In general terms, the key stakeholders of the Electricity Sub-sector consist of the electricity suppliers and users in Samoa. As set out in the conceptual framework diagram in section 2.2 of this Energy Sector Plan, the key agencies responsible for implementation of the Electricity Sub-sector Work Programme are the Ministry of Finance, EPC, Ministry of Natural Resources and Environment, the Ministry of Women, Community and Social Development, and SROS.

## 6.5 Existing Activities

The most substantive programme in the electricity sector is the Samoa Power Sector Expansion Project (PSEP) with total funds obligated or committed and spent to the end of December 2011 standing at US\$69M with the remaining US\$31M to fund remaining projects over the next three years.

PSEP projects completed or near completion at 30 June 2012 are:

- Upgrade of Alaoa Distribution Feeder from 6.6kv to 22kv
- Upgrade of part of Hospital Distribution Feeder from 6.6kv to 22kv.
- Vending & Public Dissemination
- Installation and use of Power System Planning Software
- Single and Three Phase Prepayment Metering Project-92% complete
- Fiaga power plant access road, pipeline and fence-95% complete
- Hydro Power Scheme. – Feasibility Study and tender document-95% complete
- Puapua-Asau Transmission Line 22kV Re-conductoring
- Refurbishment of Alaoa hydro plant and replacement of electrical-mechanical equipment
- Completion of 95% of the Feasibility study of 5 hydro schemes and tender of 3 of these schemes
- Replacement of 22kv switchgear in Taelefaga, Lalomauga and Samasoni hydro plants and Tanugamanono diesel plant
- Refurbishment of Tanugamanono diesel generators 9A and 7A - 100% complete

PSEP projects underway or planned for the next three years include:

- Fiaga Diesel Power Station Project- 70% complete
- Fiaga power plant fuel and oil storage tanks – 20% completed
- Samasoni hydro underground transmission line to Tanugamanono - 50% complete
- Construction of Alaoa and Fale ole Fee (FOF) hydro plants dedicated transmission line to Tanugamanono – 60% complete
- Undergrounding of Fuluasou Substation to Apia Wharf 22kV distribution feeder - 20% complete
- Reconductoring of all 22kv distribution feeders on Upolu - 50% complete
- Undergrounding and upgrading of Hospital Feeder from 6.6kv to 22kv – 70% complete
- Vaipu Pump Scheme – Feasibility Study - 75% complete
- Relocation of 3 Mirrlees generators from Tanugamanono to Fiaga new power plant -20% complete
- Fiaga Diesel Power Station to Fuluasou Substation 33kv transmission line – no activity to date, awaiting arrival of materials
- Construction of 33kV Underground transmission line Fuluasou substation to Tanugamanono – 20% complete
- 22kV Fuluasou Substation – construction started, 5% complete, medium voltage switchgear arrived, factory testing of transformers completed, shipment pending
- Upolu Low Voltage Network Improvement – materials purchased, construction has not started

- SCADA System – contract is awarded and design and implementation started
- Vaiaata new power station – Feasibility study completed
- Refurbishment of Salelologa Diesel power station substation included as part of Vaiaata new power plant subproject – Feasibility study completed.
- Taelafaga Hydro Machines Governor System Replacement – tender closed, evaluation underway
- Noise and exhaust fume controls for Tanugamanono power plant – no progress to date
- Low Voltage Network Improvements on Savai'i – purchasing materials, no progress to date
- Fiaga power plant permanent water supply – 50% complete.

## 6.6 Development Opportunities and Constraints

The Electricity sub-sector has numerous renewable energy opportunities with the greatest challenge to choose the most optimum developments. The electricity sub-sector could be substantially renewable within a very short space of time based on current long run cost estimates and on projects where PPA's already exist.



Particularly on Upolu there may not be much room left for new generation and on Savai'i the opportunity exists to immediately implement renewable generation options. It is therefore proposed that the “Expressions of Interest” (EOI's) process as explained under Sector Wide strategies is deployed to tease out the real opportunities and choose the best at this time.

### Solar panels on Upolu

A structured series of EOI's is proposed, the first two being one for solar generation options and one for biodiesel to fuel the diesel generators. This could for example be followed with one for wind and one for renewable generation on Savai'i. The greater issue may rapidly become oversupply of renewables and potential need to “spill” renewable energy as the system dynamically matches demand and supply. The electricity networks and the back-up generation need urgent reassessment for a significantly different mode of operation.

### 6.6.1 Crosscutting Issues

No new electricity generation proposals offer significant reductions in the cost of generation and consequently in the delivered price of electricity. It can be hoped that over time the benefits of renewables and the move away from import dependency will lead to least cost options, and to improved social and environmental outcomes.

There is already some resilience in the electricity system due to the ring main configuration of the networks. However significant improvements in resilience can be expected with increasing points of supply and distributed renewable generation. Further opportunities to improve resilience including aspects of climate change adaptation should be examined and a programme of action determined.

### 6.6.2 Renewable Energy

The choice of renewable energy options for Samoa needs to take into consideration the differing economic benefits to be derived. Biomass options offer considerably greater increased economic activity over an extended period relative to options of high capital cost and very low operation and maintenance.

Samoa has participated in regional renewable energy projects such as a Biomass Resource Assessment coordinated by SOPAC; Pacific Islands Renewable Energy Project(PIREP) coordinated by SPREP; Renewable Energy and Energy Efficiency Program (REEP) by Asian Development Bank (ADB), Promotion of Renewable Energy, Energy Efficiency and

Greenhouse Gas Abatement (PREGA), co-financed by the ADB and the Government of Netherlands and Regional Energy Program on Poverty Reduction (REP-POR) financed by United Nations Development Programme.

Clean Development Mechanisms (CDM) should also be considered with regards to greenhouse gas emissions and potential funding pathways.

Existing hydro schemes in Samoa have experienced decreasing load factors, due to change in climate and in part to removal of vegetation in the catchments. Some reforestation is proposed along with investigating means to add storage with flood retention schemes upstream of existing facilities. EPC also has plans to develop up to five new micro hydro plants in the next five years which will increase hydro installed capacity and increase hydro generation.

### **6.6.3 Energy Efficiency**

Given the energy cost savings that an effective energy programme can provide, energy efficiency improvements will be given a high priority. Policy development will recognise that the three main energy consumer sectors – Government, Industrial/Commercial and Household – have different characteristics and will require different approaches. In all three consumer sectors measures will be a combination of advice and incentives. Specifically, the Ministry of Women, Community and Social Development is being asked to take a more prominent role in promoting energy efficiency at the individual and community level by identifying energy opportunities and the resultant benefits. Quite a number of initiatives are possible with the added benefit of demonstrating the energy sectors focus on end-users. The Ministry of Natural Resources and Environment will take a more prominent role working with the private sector, institutions, government agencies and businesses to implement energy auditing and advice functions. These initiatives are discussed in more detail under Sector Wide strategies.

## **6.7 Sub-sector Policy Outcome**

The key outcome for this subsector is to have efficient, reliable, safe, affordable and sustainable electricity services.

To support the objectives, electricity needs to be considered in a total system context, the main components being:

- Energy source - reducing cost of energy source (e.g. through reducing cost of shipment)
- Conversion efficiency - improving efficiency of conversion of energy source to electricity and end use (such as refrigeration)
- System losses - reducing total system losses from generation to billing; and
- Dependency - reducing dependence on imported fuels.

## **6.8 Strategic Direction**

The strategic direction of the Electricity Sub-sector is dominated by the potential for an immediate step change to a substantially renewable generation situation. This requires significant adaptation on the part of EPC and presents significant opportunities for the private sector to be more actively involved as Independent Power Producers (IPP'S), potentially as network operators and, by means of Interconnection Agreements, at the individual consumer level.

The options of hydro, solar and wind are near commercial if not commercial already but do not offer the economic advantages potentially available via biomass options. Biomass options are significantly more challenging to bring to market and deserve support in order to achieve their objectives. The commercial viability of electricity from biodiesel should ideally be reassessed by an Expressions of Interest process.

6.8.1 Electricity Strategies

Details of the specific Electricity Activities along with performance indicators can be found in the Energy Logical Framework in **Appendix 2** for each of the strategies below:

<b>Key Policy Outcome 3</b>	<b><i>Efficient, Reliable, Safe, Affordable and Sustainable Electricity Services;</i></b>
<b>Key Strategies</b>	3.1 <i>End user focused delivery of service is strengthened;</i> 3.2 <i>Improve the tariff structure;</i> 3.3 <i>Continue to encourage private sector involvement in electricity production;</i> 3.4 <i>Promote electricity generation from proven renewable energy technologies;</i> 3.5 <i>Promote demand and supply side-management strategies for all consumers and EPC;</i> 3.6 <i>Promote energy efficiency strategies across all consumer sectors; and</i> 3.7 <i>Greenhouse gas abatement through renewable energy (biomass gasification) in the electricity sector.</i>

Within the various strategies are specific actions related to the Electric Power Corporation (EPC) including a structural reform programme to ensure the organisation adapts to the new paradigms in the electricity sector with increased customer focus and generation widely deployed by the private sector in a distributed network configuration. New network operators may also evolve. The EPC needs to quickly establish standard Interconnection Agreements and critically assess the necessary grid upgrades to maximise penetration of distributed generation and minimise system losses.

Wide deployment of photovoltaic panels is both technically and commercially feasible. It is important that only high quality PV systems (panels, inverters and other components) are deployed and some consideration should be given to instituting quality standards similar to appliances.

The biomass opportunities offer the greatest potential economic benefits but are most challenging to implement. Various biomass gasification proposals are currently being pursued and combustion technologies should not be overlooked.

6.8.2 Electricity Indicators

The Electricity component of the Energy Sector Logical Framework in **Appendix 2** identifies key indicators against specific Activities.



## 7. HEATING AND COOKING SUB-SECTOR

### 7.1 Heating and Cooking Sub-sector Definition

The heating sub-sector comprises:

- primarily biomass (firewood, coconut husks, charcoal) used for domestic, commercial and institutional cooking and other heating applications, as well as for industrial process heat (copra drying etc);
- dual purpose kerosene (kerosene) and liquid petroleum gas (LPG) used for domestic, commercial and institutional cooking/lighting and other commercial, institutional and industrial heating applications;
- diesel used to generate process heat for institutional and industrial applications;
- biogas and potentially bio-liquids produced from waste streams used for provision of heat;
- solar energy used for water heating.



Production of Biogas

The heating sub-sector excludes heating applications including cooking that is derived from electricity. Based on the 2006 census, approximately 60% of households utilise biomass (firewood) as the cooking fuel source, including those households that utilise biomass in addition to another energy source such as LPG or kerosene. This analysis can be updated in late 2012 when there is an initial planned release of data from the 2011 census.

The typical amount of firewood consumed for cooking per household is difficult to estimate accurately. The analysis used in this Plan assumes that a household that uses firewood only for cooking would typically use 40kg (40% moisture content) across Monday to Saturday and a further 20kg on Sunday for a traditional earth oven (*umu*), or a total of 60kg/week<sup>14</sup>. Those households that use two fuel sources including firewood for cooking have been assumed to use 50% of the amount used by firewood only households. This analysis can be updated if more accurate data becomes available.

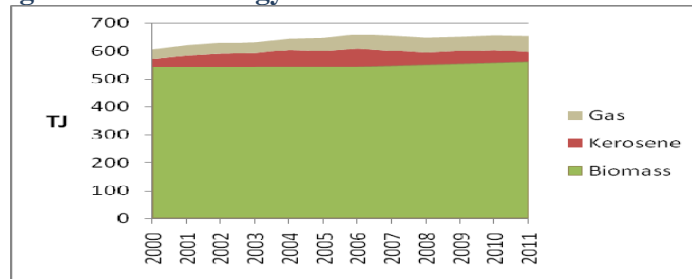
### 7.2 Heating and Cooking Sub-sector Review

This section incorporates a review of the Heating Sub-sector, its past performance, current status and its resultant potential opportunities, and its composition from energy supply and demand perspectives.

Despite growth in recent years in the use of LPG (to some degree replacing kerosene), the renewable energy content for this sub-sector is relatively constant at approximately 86%, giving limited opportunity for additional renewable energy growth unless a viable liquid biofuel can be sourced and competitively priced to replace kerosene and the more expensive but convenient LPG. However, the use of efficient wood stoves provides a good opportunity for energy efficiency gains in this sub-sector. The following graph shows the component energy sources for the heating sub-sector from 2000-2011.

<sup>14</sup> This usage is consistent with that assumed in the “Pacific Regional Energy Assessment 2004: an assessment of the key energy issues, barriers to the development of renewable energy to mitigate climate change, and capacity development needs to removing the barriers: Samoa National Report” by Herbert Wade et al – Apia, Samoa: SPREP, 2005.

**Figure 22: Heating Sub-Sector Energy Sources 2000-2011**



### 7.3 Regulatory Framework

There is no particular regulatory framework relating to the use of the biomass for heating applications, and regulations relating to the use of petroleum products (kerosene and LPG) are limited to standard safety aspects in supply.

There are health and safety concerns primarily at the domestic level in the use and application of all these energy sources, but these are not considered sufficient to warrant introduction of new regulations. The greatest benefits can be derived from an awareness campaign to encourage best practice use of these fuels, fuel substitution and improvements in efficiency.

### 7.4 Key Stakeholders

Key stakeholders are residential, commercial and industrial consumers using any of these fuel sources for heating and cooking. This includes market operators where kerosene and LPG use has been observed. The key agencies responsible for implementation of the Heating Sub-sector are the Ministry of Women, Community and Social Development (MWCSD), the Ministry of Natural Resources and Environment, including its Renewable Energy Division, and the Ministry of Finance.

### 7.5 Development Opportunities and Constraints

As noted above, there is limited opportunity for renewable energy growth in the Heating Sub-sector, unless a viable liquid biofuel can be sourced and competitively priced to replace kerosene and the more expensive but convenient LPG. There are energy efficiency gains to be made. The range of development opportunities therefore include:

- Installation of anaerobic digesters for large organic waste flows (eg solids from waste treatment plant, landfill sites) to produce biogas
- Installation of anaerobic digesters at the community level to convert organic waste to biogas
- Bio-alcohol (ethanol, butanol) industry & associated bioenergy plantation, harvesting, processing & logistics operation
- Switch to renewable electricity, possibly including solar cooking
- Biogas from organic waste
- Bio-alcohol (ethanol, butanol) as fuel source to replace kerosene and LPG
- Phase out kerosene as a domestic fuel
- Energy efficient stoves (as shown)



**Energy Efficient Stoves**

#### 7.5.1 Energy Efficiency

In addition to the above development opportunities, awareness programmes will be put in place to encourage:

- Use of solar water heating in commercial applications, particularly in the hotel and restaurant sectors;

- Appropriate installation and maintenance of industrial and commercial heating equipment;
- Use of fuel efficiency stoves, emphasising environmental and health benefits.

**7.6 Sub-sector Policy Outcome**

The key outcome for this subsector is to have efficient, reliable, safe, affordable and sustainable heat source supply.

**7.7 Strategic Direction**

Details of the Heat Strategies and specific Activities along with performance indicators can be found in the Energy Sector Logical Framework in **Appendix 2**. Due to its relatively small scale and already high renewables percentage there are only two Heating Strategies. These are however, very important in the context of cross cutting issues and also for activating increased community engagement in the Energy sector.

**7.7.1 Heating and Cooking Strategies**

Details of the specific Heating and Cooking Activities along with performance indicators can be found in the Energy Sector Logical Framework in **Appendix 2** for each of the strategies below:

<i><b>Key Policy Outcome 4</b></i>	<i><b>Efficient, Reliable, Affordable and Sustainable Heat Source Supply;</b></i>
<i><b>Key Strategies</b></i>	<i>4.1 Improve Energy Efficiency in heating and cooking; and 4.2 Promote biogas opportunities;</i>

**7.7.2 Heating and Cooking Indicators**

The Heating Component of the Energy Sector Logical Framework in **Appendix 2** identifies key indicators against specific Activities.

## **8. MONITORING AND EVALUATION FRAMEWORK**

The Sector Planning Manual produced by the Ministry of Finance mandates the development of a functional monitoring and evaluation framework to track the successful implementation of the Energy Sector Plan.

The Monitoring and Evaluation of the Energy Sector Plan will be overseen by the National Energy Coordination Committee with the EPCMD as its technical arm acting as Secretariat. The Energy Sector Logical Framework in **Appendix 2** establishes set targets to be achieved within the Sector Planning timeframe whilst the Responsibility Matrix in **Appendix 3** matches activities to lead agencies. It is the responsibility of these identified lead agencies to report on the progress of their activities towards meeting their targets on an annual basis to the National Energy Coordination Committee.

## Appendix 1: Stakeholders Consulted

### GOVERNMENT MINISTRIES:

#### MINISTRY OF FINANCE

Minister of Finance - Faumuina Tiatia Faaolatane Liuga  
Associate Minister of Finance - Tialavea Fea Tionisio Seigafolava Hunt  
Chief Executive Officer - Lavea Tupa'imatuna Iulai Lavea  
Deputy Chief Executive Officer (Policy) - Seali'imalieta Melepone Isara  
Deputy Chief Executive Officer (Operations) - Foketi Imo Evalu  
Public Finance Management Reform and Finance Sector Coordinator - Tofilau Lae Siliva

#### Economic Policy & Planning Division

Assistant Chief Executive Officer – Leiataua Henry Ah Ching

#### Energy Unit

Energy Coordinator – Heremoni Suapaia-Ah Hoy

Senior Energy Officer - Flavia Luamanuvae Vaai

Energy Officer - Watsonia Fereti

#### Project Planning and Programming Unit

Principal Planning & Programming Officer - Abigail Lee Hang

#### Sector Planning Unit

Principal Sector Planning Officer - Maliliga Peseta Vasa

#### Corporate Service Division

Assistant Executive Officer – Tupaiilei Soane Leota

#### Budget Division

Assistant Chief Executive Officer - Leasiosiofaasisina Oscar Malielegaoi

#### State Owned Enterprise Monitoring Division

Assistant Chief Executive Officer – Elita Tooala

Principal Officer – Michael Kapisi

#### Aid Coordination & Debt Management Division

Assistant Chief Executive Officer – Peseta Noumea Simi

#### Climate Resilience Investment and Coordination Unit

Project Coordinator – Litarā Taulealo

Principal Climate Resilience Investment Officer – Jean Viliamu

Senior Investment Officer – Iloauala Aumua

#### MINISTRY OF NATURAL RESOURCES & ENVIRONMENT

Chief Executive Officer - Taulealeausumai Laavasa Malua

#### Renewable Energy Division

Assistant Chief Executive Officer – Sala SagatoTuiafiso

Principal Renewable Energy Officer – Anne Trevor

Principal Valuer (Land Management) - Faanimō R. Warren

Planning Urban Management Agency Officer - Sulumanaia Malaga

#### MINISTRY OF WORKS, TRANSPORT & INFRASTRUCTURE

#### Land Transport Division

Principal Strategic Planning Officer - Paulino Pania

#### Civil Aviation Division

Acting Assistant Chief Executive Officer – AusetaliaTanuvasa

Principal Officer Aviation Security - Yvonne Tuioti Mariner Viliamu

#### Maritime Division

Principal Surveyor Officer – Tapaga Collins

Senior Building Inspector Officer - Talamoni Simi

#### MINISTRY OF AGRICULTURE AND FISHERIES

Assistant Chief Executive Officer – Misa Konelio Misa

Advisory Officer – Fataalo Fania  
Senior Information Officer – Mafutaga Tinifu  
Principal Research - Parate Matalavea  
Research Officer – Aleni Ueese  
Assistant Research Officer - Philip Tuivavalagi  
Senior Crops Development Officer – PueataTanielu  
Senior Crops Officer - Levao Ricky Faatonu  
Crops Officer – Faauuga Tavita Pulu

**MINISTRY OF WOMEN, COMMUNITY & SOCIAL DEVELOPMENT**

Assistant Chief Executive Officer (Policy & Research) - Tootoalii Roger Stanley  
Assistant Chief Executive Officer (Women Division) – Louisa Apelu  
Principal (Community Development) – Vaialia Iosua  
Principal Research Officer – Faafetai Korua  
Senior Child Protection Officer - Ame Sio  
Samoa National Youth Council Project Manager - Eric Poe  
Senior Internal Affairs Officer - Siufaga Simi  
Senior Policy Analyst - Owen Ah Ching  
Principal Accountant - Ruta Afele

**MINISTRY OF COMMERCE, INDUSTRY & LABOUR**

Industry Development & Investment Promotion Division  
Assistant Chief Executive Officer - Pulotu Lyndon Chu Ling  
Industry Development Officer - Albert Meredith  
Principal Officer - Julia Solofa Mata'i

**MINISTRY OF EDUCATION, SPORTS & CULTURE**

Assets Manager – Ieti Fa'aso'o  
Principal Curriculum (Curriculum Materials & Assessment Division)- Seumanu  
Gauna Wong  
Principal Accountant - Melaia Reed  
Principal Officer - Tamasoali'I Saivaise

**MINISTRY OF HEALTH**

Principal Health Care Officer - Dr. Tesimale Lameko

**OFFICE OF THE ATTORNEY GENERAL**

Attorney General - Aumua Ming Leung Wai

**OFFICE OF THE REGULATOR**

Regulator - Donnie De Freitas  
Manager of Technical Services – Unutoa Fonoti

**SAMOA BUREAU OF STATISTICS**

Assistant Chief Executive Officer (Census Division) - Malaefono Tau

**DEVELOPMENT PARTNERS:**

**NEW ZEALAND HIGH COMMISSION**

First Secretariat Development - Peter Zwart  
Development Programme Coordinator – Christine Saaga

**AUSTRALIAN HIGH COMMISSION**

Counsellor (Development Cooperation) - Anthony Stannard  
Senior Program Manager (Governance & Economic Stability) - Asenati Lesa-  
Tuiletufuga

**STATE OWNED ENTERPRISES:**

**ELECTRIC POWER CORPORATION**

General Manager - Tologata Tile Le'ia Tuimalealiifano

Deputy General Manager - Taule'ale'a Aumalaga Tiotio  
Acting Project Manager / Generation Engineer Consultant - Fonoti Perelini Perelini  
Assistant Chief Executive Officer (Corporate Service) - Vui Lance Lameko  
Chief Financial Officer (Distribution) - Salafai Ah Tong  
Chief Financial Officer (Accounts Receivable) - Oloipola Pelenato Futi  
Team Leader (RE) - Wairarapa Young  
Senior Human Resource Officer - Shin Ete  
Renewable Energy Associate - Bobby Ah To

**SCIENTIFIC RESEARCH ORGANISATION OF SAMOA**

Chief Executive Officer - Tilafono Leatiogie David Joseph Hunter  
Assistant Chief Executive Officer (Environment and Research) - Taitosaua Eddie Winterstein  
Principal Research Scientist – Samani Carel Tupufia  
Research Scientist - Dr. Pousui Fiame Leo  
Volunteer Service Abroad Scientific Research Adviser - Kenneth Wong

**LAND TRANSPORT AUTHORITY**

Manager (Road Use Management Division) - Tamaseu Leo Bartley  
Manager (Legal Division) - Anoanoa'I Pepe Lafai  
Acting Manager (Procurement & Programming Division) - Anna Aiolupotea  
Principal Procurement Engineer - Titi Tutuvanu  
Principal Traffic & Licensing Officer - Iakopo Saufua

**NATIONAL HEALTH SERVICES**

Principal Assets Management - Faleata Savea  
Climate Change & Health Coordinator - Tamati Fau

**SAMOA WATER AUTHORITY**

Manager (Urban Operations and Maintenance Division) - Ekiumeni O. Fauolo

**SAMOA TRUST ESTATE CORPORATION**

Chief Executive Officer – Patea Loli M. Setefano

**NATIONAL UNIVERSITY OF SAMOA**

Deputy Vice-Chancellor - Lefuimanu'asina Dr. Emma Kruse Vaai  
Acting Dean (Faculty of Science) - Dr. Tamara Ioane  
Lecturer Environmental Science – Faainuseimalie Latu  
Lecturer Physics – Faafetai Kolose

**PRIVATE SECTOR ORGANISATIONS:**

**PETROLEUM PRODUCTS SUPPLY**

Managing Director - Samau Etuale Sefo

**ORIGIN ENERGY**

Country Manager (Samoa) - Felise Sam Chong

**BOC GASES**

Country Manager (Samoa) - Gary Gibbs

**CHAMBER OF COMMERCE & INDUSTRY**

Chief Executive Officer - Ane L. Moananu  
Vice- President - Papalii Grant Percival  
Executive Member – Filifilia Iosefa  
AYAD Volunteer/Policy Analyst - Joanna Bunting  
Policy Analyst - Osana J. Liki

**SAMOA ASSOCIATION OF MANUFACTURERS & EXPORTERS**

Controller (Materials Control, Yazaki Ltd) – Siueva Sapati

**BIO-GEN 3**

Chief Executive Officer - Brenton Ellis

Commercial Manager - Steve Brown  
Assistant Chief Executive Officer - Dorothy Wright  
EcoSteps Sustainability Partner - Julian Crawford

**SOLAR SAMOA**

Board Member - Oloipola Terrance Betham

**PROCOM SAMOA**

Coordinator - Vui Tapasu Leung Wai  
Consultant - Muaausa Joseph Walter

**SAMOA BEVERAGE**

Chairman – Taimalieutu Charlie Westerlund

**IPA ENGINEERING MANAGEMENT CONSULTING**

Manager - Leiataua Isikuki Punivalu

**NON-GOVERNMENT ORGANISATIONS:**

**SECRETARIAT OF THE PACIFIC REGIONAL ENVIRONMENT PROGRAMME**

Deputy Director General – Kosimiti Latu  
Project Manager (Pacific Island Greenhouse Gas Abatement Renewable Energy) -  
Sili'a K. Ualesi  
Climate Change Mitigation Officer - Nixon Kua

**SAMOA UMBRELLA FOR NGO's**

Chief Executive Officer - Roina Faatauva- Vavatau  
Treasurer - Raymond Voigt

**Energy Sector Projects:**

**YOUTH WITH A MISSION PROJECT**

Samoa Base Leader – Usufono Fepulea'i  
Samoa Base Leader – Sose Fepulea'i



## Appendix 2: Energy Sector Logical Framework

‘STRATEGY FOR THE DEVELOPMENT OF SAMOA (SDS) 2012 -2016			
<b>Key Outcome Strategic Areas</b>	Sustainable Energy Supply		
<b>Key Indicators</b>	<ol style="list-style-type: none"> <li>1. Promote and increase RE investment and generation;</li> <li>2. Efficient, affordable and reliable electricity supply;</li> <li>3. Effective management of petroleum supply;</li> <li>4. Promote energy efficiency practices in all sectors particularly the transport sector; and</li> <li>5. Efficient and effective coordination and management of the sector through the implementation of the Energy Sector Plan.</li> </ol>		
	<ol style="list-style-type: none"> <li>1. Gradual phasing out of fossil fuels;</li> <li>2. To increase the contribution of RE for energy services and supply by 8% over the 4 year planning horizon;</li> <li>3. Complete and implement Energy Sector Plan; and</li> <li>4. Energy regulatory functions established.</li> </ol>		
ENERGY SECTOR PLAN 2012 - 2016			
<b>The Sector Vision</b>	Sustainable Energy Supply		
<b>Theme</b>	“... Sustainable energy supply - towards energy self sufficiency...”		
<b>Overall Sector Goal/ Objective</b>	<b>Reduce the growth rate in the volume of imported fossil fuels by 10% by 2016</b>		
<b>Sector High Level Indicators</b>	<ol style="list-style-type: none"> <li>i. Energy Sector Plan launched and implemented with 75% number of targets achieved by 2016;</li> <li>ii. Increase the contribution of RE to total country energy consumption by 10% by 2016;</li> <li>iii. Increase the supply of RE for energy services by 10% by 2016;</li> </ol>		
Sector Policy Outcomes			
<b>Key Sector Policy Outcome 1:</b> <i>Efficient and Effective coordination and management of the Energy Sector;</i>	<b>Key Sector Policy Outcome 2:</b> <i>Efficient, sustainable, safe and cost-effective energy use in the transport sector;</i>	<b>Key Sector Policy Outcome 3:</b> <i>Efficient, reliable, safe, affordable and sustainable electricity services;</i>	<b>Key Sector Policy Outcome 4:</b> <i>Efficient, reliable, affordable and sustainable heat source supply;</i>
Policy Sub-Sectors			
Institutional Framework	Transport	Electricity	Heating and Cooking
Strategies			
<b>1.1 Ensure strong leadership, with clarity of roles and responsibilities;</b> <b>1.2 Ensure that the Energy Policy Coordination and</b>	<b>2.1 Regulate the importation and use of environmentally friendly and energy efficient vessels, motor vehicles and aircrafts;</b>	<b>3.1 End user focused delivery of service is strengthened;</b> <b>3.2 Set an appropriate tariff structure;</b> <b>3.3 Continue to encourage private</b>	<b>4.1 Improve Energy Efficiency in heating and cooking; and</b> <b>4.2 Advance biogas opportunities.</b>

<p><i>Management Division has the capacity to coordinate energy sector policies;</i></p> <p><b>1.3</b> <i>Ensure that the Electricity Regulator has the capacity and sufficient resources to competently undertake responsibilities;</i></p> <p><b>1.4</b> <i>Ensure that a firm legal framework exists;</i></p> <p><b>1.5</b> <i>Improve human resource capacity within the Energy Sector;</i></p> <p><b>1.6</b> <i>Effective and reliable database management system and dissemination of information for all key line agencies;</i></p> <p><b>1.7</b> <i>Promote the use of indigenous energy resources and renewable energy technologies;</i></p> <p><b>1.8</b> <i>Promote partnerships with communities and all energy stakeholders;</i></p> <p><b>1.9</b> <i>Promote Clean Development Mechanism (CDM) and Clean Energy Fund (CEF)</i></p> <p><b>1.10</b> <i>Improve Scientific Research Organisation of Samoa (SROS)'s capacity to undertake RE research and development</i></p> <p><b>1.11</b> <i>Consider how the Energy Sector Strategies will assist in the alleviation of hardship.</i></p>	<p><b>2.2</b> <i>Promote fuel efficiency in land and sea transport and ensure systems are reliable, efficient and affordable;</i></p> <p><b>2.3</b> <i>Promote the use of bio-fuel as a substitute for imported fossil fuels;</i></p> <p><b>2.4</b> <i>Enforce national and international safety regulations when storing and refueling land, sea and air transport;</i></p> <p><b>2.5</b> <i>Operationalize the Petroleum Taskforce;</i></p> <p><b>2.6</b> <i>Ensure that energy related Acts and Regulations are enforced to govern supply, use, storage, distribution and disposal of fossil fuel and its by-products (subject to Energy Sector Strategy 2.4 above);</i></p> <p><b>2.7</b> <i>Encourage competition in the supply and distribution of fuel and ensure quality standards exceeded;</i></p> <p><b>2.8</b> <i>Investigate the viability of Bio-alcohols; and</i></p> <p><b>2.9</b> <i>Greenhouse gas abatement through energy efficiency and bio-fuel application in the transport sector.</i></p>	<p><i>sector involvement in electricity production;</i></p> <p><b>3.4</b> <i>Promote electricity generation from proven renewable energy technologies;</i></p> <p><b>3.5</b> <i>Promote demand and supply-side management strategies for all consumers and EPC;</i></p> <p><b>3.6</b> <i>Promote energy efficiency strategies across all consumer sectors; and</i></p> <p><b>3.7</b> <i>Greenhouse gas abatement through renewable energy (biomass gasification) in the electricity sector;</i></p>	
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Institutional Support							
Key Policy Outcome 1: Efficient and Effective coordination and management of the Energy Sector							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
<b>1.1 Ensure strong leadership, with clarity of roles and responsibilities;</b>	1.1.1 Review and finalize the Terms of Reference for the NECC;	1.1.1 National Energy Coordination Committee is clearly recognized for overarching sector governance, Cabinet advice and high level linking with other sectors;	Old TOR does not account for provisions for IPP and PPA' s;	Revised NECC TOR approved by members and endorsed by Cabinet in 3Q FY2012/13			
	1.1.2 Set up an Electricity Regulator under the OOTR;	1.1.2(a) Electricity regulator in place, fully staffed and functional; 1.1.2 (b) All electricity tariffs regulated under the OOTR;	1.1.2 (a)ACEO – Electricity Regulator yet to be procured;  1.1.2 (b)Electricity tariffs are not regulated (sole supplier – EPC);	ACEO and Principal in place;  Framework for tariff regulation drafted	ER fully staffed and operational;  Framework in place and implemented		
<b>1.2 Ensure that the Energy Policy Coordination and Management Division has the capacity to coordinate energy sector;</b>	1.2.1 Set up the Energy Policy Coordination and Management Division;	1.2.1 Energy Policy Coordination and Management Division set up, fully staffed and functional;	1.2.1 Energy is a unit within the EPPD and comprised of only 3 staff (principal and 2 seniors);	Energy separated from EPPD and EPCMD established with ACEO in place;	EPCMD structure finalized with all positions filled;		
	1.2.2 Develop clear guidelines and manuals for submitting proposals to	1.2.2 Energy Projects and Programming	1.2.2 Energy projects are submitted to	TA procured to compile EPPM;	EPPM finalized and in place, publicized and		

Institutional Support							
<i>Key Policy Outcome 1: Efficient and Effective coordination and management of the Energy Sector</i>							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
	NECC;	manual in place, publicized and used;	and approved/declined by NECC on an ad hoc basis;		used;		
	1.2.3 Identify capacity needs and resource gaps within the EPCMD;	1.2.3 EPCMD has capacity and resources to effectively undertake activities;	1.2.1 No Capability Plan in place	Capability Plan in place	EPCMD attend trainings	EPCMD attend trainings	EPCMD attend trainings
<b>1.3 Ensure that the Electricity Regulator have the capacity and sufficient resources to competently undertake responsibilities;</b>	1.3.1 Identify capacity needs and resources required for ER;	1.3.1 Electricity Regulator has capacity and resources to effectively undertake activities;	1.3.1 ER not yet fully staff with current OOTR staff ill equipped to regulate Energy Sector;	Capacity Plan in place	ER and other staff of OOTR attend trainings	ER and other staff of OOTR attend trainings	ER and other staff of OOTR attend trainings
	1.3.2 Develop clear guidelines and manuals for monitoring and regulating electricity tariffs;	1.3.2 Electricity Regulator processes all required actions within pre-agreed timeframes;	1.3.2 No guidelines and manuals in place;(EPC is the sole provider electricity)	Manual and guidelines in place	Manuals and guidelines adopted		
<b>1.4 Ensure that a firm legal framework exists;</b>	1.4.1 Develop the Energy Bill	1.4.1 Energy Bill is Act of Parliament;	1.4.1 No Energy Bill	Consultations conducted;	Energy Policy drafted and finalized by 4Q	Legal Drafter Procured	Energy Bill read in Parliament and becomes an Act

Institutional Support							
Key Policy Outcome 1: Efficient and Effective coordination and management of the Energy Sector							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
	1.4.2 Amend and update the Petroleum Act to incorporate at least importation/ domestic production and sale of biofuels;	1.4.2 Petroleum Act Amended	1.4.2 Petroleum Act 1984, Amendment Petroleum Act 2003;	Consult key stakeholders on amendments;	Amendments finalized and endorsed by NECC	Petroleum Act Amendment 2015;	
	1.4.3 Amend and update the Electric Power Corporation Act to incorporate at least; Electricity Act Amendments, clarification of licenses to undertake electrical work, requirements to provide regular data and	1.4.3 EPC Act Amended	1.4.2 EPC Act 1980 (Amendments .... 1992, 1993)	Consult key stakeholders on amendments;	Amendments finalized and endorsed by NECC	Petroleum Act Amendment 2015;	
1.5 Improve human resource capacity within the Energy Sector;	1.5.1 Conduct training needs assessment (TNA) for the Energy Sector;	Number of energy related training conducted	No works have yet been done in the Energy Sector	Start Collecting data	Collect data and analyze	Finalize report	
	1.5.2 Develop HR Plan for the Energy Sector;						
	1.5.3 Implement training programs through NUS, offshore institutions, EPC, PPS and others;	Number of personnel trained					
1.6 Effective and reliable database management system and dissemination of information for all key line agencies;	1.6.1 Identify gaps in existing database and collection systems within MNRE, EPC, PPS, Customs, SBS and LTA;	Sector Review published within 6 months following year reviewed	Sector review is published between October - November of the year following the year reviewed;	Needs assessment conducted on database systems and HR needs;	Procure systems for experts for LTA and EPC	Roll out upgrade of systems and HR in other agencies	
	1.6.2 Identify capability gaps within all of the above agencies for data collection and	(Accurate and reliable energy data is made available in a timely manner on a					

Institutional Support							
Key Policy Outcome 1: Efficient and Effective coordination and management of the Energy Sector							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
	dissemination;	<i>regular basis to inform performance reviews;</i> )					
<b>1.7 Promote the use of indigenous energy resources in renewable energy technologies;</b>	1.7.1 Identify indigenous energy sources and RE technologies applicable to Samoa;	RE technologies using indigenous resources in place;	Only coconut has been developed for RE		Report on indigenous resources and technologies in place;	Research into viable indigenous RE technologies conducted	RE technologies using indigenous resources piloted
	1.7.2 Invest in piloting applicable technologies;						
	1.7.3 Develop optimised strategy to bring to market most promising renewable energy technologies using indigenous resources;						
<b>1.8 Promote partnerships with communities and all energy stakeholders;</b>	1.8.1 Conduct national Energy Awareness Campaign days.	Energy Awareness Campaigns conducted nationwide (by district)	Energy Awareness Days done only in Apia and Salelologa		At least 2 districts in Upolu and 1 in Savaii	4 districts in Upolu and 2 in Savaii	5 districts in Upolu and 3 in Savaii
	1.8.2 Prepare and implement annual community based RE & EE program						
	1.8.3 Implement community based RE and EE project/s	3 RE and EE community based projects in place;	1 project in the pipeline for Vaitele Fou community;		1 project successfully implemented	1 project successfully implemented	1 project successfully implemented
<b>1.9 Promote Clean Development Mechanism (CDM) and Clean Energy Fund (CEF);</b>	1.9.1 Conduct CDM and CEF awareness;	6 CDM activities being implemented (1 per annum incl. 3 proposed)	3 proposed activities	3 activities	4 activities	5 activities	6 activities
	1.9.2 Build capacity in CDM & Clean Energy Fund operational processes and implementation within EPCMD;						

Institutional Support							
<i>Key Policy Outcome 1: Efficient and Effective coordination and management of the Energy Sector</i>							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
	1.9.3 Identify potential CDM activities and develop funding proposals (link to 2.2.3, 2.1.5)						
<b>1.10 Improve Scientific Research Organisation of Samoa (SROS)'s capacity to undertake RE research and development;</b>	1.10.1 Identify HR and technological gaps;	At least 3 new RE initiatives developed with 1 successfully piloted (other than coconut biofuel) - one new project per annum	RE Division of SROS has limited resources;		1 new RE project	1 new RE project	1 new RE project
	1.10.2 Identify funding sources to address gaps;						
<b>1.11 Promote energy efficiency in each of the three sub-sectors; and</b>	1.11.1 Develop Energy Use Database	Reduce Total Energy Consumption by 1.5% p.a.	Total Energy Consumption 113.1kTOE	111.4kTOE	109.7kTOE	108.1kTOE	106.5kTOE
	1.11.2 Develop Energy Efficiency Policies and Procedures						
	1.11.3 Implement Energy Efficiency Programs						
	1.11.4 Conduct information Dissemination and Public Awareness						

Transport							
Key Policy Outcome 2: Efficient, sustainable, safe and cost-effective energy use in the Transport Sector							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
<b>2.1 Regulate the importation and use of environmentally friendly and energy efficient vessels, motor vehicles and aircrafts;</b>	2.1.1 Review tariff and registration costs for importation and usage of different modes of transportation.	2.1.1 (a) 10% reduction in average engine size of imported vessels; 2.1.1 (b) 6 month reduction in the average age of vehicles imported within the country;	Average Engine Size = data available but requires analysis  Average Age of Vehicles = data available but requires analysis	Consultations conducted on review;	Revised tariffs/ registration costs approved by NECC and endorsed by Cabinet;	Revised tariffs successfully implemented;	
<b>2.2 Promote fuel efficiency in land and sea transport and ensure systems are reliable, efficient and affordable;</b>	2.2.1 Review current transport systems on their reliability, efficiency and affordability. 2.2.2 Implement efficiency initiatives based on recommendations made from 2.2.1	5% decline in both ADO and ULP consumption by 2016;	ADO - 11.5million litres  ULP - 28.4million litres	1.25% decrease p.a.  ADO - 11.36million litres  ULP - 28.05million litres	1.25% decrease p.a.  ADO - 11.22million litres  ULP - 27.7million litres	1.25% decrease p.a.  ADO - 11.08million litres  ULP - 27.35million litres	1.25% decrease p.a.  ADO - 10.94million litres  ULP - 27.01million litres
<b>2.3 Promote the use of bio-fuel as a substitute for imported fossil fuels;</b>	2.3.1 Assures/Anticipates collaboration with Agriculture Sector to ensure efficient supply of coconut; 2.3.2 Invest in bio fuel technology for mass production;	Increase by 1% of transport energy consumption to be from bio fuel (RE)	SROS vehicles run on blended biodiesel;	EOI evaluation for successful applicant to mass produce bio-diesel	Successful applicant starts production	.5% increase bio fuel consumption per annual	.5% increase bio fuel consumption per annual
<b>2.4 Ensure that energy related Acts and Regulations are enforced to</b>	2.4.1(a) Monitor and ensure compliance with the Petroleum Act and associated regulations.	2.4.1(a) Petroleum Taskforce to elect team to conduct quarterly	2.4.1 (a) Standards in place but monitoring of compliance only	(a) Inspection Team to inspect and evaluate compliance		Implement the PSH Booklet	



Transport							
Key Policy Outcome 2: Efficient, sustainable, safe and cost-effective energy use in the Transport Sector							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
<i>govern supply, use, storage, distribution, disposal and refueling of fossil fuel and its by-products (sea, land and air transport)</i>	2.4.2 Review retail licensing procedures for petroleum products.	inspections (MCIL, MOF, PPS); (b)Petroleum Regulation endorsed by Parliament and implemented	done ad hoc;  (b) Petroleum Act 1984;Guidelines for the Construction of Service Stations	(at least 50% of stations should comply;  (b) Consultations with stakeholders	(b) Petroleum Regulation endorsed by Cabinet and implement	(b) 25% of existing retailers comply	(b) 25% of existing retailers comply
	2.4.3 Review National and International Safety regulations for storing and refueling land, sea and air transport	2.4.3 (a)100% compliance with National and International Safety Regulations (Supplier, Distributor).  (b) at least 50% of retailers comply with National Safety Regulations	2.4.2 Petroleum Procedures & Conditions for Processing Licenses to Operate New Petroleum Service Stations; (a)Petroleum Storage & Handling (PSH) Booklet (b.1)Health Safety and Security and Environment (HSSE) Booklet; (c.2)Guidelines for Construction of Petrol Stations	(a)Consultations with stakeholders  Consultations with existing retailers to upgrade existing infrastructure	(a)The review of PSH approved by Petroleum Taskforce and endorsed by Cabinet  Enforce compliance with existing retailers		
<b>2.5 Enforce Waste and oil spillage strategies (Waste Management)</b>	2.6.1 Develop appropriate procedures for the safe collection, storage and disposal of waste oil.	2.6.1Disaster Management Plans have incorporated	2.6.1 DMP' s do not have contingencies for oil spills;	2.6.2 Consultations begin on DMP for oil	2.6.2 DMP drafted and approved by NECC;	2.6.2DMP on oil spills publicized and training	

Transport							
Key Policy Outcome 2: Efficient, sustainable, safe and cost-effective energy use in the Transport Sector							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
<i>Plan)</i>	2.6.2 Develop contingency plans for management of oil spills;	contingencies for oil spills with full awareness and training conducted for stakeholders;		spills;		conducted;	
<b>2.6 Encourage competition in the supply and distribution of fuel and ensure quality standards exceeded;</b>	2.7.1 Review the tender procedures for the Request for Proposals (RFP) to attract more suppliers.	Supplier and distributor must met 100% compliance every year(Petroleum Guidelines and Process)	Procedures and Guidelines already in place (Storage and Handling Booklet)	Procedures Review every 5 years before tendering	100% compliance met by both Supplier and distributors	100% compliance met by both Supplier and distributors	100% compliance met by both Supplier and distributors
	2.7.3 Review tender for on shore fuels management and distribution						
	2.7.4 Conduct awareness training on the safety issues pertaining to handling, transportation, storage, quality and use of petroleum products.	2.7.4 Conduct at least 8 training	2.7.4 Government Engineers conduct training for PPS	2 trainings conducted	2 trainings conducted	3 trainings conducted	2 trainings conducted
	2.7.5 Improve transparent fuel management system & reporting.	2.7.5 43 monthly updates of information provided to Fuel Facility Manager	2.7.5 PPS has a Fuel Management and Reporting System	7 monthly updates	12 monthly updates	12 monthly updates	12 monthly updates
	2.7.6 Review in-country minimum storage criteria	2.7.6 Increase from 7 days to 14 days minimum storage	2.7.6 currently 7 days storage	Consultation with stakeholders regarding the minimum storage criteria	Compile the review and approved by NECC and endorsed by Cabinet	Implement the Minimum Storage Criteria	
<b>2.7 Greenhouse gas abatement through energy</b>	2.9.1 Compile awareness packages (flyers, pamphlets etc.) to	2.9. (a) 50% increase in smog fines;	2.9 (a) Currently no data on smog fines;	2.9 (a) Consult LTA on	2.9 (a) Secure data and enforce;	2.9 (a) 30% increase in fines;	2.9 (a) 20% increase in fines;

Transport							
<i>Key Policy Outcome 2: Efficient, sustainable, safe and cost-effective energy use in the Transport Sector</i>							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
<i>efficiency and bio-fuel application in the transport sector.</i>	promote energy efficient practices in the transport sector;	2.9 (b) 40% decrease in newly registered vehicles;	2.9 (b) Total number of newly registered vehicles 1,850 (2011); 2.9 (c) Currently no initiatives; 2.9 (d) Currently no carpooling data;	data;	2.9 (b) 10% decrease;	2.9 (b) 10% decrease;	2.9 (b) 10% decrease;
	2.9.2 Raise efforts to enforce regulations on vehicle standards (smog checks and fines);	2.9 (c) At least 5 Government Ministries and Corporations implementing non-motorized transport initiatives;		2.9 (c) First Non-Motorized Transport Day for Public Service successfully implemented by at least 2 Ministries and Corporations;	2.9 (c) Second Non-Motorized Transport Annual Day illustrates an increase in participation (at least one more Ministry or Corp)	2.9 (c) At least one more Ministry/ Corporation participates in Annual Non Motorized Transport Day;	
	2.9.3 Pilot non-motorized transport within the public sector;						
	2.9.4 Promote car pooling within schools;	2.9 (d) At least 4 schools implementing car pooling;		2.9 (d) At least 2 schools implementing carpooling and rewarded;	2.9 (d) Energy Awareness days to be mechanism by which to engage schools on carpooling;	2.9 (d) Energy Awareness days to be mechanism by which to engage schools on carpooling;	2.9 (d) Energy Awareness days to be mechanism by which to engage schools on carpooling;

Electricity							
<i>Key Policy Outcome 3: Efficient, reliable, safe and affordable and sustainable electricity services;</i>							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
<b>3.1 End user focused delivery of service is strengthened;</b>	3.1.1 Conduct a Human Resource Capability Needs Assessment for EPC staff	Human Resource Capability Plan in place and implemented	Existing Capability Plan	Procure TA to conduct HRC Needs Assessment and compile HRC Plan	Approved the HRC Plan and Training Programmed implemented	Conduct training for EPC Staff	Conduct training for EPC Staff
	3.1.2 Develop a Training programme for EPC staff (guided by 3.1.1)	Training Programme in place	Existing Training Programme				
	3.1.3 Network reanalysed based on distributed generation	Network Assessment Plan for distributed generation in place and implemented	Existing Network Plan	Conduct Network Assessment	Finalized the Network Plan and approved	Implement the Network Plan	Implement the Network Plan
	3.1.4 Develop database to improve forward planning/ scenario analysis	Update Database in place for forward planning	Existing Database is outdated	Computerized Information System procured	Approved the CIS and implement	Update old and new data	Monitor and evaluate the CIS for forward planning and scenario analysis
<b>3.2 Improve the tariff structure;</b>	3.2.1 Review the current tariff structure.	Tariff structure review in place	Existing tariff structure	Consult with relevant stakeholders and develop template for calculating tariff	Approve the review template and the review tariff structure and implement		
<b>3.3 Continue to encourage private sector involvement in electricity production;</b>	3.3.1 Develop standard interconnection agreements for the private sector to install own generation (photovoltaic panels, etc).	Standard Interconnection Agreement (SIA) for private sector in place	No SIA in place	Procure TA to develop the SIA	Consultation and finalized the SIA and approved		

Electricity							
Key Policy Outcome 3: Efficient, reliable, safe and affordable and sustainable electricity services;							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
	3.3.2 Develop guidelines for distributed generation (refer example of Tonga)	Guidelines for distributed generation in place	No existing guideline	Procure TA and start consultations	Guideline finalized and approved and adopted		
	3.3.4 Seek Expressions of Interest (EOI's) for Independent Power producer (IPP) delivery of generation	At least 2 successful applicant from EOI generating electricity	Current EOI for IPP in place (Bio-diesel, Solar)	Evaluation of application	Finalized contract for successful IPP	Commence production of electricity by IPP	
<b>3.4 Promote electricity generation from proven renewable energy technologies;</b>	3.4.1 Conduct commercial viability assessment of existing hydro enhancement; reforestation of catchments & flood retention storage upstream.	Commercial Viability Assessment in place for existing Hydro	Current Hydro Monitoring System	Conduct in-house assessment	Finalized the Commercial Viability Assessment	Approved the Commercial Viability Assessment and implement	
	3.4.2 Identify potential renewable energy projects	At least 3 potential RE projects approved	Existing RE projects (solar, hydro, bio-fuel)	RE project identified and prioritized	1 RE project approved	1 RE project approved	1 RE project approved
	3.4.3 Develop funding proposals based on 3.4.2.	At least 1 funding proposal approved	Existing funding proposals for RE projects approved	Existing funding proposals for RE projects approved	Donor/Development Partner identified	Develop funding proposal Submit to donor/development partner	Approved by the interested development partner(s)
<b>3.5 Promote demand and supply-side management strategies for all consumers and EPC;</b>	3.5.1 Conduct a consultancy to identify DSM activities relevant for Samoa;	Demand and Supply Management Strategy in place	Existing Demand and Supply Monitoring System in place	Consult with relevant stakeholders	Compile and Finalize the DSM strategy and approved	Implement the DSM Strategy	
	3.5.2 Develop DSM strategies for major (top 10) electricity users			Identify strategies			

Electricity							
<i>Key Policy Outcome 3: Efficient, reliable, safe and affordable and sustainable electricity services;</i>							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
	3.5.3 Develop and implement DSM activities based on 3.5.1 above			for top 10 electricity users			
<b>3.6 Greenhouse gas abatement through renewable energy (biomass gasification) in the electricity sector;</b>	3.6.1 Develop Regulatory framework to mitigate GHG emissions	3.6.1 Regulatory Framework in place	Ozone Regulation other related Act(s), Regulation(s), Amendment(s)	Consultations for the regulatory framework	Regulation finalized and endorsed by Cabinet		
	3.6.2 Develop biomass project for electricity generation;	3.6.2 Increase electricity generation from Biomass gasification by 5% by 2016	Biomass project implemented by Biogen 3 approved by NECC in 2011	Establish infrastructure for electricity generation from biomass	Generate electricity and collection of data 1% electricity produces	Generate 2% of electricity	Generate 2% of electricity

Heating and Cooking							
<i>Key Policy Outcome 4: Efficient, reliable, affordable and sustainable heat source supply;</i>							
Strategy	Activities	Performance Indicator	Baseline	Targets			
				2012/13	2013/14	2014/15	2015/16
<b>4.1 Improve Energy Efficiency and health safety for cooking and heating; and</b>	4.1.1 Promote application of energy efficient wood stoves	Increase the number of households utilizing wood stoves by 2% p.a	HIES 2008 Population Census 2011	65.1% <sup>15</sup> of households are using wood stoves for cooking.	67.1% of households	69.1% of households	71.1% of households
	4.1.2 Conduct public awareness on the harmful effects of cooking fuels (kerosene) being used	Reduced number of households using kerosene by 1% p.a	HIES 2008 Population Census 2011	4.5% <sup>1</sup> of households using kerosene p.a	3.5% of households	2.5% of households	1.5% of households
<b>4.2 Promote biogas opportunities</b>	4.2.1 Monitor existing installations and share experiences with local community through the Community Sector and identified potential piloted villages/districts/church etc	At least 2 biogas projects piloted with the community	CROPS Division (MAF) YWAM	Awareness program with local community and identified potential community	Identify financing mechanisms	Implement 1 successful with secures funding	Implement 1 successful with secures funding
	4.2.2 Develop funding proposals based on 4.2.1						

<sup>15</sup> Based on Population and Housing Census 2011;

### Appendix 3: Responsibility Matrix

Institutional Support										
Key Policy Outcome 1: Efficient and Effective coordination and management of the Energy Sector										
Strategy	Activities	Performance Indicator	Responsible Agencies							Other
			MOF	MNRE	EPC	LTA	SROS	OOTR	MFR (Customs)	
<b>1.1 Ensure strong leadership, with clarity of roles and responsibilities;</b>	1.1.1 Review and finalize the Terms of Reference for the NECC;	3.1.1 National Energy Coordination Committee is clearly recognized for overarching sector governance, Cabinet advice and high level linking with other sectors;	■	■	■	■	■			
	1.1.2 Set up an Electricity Regulator under the OOTR;	1.1.2(a) Electricity Regulator in place, fully staffed and functional; 1.1.2 (b) All electricity tariffs regulated under the OOTR;	■	■	■	■	■	■		
<b>1.2 Ensure that the Energy Policy Coordination and Management Division has the capacity to coordinate energy sector;</b>	1.2.1 Set up the Energy Policy Coordination and Management Division;	1.2.1 Energy Policy Coordination and Management Division set up, fully staffed and functional;	■	■	■	■	■			
	1.2.2 Develop clear guidelines and manuals for submitting proposals to NECC;	1.2.2 Energy Projects and Programming manual in place, publicized and used;	■	■	■	■	■			
	1.2.3 Identify capacity needs and resource gaps within the EPCMD;	1.2.3 EPCMD has capacity and resources to effectively undertake activities;	■	■	■	■	■			
<b>1.3 Ensure that the Electricity Regulator have the capacity and sufficient resources to competently undertake responsibilities;</b>	1.3.1 Identify capacity needs and resources required for ER;	1.3.1 Electricity Regulator has capacity and resources to effectively undertake activities;	■	■	■	■	■			
	1.3.2 Develop clear guidelines and manuals for monitoring and regulating electricity tariffs;	1.3.2 Electricity Regulator processes all required actions within pre-agreed timeframes;	■	■	■	■	■	■		
<b>1.4 Ensure that a firm legal framework exists;</b>	1.4.1 Develop the Energy Bill	1.4.1 Energy Bill is Act of Parliament;	■	■	■	■	■	■	■	AG



Institutional Support											
Key Policy Outcome 1: Efficient and Effective coordination and management of the Energy Sector											
Strategy	Activities	Performance Indicator	Responsible Agencies							Other	
			MOF	MNRE	EPC	LTA	SROS	OOTR	MfR (Customs)		MWCSD
	1.4.2 Amend and update the Petroleum Act to incorporate at least importation/ domestic production and sale of biofuels;	1.4.2 Petroleum Act Amended									AG
	1.4.3 Amend and update the Electric Power Corporation Act to incorporate at least; Electricity Act Amendments, clarification of licenses to undertake electrical work, requirements to provide regular data and	1.4.3 EPC Act Amended									AG
1.5 Improve human resource capacity within the Energy Sector;	1.5.1 Conduct training needs assessment (TNA) for the Energy Sector;	Number of energy related training conducted  Number of personnel trained									Training Providers
	1.5.2 Develop HR Plan for the Energy Sector;										
	1.5.3 Implement training programs through NUS, offshore institutions, EPC, PPS and others;										
1.6 Effective and reliable database management system and dissemination of information for all key line agencies;	1.6.1 Identify gaps in existing database and collection systems within MNRE, EPC, PPS, Customs, SBS and LTA;	Sector Review published within 6 months following year reviewed <i>(Accurate and reliable energy data is made available in a timely manner on a regular basis to inform performance reviews;)</i>									SBS, PPS and other private sector providers
	1.6.2 Identify capability gaps within all of the above agencies for data collection and dissemination;										
1.7 Promote the use of indigenous energy resources in renewable energy technologies;	1.7.1 Identify indigenous energy sources and RE technologies applicable to Samoa;	RE technologies using indigenous resources in place;									Farmers/ Private Sector
	1.7.2 Invest in piloting applicable technologies;										
	1.7.3 Develop optimised strategy to bring to market most promising renewable energy technologies using indigenous resources;										
1.8 Promote partnerships with communities and all energy	1.8.1 Conduct national Energy Awareness Campaign days.	Energy Awareness Campaigns conducted nationwide (by district)									

Institutional Support										
Key Policy Outcome 1: Efficient and Effective coordination and management of the Energy Sector										
Strategy	Activities	Performance Indicator	Responsible Agencies							
			MOF	MNRE	EPC	LTA	SROS	OOTR	MfR (Customs)	MWCSD
stakeholders;	1.8.2 Prepare and implement annual community based RE & EE program	3 RE and EE community based projects in place;								
	1.8.3 Implement community based RE and EE project/s									
1.9 Promote Clean Development Mechanism (CDM) and Clean Energy Fund (CEF);	1.9.1 Conduct CDM and CEF awareness;	6 CDM activities being implemented (1 per annum incl. 3 proposed)								
	1.9.2 Build capacity in CDM & Clean Energy Fund operational processes and implementation within EPCMD;									
	1.9.3 Identify potential CDM activities and develop funding proposals (link to 2.2.3, 2.1.5)									
1.10 Improve Scientific Research Organisation of Samoa (SROS)'s capacity to undertake RE research and development;	1.10.1 Identify HR and technological gaps;	At least 3 new RE initiatives developed with 1 successfully piloted (other than coconut biofuel) - one new project per annum								
	1.10.2 Identify funding sources to address gaps;									
1.11 Promote energy efficiency in each of the three sub-sectors;	1.11.1 Develop Energy Use Database	Reduce Total Energy Consumption by 1.5% p.a.								
	1.11.2 Develop Energy Efficiency Policies and Procedures									
	1.11.3 Implement Energy Efficiency Programs									
	1.11.4 Conduct information Dissemination and Public Awareness									

Transport Sector										
Key Policy Outcome 2: Efficient, Sustainable, Safe and Cost Effective Energy Use in the Transport Sector										
Strategy	Activities	Performance Indicator	Responsible Agencies							Other
			MOF	MINRE	EPC	LTA	SROS	OOTR	MFR (Customs)	
			<span style="background-color: #92d050; border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> = Lead Agency; <span style="background-color: #ffff00; border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> = Supporting Agency							
<b>2.1 Regulate the importation and use of environmentally friendly and energy efficient vessels, motor vehicles and aircrafts;</b>	2.1.1 Review tariff and registration costs for importation and usage of different modes of transportation.	2.1.1 (a) 10% reduction in average engine size; 2.1.1 (b) 6 month reduction in the average age of vehicles within the country								
<b>2.2 Promote fuel efficiency in land and sea transport and ensure systems are reliable, efficient and affordable;</b>	2.2.1 Review current transport systems on their reliability, efficiency and affordability.	5% decline in both ADO and ULP consumption by 2016;								MWTI
	2.2.2 Implement efficiency initiatives from 2.2.1									
<b>2.3 Promote the use of bio-fuel as a substitute for imported fossil fuels;</b>	2.3.1 Anticipated collaboration with Agriculture Sector to ensure efficient supply of coconut;	Increase by 1% of transport energy consumption to be from bio fuel (RE)								Farmers (Agriculture Sector)
	2.3.2 Invest in bio fuel technology for mass production;									
<b>2.4 Ensure that energy related Acts and Regulations are enforced to govern supply, use, storage, distribution, disposal and refueling of fossil fuel and its by-products (sea, land and air transport)</b>	2.4.1 Monitor and ensure compliance with the Petroleum Act and associated regulations.	2.4.1 (a) Petroleum Taskforce to elect team to conduct quarterly inspections (MCIL, MOF, PPS); 2.4.1 (b) Petroleum Regulation endorsed by Parliament and implemented 2.4.3 (a) 100% compliance with National and International Safety Regulations (Supplier, Distributor) 2.4.3(b) At least 50% of retailers comply with National Safety Regulations								PPS, MCIL AA, SPA
	2.4.2 Review retail licensing procedures for petroleum products.									
	2.4.3 Review National Safety regulations for storing and refueling land, sea and air transport									
<b>2.5 Enforce Waste and oil spillage strategies (Waste Management Plan)</b>	2.5.1 Develop appropriate procedures for the safe collection, storage and disposal of waste oil.	Disaster Management Plans have incorporated contingencies for oil spills with full awareness and training conducted for								MCIL, PPS

Transport Sector										
Key Policy Outcome 2: Efficient, Sustainable, Safe and Cost Effective Energy Use in the Transport Sector										
Strategy	Activities	Performance Indicator	Responsible Agencies							Other
			MOF	MINRE	EPC	LTA	SROS	OOTR	MFR (Customs)	
	2.5.2 Develop contingency plans for management of oil spills;	stakeholders;								
<b>2.6 Encourage competition in the supply and distribution of fuel and ensure quality standards exceeded;</b>	2.6.1 Review the tender procedures for the Request for Proposals (RFP) to attract more suppliers	Supplier and distributor must met 100% compliance every year(Petroleum Guidelines and Process)								MCIL, PPS
	2.6.2 Review tender for on shore fuels management and distribution	2.6.3 Conduct at least 8 training								
	2.6.3 Conduct awareness training on the safety issues pertaining to handling, transportation, storage, quality and use of petroleum products	2.6.4 43 monthly updates of information provided to Fuel Facility Manager								
	2.6.4 Improve transparent fuel management system and reporting	2.6.5 Increase from 7 days to 14 days minimum storage								
	2.6.5 Review in-country minimum storage criteria									
<b>2.7 Greenhouse gas abatement through energy efficiency and bio-fuel application in the transport sector;</b>	2.7.1 Compile awareness packages (flyers, pamphlets etc.) to promote energy efficient practices in the transport sector;	50% increase in smog fines;								All Government Ministries/Corporations, Education Sector
	2.7.2 Raise efforts to enforce regulations on vehicle standards (smog checks and fines);									
	2.7.3 Pilot non-motorized transport within the public sector;	2.7.3 At least 5 Government Ministries and Corporations implementing non-motorized transport initiatives;								
	2.7.4 Promote car pooling within schools;	2.7.4 At least 4 schools implementing car pooling;								

Electricity Sector										
Key Policy Outcome 3: Efficient, Reliable, Safe, Affordable and Sustainable Electricity Services										
Strategy	Activities	Performance Indicator	Responsible Agencies							
			MOF	MNRE	EPC	LTA	SROS	OOTR	MFR (Customs)	MWCSD
<b>3.1 End user focused delivery of service is strengthened;</b>	3.1.1 Conduct a Human Resource Capability Needs Assessment for EPC staff	3.1.1 Human Resource Capability Plan in place and implemented								
	3.1.2 Develop a Training programme for EPC staff (guided by 3.1.1)	3.1.2 Training Programme in place and implemented								
	3.1.3 Network reanalysed based on distributed generation	3.1.3 Network Assessment Plan for distributed generation in place and implemented								
	3.1.4 Develop database to improve forward planning/ scenario analysis	3.1.4 Update Database in place for forward planning								
<b>3.2 Improve the tariff structure;</b>	3.2.1 Review the current tariff structure.	3.2.1 Tariff structure review in place and implemented								AG
<b>3.3 Continue to encourage private sector involvement in electricity production;</b>	3.3.1 Develop standard interconnection agreements for the private sector to install own generation (photovoltaic panels, etc).	3.3.1 Standard Interconnection Agreement (SIA) for private sector in place								
	3.3.2 Develop guidelines for distributed generation (refer example of Tonga)	3.3.2 Guidelines for distributed generation in place								
	3.3.3 Seek Expressions of Interest (EOI's) for Independent Power producer (IPP) delivery of generation	3.3.3 at least 2 successful applicant from EOI generating electricity								AG
<b>3.4 Promote electricity generation from proven renewable energy technologies;</b>	3.4.1 Conduct commercial viability assessment of existing hydro enhancement; reforestation of catchments & flood retention storage upstream.	3.4.1 Commercial Viability Assessment in place for existing Hydro								NECC
	3.4.2 Identify potential renewable energy projects	3.4.2 At least 3 potential RE projects approved								
	3.4.3 Develop funding proposals based on 3.4.2.	3.4.3 At least 1 funding proposal approved								

<b>3.5 Promote demand and supply-side management strategies for all consumers and EPC;</b>	3.5.1 Conduct a consultancy to identify DSM activities relevant for Samoa	Demand and Supply Management Strategy in place										
	3.5.2 Develop DSM strategies for major (top 10) electricity users											
	3.5.3 Develop and implement DSM activities based on 3.5.1 above											
<b>3.6 Greenhouse gas abatement through renewable energy (biomass gasification) in the electricity sector;</b>	3.6.1 Develop Regulatory framework to mitigate GHG emissions	3.6.1 Regulatory Framework in place.										
	3.6.2 Develop biomass project for electricity generation	3.6.2 Increase electricity generation from Biomass gasification by 5% by 2016										AG

Heating and Cooking										
Key Policy Outcome 4: Efficient, Affordable and Sustainable Heat Source Supply										
Strategy	Activities	Performance Indicator	Responsible Agencies							Other
			MOF	MNRE	EPC	LTA	SROS	OATR	MIR (Customs)	
<b>4.1 Improve Energy Efficiency and health safety for cooking and heating;</b>	4.1.1 Promote application of energy efficient wood stoves	4.1.1 Increase the number of households utilizing wood stoves by 2% p.a	■	■						■
	4.1.2 Conduct public awareness on the harmful effects of cooking fuels (kerosene) being used	4.1.2 Reduced number of households using kerosene by 1% p.a	■	■						■
<b>4.2 Promote biogas opportunities</b>	4.2.1 Monitor existing installations and share experiences with local community through the Community Sector and identified potential piloted villages/districts/church etc	At least 2 biogas projects piloted with the community	■	■	■		■			■ STEC MAF
	4.2.2 Develop funding proposals based on 4.2.1		■						■	■ CSSP