SUSTAINABLE
ENERGY FOR ALL

Rapid Assessment Gap Analysis
Gambia

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Sustainable Energy for All

Rapid Assessment and Gap Analysis

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EXECUTIVE SUMMARY

1. BACKGROUND

In recognition of the critical need to improve global access to sustainable, affordable and environmentally sound energy services and resources, the United Nations General Assembly has declared 2012 the International Year of Sustainable Energy for All and urged Member States and the UN system to increase the awareness of the importance of addressing energy issues and to promote action at the local, national, regional and international levels. In response, the UN Secretary General has launched a global Initiative to achieve Sustainable Energy for All by the year 2030. The key objectives under this goal are: (1) ensuring universal access to modern energy services; (2) doubling the rate of improvements in energy efficiency; and (3) doubling the share of renewable energy in the global energy mix.

This document presents the rapid assessment and gap analysis of the energy and related sectors of the Gambia, with particular reference to the three objectives of "Sustainable Energy for All."

The Rapid Assessment and Gap Analysis was conducted through a comprehensive desk review and stakeholder consultation covering government ministries and departments, utilities, private sector and development partners in The Gambia. The activity included a situation analysis, with baseline data on sustainable energy production, distribution and utilisation, and covered an assessment of national initiatives on (1) universal access to electricity; clean fuels and devices for cooking/heating; and mechanical power; (2) improvements in energy efficiency; and (3) increasing the share of renewable energy in the national energy mix; and an analysis of sector strengths and weaknesses in specific areas relevant to the sector such as policy, planning, institutions, finance, monitoring (data and accountability), capacity and partnerships.

2. SUMMARY OF KEY FINDINGS AND CONCLUSIONS

2.1.1 Gap Analysis on Universal Access to Electricity

The power sector is characterized by a number of strengths which provide opportunities for the realization of the goal of universal access to electricity. The strengths of the power sector include the following:

- The Government's strong commitment to expand the electricity network to many communities in The Gambia;
- Willingness of private sector(investors) to partner with government to provide electricity services;
- Examples of connectivity within the sub-region to learn from;
- Availability of market (domestic and commercial) for the electricity that could be produced in future

The power sub-sector also faces a number challenges in achieving the stated goal of ensuring wider access to electricity in The Gambia. The sector is challenged by:

- Inadequacy of the transmission and distribution (T&D) network;
- Lack of fuel diversityas well as high cost and irregular supply of fuel for electricity generation;
- Operational inefficiencies in the key utility company NAWEC resulting in transmission and distribution losses;
- NAWEC's poor financial performance;
- Weak regulatory and enforcement capacity;
- Poor reliability of electricity supply from the grid;
- Limited hours of supply of power by stand-alone generators in the rural areas; and
- High electricity tariffs and non-affordability of electricity.

Recommended strategies to address these challenges include:

Short Term

- Perform detailed transmission and distribution infrastructure analysis to reduce technical transmission and distribution losses, analyze potential interconnections with Senegal, integration into the West Africa Power Pool, and generate a comprehensive T&D master plan;
- Improve financial performance of NAWEC;
- Employ financial advisory services organization to investigate strategies for fuel price volatility reduction;
- Arrange payment of past-due bills by Central and Local Governments;
- Increase use of pre-paid metering. Require that government facilities and electric loads, including street lights, utilize pre-paid meters;
- Amnesty offer to domestic and commercial customers with past-due bills and unbilled use of energy followed by aggressive pursuit of payment with Government assistance;
- Enhance maintenance plans for generation facilities to improve availability;
- Assess the investment incentive structure to determine if incentives are sufficient to attract private investors;
- Perform detailed renewable energy study for potential domestic sources of power generation;
- Conduct a review of PURA's capabilities and independence including the government, regulators, utility, and IPP to address empowerment of PURA and improvement of the industry;
- Implement demand side management initiatives such as promotion of compact fluorescent lamps (vs. incandescent), energy efficient appliances, energy efficient motors for industrials, and peak shaving tariff structures; and
- Investigate feasibility of upgrading generation facilities to combined cycle operation.

Medium/Long Term

- Solicit financing (using results of incentive review) to implement the actions recommended in the transmission and distribution infrastructure analysis;
- Improve financial performance of NAWEC;

- Adjust tariffs to reflect new, more stable cost structure and incorporate fuel charge adjustment on customer bills;
- Identify the most promising renewable energy projects and provide incentives (based on results of short-term incentive review) to attract private financing; and
- Revisit increased privatization and a less vertically integrated industry structure after the above issues have been addressed.

2.1.2Gap Analysis on Promotion Liquefied Petroleum Gas (LPG)

Many of the programmes to promote improved cookstoves under-performed mainly due to the following reasons: lack of standards and quality control of the cookstoves; high cost of the improved cookstoves compared to the traditional cookstoves; and supply driven projects that paid very little attention to consumer research, stove design, market development, long-term financing and business growth.

In order to scale up the adoption of improved cookstoves nationwide requires the implementation of sustainable promotional measures that:

- Promote technical research and development to adapting cookstoves and programs to country context;
- Develop performance standards and benchmarks on safety, (energy) efficiency, emissions, and durability;
- Promote awareness raising, consumer research and business development taking account of consumer preferences and behaviour;
- Develop innovative financing mechanisms that can target subsidies and grants;
- Enhance the capacity of local and national institutions to promote advanced biomass cookstoves;
- Encourage the establishment of energy funds that enable financial institutions to effectively administer support to promote biomass cookstoves; and
- Develop and implement coordination, monitoring and evaluation mechanisms.

2.1.3 Gap Analysis on Promotion of Improved Cook Stoves

Many of the programmes to promote improved cookstoves under-performed mainly due to the following reasons: lack of standards and quality control of the cookstoves; high cost of the improved cookstoves compared to the traditional cookstoves; and supply driven projects that paid very little attention to consumer research, stove design, market development, long-term financing and business growth.

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- Enhance the capacity of local and national institutions to promote advanced biomass cookstoves;
- Encourage the establishment of energy funds that enable financial institutions to effectively administer support to promote biomass cookstoves; and
- Develop and implement coordination, monitoring and evaluation mechanisms.

2.1.4Gap Analysis on Promotion of Energy Efficiency

The challenges related to the promotion of energy efficiency in The Gambia include:

- Weak public education and awareness of significance and measures for energy efficiency and conservation;
- Lack of fiscal and financial incentives to encourage the use of energy efficient appliances and technology;
- Inadequate financing for energy efficiency and conservation programmes;
- Limited outreach of relevant institutions to extend services to districts and rural communities;
- Weak institutional capacity for monitoring and enforcement of relevant regulations; and
- Weak coordination of monitoring and enforcement of relevant regulations

In terms of the SE4ALL, the key issues to be addressed to promote of energy efficiency in The Gambia include:

- Intensive and extensive public awareness and education;
- Improved institutional capacity building and effective coordination for monitoring and enforcement of relevant regulations;
- Fiscal and financial incentives to encourage the use of energy efficient appliances and technology by households, commercial and industrial sectors;
- Innovative financing schemes for energy efficiency and conservation programmes; and
- Addressing gaps in statistical data for periodically evaluating the rates of energy efficiency and conservation nationwide, covering domestic, industrial, commercial and agricultural users and public services (e.g. health and education).

2.1.5 Gap Analysis on Share of Renewable Energy in the National Energy Mix

The main strengths related to the promotion of renewable energy in the national energy mix are summarized as follows:

Biomass:

- Widespread availability of biomass resources

Mini-hydro, Solar and Wind energy:

- Favourable locations for mini-hydro development identified
- Favourable wind speed in coastal areas
- Solar radiation levels generally satisfactory

Waste-to-Energy

- Widespread availability and generation of municipal, industrial and agricultural waste

Despite these strengths and opportunities, some rural communities may regard renewable energy (RE) an inferior forms of energy and therefore integration into the national electrification programme will require extensive rebranding, strategizing and planning to ensure effective integration of RE into The Gambia's energy mix. Other challenges specific to the various forms of renewable energy include:

Biomass

- Unsustainable production techniques
- Inefficient utilization
- Difficulties in obtaining secure tenure for large tracts of land for commercial development of biomass

Mini-hydro, Solar and Wind energy

- High cost of energy generation due to current state of technology
- Mini-hydro highly susceptible to climate changes

Waste-to-Energy

- Low exploitation of waste-to-energy technologies
- High cost associated with the collection and management of waste materials.

The under listed are key issues and gaps related to the promotion of renewable energy in the national energy mix:

- Availability of land with secure tenure for private sector investment in large-scale biomass development;
- Long-term sustainability of biomass production;
- High initial investment cost of energy generation from solar, wind and mini-hydro;
- High cost of waste collection and management; and
- Inadequate statistics and data disaggregation on renewable energy

1. INTRODUCTION

1.1 BACKGROUND

Energy plays a significant role in improving people's living, thereby contributing to development. It supplies water and fuels agricultural output, health, education, job creation and environmental sustainability. Despite this, over 1.6 billion people in developing countries are deprived of access to reliable and affordable energy services (such as electricity and LPG), and over 80% of the population of sub-Saharan Africa use traditional biomass for cooking and heating. With more than one-third of a household's budget being set aside for fuel costs in many countries, the region's population pays an onerous price for fuel (mainly biomass) that is of poor quality and not very effective. In many countries in sub-Saharan Africa, there is inadequate access to adequate, affordable, effective and environmentally sustainable energy services that could support economic and human development.

The predominance of traditional fuels for cooking – over 60% dependency on biomass in Africa, and about 80% in ECOWAS countries - takes a toll on the environment (soil erosion, desertification, etc.), and the absence of modern fuels propels the poverty spiral further downward. However, increasing access to good, affordable modern energy services is likely to engender considerable benefits in terms of people's living conditions, as well as help to achieve Millennium Development Goals.

Though energy is not explicitly taken into account in the Millennium Development Goals, the contribution of energy services to their achievement is widely acknowledged. Figure 1.1 shows the relationship between access to energy services and a selection of the eight Millennium Development Goals.

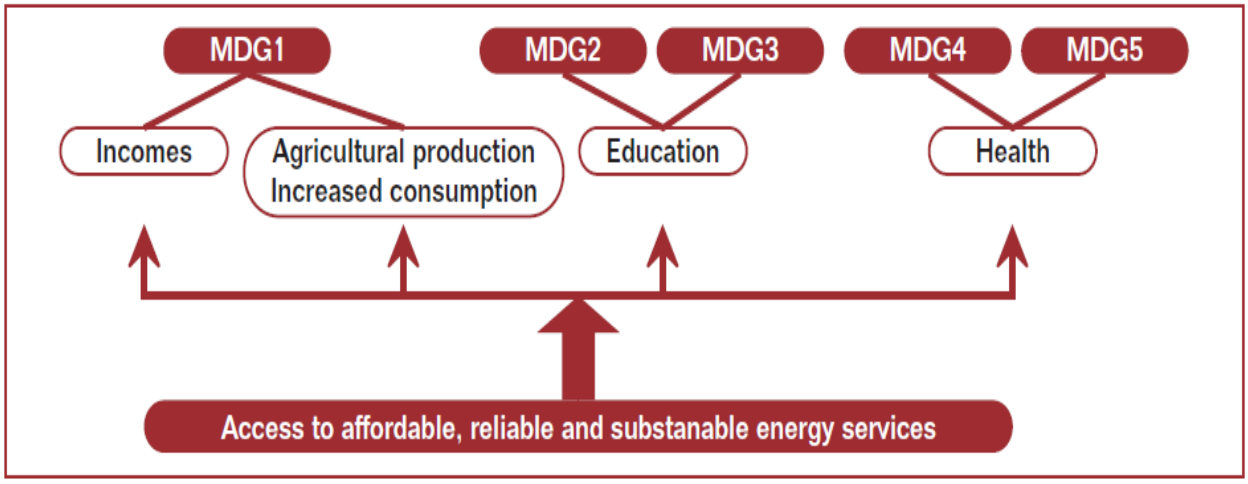

Figure 1.1: Relationship between energy and achieving MDGs

1.1.1 Sustainable Energy for All Rapid Assessment and Gap Analysis on The Gambia

In recognition of the critical need to improve global access to sustainable, affordable and environmentally sound energy services and resources, the United Nations General

Assembly declared 2012 the International Year of Sustainable Energy for All. It called on the UN Secretary-General Ban Ki-moon to organize and coordinate activities to increase awareness of the importance of addressing energy issues. In response, the Secretary-General launched a global initiative on Sustainable Energy for All. The initiative is aimed at mobilizing action from governments, the private sector, and civil society around three objectives: ensuring universal access to modern energy services, doubling the global rate of improvements in energy efficiency, and doubling the share of renewable energy in the global energy mix, all to be reached by 2030.

Since the launching of the initiative at the General Assembly in September 2011, the Secretary-General has been successful in mobilizing action across the globe. This has included support from many developing countries which have now embraced the initiative, and are actively undertaking stock-taking exercises to determine plans of action designed to advance on the objectives, according to each country's priorities and circumstances.

Among the various activities envisaged, one is to undertake a undertaking a rapid assessment and gap analysis with baseline data on sustainable energy access, including an assessment of national initiatives on (1) universal access to electricity; clean fuels and devices for cooking/heating; and mechanical power; (2) improvements in energy efficiency; and (3) increasing the share of renewable energy in the national energy mix; and an analysis of sector strengths and weaknesses in specific areas relevant to the sector such as policy, planning, institutions, finance, monitoring (data and accountability), capacity and partnerships.

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1.2 METHODOLOGY

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2. COUNTRY OVERVIEW

2.1 GEOGRAPHY

The Gambia is located on the west coast of West Africa and extends about 400 km inland. The width of the country varies between 24 to 28 kilometres across the length of the country and thus The Gambia covers a land area of 10,689 square kilometres in total. It is bordered on the North, South and East by the Republic of Senegal and on the West by the Atlantic Ocean. The country has a tropical climate characterised by 2 seasons, rainy season June-October and dry season November-May (Health Policy).

The natural vegetation type of the Gambia is Guinea Savanna Woodland in the coastal area, that gradually changes into Open Sudan Savanna in the east. The climate is Sudano-sahelian characterized by a short rainy season from June to October and a long dry spell from November to May with scattered vegetation and forest cover. Mean annual rainfall varies from 900 mm in the south-west to about 500 mm in the north-east. Mean temperatures vary from 14^{o}C to 40^{o}C and generally higher in the eastern part of the country. The country has a total arable land area of 558,000 ha and about 320,000 ha or 57 percent is cropped annually. The estuary basin of The Gambia River is a tidal inlet with a saltwater intrusion ranging from 180 km in the rainy season to 250 km in the dry season. Agriculture is mostly rainfed, and only about six percent of the irrigation potential has been used.

2.2 DEMOGRAPHIC CHARACTERISTICS

From information from the population census of 2003, the population is estimated at 1.36 million and was growing at the rate of 2.74% per annum. With this growth rate, the population by the year 2011 it is estimated to reach 1.79 million. In 2003, about 50% of the population lives in the rural area; and women constitute 51% of the total population. The total fertility rate was 5.4 births per woman and this perhaps explain the very youthful population structure. Nearly 44% of the population was below 15 years and 19% between the ages 15 to 24. Average life expectancy at birth is 64 years overall. Since the 1980s the population of The Gambia has undergone major changes and is now characterised by accelerated rate of urbanization. With 50% of the population living in the urban areas which covers relatively less land area, population density was very high in the Banjul and Kanifing, as can be seen in Table 2.1.

The agricultural sector accounted for about 29% of GDP in 2009. It provides employment to 75% of the country's population and meets about 50% of the national food requirements. Its share of the country's total exports is 70%, thus constituting a substantial part of The Gambia's foreign exchange earnings. Gambia's Gross Domestic Product was about US$ 730 million in 2009 and Gross National Income per capita was US$ 440.

Table 2.1: Population of The Gambia, 2003

Region	Land Area, sq. km	Population, persons	Population Density (persons/sq.km)
Banjul Municipality (BCC)	12	35,016	2,867
Kanifing Municipality (KMC)	76	322,735	4,272
West Coast Region (WCR)	1,764	389,594	221
North Bank Region (NBR)	1,618	72,167	77
Lower River Region (LRR)	2,255	172,835	45
Central River Region (CRR)	1,895	180,703	64
Upper River Region (URR)	2,070	182,586	88
The Gambia	10,690	1,360, 681	127

Source: Excerpt from the 2003 Census Report

2.3 ECONOMY

According to the United Nation System Common Country Assessment 2011, The Gambia is one of the poorest countries in the world ranking 151 out of 169 countries in the 2010 United Nations Development Programme (UNDP) Human Development Index (HDI). This is in spite of the fact that The Gambia has implemented programmes to reduce poverty since 1994, when the first Strategy for Poverty Alleviation (SPAI) was launched. From a Gambia Bureau of Statistics (GBOS) poverty assessment, the overall poverty level in 2008 was estimated at 55.5% of the population. This marks a slight decline from the 58% estimated in 2003. Recently however, a multidimensional poverty index (MPI) analysis showed that 34% of the population lives on less than an equivalent of US$1.25 per day, and 57% on less than US$2.00 per day. The poverty level is still worse at the rural areas at 68% compared to 40% in the urban areas.

Economic growth has rebounded from an annual average of 5.9% from 2003-2006 to about 7% in 2007. In 2008 Real GDP grew by 6.3%, led by strong growth in tourism and the construction industry. The contribution of the different economic sectors to overall is shown in the Table 2.2.

These fluctuations are largely attributable to the effect of weather conditions on agricultural output, but also due to variable growth in key sectors such as tourism, industry, re-exports, trading activities and construction in recent years.

2.2 ENERGY SITUATION

The supply of modern energy services plays a significant role in the development of economies. The availability of energy provides for greater opportunities in the productive sectors, in value addition, in services and also for the domestic sector, all contributing to economic growth. Conversely, the absence or limitation in modern energy supply restricts economic growth. The lack of reliable power and the high cost of energy are seriously limiting investment in The Gambia and are limiting growth in productive sectors such as the agro-processing and manufacturing sectors.

Table 2.2: Real GDP growth rates from 2005 to 2009 by sector

Sectors and subsectors	% of GDP (2009)	GDP growth rate (%) relative to previous year						Cumulative growth rate (2005-2009), %	Average annual growth rate (2005-2009), %
		2005	2006	2007	2008	2009	2010		
GDP Growth rate (all sectors)		0.3	3.3	6.0	6.3	5.6	5.0	23.3	4.7
AGRICULTURE	26.3	-2.3	14.3	-1.9	26.6	9.8	4.6	14.3	2.9
Crops	14.8	-4.1	26.3	15.2	55.2	14.3	4.6	6.3	1.3
Livestock	8.9	0.9	2.4	11.9	4.3	4.5	4.5	26.0	5.2
INDUSTRY	13.0	3.5	4.5	2.5	-1.2	2.1	5.1	11.9	2.4
Manufacturing	5.4	17.5	4.1	3.9	-8.3	-2.8	3.2	13.3	2.7
Construction	4.0	25.4	6	-4.3	5	3	1.0	-18.1	-3.6
SERVICES	60.7	2.7	9.9	8.3	4.2	4.3	4.9	32.9	6.6
Wholesale & retail trade	26.7	-6.3	16.1	9.7	-2.3	6	1.0	23.6	4.7
Hotels & restaurants	2.6	19.8	15.7	14.3	2.9	26.8	3.7	19.2	3.8
Transport, storage, communication	11.0	9.1	2.7	7	-8	5	7.6	15.8	3.2
Finance & Insurance	9.0	8.1	5.7	-0.9	28.2	13.2	8.0	64.2	12.8
Real estate & business activities	3.0	0.3	-3.9	1.4	0	2.5	0.1	0.2	0.03
Public administration	3.6	8.2	7.6	12.9	42.1	2	8.5	94.6	18.9

Source: Ministry of Finance and Economic Affairs, 2010

The Gambian government recognises the problem and has, as one of its key objectives, to ensure a reliable and adequate supply of energy, both conventional and renewable energy, at affordable prices. Some of the major challenges are seen as:

- Heavy reliance on imported petroleum products to meet the country's energy requirements, placing a heavy burden on the foreign exchange reserves;
- Limited investment in new assets and inadequate maintenance of old and ageing electricity power facilities;
- Growing population and rapidly growing demand for all forms of energy; and
- Limited capacity to develop renewable energy projects in the country.

The major sources of energy in The Gambia are biomass, electricity, petroleum fuels and renewable energy. Table 2.3 presents the evolution of the energy mix in The Gambia

2.2.1 Electricity Generation

Electricity is produced using heavy fuel oil in the Greater Banjul Area and diesel oil for the provincial operations. All the fuel used in electricity production is imported at great cost to the economy. Not only is the foreign exchange involved a major issue, but the country is vulnerable to the price volatility of the oil prices. This amongst other factors leads to The Gambia having one of the highest electricity tariffs in the sub-region.

Currently there are three major power plants in The Gambia, mostly in the Greater Banjul Area namely Kotu and Brikama (see Tables 2.4 and 2.5). In Brikama, the National Water and Electricity Company (NAWEC) and an Independent Power Producer (Global Electric

Group) own separate facilities. NAWEC maintains several smaller stations in all the provincial operations (see Table 2.6).

Table 2.3: Evolution of the Energy Mix of The Gambia

YEAR	BIOMASS/ FUELWOOD	ELECTRICITY	PETROLEUM	LPG	RE	TOTAL
1996	295.940	4.190	72.160	1.160	0.070	373.530
1997	304.820	5.330	71.720	1.210	0.080	383.170
1998	313.960	6.160	76.980	1.260	0.090	398.460
1999	323.380	7.170	81.880	1.310	0.110	413.850
2000	333.090	6.850	86.890	1.360	0.110	428.300
2001	343.080	8.770	83.770	1.420	0.110	437.150
2002	353.370	9.900	83.100	1.470	0.121	447.960
2003	363.970	8.860	82.460	1.530	0.132	456.950
2004	374.890	7.170	84.730	1.590	0.133	468.510
2005	386.140	9.440	86.040	1.660	0.134	483.410
2006	397.720	10.370	95.880	1.720	0.134	505.830

Source: DoSEMR for Energy, 2008

The overall availability of plants at Kotu in particular remains low due to mechanical breakdowns. In 2001, only 73GWh of electricity was produced from the station whilst in 2010 the production rose to 104GWh. The only one Independent Power Producer (IPP) in The Gambia started operation in 2006. Its mode of electricity production is similar to the NAWEC Kotu power station that uses heavy fuel oil. Huge investments have also been made in electricity generation in the Provinces (see Table 2.6).

Table 2.4: Installed Electricity Generation at Kotu, 2011

Power Station	Installed Capacity, MW
KPS-G1	3.0
KPS-G2	3.0
KPS-G3	3.4
KPS-G4	6.4
KPS-G6	6.4
KPS-G7	6.4
KPS-G8	6.4
KPS-G9	6.4
KPS-G11	0.0
BPS-Wartsila	9.0
Total	50.4

Source: NAWEC, 2012

Table 2.5: Installed Electricity Generation at Brikama

Power Station	Installed Capacity, MW
BRK-G1	6.4
BRK-G2	6.4
BRK-G3	6.4
BRK-G4	6.4
G5	0.0
G6	0.0
Total	25.6

Source: NAWEC, 2012

Table 2.6: Installed Electricity Generation in the Provinces, 2010

Provincial Stations	Installed Capacity, kW
Barra	368
Kerewan	536
Kaur	145
Farafenni	1,400
Bansang	600
Basse	1,560
Total	4,249

Source: NAWEC, 2012

Unfortunately, the River Gambia offers no potential for hydropower, and within the borders of The Gambia there is no drop in level of more than 10m from one end of the river to other. However, the OMVG, the organisation for the exploitation of the river Gambia, proposed a regional energy project to construct a dam on the river in southern Senegal. The power would then be shared by all the member countries through high voltage transmission. Due to escalating costs and fragile political environments in many of the countries involved, the implementation of the project has been delayed for more than 30 years.

2.2.2 Supply of Petroleum Products

Like the fuel used to produce electricity, all the transport fuels including aviation fuels are imported. While accounting for the second most used form of energy, the cost of fuel imports have consistently been a major drain of foreign exchange reserves. In 1998 about US$4.6 million was spent on petroleum imports. This figure rose sharply in 2009 to just over US$75 million, as shown in Table 2.7 (World Bank, 2010). The consumption of petroleum products in 2005 was 140,068 metric tonnes (see Figure 2.2). Although the consumption has increased due to increasing car ownership and electricity production, the price per tonne of petroleum products over the last decade has more than doubled as well. Petroleum products are usually sourced from Abidjan, Cote d'Ivoire or Port Gentil in Gabon. However, the country has a very modern infrastructure regarding transport, fuel storage and delivery.

Table 2.7: Light and Heavy Fuel Oil Imports of The Gambia

LFO HFO INFORMATION FIGURES
2005, 2006, 2007, and 2008

EURO AFRICAN GROUP - FUEL IMPORTATION FIGURES INTO THE GAMBIA

	2005		2006		2007		2008		2009		Total	
	QTY/MT	COST/US$	QTY/MT	COST/US$	QTY/MT	COST/US$	QTY/MT	COST/US$	QTY/MT	COST/US$	QTY/MT	COST/US$
GASOLINE	16,713.00	$9,505,920.00	15,028.00	$9,986,046.00	17,979.00	$13,394,460.00	15,435.16	$14,374,350.07	17,895.57	$11,464,865.50	83,050.73	$58,725,641.57
GASOIL	39,356.00	$22,915,540.00	42,526.00	$27,512,780.00	42,152.00	$30,054,376.00	44,107.40	$44,648,488.11	50,571.13	$29,473,838.44	218,712.53	$154,605,022.55
JET FUEL	14,361.00	$9,095,025.00	18,554.00	$12,860,082.00	21,751.00	$16,560,576.00	14,959.98	$15,103,436.49	14,975.26	$9,357,248.33	84,601.24	$62,976,367.82
HFO	37,178.00	$12,721,529.00	36,407.98	$13,291,370.00	44,874.00	$19,073,111.00	42,386.71	$25,113,591.02	54,916.40	$23,270,780.59	215,763.09	$93,470,381.61
LPG									2,250.00	$1,616,775.00	2,250.00	$1,616,775.00
	107,608.00	**$54,238,014.00**	**112,515.98**	**$63,650,278.00**	**126,756.00**	**$79,082,523.00**	**116,889.25**	**$99,239,865.69**	**140,608.36**	**$75,183,507.86**	**604,377.59**	**$371,394,188.55**

	2005		2006		2007		2008		2009		Average	
AVERAGE PRICES	GASOLINE	568.77	GASOLINE	664.50	GASOLINE	745.01	GASOLINE	931.27	GASOLINE	640.65	GASOLINE	707.11
	GASOIL	582.26	GASOIL	646.96	GASOIL	713.00	GASOIL	1,012.27	GASOIL	582.82	GASOIL	706.89
	JET FUEL	633.31	JET FUEL	693.12	JET FUEL	761.37	JET FUEL	1,009.59	JET FUEL	624.85	JET FUEL	744.39
	HFO	342.18	HFO	365.07	HFO	425.04	HFO	592.49	HFO	423.75	HFO	433.21
	LPG		LPG		LPG		LPG		LPG	718.57	LPG	718.57

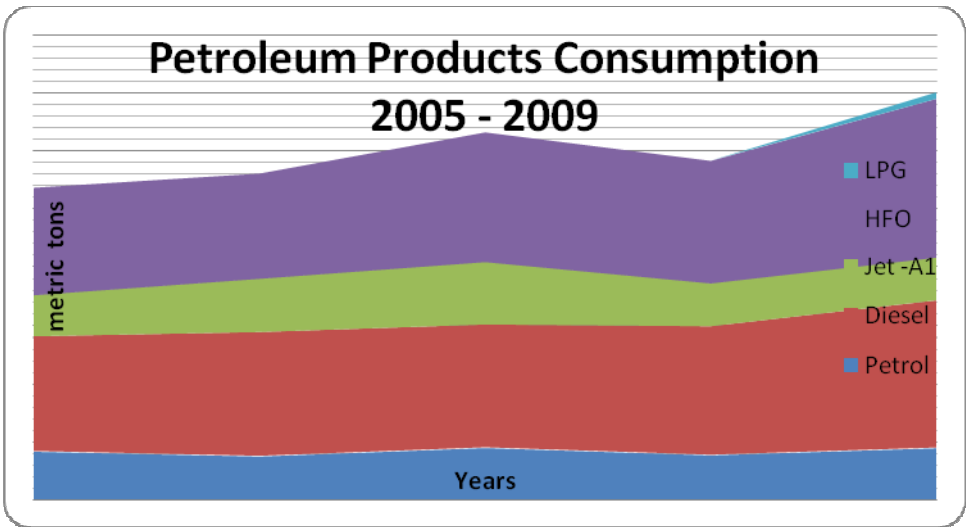

Figure 2.2: Consumption of Petroleum Production in The Gambia
Source: Ministry of Energy, 2010

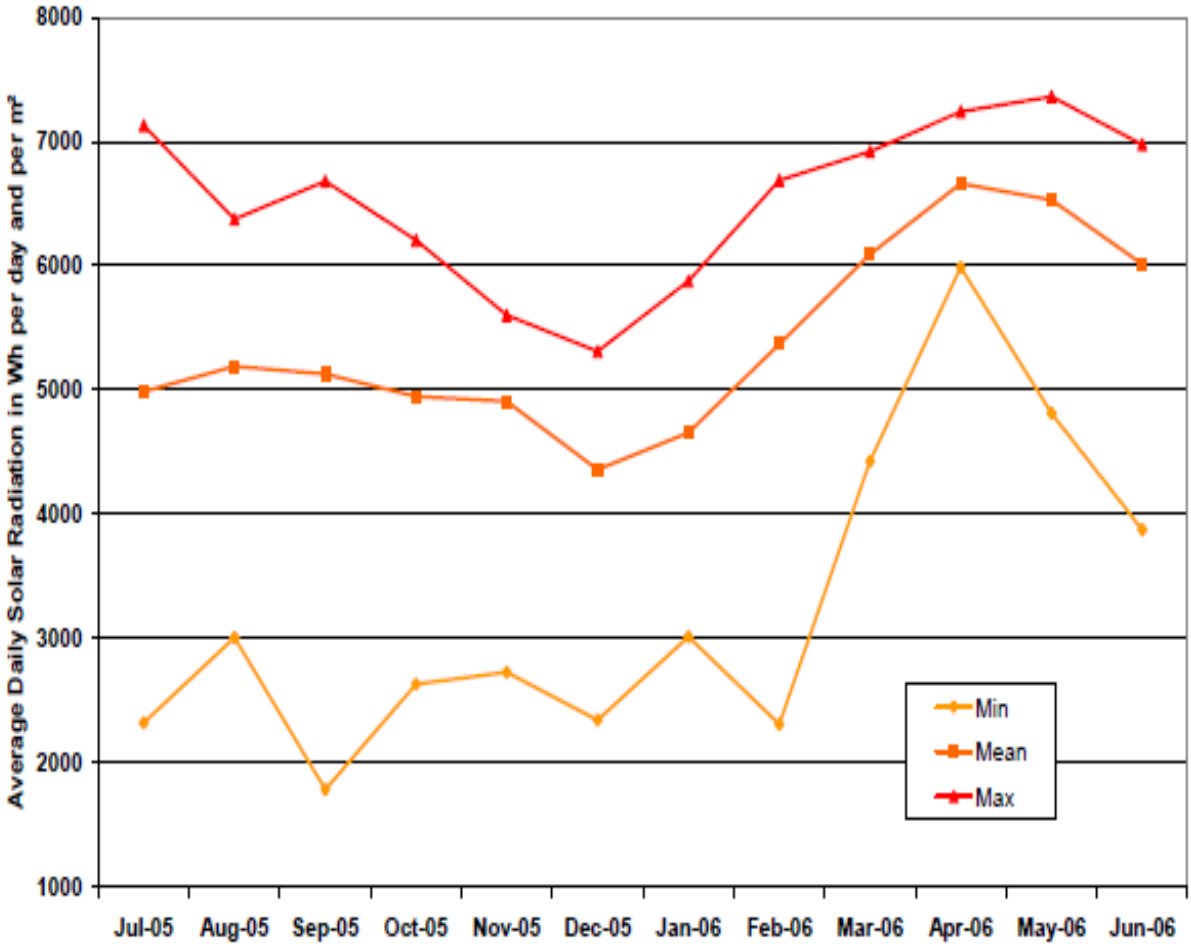

Figure 2.3: Solar Radiation in The Gambia
Source: Flores, 2010

As solar radiation reaches good values all over the country, several energy (electricity) supply possibilities can be explored. Preliminarily, PV Power Plants, Solar Home Systems (SHS) and Hybrid Diesel-PV Systems could be considered. The existing PV based energy generation projects

(i.e. the European Union-sponsored solar PV pumping, SHS projects and PV-Diesel hybrid system in Darsilami) supports this consideration.

Although normal irradiance figures in The Gambia strongly support the present Solar Water Heating applications in the tourism industry, it is very difficult to envisage any solar thermal power generation plant, as an electricity supply option in the Renewable Energy Master Plan (REMP) for The Gambia, due to the relatively small power capacity requirements in the country. At the present technology state of the art, the technical and economic viability of such Concentrated Solar Power (CSP) power plants are in the same or over range of installed capacity in the whole country (Flores, 2010).

Solar energy has had the most successful application of renewable energy in The Gambia and it has been used extensively since the early 1980s. Early uses included rural water supply and remote power for telecommunication facilities. Recently solar thermal is being used for water heating even at the industrial level. These solar thermal units range from tank and collector systems for standards households to networks types with vast arrays of collectors connected to single tanks with mechanical pumping systems.

2.2.4.2 Wind Energy

In 2004, the Government obtained a grant from the African Development Bank to conduct a Renewable Energy study. The study for the first time provided wind speed measurements for more than a year at heights of 30 m. Prior to that the Department of Water Resources has been conducting solar measurements and wind but at lower heights.

Mainly due to latitudinal vicinity of The Gambia to the equator, wind conditions are moderate (below 4.0 m/s at 30 m height) all over the country, above all in the hinterland (Flores, 2010). Near the coast (e.g. at Kanuma and Jambanjelly) the wind condition are slightly higher (at 3.4 m/s to 4.2 m/s at 30 m measurement height) than in the interior due to the free wind flow coming from the sea in the West. The trend is that the wind speeds are higher from January until May and lower from June to December. The moderate wind speeds are hardly suitable for wind powered electricity generation on economical basis, but at the coast a meaningful use of wind power could be possible.

2.2.4.3 Biomass

2.2.4.3.1 Fuelwood

It is difficult to find precise data on total fuelwood resources in The Gambia as most of the data in the literature are estimates or projections from previous studies. From Table 2.3 it is evident that the country has lost more than 50% of the forest cover between 1946 and 2005. However, the projections to 2015 show a lower rate of degradation and this could be attributed to the interventions through more aggressive forestry policies.

Two main activities have been attributed to the loss of the forest cover: i) agriculture; and ii) other human activities. Land clearing for agriculture especially for groundnut production has led to an alarming rate of the loss of the forest cover of the country. Overgrazing and bush fires have also contributed to this loss. Clearing of land for human settlements and unsustainable exploitation of forest products such as timber and fuelwood have also been destructive of the forest resource to varying extents.

A household energy study conducted in 2005(DCMI, 2005) attempted to make projections of the supply/demand balance of fuelwood resources in the period 1983-2004 from historical figures. The

study showed that the standing stock of fuelwood resources in 2004 was less than 50% of that in 1983, whilst the population of The Gambia has doubled in the same period (see Tables2.8 and 2.9).

Table 2.8: Forest Resource of The Gambia

Forest Type	% of total land area						
	1946	1968	1980	1993	1998	2005	2015
Closed Woodland	60.1	8.0	1.3	1.1	0.7	1.5	2.8
Open Woodland	13.3	14.6	10.7	7.8	6.2	12.0	12.2
Savannah	7.8	31.6	24.8	31.8	34.6	31.5	25.0
Total Forest Cover	81.2	57.3	36.8	40.7	41.5	45.0	40.0

Source: DCMI, Household Energy Survey 2005

Table 2.9: Supply and Demand Balance of Fuelwood Resources of The Gambia

	Fuelwood Resource, '000 tonnes/yr			
Description	1983	1993	2003	2004
Standing stock	16,620	11,049.5	7,652.2	7,312.47
Annual yield	302.0	272.0	153.0	143.48
Consumption	430.0	485.1	648.1	884.55
Deficit	128.0	213.1	495.1	741.07
	Persons, '000			
Population	687.8	1,026.8	1,360.0	1,397.6

Source: DCMI, Household Energy Survey 2005

In The Gambia the production of charcoal is technically illegal since charcoal production was banned in February 1977 by a Presidential Decree[i]. However, the law is loosely defined and it is generally not conformed to. Thus charcoal is easily produced as several villages in the West Coast Region. However, it must be emphasised that the bulk of the charcoal is imported from the Casamance region in southern Senegal. The bulk of the fuelwood imported for consumption in the Greater Gambia Area is also mainly imported by truck from Guinea and southern Senegal. Figure 2.4 presents the consumption of fuelwood in the period 1991 – 2004 (Lahmeyer, 2005).

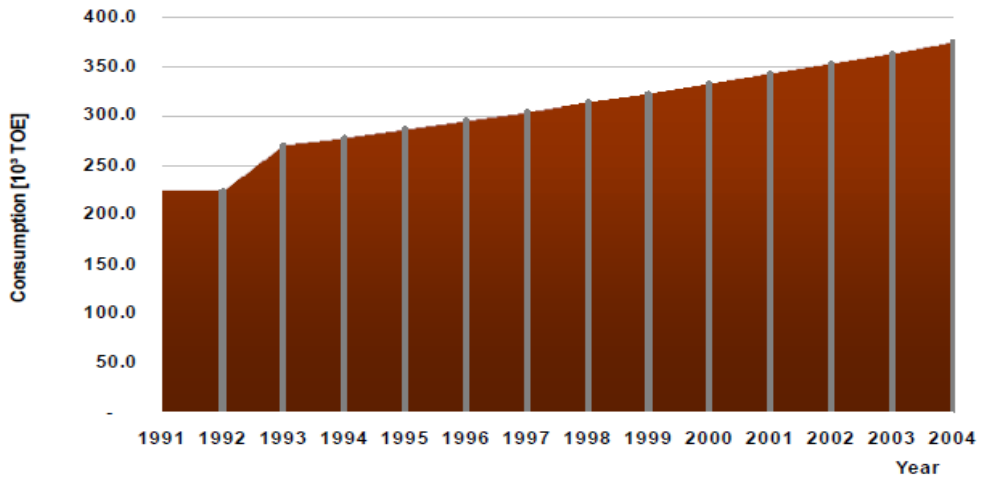

Figure 2.4: Consumption of Fuelwood in The Gambia, 1991 – 2004
Source: Lahmeyer, 2005

The Department of Forestry has an office on Brikama which is the main entry point of imports coming from the east into The Gambia. The data appears to be an underestimation because it does not account for the charcoal and fuelwood brought into The Gambia by private or commercial passenger vehicles mainly from Foni and beyond. The PIWAMP study noted that about 50% of the fuelwood was imported and almost all the charcoal was imported.

In the rural areas, fuelwood is mainly cut from community woodlands or shrubs near to the villages. It must be noted that The Gambia derives more than 80% of its total energy consumed from fuelwood, which also accounts for more than 90% of household energy consumption. In the rural areas, this proportion is as high as 97%. This pattern of consumption is not sustainable and it is becoming evident that considerable deforestation is taking place.

On the supply side, the continued use of charcoal as a preferred cooking fuel is very inefficient and unsustainable. The production of charcoal is often destructive and consumes considerable quantity of wood in the conversion process. Most of the charcoal is produced through earth kilns with varying yields depending on the type of wood used and the skill of the producer. Openshaw indicates that the conversion efficiency ranges from 10m^3 to 27m^3 of wood for a yield of one tonne of charcoal. Ironically, the Casamance kiln, which is highly efficient and produces good quality charcoal, is not widely used due to its higher cost and the clandestine nature of the charcoal trade.

2.2.4.3.2 Biomass Residues

The most important biomass resources in The Gambia are agricultural residues and industrial wastes of agricultural origin. The uses of agricultural residues on the farm are important and likely to impose a stiff competition for their use as household energy sources. Table 2.10 presents estimates of the likely available quantities of these biomass resources for briquetting projected over 2004-2009, in a feasibility study conducted in 2004.

Table 2.10: 5-Year Projection of Biomass Availability at 2004 in Tonnes

Material	2004	2005	2006	2007	2008
Groundnut Shells	19900	21,300	22,800	24,400	26,100
Millet Stalks	78,500	83,200	88,200	93,500	99,100
Maize Stalks/Cobs	18,800	20,500	22,300	24,300	26,500
Sorghum Stalks	31,500	34,600	38,100	41,900	46,100
Rice Straws/ Husks	6,900 +	7,300	7,800	8,300	8,800
Cotton Stalks	1,270	1,300	1,330	1,360	3,400
Total	155,600	166,900	179,200	192,400	206,600

Source: Charcoal Briquetting Feasibility S.Kinteh et al, DCMI, 2004.

Several projects over the years have also piloted biogas projects notably through the PIWAMP project. Biogas has a significant potential in the Gambia and can be made from animal waste as well as agricultural waste and sewage sludge. The gas formed from anaerobic digestion of the waste can have varying methane content and corresponding heat value ranging from 14 to 29 MJ/Nm^3. The main advantage of biogas technology in The Gambia is the appropriateness of the technology with little or no components being imported. Biogas has the potential to be used as a cooking fuel in The Gambia especially in large institutions such as abattoirs and breweries. In rural areas, there may be an issue with the collection of cow dung as it is heavily relied upon as a natural fertilizer. The Gambia has about half a million cows which are reared in a nomadic fashion. This may also limit cow dung collection.

Landfill gas also offers another potential source of biogas. Municipal waste management is not well coordinated. Most of the landfills are open pits in which unsorted waste is indiscriminately dumped, resulting in serious environmental pollution. The Bakoteh site is a classic example in which spontaneous combustion releases toxic smoke daily. In 2004, the World Bank financed a project to develop the Bakoteh dumpsite into a rehabilitated landfill with the gas collected through a network of pipes and released into the atmosphere. However, there was is no information on the quality nor quantity of the gas and its potential use for electricity production. This however does not eliminate the fact that commercial landfill operation could be viable in The Gambia.

3. CURRENT SITUATION WITH REGARD TO SE4ALL GOALS

3.1ENERGY ACCESS vis-à-vis GOAL OF SE4ALL

3.1.1 Modern Energy for Cooking

In 2004, cooking represented the most energy intensive household activity with fuelwood representing 95% of the household energy consumption with charcoal being the second most used fuel at 2%. LPG for cooking represented only 0.51% of household energy demand. Lighting was the next biggest user of energy, with kerosene accounting for 1.6% and electricity just under 1%. The Census a year earlier in 2003, gave a more detailed distribution of these fuels for cooking amongst rural and urban households (see Table 3.1).

Table 3.1: Cooking Fuels of Households in The Gambia

Type of Household	Cooking Fuel					
	Fuelwood	Charcoal	LPG	Kerosene	Briquette	Sawdust
Urban Households, %	84.5	7.5	6.6	0.3	0.1	0.9
Rural Household, %	98.6	0.5	0.5	0.2	0.2	

The past interventions in The Gambia towards improving access of households to modern energy for cooking focused on two key areas:

1. Use of alternative, sustainable or renewable fuels - past projects include the production of both carbonised and non-carbonised briquettes;biogas has also been promoted by independent projects.

2. Use of improved cookstoves –these include clay-lined stoves such as the *furno jambarr,*and other designs such as the *furno noflie.*

3.1.1.1 Promotion of LPG

LPG was introduced as a project first in the early 1980s and then in 1990 as Regional Butane Project under CILSS Gas Project. At the moment, all LPG is imported from Senegal, with hightransport costs, periodic shortages and foreign exchange vulnerability. Tax subsidies for free importation of LPG exist currently. However, penetration of LPG usage in the Gambia is very low, and it is vital that LPG is promoted in The Gambia.

3.1.1.2 Improved Cook Stoves

The National Improved Cooking Stove Project was implemented from 1982 under the auspices of the Department of Community Development (DCD) with the long term objective of combating desertification, conserving the environment and diversifying the energy base. It also aimed to improve the living and working conditions of the people of The Gambia particularly women and children as well as men who had to work extra hard to meet the increasing fuelwood needs of the household in the urban areas. The project resulted in the production of the *Noflie, Pottery* and *Kumba Gaye* stoves which were found to achieve wood saving of 40% compared to the traditional tripod (stone) fireplace. The specific objectives were related to the needed promotion to make sure

the stoves were accepted; that the stoves meet some standard relating to safety, efficiency and durability; and the need to strengthen the capacity of DCD to sustain the initiative.

The DCD has been promoting not only the stoves itself but has also been actively training several artisanal metal workshops on how to fabricate the stoves locally. Two types of stoves used in The Gambia are presented in Figure 3.1; the figure also shows a fuel-efficient stove, the *Rocket* Stove. Earlier a comparison of the efficiency of cooking stoves had been provided by Joof in his studies in the early 1990s (*Joof, 1991).*

Figure 3.1 Some types of Stoves in The Gambia

Greentech Ltd, a company in The Gambia that produces briquettes from groundnut shells, conducted a demonstration to compare three different fuels namely charcoal, fuelwood and its own briquettes to cook two local meals of *Domoda* and *Beneachin*. For the same amount of meals, the Rocket stove using briquettes cooked faster than the charcoal *furno.* Greentech Ltd. reports that 2.4kg of briquettes can be used to cook 2.5kg of rice, compared with 3.6kg of fuelwood and 2.0kg of charcoal needed to cook the same amount of meal. Cooking with charcoal is generally the most expensive whilst fuelwood remains the cheapest to cook with. The briquette stove (*Rocket*) therefore has the potential to compete with charcoal stoves, though more extensive awareness campaigns are required to demonstrate its advantages over improved charcoal stoves, if it is to be widely accepted by households.

Evidence from several countries in the sub-region including Senegal (GTZ, 2010) has also shown that improved cooking stoves programmes achieve significant savings if implemented and targeted towards urban households. This is especially true for the *Sinkili Kuto* which has a cooking chamber made with red bricks. Even though improved cookstoves appear to be the most sustainable option for cooking considering environmental and social factors, they are more expensive compared with regular cooking stoves. The cost of the improved stoves is over D200 (US$6.67), whilst the regular cooking stoves costs D75 (US$2.50) (see Table 3.2).

Table 3.2: Prices of Traditional and Improved Stoves in The Gambia

Stove	Fuel Used	Fabrication Material	Cost	
			D	US$
Traditional square top	fuelwood/charcoal	metal	75	3
Furno Noflie	Fuelwood	metal	75	3
Kumba Gaye	fuelwood	mud	250	8
Furno Jambarr	Charcoal	metal with ceramic lining	450	15
Greentech (gasifier)	groundnut briquette	metal with lining	350	12
Furno Noflie Tanki	fuelwood / charcoal	car wheel drum	350	12

Moto				
Sinkiri Kuto	Fuelwood	bricks/cement	10,000	330

Source: Prices from Serrekunda Market Dec. 2011

Most of the stoves have been modelled on Senegalese variations of well-established stoves such as the clay-lined Kenyan *Jiko* stove. Regarding alternative cooking fuels, most of the substitution programmes have focussed on agricultural waste or by-products of the timber industry. The use of briquettes as a cooking fuel goes back as early as 1986 when it was promoted by the groundnut oil mill company (PIWAMP, 2007). A GEF-funded project was also implemented in 2004 that made long fuelwood-like octagonal briquettes, but the company is currently not operational.

3.1.2 Modern Energy for Productive Uses

Productive uses of energy involve the utilization of energy – both electric and non-electric energy in the form of heat or mechanical energy - for activities that enhance income and welfare. These activities are typically in the sectors of agriculture, rural enterprise, health and education. Examples of such activities include pumping water for agriculture, agro-processing, lighting, information and communications, and vaccine refrigeration. The promotion of the productive uses of energy is an important aspect in the design and implementation of rural energy projects. Initiatives on productive uses of energy in The Gambia include the installation of solar and wind pumps.

3.1.2.1 Solar Powered Water Pumps

The promotion of solar-powered water pumps was initiated in the Gambia in the early 1980s at a bore hole in Jambanjaleh with funding from Saudi Arabia and German Technical Assistance. A second pilot plant was later installed in Mandinaba as part of a UNDP-funded project (World Bank Report, 1983*).* These pilot projects proved economically viable and sustainable leading to their roll-out throughout the country. Currently, there are over 200 solar powered water pump systems in the country (See Figure 3.2).

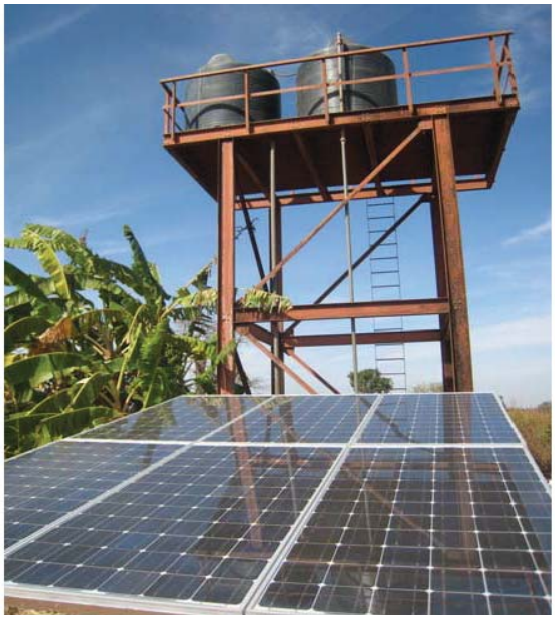

Figure 3.2: Solar Water Pumping System at Hospital at Bwiam, Foni Kansala District

3.1.2.2Wind Pumps

Wind pumps are not very prevalent in The Gambia. The Ministry of Water Resources indicated that the European Union funded some wind pumps along the coastal villages in the early 1990s. The pilot systems were installed in Brufut, Tanji and Batakunku by the Atlantic Coast. However, none of these systems are currently working, with most of the systems abandoned and rusting. Many more wind pumps are currently in use in the country but they have been private projects mostly on private farms (see Figure 3.3).

Figure 3.3: Typical Wind Pump System

3.2 ENERGY EFFICIENCY vis-à-vis GOAL OF SE4ALL

The government has adopted a policy of discriminating against the use of incandescent light bulbs in all government buildings, including public enterprises. All lighting must be from fluorescent tubes or CFL bulbs.The Public Utilities Regulatory Authority (PURA), the national regulator, replaced all incandescent bulbs in their office in December 2007 and currently saves more than GMD 42,000 annually.

3.3 RENEWABLE ENERGY vis-à-vis GOAL OF SE4ALL

The Gambia has some potential to tap renewable energy sources that are in widespread use in countries around the world such as wind, solar, hydro, biogas, biomass, and geothermal. While most of these technologies show reasonable potential based on the limited information available, further detailed studies would be required to definitively determine the most economical solutions.

3.3.1Wind Turbines and Pumps

There are currently two wind turbines in The Gambia. The first is a 1kW unit in Gunjur and the second is a 150kW unit which supplies power to the entire village of Batukunku and in some instances produces excess energy that is sold back to the NAWEC grid via an established power purchase agreement (see Figure 3.4). There appears to be reasonable wind energy potential that requires further study to quantify this resource.

Figure 3.4: Batukunku Wind Turbine

Wind pumps are not very prevalent in The Gambia. The Ministry of Water Resources indicated that the European Union funded some wind pumps along the coastal villages in the early 1990s. The pilot systems were installed in Brufut, Tanji and Batakunku by the Atlantic Coast. However, none of these systems are currently working, with most of the systems abandoned and rusting. Many more wind pumps are currently in use in the country but they have been private projects mostly on private farms.

3.3.2 Micro Hydro

There are currently no installed hydro driven generators in The Gambia. However, according to the Renewable Energy Association of The Gambia (REAGAM), it appears that there are potential sources within the Gambia River and its tributaries that could be utilized for power generation. Additionally, several neighboring countries such as Burkina Faso, Cote d'Ivoire, and Ghana have had success with the implementation of hydro generation technology and supply 25%, 42%, and 53% respectively of those countries' total generated electricity. The hydro potential of the Gambia River has not been evaluated and suitable locations for run of river, mini, and micro hydro opportunities have not been identified and require additional study to quantify the potential of this energy resource.

3.3.3Solar

The Gambia currently has small solar photovoltaic (PV) and solar thermal systems installed, most commonly at rural hospitals, schools and private residences. The average annual solar insolation for The Gambia is 4.5-5.3 kWh/m^2-day, which represents a high generating potential for the country The cost of solar energy systems continues to be high; however, the recent adoption of solar energy systems in various countries globally has had a positive effect on driving down installed costs of new solar PV systems. In the future, it is anticipated that such a system could

offer a cost effective solution for the sustainable development of The Gambia. However, at this time, this technology should continue to be considered for smaller scale distributed applications as there appear to be other, more economical options available to The Gambia for large scale generation.

3.3.3.1 Solar Cookers

Solar cooking stoves have a long history in The Gambia. However, over the last decade its promotion has been mainly by civil society groups and NGOs. There are also a number of associations involved although there is very little data on how widespread solar cookers are. In a 2009 interview on the work of AHEAD an NGO promoting solar cooking in The Gambia, Lamin Sawo reported that about 900 families are using solar cookers through the efforts of his NGO (Solar Wiki, 2008).

In Marakissa in the West Coast Region, solar cookers have been promoted through the Methodist Agricultural Mission there, and there exists a Solar Cooking Club which is probably the oldest of such organised clubs. A report published on the Tearfund website, highlights the acceptability of solar cookers amongst women. An extract of the conclusions of the solar cooker trials and training sessions is provided below:

- Women will only be convinced of the benefits of solar cooking if they are encouraged and supported in experimenting with cooking methods. Demonstrations by 'outsiders' will achieve little. The policy of working closely with a small group of women over time and then using them to train others is ideal;
- Solar cooker designs must be easy for local craftsmen to produce and cheap to buy; and
- Women were very quick to understand the techniques of solar cooking, the limitations and possibilities. They need support to find the right design and to experiment.

The Solar Association at Tiloo has also been actively promoting solar cookers and solar cooked pastry products since 2006. Its work was recently recognised through the award of the Yves Rocher Foundation in 2010. The Association makes the box type solar cookers locally.

3.3.3.2 Solar Water Heating Systems

The potential of solar water heating systems was studied in the 1980s and the conclusions were that it was in the interest of major users of hot water both in terms of financial profitability and economic viability to switch from diesel powered and electric water heating systems to solar heating systems. In 2004, the Department of Energy working closely with Gambia Technical Training Institute developed a solar water heater using a converted electric water heater tank. It is increasingly a common sight in the Kombos to find solar water heaters. However, there has not been any national programme promoting solar water heating, and solar water heaters that have been installed are mostly private initiatives. For households, two types of the solar water heating systems are available in the market, with the vacuum type being more expensive costing from D19,000 (US$ 633) to D78,000 (US$2,600) whilst the flat bed collectors cost around D12,000 (US$ 400)

With increasing awareness of ecotourism policies and practices and also due to the high cost of electricity, many hotels have invested in solar water heating (see Box 1). The earliest systems were installed at the Palmer Rima Hotel. Most hotels that are aware of this potential were unable to adopt it because of the huge initial investment required. In smaller hotels especially where there is no grid, solar heating systems are also widely used as the only option.

Box 1: Solar Water heating System at Kombo Beach Hotel:

Kombo Beach, formerly Novotel is one of the leading hotels that have embraced energy efficiency and renewable energy. The hotel already has almost all its light bulbs changed to energy saving lamps. It has installed a D1,800,000 (US$60,000) solar water heating system which has been operational since 2007. Within just one year of operations the hotel has been able to save about D540,000 (US$18,000) in fuels consumption. This gives a projected payback period of just 4 years.

Whilst this was a purely private sector initiative, it could be easily replicated with good support and policy incentives to make our tourism sector more competitive.

Source: Kombo Beach

3.3.4Biomass

While a large proportion of The Gambia's energy usage is currently supplied by biomass in the form of domestic fuel wood from agricultural residues, this would not be a short term option for increasing the electric generation capacity of the country. Specific assessments need to review fuel availability and associated costs, and opportunity to import wood biomass chips from neighboring markets. Closed loop biomass cultivation could be considered within the context of a medium to long term plan. Biogas is also a potential source for renewable energy in The Gambia. Given that Agriculture was projected to make up approximately 25% of Gambian GDP in 2009, potential feedstocks for a biogas plant are expected to be available. Biomass and biogas power can offer a cost effective choice within a future portfolio of electric generation choices.

4. CHALLENGES AND OPPORTUNITIES FOR ACHIEVING SE4ALL GOALS

4.1 INSTITUTIONAL AND POLICY FRAMEWORK

4.1.1 Key Institutions related to Energy

Until 2007, the power sector was controlled by NAWEC, a vertically-integrated monopoly that handled generation, transmission, and distribution of electricity in the country. In 2007, the Global Electric Group (GEG) was contracted by NAWEC to build, own, operate, and maintain one of the two power generation facilities in the greater Banjul area. This nearly doubled the available capacity in the country from approximately 31MW to 55MW. Discussions were held with several potential IPPs but GEG was the only one that didn't require sovereign or external guarantees, and therefore it was selected for the contract. Although this agreement set the precedent for the use of the independent Power producer (IPP) structure in The Gambia, no new power generation capacity has been added since, despite interest from other potential IPPs. As covered in detail later in the report, reasons for this include inadequate transmission and distribution (T&D) infrastructure, a financially unstable off-taker, and an ineffective regulator. Figure 4.1 outlines the organizational structure within the energy sector.

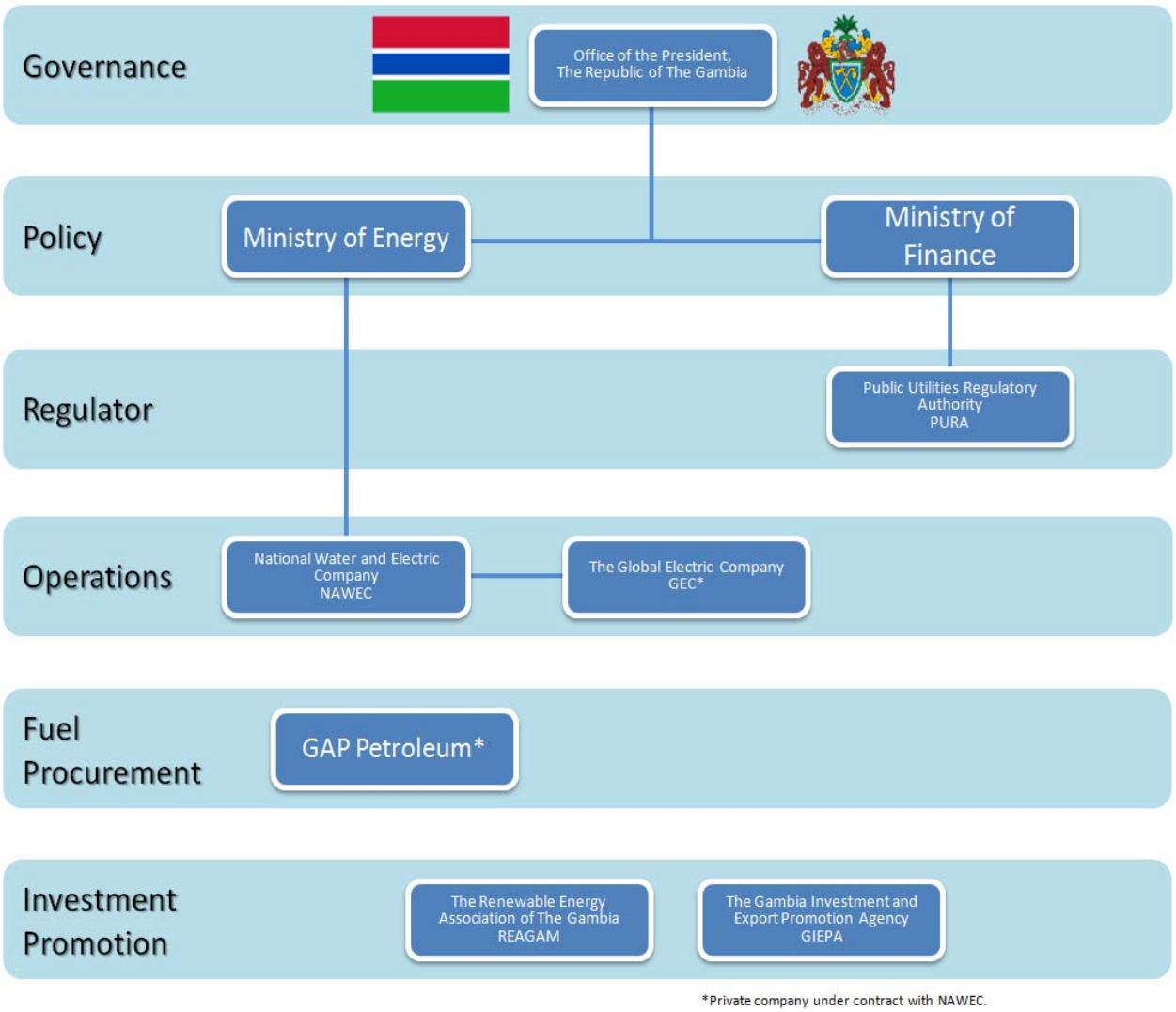

Figure 4.1: Gambia Energy Sector Organizational Hierarchy Structure

Descriptions of each institution relevant to the energy sector and their individual responsibilities along with relevant legislation are summarized in the sections below.

4.1.1.1 Office of the President, The Republic of The Gambia

The Office of the President receives the information from all of the ministries as they relate to each specific energy objective and ultimately has the final authority on the regulations, tariffs, and on contracting of any IPPs for the well being of the country.

4.1.1.2 Ministry of Energy

The Ministry of Energy oversees the entire operation of the energy sector for the country and provides support and assistance to National Water and Electric Company (NAWEC) and the Global Electrical Group Ltd (GEG) to provide recommendations on the institution of energy related tariffs to the President.

4.1.1.3 Ministry of Finance

The Ministry of Finance plays an important role in the energy sector, by which they receive the recommendations of PURA, evaluate the financial implications, and provide recommendations to the President.

4.1.1.4 National Water and Electric Company (NAWEC)

NAWEC is responsible for the operation and maintenance of one of the two power generation facilities in the greater Banjul area, the transmission and distribution of power within the country, and establishing and collecting the electric tariffs for all customer classes. NAWEC also establishes and administers Power Purchase Agreements (PPA) with the private power producers in the country.

4.1.1.5 Global Electrical Group Ltd (GEG)

GEG, an independent power producer and subsidiary of Global Trading Group N.V. (GTG), is contracted by NAWEC to build, own, operate and maintain one of the two power generation facilities in the greater Banjul area. GEG does not provide any transmission or distribution infrastructure or services for the power that they generate, nor do they establish or collect any electrical tariffs from any customers. GEG's PPA is a must-run, take-or-pay contract with fuel price adjustments. More details on the PPA are provided under the Cost of Power subheading in section **Error! Reference source not found.** below.

4.1.1.6 GAMPetroleum (GAP)

GAP Petroleum, an affiliate of GEG, is responsible for the contracting, storage and delivery of the majority of the country's fuel supply. Conversations held during the mission indicated that GAP is in some way affiliated with GEG and GTG, however the exact relationship was not clear. No evidence was observed that indicated that the fuel sale transactions between GAP and GEG were anything other than arms-length transactions, although the fuel sale agreement was not made available to the team. In May 2008, GAP completed construction of a new fuel storage facility. This facility, capable of storing 51,000 metric tonnes of HFO, LFO, and LPG, provides approximately 6 months worth of storage for the three fuel types. Indications from the mission are that the investment made by GAP to establish the fuel storage facility has effectively made them a monopoly supplier of HFO and LFO in the country (including to NAWEC).

4.1.1.7 Public Utilities Regulatory Authority (PURA)

The Public Utilities Regulatory Authority was created by The Gambia Public Utilities Regulatory Authority Act of 2001 and is the authority which regulates the activities of the country's public utility sectors (electricity, water and telecommunications). The functions of PURA as called out in the Act include:

- Provide guidelines on rates and fees for the provision of regulated public services;
- Examine rates and fees chargeable for the provision of regulated public services;
- Protect the interest of consumers and of public utilities;
- Monitor and enforce standards of performance by public utilities;
- Initiate and conduct investigations into standards of services by public utilities;
- Promote fair competition among public utilities;
- Conduct studies relating to economies and efficiency in the provision of regulated public services to consumers;
- Collect and compile data on regulated public services and their provision necessary for the performance of the Authority's functions;
- Provide advice in respect of regulated public services and their provision;
- Maintain a register of public utilities and the services they provide;

- Publish, in such manner as it considers appropriate, information relating to the Authority's functions and activities;
- Recommend and administer, in accordance with the Act, a licensing system in respect of public utilities;
- Provide advice or assistance to a public utility to assist or enable the utility to comply with a requirement of the Act or of any license;
- Prepare any relevant documentation necessary to give the Authority the power to regulate public utilities in accordance with the Act; and
- Perform such other functions as may be imposed on it by any other legislation.

With respect to the independence of PURA the Act states that "The Authority shall not be subject to the direction or control of any person or authority in the performance of its functions or exercise of its powers under this Act and shall act in all matters and at all times impartially".

The Act also states that "The Authority may, with approval of the appropriate person [Secretary of State], suspend or cancel a license if it is satisfied that the public utility is not complying with or has not complied with any provision, term or condition of the license". Therefore, PURA has the authority to suspend licenses, but only with the approval of the Secretary of State responsible for the energy sector. While the Act also discusses fines to be levied on non-compliant utilities, the language used is somewhat ambiguous. The Act states that if a public utility fails to provide information to PURA or provides false information, it "commits an offence and is liable on conviction to a fine". This implies that the court system would have to convict the utility in order for fines to be levied.

PURA's important role in setting electricity tariffs was further refined by the Electricity Bill of 2005. as detailed below.

4.1.1.8Renewable Energy Association of The Gambia (REAGAM)

REAGAM is a non-profit cooperation of approximately 17 to 19 private and public companies and individuals active in the promotion of renewable energy projects such as small solar PV installations, solar thermal, micro hydro, cooking stove improvements, and the expansion of jathropa growth for oil production in The Gambia.

4.1.1.9The Gambia Investment and Export Promotion Agency (GIEPA)

GIEPA, created by The Gambia Investment and Export Promotion Agency Act of 2010[1], serves the primary functions detailed below:

- Promote investment in The Gambia by projecting its image as an investor friendly country;
- Conduct investment missions to attract investors to The Gambia;
- Facilitate the securing of investment incentives by investors;
- Provide investors with the necessary information to apply for incentives;
- Undertake the analysis of applications for incentives, for location in an export processing zone or to become an export processing zone operator;
- Collect data on investment, particularly investments that have received incentives;
- Monitor the performance of investors in respect of their obligations as set out in their investment proposals, or special investment certificate and take appropriate action in the event of a violation;

[1] Replacing *The Gambia Investment Promotion and Free Zones Agency* (GIPFZA) created by the Gambia Investment Promotion Act of 2001

- Formulate and implement investment export and enterprise development guidelines and investment promotion strategies;
- Promote and facilitate the development of micro, small and medium enterprises;
- Register and keep a record of all investment enterprises;
- Undertake trade and sector studies. Including market surveys, with a view to identifying investment opportunities;
- Advise Government on investment, export and industrial policy and related matters; and
- Do any other act which may be incidental or conducive to the attainment of the objectives of the Agency or the exercise of its powers under this Act.

4.1.1.10 Other Institutions

The **Department of Forestry** plays a leading role in the fuelwood sector both in terms of policy formulation and regulation. For example, vehicles importing charcoal pay a levy per bag of charcoal once they enter The Gambia and are subject to inspection by the Forestry Department staff. The Department is also very active in promoting community forestry as a sustainable way to exploit forest resources not only for fuelwood but also for other products such as honey.

The**Department of Community Development**is under the Ministry of Local Government and Lands,. The department promotes the efficient management of fuel wood resources through the promotion of substitutes, and improved end-use appliances, such as improved cooking stoves and biogas research.The Department has two regional facilities in Mansakonko and Brikama.

The **National Environment Agency (NEA)** is tasked with the formation, implementation, monitoring of compliance with environment standards.

4.2 ENERGY POLICY AND OTHER RELATED POLICIES AND LAWS

4.2.1 The Energy Policy

The Gambia's Energy Policy, 2005 was approved by the Secretary of State in June 2005. The policy sets out the objectives for the Government for the energy sector and also the aims for the renewable energy sub-sector. The main aims of the electricity sub-sector are to:

- Ensure that there is an adequate, efficient and affordable electricity supply to support socio-economic development in an environmentally-sustainable way;
- Improve the reliability and security of power supply as well as enhance power sector efficiency;
- Promote the long-term sustainability of power sector operations by encouraging more private sector participation in power supply.

The specific development objectives with respect to electricity are to:

- Improve and expand generating, transmission and distribution capacity to improve the reliability and quality of electricity services and cater for load growth;
- Reduce the cost of electricity;
- Encourage investment in rural power supply;
- Encourage the use of alternative and efficient technologies and fuels for electricity.

The aim for the Renewable Energy sub-sector is to ensure the promotion and utilisation of renewable energy in support of sustainable development in the country. The specific objectives are:

- Promote the utilisation of renewable forms of energy such as solar, wind and bio-mass;
- Promote the use and develop, to the extent possible, a domestic production capacity for renewable energy fuels and technologies;
- Ensure the sustainable supply of renewable energy fuels/device/technologies at competitive prices through private sector participation.

4.2.2Electricity Act, 2005

The Electricity Act was enacted in 2005 to promote the development of the electricity sub-sector in The Gambia, to encourage private investment in the sector, promote competition, set out the responsibilities for policy and regulation and to regulate electricity service providers. The Act sets out, inter alia, the objectives, licences and licensing procedures, tariff principles and accounting standards for the electricity sub-sector. The objectives of this Act are to -

- promote the generation, transmission, supply, dispatch and distribution of electricity in The Gambia;
- set standards relative to electricity services;
- promote electricity efficiency and supplies;
- ensure sufficient and reliable electricity supplies for the population and the economy of The Gambia at just and reasonable rates;
- establish cost-effective and reliable electricity supplies for all classes of consumers;
- effect a transition to a private investor controlled and operated electricity sector in which, through competition, where feasible, and regulation in non-competitive markets, prices accurately reflect the costs of efficient production, transmission, dispatch, and distribution of electricity;
- establish a framework for the regulation of the electric sector;
- assign responsibility for overall policy development in the electric sector to the Department of State and relieve the Department of State from regulatory responsibilities in the electricity sub-sector;
- encourage private sector investments in electric sector activities;
- encourage domestic and foreign private capital participation in the electric sector;
- promote competition in the electricity market; and
- encourage the production of electricity through the use of renewable energy.

4.2.3 Public Regulatory Authority Act, 2001

This Act established the Gambia Public Utilities Regulatory Authority (PURA) as the body responsible for the regulation of public utilities including energy services (electricity, petroleum and gas). The Act provides for the licensing arrangements to be administered by PURA. However the power to issue licences (for generation, distribution and transmission of electricity) is vested with the Minister for Energy. The licensing arrangement allows PURA the power to protect the interests of the public utility and of the consumer. The intention is that PURA will become self-funding and be seen as completely independent.

4.2.4 Draft Energy Strategy and Energy Action Plan, 2010

The Ministry of Energy is publishing an Energy Action Plan for the period 2010-2014. The Energy Action Plan has nine key objectives for the next four years, in line with the objectives of the Energy

Policy. These are set out below; for each objective there are clear strategies and a number of related activities set against targets and budgets:

- Increase electricity generation, transmission and distribution capacities;
- Improve access to electricity and safe drinking water;
- Provide affordable electricity and water;
- Improve national security through street lighting projects;
- Promote the use of renewable energy and energy efficiency;
- To regulate the downstream petroleum sub sector;
- To encourage the re-exportation of petroleum products to neighbouring countries;
- Strengthen the institutional framework; and
- To popularize the use of LPG by making the price affordable.

Other relevant policies include:

- PRSP I and PRSP II
- Macroeconomic Policy
- Agriculture Policy
- Gambia Tourism Policy
- Trade Policy
- Industrial Policy
- Employment Policy
- Gambia Investment and Export Promotion Agency (GIEPA) Act 2010
- Health Policy
- Education Policy
- Sanitation Policy
- Water Resource Policy
- Fisheries and Marine Resources Policy
- National Information & Communication Infrastructure Policy

4.2.5 PRSP I and PRSP II

The Poverty Reduction Strategy Papers (PRSPs) have constituted The Gambia's socio economic development framework from 2000 and are focused on improving the welfare of all Gambians as well as eradicating poverty. PRSP II in particular was also designed to facilitate the achievement of the Millennium Development Goals (MDGs) in the medium term and the Vision 2020 in the long term. It is broadly focused on the following five pillars:

- Improving the Enabling Policy Environment to Promote Growth and Poverty Reduction;
- Enhancing the capacity and output of productive sectors: Agriculture, Fisheries, Industry, Trade, Tourism and Infrastructure, with emphasis on productive capacities of the poor and vulnerable populations;
- Improving coverage of the basic social services and social protection needs of the poor and vulnerable;
- Enhancing governance systems and building the capacity of local communities and Civil Society Organizations (CSOs) to play an active role in economic growth and poverty reduction
- Mainstreaming cross-cutting issues: Gender, Youths, Population, HIV/AIDS, Nutrition and Environment into the development process

Strong macroeconomic performance over the last two of the three regimes of poverty reduction programmes (namely SPA I, PRSP I and PRSP II) implemented, have not translated into significant reduction of poverty. According to the most recent assessment of progress, it is observed that access to basic health services is generally improved although access level in some pockets in the rural areas remain poor. Significant achievements have been registered with regard to immunization services, with 90% coverage for childhood immunization. Under-5 and infant mortality rates have also declined over the past 30 years from 320 and 217 per thousand live births respectively to the present levels estimated at 99 and 75 per 1000 live births respectively.

Gains were also registered in the provision of safe drinking water, improving the literacy rate (which now stands at 65%), and in primary school enrolment targets. School completion rates however need to increase. Overall performance surpassed set targets, but the resultant impact on wellbeing fell short of the desired level due mainly to low level of programme implementation owing to among others limited available financing, limited human resource capacity and poorly defined interventions

4.2.6 Macroeconomic Policy

Macroeconomic policy from the past has focussed on securing stability and promoting growth. This focus has not changed in the PAGE. Specifically, fiscal policy aims to register improvement in the government fiscal balance. Already several structural and procedural reforms have been implemented in this direction, all in the drive to enhance public financial management – increase efficiency of revenue collection and check expenditure overruns which has resulted in a huge public debt. These reforms including the creation of Gambia Revenue Authority (GRA), introduction of Integrated Financial Management Information System (IFMIS), Civil Service Reform (CSR) to name a few, will be strengthened during the implementation of the PAGE.

4.2.7 Agricultural Policy

The current agricultural policy also covers other areas related to agriculture, as it also includes the other natural resource sectors such as water resources, forestry, fisheries, parks and wildlife, and lands and soils. The policy is designed to transform the sector from the traditional subsistent orientation to a modern and market- oriented focus. In summary, the specific objectives of the sector among others are to improve food and nutritional security level of the population, ensure commercial and market orientation of agricultural activity, and to ensure the sustainable and effective management of the natural resource base of the country. These are necessary for the achievement of MDG1 and MDG7.

The policy identified several key interventions designed to achieve the policy objectives. Two such interventions that are of strategic relevance to the matter of energy access are the drive to increase food production through irrigation, mechanisation and diversification to meet the increasing food need of the population; and the need to advance the process of modernising and commercialising the activities of the agricultural sector through agro processing and marketing (Agriculture and Natural Resource Policy 2009 – 2015). The Gambia National Agricultural Investment Programme (GNAIP) has been adopted as the instrument for the operationalisation of the ANR policy.

4.2.8 Trade Policy

Overall, the objective of the National Trade Policy (NTP) “is to maintain an open and liberal trading environment and to better integrate The Gambia into the global economy. It also aims at providing direction for trade activities as well as to ensure trade mainstreaming in the productive sectors to

make its contribution to the attainment of national goals of growth, development, and poverty reduction".

The policy identified the following strategic interventions to realise its noble objectives:

- improve the competitiveness of The Gambia trading environment;
- support production activities for the domestic and international markets;
- establish and strengthen quality infrastructure for enhanced market access;
- ensure a fair trading environment for producers and consumers;
- establish an efficient trade information system;
- strengthen bilateral, regional and multilateral trade corporation

4.2.9 Industrial Policy

The industrial sector in The Gambia consists of four subsectors, mining and quarrying; manufacturing; electricity, gas and water supply; and construction. In spite of it huge potential, the industrial sector contributed only 13% to GDP owing to poor performances in the manufacturing and construction components which together accounts for about 70 % of the sector.

The Gambia's manufacturing sector is small and it is not very diverse or interlinked, with larger enterprises based either on the few available resources or almost entirely on imported inputs. Small-scale manufacturing firms are mainly in the informal sector. The primary objective of the National Industrial Policy is to establish conditions required by the private sector to maximize gainful employment at ever increasing levels of productivity within the framework of a sustainable environment, social justice and equity.

Electricity supply continues to be the most pressing need of the industrial sector. In the past it was due to frequent and unpredictable power outages which have now stabilized. Stability of supply is however achieved at a high cost resulting in high tariff which is now a major challenge for the sector. Energy cost constitute on average about 35% of manufacturing cost in most firms. Another constraint to industrial activity in the country is the availability of cheap imports. These imports are relatively cheaper due to under-invoicing and the resultant assessment of inappropriate duties. Cheap imports undermine industrial growth in two ways – it tilts competition against local industries and it also diverts investment capital from the sector as potential investors find it more profitable to operate in the distributive trade sector.

The growth of the sector remain strategic for significant poverty reduction and for the achievement of the MDGs. Expansion in industrial activity is one sure way of generating employment and enhancing incomes directly, but also indirectly by complementing and sustaining economic activity in the other sector through the demand for raw material inputs. This assertion is most compelling in agro-based manufacturing, as the agriculture sector employs most of the people, yet experiences the lowest of incomes due to lack of market outlets for the produce of the sector.

The current policy seeks to "increase employment through the expansion of the number of jobs at the prevailing level of productivity and a continuous drive to improve the level of productivity, technology and technological capability." This policy prepared in 1996 has become redundant. It is currently being revised and the revised policy will attempt to address some of the above issues as well as the priorities set out in PRSP II with a view to creating an investment friendly environment for industry in the country, and embrace advances in technology to foster greater productivity. (Industrial Policy 1996)

4.2.10 Water Resource Policy

The Gambia's Water Policy was developed through a consultative process and draws from various international accords before it. Some objectives of the Water Policy in summary are as follows:

- Acknowledges that access to water is a common right;
- Involves people and places them at the centre of the process, consults widely with stakeholders to achieve the objectives;
- Places environmental protection and the preservation of the country's ecological heritage at the fore front of development;
- Defines the necessary administrative structures and defines the procedures required to implement the policy etc. (Report on the Situational Analysis of Children and Women in The Gambia 2010 – UNICEF)

Considering the objectives above, the Water Policy appears to have been poorly developed. The Policy document only covers guidelines and does not articulate what the policy is formulated to achieve or the strategic actions for achieving the objectives. In its current form, the policy does not clearly show the relevance of energy services for the provision of adequate safe water. The revised water Bill is yet to be passed into law.

The preoccupation of any effective Water Policy should be how to provide water for domestic, industrial and institutional use, especially bearing in mind the need for water for irrigation schemes for expanded and continuous cultivation, as well provision of safe water as an essential pillar of sustainable health for the population. Access to safe water covers 85.1% of all households, 79.9% of urban households and 64.9% rural households. According to officials of the Ministry of Fisheries and Water Resources, most of the water provided now is for domestic consumption using solar reticulation system.

4.2.11 Sanitation Policy

The draft National Sanitation Policy recognises basic sanitation as a human right. The policy stresses the importance of water in sanitation, and it may pass as a water and sanitation policy. It has the following objectives:

- All people in The Gambia have access to a functioning basic quality water supply by 2015 – access is defined to mean that the distance to the water source must not be more that 200 metres from one's location ;
- All people in The Gambia have access to functioning basic quality sanitation facilities by 2015
- 70% of households have access to basic sanitation know-how to practice safe sanitation by 2015
- All schools/clinics/health centres have access to adequate and safe water and sanitation facilities by 2015

Hygiene education and wise use of water are taught in all schools including Madrassas by 2010 (Situational Analysis of Children and Women in The Gambia 2010 – UNICEF)

The Sanitation Policy is clearly articulated, but it remains a draft – not approved; the Public Health Act that provided the framework for the implementation of the policy has also not been finalised.

4.2.12 Health Policy

The long-term objective of the health sector in Vision 2020 is to provide adequate, effective and affordable health care for all Gambians.The main objective of the Health Policy 2011 – 2015 in a bid to realise the Vision goals, is thus to provide quality and affordable health services for all by 2020.

Currently,Infant Mortality Rate stands at 75/1,000 live births driven mainly by malaria, diarrhoeal diseases and acute respiratory tract infections. The main causes of child mortality in addition to malaria and diarrhoeal diseases are pneumonia and malnutrition. Maternal Mortality Ratio is estimated at 730/100,000 live births, the majority of which are due to sepsis, haemorrhage and eclampsia (PAGE 2012). HIV prevalence rate is 1.1% for HIV1 and 0.6% for HIV2 (PAGE). Tuberculosis remains a disease of public health importance in The Gambia as positive cases identified has increased from 56% in 2004 to 66.7% in 2005.

There has been an increase in national coverage for fully immunized children to a present level of 79.6 % for under 1 year and 84.9% for the under 2 years. Considerable progress has been made in the areas of Expanded Programme of Immunisation (EPI) coverage, expansion of health facilities and in recruitment of trained health personnel. Also, relevant policy documents were developed including that of Nutrition, Drug, Malaria Reproductive and Child Health, Human Resource for Health, Maintenance, Mental Health, HIV/AIDS, Health Management Information System, National Blood Transfusion and Information Technology; others on related issues such as Traditional Medicine, National Health Laboratory and Health Research are at various stages of development.

4.2.13 Gambia Investment and Export Promotion Agency (GIEPA) Act 2010

The Act establishes the Gambia Investment and Export Promotion Agency (GIEPA) to among others:

- Promote investments in The Gambia by promoting its image as an investor friendly country;
- Facilitate the securing of investment incentives by investors;
- Undertake analysis of applications for incentives, location of export processing zones or export processing zones operators;
- Monitor the performance of investors in respect of their obligations as set out in their investment proposal, special investment certificate and take appropriate action in the event of violation;
- Formulate and implement investment, export and enterprise development guidelines and investment promotion strategies;
- Promote and facilitate the development of micro, small and medium scale enterprises;
- Undertake trade and sector studies including market surveys, with a view to identifying investment opportunities; and
- Advise government on investment, export and industrial policy and related matters.

The Act in addition to guaranteeing the rights and obligations of investors also provides for incentives for various categories of investment and priority investment defined either by sector or geographic location. Also specified in the Act are incentives for export promotion including the establishment of export processing zones, and support to micro, small and medium scale enterprises.

4.2.14 Employment Policy 2010-2014

Increasing the proportion of the population in gainful employment helps to spread the wealth around and reduce dependency and poverty. Employment creation is therefore an essential

component of the PAGE. In this pursuit, economic activities as well as skills that generate more employment opportunities will be promoted.

The Employment Policy is thus designed "to promote full employment as a priority in national, economic and social policy and to enable the economically active population to attain and secure sustainable livelihood through full productive and freely chosen employment and work by the year 2020".

The specific objectives include:

- Reducing rates of unemployment and under-employment by 5% per annum;
- Promoting a well-educated, trained, skilled versatile, self-reliant and enterprising labour force;
- Pursuing poverty reduction policies through labour intensive programs consistent with improvement of the labour environment; and,
- Strengthening the existing labour administrative system for promotion of decent work, worker participation in decision and an efficient industrial conflict resolution mechanism in the labour market.

Some strategic actions have been identified for achieving the objectives of the Policy. These in summary include: i) promoting micro and small enterprises both in the urban and rural areas; ii) establishment of a Special Fund for enterprise and skills development training as well as start-up capital; iii) promotion of labour intensive technologies in public works/programmes both at the Central and Local Government level targeting youths and women; iv) improving the working conditions and labour productivity; and v) strengthening the institutional framework and mechanisms for coordination, monitoring and evaluation of employment generation strategies on a continuous basis. The employment policy must however be implemented in conjunction with other sector policy that employ resources including human resources for obvious reasons, thus the importance of establishing a consistent framework for the coordination of policy implementation across the relevant sectors.

The overall national unemployment rate in The Gambia is low at 6 (The Medium Term Programme (MTP) 2011. However, it appears that many people earn far below the income needed to maintain a decent standard of living. This is in consideration of the fact that the majority of urban residents depend on wage employment and a monetized system, underemployment and low wages. These coupled with high costs of basic needs (e.g. food, housing, health and education services) as well as large family size and high dependency rate all go to undermine the potential impact of high employment rate on living standard. . According to statistics, 40% of the youth and 70% of the women are engaged in low productivity subsistence agriculture. It is thus in order that employment issues are a major cause for concern for the government.

4.2.15 National Information & Communication Infrastructure Policy

The National Information & Communication Infrastructure (NICI) policy was designed to increase the benefits of accessing and using ICT to the population by liberalizing the ICT sector to increase competition and more choice for consumers, developing sufficient ICT human resources capacity in the country, promoting the building of appropriate ICT infrastructure and supporting ICT development countrywide and by establishing a Universal Services Fund to provide reliable basic ICT services for the citizenry countrywide so as to meet Universal Services Obligations.

Of relevance is the provision of ICT services to the citizens considering the significant role information could play in national development. Most national development efforts require citizen support, participation and ownership to succeed and be sustained. Information also empowers

people to take better charge of their health, production and marketing decisions. Thus bringing basic ICT services to the door step of every citizen provides government with a means to mobilise the public in support of public policies and programmes. Expanding ICT services to rural and peri-urban Gambia is challenging considering the lack of supporting energy services. Widespread provision of ICT facilities should therefore be preceded by the provision of supporting energy services in all communities.

4.3STRATEGIES AND PLANS

4.3.1 Universal Access to Electricity

Over the last ten years access to electricity by the general population has increased significantly especially for the urban population. In 2000, the number of residential customers connected to the public utility company's networks was about 36,000 customers, but this has increased to just under 100,000 in 2011. Figure 4.2 shows the long term electricity generation in The Gambia. It is very clear that over the last five years electricity generation has risen sharply due to rapid urban development. However, this figure represents only the supply side as full demand is still unmet.

In 2000, only 111 GWh of electricity was generated, but in 2010 this figure more than doubled to 234 GWh. The Government has made a strong commitment to expand both rural (provincial) and urban electrification. Since 1994, more than 50MW of new generation capacity has been added, which has improved the power supply significantly. However, this must be reviewed within the context of increasing demand. NAWEC estimates that the annual growth of electricity demand in The Gambia is 6 MW.

In 2001, the electrification rate of the City of Banjul was estimated to be about 70% and 20% for the entire country (National Energy Policy, 2005). The national electrification rate in 2010 was estimated be 40%. The residential sector has seen the highest growth in terms of electricity consumption (see Figure 4.3). The overwhelming acceptance of prepayment meters has contributed to the strong demand for the electricity sector. Another factor for the increased demand is the government policy to reduce the cost of electricity meters by 50% for provincial consumers in 2009 from D6000 (US$200) to D3000 (US$100). Furthermore, low income households were granted a relief with the introduction of a lifeline tariff where the first 40kWh consumed was charged at a subsidized rate of D2.02 (US$0.07/kWh).

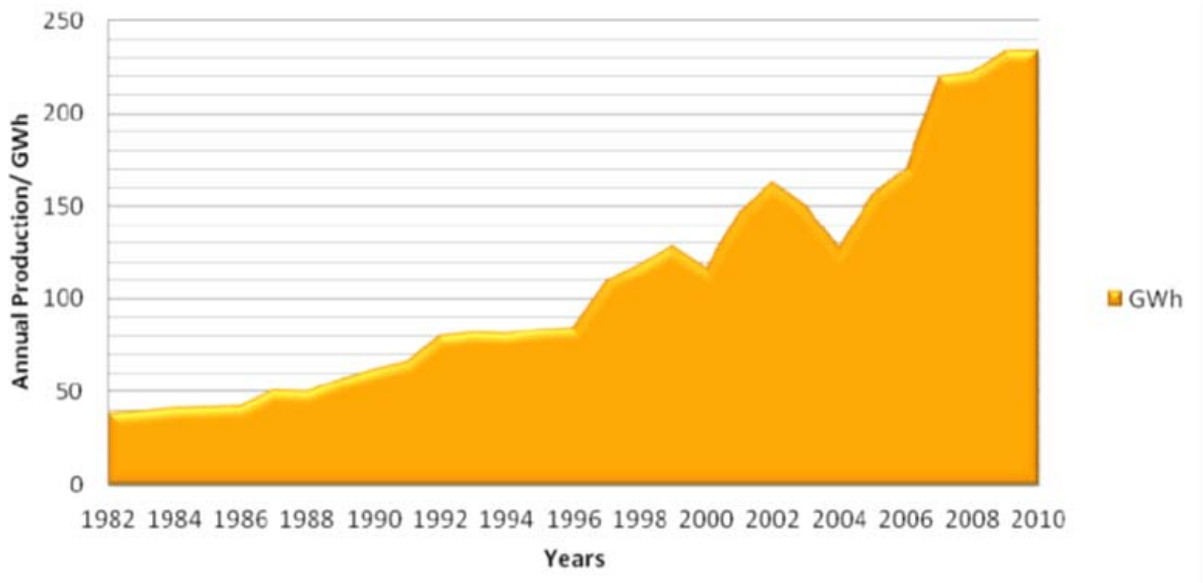

Figure 4.2: Historic Generation of Electricity in The Gambia (MOE/PURA)

Figure 4.2: Historic Generation of Electricity in The Gambia (MOE/PURA)

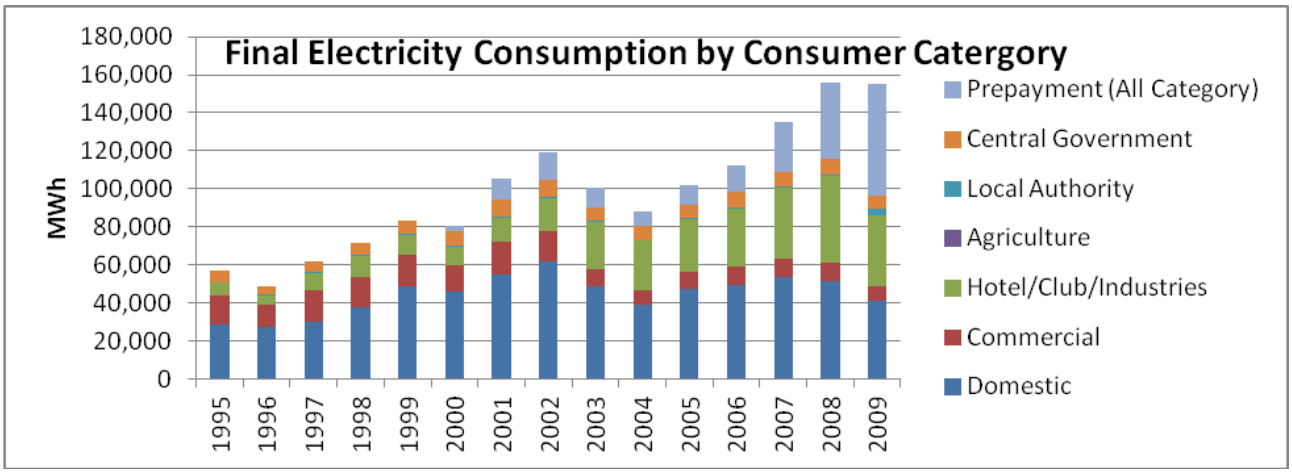

Figure 4.3: Final Electricity Consumption in The Gambia by Consumer Category

Recently NAWEC has embarked on the expansion of the grid infrastructure and a medium voltage transmission line (33kV) has been extended 120km to the end of the western region. This will inevitably increase access to the majority of the population in the GBA (see Table 4.1). Figure 4.4shows the Electricity Grid Infrastructure in The Gambia.

Table 4.1: Rate of Access to Electricity by Local Government Area

Region	Electrification Rate
Banjul	93%
Western	22%
UpperRiver	14%
LowerRiver	12%
CentralRiver	7%
North Bank Region	6%

Source: Ministry of Energy, 2011

In spite of the lifeline tariff for low income households, affordability of electricity remains a highly sensitive issue. Regional benchmarking shows that electricity in The Gambia is very expensive for both residential and commercial consumers. Table 4.2 shows the tariffs for the various categories of consumers. Figure 4.4 also shows the electricity tariff in the Gambia, in comparison to those in some other ECOWAS member countries.Table 4.3 below compares the tariffs in The Gambia with some of its West African neighbours. As shown in the table, The Gambia has the highest tariff as a percentage of per capita GDP even after the two recent reductions.

Table 4.2: Electricity Tariff in The Gambia, 2011

Customer Category	Consumption Band	Current Tariff / D/kWh	Current Tariff / US $/kWh
Domestic	0 - 40 kWh	2.24	0.07

	41 - 600 kWh	7.20	0.24
	601 -1000 kWh	7.75	0.26
	balance	8.40	0.28
Commercial	Flat Rate	8.60	0.29
Hotel / Club / Industries	Flat Rate	8.95	0.30
Agriculture	Flat Rate	8.00	0.27
Area Councils	Flat Rate	8.70	0.29
Central Government	Flat Rate	8.70	0.29
Prepayment Domestic	Flat Rate	7.20	0.24

Source: NAWEC, 2011

Table 4.3:Comparison of Tariff Affordability in Select West African Countries

	Effective Residential Tariff (US cents) @ 100 kWh/month Usage[2]	2009 Monthly Per Capita GDP ($US)[3]	% of Monthly Per Capita GDP Spent on 100 kWh of Electricity
The Gambia[1]	21.2	98	21.7%
Senegal	23.8	139	17.2%
Burkina Faso	20.0	103	19.5%
Cote d' Ivoire	11.9	134	8.9%
Ghana	8.2	128	6.4%

1: Information provided during the mission to The Gambia (no two-part tariff fixed charge was included as information provided did not suggest the presence of one)

2: Source: Power Tariffs: Caught between cost recovery and affordability - World Bank

3: Source: OECD database - http://stats.oecd.org/

Affordability and reliability of electricity also remains the biggest challenge for industry consumers. Consultation with the Manufacturers' Association as well as the Hotels' Association highlighted the fact that the cost of energy severely limits their business growth and competitiveness. In both the manufacturing and tourism sectors, the cost of electricity was reported as high as 30% and 35% of total operating cost, respectively. Figure 4.5 gives a graphical presentation of the Power Sector Planning and Expansion Strategy of The Gambia, with the aim of addressing some of the challenges of the sector.

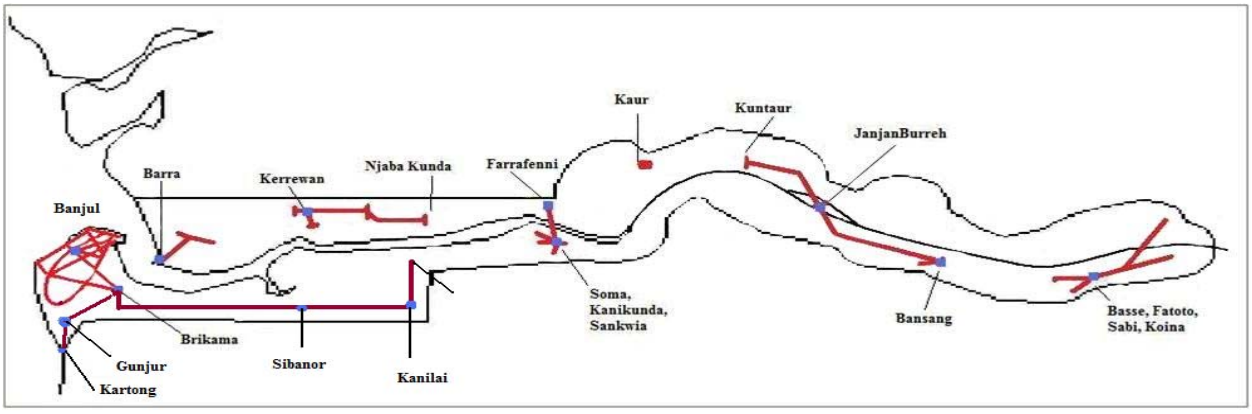

Figure 4.4: Electricity Grid Infrastructure in The Gambia

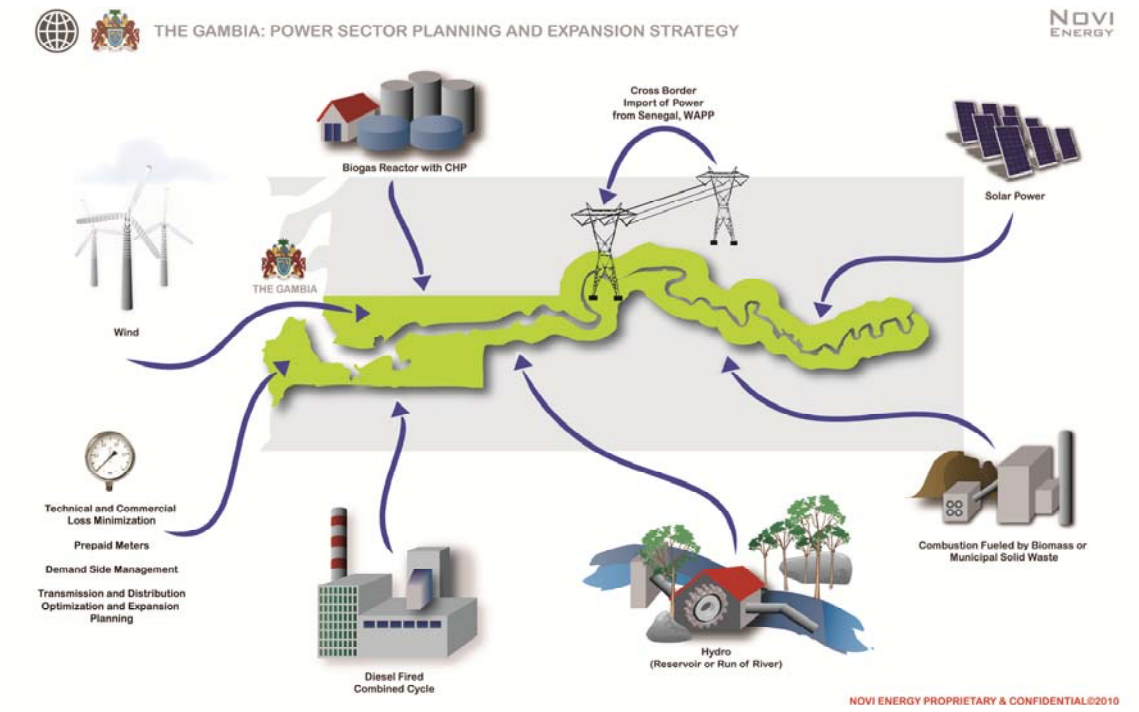

Figure 4.5: Power Sector Planning and Expansion Strategy of The Gambia

Source: World Bank, 2010

Over the longer term, The Gambia has an opportunity to enhance and diversify power supplies by tapping into the West Africa Power Pool (WAPP). Ongoing planning by the WAPP includes hydro power projects expected to be developed in member countries of the Gambia River Basin Development Organization (OMVG) that include Guinea, Guinea Bissau, Mali and Senegal, in addition to the Gambia. Under the WAPP, preparations are currently underway for the development of a power systems development subprogram that would link the networks of The Gambia, Guinea, Guinea Bissau, Mali and Senegal with a 225 kV transmission line of 1674 km length interconnecting the five countries (Gambia portion would be 183km). Two hydropower generation projects are integrated with the transmission line project under consideration: 128 MW hydropower project at Sambangalou; and 240 MW hydropower project at Kaleta. Given the large size of the overall projects, and considering the need to mobilize resources and build capacity over time, OMVG is considering a phased implementation of the project, starting with the Kaleta hydropower plant (240MW) and 1151 km transmission lines connecting the five OMVG members. The Gambia should begin planning for this first phase while preparatory and fund-raising activities continue to implement the second phase which includes the Sambangalou power plant and closing of the transmission loop. The first phase is expected to be completed by 2016.

The main objective of the OMVG subprogram is the regional management of water resources in order to develop power generation, irrigation and navigation; and cooperation amongst the counties in sectors including transport, agriculture, environment and energy. The five OMVG member states belong to the isolated Zone B countries. Of these five OMVG member states only Senegal is currently connected to the WAPP grid through the OMVS network, and has a sizeable power sector, with a total installed generation capacity of 514 MW. The installed generation capacity in the four remaining countries combined is about 300 MW. The OMVG sub-region (particularly Guinea) has abundant hydro resources that are considered suitable for power

generation, but have not been exploited yet. Studies estimate that Guinea's hydro-generation potential (technically and economically feasible) could reach 6,000MW. Regional cooperation under the OMVG/WAPP can help Guinea to unlock this potential, with benefits for the whole sub-region, including The Gambia which currently relies heavily on imported oil for power generation, and is looking for opportunities to diversify electricity supply mix towards cleaner energy sources. There are several steps The Gambia can undertake to prepare for the interconnection including: initiating the planning of the distribution network needed to absorb their share of energy; a technical grid synchronization and integration study; and capacity building measures to understand the operations of a high voltage transmission system.

4.2.1.1 Stand-alone Diesel Generation Units

Through the Rural Electrification Project (REP), NAWEC was able to build new power plants in all the provincial towns and also distribute LV networks throughout these settlements. This has greatly improved the access to electricity not only for households but also businesses. However, the supply of electricity is not continuous because the generators operate for only six hours in the morning and six hours in the evening. Since the oil price increases particularly during 2008, the provincial operations have become very expensive not only to run but also to maintain.

In The Gambia the tariff for electricity is the same throughout the country and hence although the cost of using a diesel generator set in the provinces may be as high as D20.00/kWh (US$0.66/kWh) the customers pay the same price as those in the Greater Banjul Area. The Rural Electrification Project did not only put generator sets in the towns, but in some areas a transmission network to satellite villages was added. For instance, Basse supplies more than 20 settlements and the furthest one Koina, is about 50km away served through a 33kv line. The total project cost was US$21 million. Recently other notably projects that have had huge impacts on access are the Venezuela project (US$20m) and the Western Region Electrification project (US$10m). The former is focused on extending LV lines to several peri-urban villages whilst the latter will extend the medium voltage network by more than 150km to cover the entire West Coast region.

4.2.1.2 Gap Analysis

The power sector is characterized by a number of strengths which provide opportunities for the realization of the goal of universal access to electricity. The strengths of the power sector include the following:

- The Government's strong commitment to expand the electricity network to many communities in The Gambia;
- Willingness of private sector(investors) to partner with government to provide electricity services;
- Examples of connectivity within the sub-region to learn from;
- Availability of market (domestic and commercial) for the electricity that could be produced in future

The power sub-sector also faces a number challenges in achieving the stated goal of ensuring wider access to electricity in The Gambia. The sector is challenged by:

- Inadequacy of the transmission and distribution (T&D) network;
- Lack of fuel diversityas well as high cost and irregular supply of fuel for electricity generation;

- Operational inefficiencies in the key utility companyNAWEC resulting in transmission and distribution losses;
- NAWEC's poor financial performance;
- Weak regulatory and enforcement capacity;
- Poor reliability of electricity supply from the grid;
- Limited hours of supply of power by stand-alone generators in the rural areas; and
- High electricity tariffs and non-affordability of electricity.

Recommended strategies to address these challenges include:

Short Term

- Perform detailed transmission and distribution infrastructure analysis to reduce technical transmission and distribution losses, analyze potential interconnections with Senegal, integration into the West Africa Power Pool, and generate a comprehensive T&D master plan;
- Improve financial performance of NAWEC;
- Employ financial advisory services organization to investigate strategies for fuel price volatility reduction;
- Arrange payment of past-due bills by Central and Local Governments;
- Increase use of pre-paid metering. Require that government facilities and electric loads, including street lights, utilize pre-paid meters;
- Amnesty offer to domestic and commercial customers with past-due bills and unbilled use of energy followed by aggressive pursuit of payment with Government assistance;
- Enhance maintenance plans for generation facilities to improve availability;
- Assess the investment incentive structure to determine if incentives are sufficient to attract private investors;
- Perform detailed renewable energy study for potential domestic sources of power generation;
- Conduct a review of PURA's capabilities and independence including the government, regulators, utility, and IPP to address empowerment of PURA and improvement of the industry;
- Implement demand side management initiatives such as promotion of compact fluorescent lamps (vs. incandescent), energy efficient appliances, energy efficient motors for industrials, and peak shaving tariff structures; and
- Investigate feasibility of upgrading generation facilities to combined cycle operation.

Medium/Long Term

- Solicit financing (using results of incentive review) to implement the actions recommended in the transmission and distribution infrastructure analysis;
- Improve financial performance of NAWEC;
- Adjust tariffs to reflect new, more stable cost structure and incorporate fuel charge adjustment on customer bills;
- Identify the most promising renewable energy projects and provide incentives (based on results of short-term incentive review) to attract private financing; and
- Revisit increased privatization and a less vertically integrated industry structure after the above issues have been addressed.

4.2.3 Modern Energy for Cooking

With respect to ensuring access to clean fuels and devices for cooking and heating, the strategies pursued by The Gambia include the promotion of the following:

- Liquefied Petroleum Gas
- Improved Cook Stoves

4.2.3.1 Liquefied Petroleum Gas (LPG)

The Gambia currently has the infrastructure to import and store it in bulk. The main issue with LPG remains the initial costs of the cylinders, and effort need to be made to reduce the costs of the cylinder for ordinary Gambians. Lessons and good practices on LPG promotion from Senegal and Ghana could be applied in The Gambia. To enhance the switch of households to LPG, it is necessary to review the price of charcoal to reflect the real cost of production.Table 4.4 compares the LPG Programmes in The Gambia and Senegal.

Table 4.4:Differences in LPG Programmes in Senegal and The Gambia

The Gambia LPG Programme	Senegal LPG Programme
LPG introduced as a project first in the early 1980s and then in 1990 as Regional Butane Project under CILSS Gas Project	Government initiative started in 1973, before the Regional Project
All LPG is imported from Senegal, with high transport costs, periodic shortages and foreign exchange vulnerability	LPG produced locally from the refinery and adequate storage available
Tax subsidies for free importation of LPG	LPG is fully subsidised by the government
Penetration very low	High penetration level in urban centres; 60% of all Dakar households use LPG.

4.2.3.2 Improved Cook Stoves

Several stoves been promoted that are purported to enhance saving in fuel from 40% to 75%, however these figures are often achievable under controlled environments and the actual saving that is gained in the household is often lower, generally about 25%. Some factors that have influenced the success or failure of past initiatives to promote improved stoves arfe summarised in Table 4.5.

Table 4.5: Factors for Success / Failure of Promotion of Improved Stoves

Reasons for Success	Reasons for Failure

Stoves are designed with assistance from local artisans	Local metal workers are required to build stoves based on rigid specification
Local materials and scrap metal are used in stove construction to limit costs	New or imported materials are used, making the stoves expensive
Design is simple and similar to traditional stove	Complicated stoves different from traditional stove
Stove reduces cooking time, fuel and effort	Stoves do not lead to any noticeable saving in real cooking conditions
Short payback time (1-3 months)	Consumer payback time greater than 1 year
Market surveys are undertaken to assess potential market for the new stoves	Outside ''experts'' determine the new stoves are needed
Improved stoves are introduced where already smoke is a problem	Where smoke is not an issue and people cook outside

Source: ESMAP, World Bank, 1994

The strengths of improved cookstoves in achieving social, economic and environmental goals can be summarized as follows:

Social:

- Reduced fuel costs for families and freeing up money for other uses, thereby improving livelihoods of the poor.
- The improved stoves provide less smoky, reduced emissions of hazardous air pollutants and improved the health of users, typically women and children.

Economic:

- Employment and income opportunities throughout the value chain i.e. in manufacturing, distribution, retailing, quality control and project management.
- Improving technological self-reliance when stoves are locally manufactured and specialist skills developed or transferred in-country.

Environmental:

- Significant savings in greenhouse gas emissions through a reduction in charcoal consumption.
- Reduced pressure on remaining forest reserves in The Gambia, slowing widespread deforestation and aiding biodiversity.

In addressing the challenges relating to wood fuels, the strategies implemented by Government will include:

- Support for the sustained regeneration of woody biomass resources through legislation and fiscal incentive;
- Promotion of the establishment of dedicated woodlots for wood fuel production;
- Promotion of the production and use of improved and more efficient wood fuel utilisationtechnologies;
- Promotion of the use of alternative fuels such as LPG as substitute for fuel wood and charcoal;
- Promotion of the production and use of other wood fuel energy resources (waste, biofuels);
- Sensitisation and Capacity Building of communities in community forest management, training of craftsmen on the construction of fuel efficient stoves, and support to set up distributors and distribution networks;

- Expansion of access to LPG for cooking in the urban and peri-urban areas;
- Promotion of improved charcoal stoves in the urban and peri-urban areas, and improved fuelwood stoves in rural areas; and
- Promotion of the production and use of briquettes from groundnut residue.

4.2.3.1.1 Institutional Framework

The Ministry of Energy continues to play a key role in the promotion of improved stoves, in collaboration with the following institutions and agencies:

- Department of Community Development
- Non-governmental organisations
- Community-based organisations

4.2.3.1.2 Gap Analysis

Many of the programmes to promote improved cookstoves under-performed mainly due to the following reasons: lack of standards and quality control of the cookstoves; high cost of the improved cookstoves compared to the traditional cookstoves; and supply driven projects that paid very little attention to consumer research, stove design, market development, long-term financing and business growth.

In order to scale up the adoption of improved cookstoves nationwide requires the implementation of sustainable promotional measures that:

- Promote technical research and development to adapting cookstoves and programs to country context;
- Develop performance standards and benchmarks on safety, (energy) efficiency, emissions, and durability;
- Promote awareness raising, consumer research and business development taking account of consumer preferences and behaviour;
- Develop innovative financing mechanisms that can target subsidies and grants;
- Enhance the capacity of local and national institutions to promote advanced biomass cookstoves;
- Encourage the establishment of energy funds that enable financial institutions to effectively administer support to promote biomass cookstoves; and
- Develop and implement coordination, monitoring and evaluation mechanisms.

4.2.4Promotion of Energy Efficiency

The biggest consumption of electricity in Gambian households is for lighting, entertainment (TVs, etc.) and refrigeration. Primary energy consumption per capita is 0.081 toe. Air conditioning in office buildings contributes significantly to the energy consumption by businesses.

The key issues and gaps regarding energy efficiency are summarized and presented as follows:

- Limited generation capacity of power generating companies to able to supply urban and peri-urban areas
- Heavy dependence on oil to produce electricity with its attendant high cost

4.2.4.1 Institutional Framework

The key players in energy efficiency sub-sector in The Gambia are the Ministry of Energy, Gambia Renewable Energy Centre (GREC), the Renewable Energy Association of The Gambia (REAGAM), and private sector/civil society organizations.

4.2.4.2 Gap Analysis

The challenges related to the promotion of energy efficiency in The Gambia include:

- Weak public education and awareness of significance and measures for energy efficiency and conservation;
- Lack of fiscal and financial incentives to encourage the use of energy efficient appliances and technology;
- Inadequate financing for energy efficiency and conservation programmes;
- Limited outreach of relevant institutions to extend services to districts and rural communities;
- Weak institutional capacity for monitoring and enforcement of relevant regulations; and
- Weak coordination of monitoring and enforcement of relevant regulations

In terms of the SE4ALL, the key issues to be addressed to promote of energy efficiency in The Gambia include:

- Intensive and extensive public awareness and education;
- Improved institutional capacity building and effective coordination for monitoring and enforcement of relevant regulations;
- Fiscal and financial incentives to encourage the use of energy efficient appliances and technology by households, commercial and industrial sectors;
- Innovative financing schemes for energy efficiency and conservation programmes; and
- Addressing gaps in statistical data for periodically evaluating the rates of energy efficiency and conservation nationwide, covering domestic, industrial, commercial and agricultural users and public services (e.g. health and education).

4.2.5 Share of Renewable Energy in the National Energy Mix

Table 4.6 presents the strategies and actions planned by the Ministry of Energy for the Promotion of Renewable Energy and Energy Efficiency in the period 2010 – 2014

Table 4.6:Strategies for Promotion of Renewable Energy and Energy Efficiency, 2010 – 2014

Strategy	Activities
1. Resource mobilization	Donor roundtable Private Sector
2. Research and development	Make GREC as a Directorate and provide funding
3. Develop legal and regulatory framework	Legislate Renewable Energy and Energy Efficiency law
4. Increase the usage of solar PV and wind turbine for electricity generation	Implement renewable projectsVillage solar lighting system (5 Villages in 2010)
5. Devise a classification/ grading mechanism for renewable energy devices	Conduct verification test on the devices
6. Comprehensive sensitization program	Continue sensitization
7. Provide special incentives for would-be investors in renewable energy	Liaise with GIPFZA on incentives/ prepare Cabinet Paper on the special incentive

4.2.5.5 Planned Programmes on Renewable Energy

To support the government on energy source diversity, institutions such as the Gambia Renewable Energy Center (GREC) and REAGAM have been established to research, develop, and promote the various renewable energy technologies in an effort to harness the full potential of renewable energy in The Gambia.

The Ministry of Energy as part of their Strategy Plan has identified the promotion of the use of renewable energy and energy efficiency as two of their objectives. The Ministry has indicated that there are three strategies that need to be targeted in order to improve the implementation of renewable energy generation: 1) The development of legal and regulatory framework as it relates to renewable energy and energy efficiency; 2) increasing the usage of Solar PV and Wind turbines for electrical generation; and 3) the inception of incentives for independent investors in renewable energy.

The Ministry has provided a plan that identifies the usage of Solar PV and Wind turbines as priorities, and they have allocated the largest amount of investment to address this program. Although, the Ministry's Action Plan did not provide information to support the basis for these allocations, the Ministry did receive a two-phased study from the African Development Bank that may have guided their decision. The first phase of the study was to screen the renewable sources of energy and evaluate the potential, technical feasibility, and environmental benefits for The Gambia (28). The Government of The Gambia then decided that further feasibility studies be conducted to focus on two projects:

- Small Scale Wind Park – A small wind farm (4MW) near the city of Brufut; and
- Solar Home System Program – Development of Solar Home Systems (SHS) for rural households and other PV systems for schools, medical clinics and telecommunication centres.

The Small Scale Wind Park is a proposal that would be the first wind park project in the country. The project included the installation of medium sized (600kW) proven wind turbine types in the town of Tujereng. The wind park was proposed as a two phase project with the installation of three turbine units during each phase. The feasibility study included the use of new and re-powered wind turbines to demonstrate the influence on project economics.

The Solar Home System Program was recommended to the Government as an energy supply option for remote communities or small villages where connection to the transmission and distribution network are not feasible. The SHS Program included the installation of approximately 10,200 SHS and PV systems for rural clinics (30 systems), schools (54 systems), and in community centers for telecommunications (18 systems). The proposal on the program noted that the SHS program is very expensive in terms of generation costs over the project's lifetime but it was more economical than conventional power generation solutions that would require transmission and distribution network extension.Both studies have provided the appropriate amount of information for the Government to make a determination on whether to proceed with projects. However, neither of the projects hasbeen pursued yet by the Government.

Targeting The Gambia's potential for renewable generation and evaluating the economic viability of the various technologies should help improve the country's self-sufficiency and ability to meet the increasing power demand.

4.3.5.1 Institutional Framework

The key players in renewable energy sub-sector in The Gambia are the Ministry of Energy, Gambia Renewable Energy Center (GREC), the Renewable Energy Association of The Gambia (REAGAM), private sector/civil society organizations such as the Solar Association at Tiloo, and the private sector.

4.2.5.2 Gap Analysis

The main strengths related to the promotion of renewable energy in the national energy mix are summarized as follows:

Biomass:

- Widespread availability of biomass resources

Mini-hydro, Solar and Wind energy:

- Favourable locations for mini-hydro development identified
- Favourable wind speed in coastal areas
- Solar radiation levels generally satisfactory

Waste-to-Energy

- Widespread availability and generation of municipal, industrial and agricultural waste

Despite these strengths and opportunities, some rural communities may regard renewable energy (RE) an inferior forms of energy and therefore integration into the national electrification programme will require extensive rebranding, strategizing and planning to ensure effective integration of RE into The Gambia's energy mix. Other challenges specific to the various forms of renewable energy include:

Biomass

- Unsustainable production techniques
- Inefficient utilization
- Difficulties in obtaining secure tenure for large tracts of land for commercial development of biomass

Mini-hydro, Solar and Wind energy

- High cost of energy generation due to current state of technology
- Mini-hydro highly susceptible to climate changes

Waste-to-Energy

- Low exploitation of waste-to-energy technologies
- High cost associated with the collection and management of waste materials.

The under listed are key issues and gaps related to the promotion of renewable energy in the national energy mix:

- Availability of land with secure tenure for private sector investment in large-scale biomass development;

- Long-term sustainability of biomass production;
- High initial investment cost of energy generation from solar, wind and mini-hydro;
- High cost of waste collection and management; and
- Inadequate statistics and data disaggregation on renewable energy

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