



# **Kingdom of Swaziland**

# **Sustainable Energy for All Country Action Plan**

**Final Report**

**May, 2014**

## FOREWORD

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## ABBREVIATIONS

CSO	Central Statistics Office
CSP	Concentrated Solar Power
EdM	Electricidade de Moçambique
ESKOM	Electricity Supply Commission of South Africa
EIA	Environmental Impact Assessment
FSE&CC	Federation of Swaziland Employers and Chamber of Commerce
ha	Hectare (10,000 m <sup>2</sup> )
GoS	Government of Swaziland
kW	Kilowatt (10 <sup>3</sup> watts)
HFO	Heavy Furnace Oil
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
LPG	Liquefied Petroleum Gas
MNRE	Ministry of Natural Resources and Energy
MET	Swaziland Meteorological Services
MOA	Ministry of Agriculture
MW	Megawatt (10 <sup>6</sup> watts)
NEPIS	National Energy Policy Implementation Strategy
PPP	Public Private Partnership
PV	Photovoltaic
RSSC	Royal Swaziland Sugar Corporation
RRA	Renewables Readiness Assessment
RE	Renewable Energy
RETs	Renewable Energy Technologies
SAPP	Southern African Power Pool
SEA	Swaziland Environment Authority
SEB	Swaziland Electricity Board
SEC	Swaziland Electricity Company (Formerly SEB)
SERA	Swaziland Energy Regulatory Authority
SIPA	Swaziland Investment Promotion Authority
SWASA	Swaziland Standards Authority
TJ	Terra-Joule (10 <sup>12</sup> Joules)
USL	Ubombo Sugar Limited
UNISWA	University of Swaziland

# 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 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 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.

The Kingdom of Swaziland is one of the Sub-Saharan countries which embraced the UN initiative it embarked on the Sustainable Energy for All (SE4ALL) Rapid Assessment and Gap Analysis and subsequently developed a Country Action Plan on SE4ALL in Swaziland. This report presents the SE4ALL) Rapid Assessment, Gap Analysis and Country Action Plan of Swaziland.

The SE4ALL Rapid Assessment, Gap Analysis and Country Action Plan of Swaziland was conducted through a comprehensive desk review and stakeholder consultations covering government ministries and departments, utilities, non-governmental organisations, the private sector and development partners in Swaziland. The list of stakeholders who participated in the consultations is presented in the Appendix. 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, The assessment and analysis also covered the energy 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 **key issues and gaps** to be addressed with respect to access to electricity in Swaziland under the SE4ALL Action Plan are identified and summarised as follows:

- Provision of major incentives for the commercial development of the sub-sector by private sector investment. Increased private sector investment in power generation infrastructure through Independent Power Producers (IPPs) will



reverse the current situation of the very low proportion of direct investment from the private sector;

- Raising investment funding through carbon credits for green energy generated from sugar cane residue and wood chips;
- Promotion of productive use of electricity to accelerate agricultural and industrial development to address limited productive uses of electricity;
- Improvement of the technical, managerial, financial and regulatory capacity of key institutions in the energy sector in order to address managerial and technical inefficiencies;
- Review of the guideline that requires reapplication of electricity generation licence every 2 years – which creates uncertainty on long term planning and cogeneration expansion programmes; and
- Development of National Integrated Resource Plan clearly outlining generation, transmission and distribution expansion plans and the contribution of renewable energy in the energy mix.

### **2.1.2 Gap Analysis on Productive Uses of Electricity**

The key issues and challenges identified in the promotion of productive uses of energy (PUE) include the following:

- Development of strategic partnerships with clear roles and responsibilities for key project stakeholders including development partners, Ministries, Departments and Agencies, Town Councils and Tinkhundla Centres, Community-based organisations, financial institutions, NGOs and private sector entrepreneurs and investors;
- Provision of sound business development training for key project implementers/managers, service providers and beneficiaries of PUE projects;
- Introduction of new business-oriented models and more robust results-based planning, monitoring and evaluation indicators and targets for PUE pilot projects, to ensure long term impact and sustainability of the projects;
- Participation of Town Councils and Tinkhundla Centres in the monitoring and evaluation of PUE projects, with the assistance of Implementation Committees that will be formed in the various communities where these projects are identified and implemented;
- Improved efficiency in the operation and maintenance of machinery and equipment, and adoption of technological improvements and upgrades.
- Better use and leverage of technical and research institutions such as the University of Swaziland and the Swaziland College of Technology.

### **2.1.3 Gap Analysis on Promotion of Improved Cookstoves**

The **key issues and gaps** that need to be addressed in Swaziland's SE4ALL Action Plan on improved cookstoves are summarised as follows:

- Promotion of technical research and development to adapt cookstoves and programs to country context;
- Development of performance standards and benchmarks on safety, (energy) efficiency, emissions, and durability of cookstoves;
- Promotion of awareness raising, consumer research and business development taking account of consumer preferences and behaviour;
- Development of innovative financing mechanisms that can target subsidies and grants on cookstoves;
- Enhancing the capacity of local and national institutions to promote advanced biomass cookstoves;
- Encouraging the establishment of energy funds to enable financial institutions to effectively administer support to promote biomass cookstoves; and
- Development and implementation of coordination, monitoring and evaluation (M&E) mechanisms.

#### **2.1.4 Gap Analysis on Promotion of Liquefied Petroleum Gas (LPG)**

The **key issues and gaps** to be addressed under the Swaziland's SE4ALL Action Plan relating to access of households to LPG are identified and summarised as follows::

- Awareness raising about the safe use of LPG, which statistics show that LPG is about two orders of magnitude safer than paraffin , as well as the benefits associated with its use
- Creation of a local LPG Safety Association to facilitate a forum for LPG suppliers, end-users and Government to raise and address industry issues collectively for the benefit of all citizens of the country;
- Development of networks of LPG shops and outlets, and development of a new business model to facilitate rapid household/commercial access to LPG as a fuel for cooking;
- Creation of legal and other institutional frameworks that will ensure availability and support enterprise for the distribution of this fuel in the country; and
- Regulation of the maximum retail price of LPG to ensure affordability of this energy source, particularly for low income households.

#### **2.1.5 Gap Analysis on Promotion of Energy Efficiency**

In terms of the SE4ALL, the key issues and gaps to be addressed to promote of energy efficiency in Swaziland include:

- Development, adoption and implementation of policy and regulatory framework for energy efficiency;
- Intensive and extensive public awareness and education on the benefits of energy efficiency;

- 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).

### 2.1.6 Gap Analysis on Share of Renewable Energy in the National Energy Mix

The **key issues and gaps** related to increasing the contribution of renewable energy in the national energy mix are:

- High initial investment cost of energy generation from solar, wind and small hydro;
- Inadequate statistics and data disaggregation on renewable energy – often leading to under-estimation of the renewable energy potential;
- Barriers to the availability of land with secure tenure for private sector investment in large-scale solar PV development;
- Lack of cost comparison studies on using renewable energy sources vis-a-vis conventional sources of energy; and
- High cost of collection and management of waste (as a renewable resource).

## 3. SWAZILAND SE4ALL COUNTRY ACTION PLAN

Swaziland’s SE4ALL Country Action Plan covers priority intervention areas to accelerate the attainment of the goal of SE4ALL by 2030, where the removal of critical bottlenecks are likely to yield the highest and most widespread impacts on people’s living conditions and economic livelihoods, particularly in under-served rural and peri-urban communities and households. In previous sections, the progress made in the energy sector of Swaziland has been highlighted, and strengths as well as many constraints in the sector have been identified through interactive consultations with energy sector stakeholders.

The stakeholder consultation process helped in collectively devising specific solutions and prioritized actions to accelerate the achievement in Swaziland of positive outcomes towards “Sustainable Energy for All” by 2030. The investment requirement for the Swaziland SE4ALL Country Action Plan is summarised in Table E.1, whilst the details are presented in Table 6.2. The total cost of the SE4ALL Country Action Plan is estimated to be **US\$1.06 billion (or SZL11.29 billion)** over the period 2014-2022, in consideration of 2022 being the target date of Swaziland’s National Development Strategy. As presented in Figure 6.1, required investment on access to modern energy constitute 84% of the total investment, followed by

investment on renewable energy at 14% and energy efficiency at 1%; required investment on cross-cutting issues constitute 1% of the total investment.

**Table E.1: Summary of Investment Requirement for Swaziland SE4ALL Country Action Plan**

<b>Component of SE4ALL Objectives</b>	<b>Prioritized Interventions</b>	<b>Total Cost, US\$ million</b>
Universal Access to Modern Energy Services	Increasing Local Electricity Generation Capacity	833.00
	Promotion of Productive Use of Energy (PUE)	0.65
	Access to Modern Energy for Cooking - LPG	0.90
	Access to Modern Energy for Cooking – Improved Cookstoves	6.35
	<b>Sub-Total</b>	<b>890.90</b>
Renewable Energy	Increasing the Contribution Of Renewable Energy in The National Energy Mix	142.75
Energy Efficiency	Increasing Energy Efficiency	6.10
Cross-cutting Issues	Cross-Cutting Issues	15.50
	<b>GRAND TOTAL</b>	<b>US\$1.06 billion</b> OR <b>SZL11.29 billion</b>

# 1. INTRODUCTION

## 1.1 BACKGROUND

Energy plays a significant role in improving people's living, thereby contributing to development. Energy is used for water supply 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 butane gas), 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 absence of modern fuels propels poverty spiral further downward. Thus, it is obvious that increasing access to good, affordable energy services is likely to engender considerable benefits in terms of people's living conditions, as well as helping 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.

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 and urged Member States and the United Nations 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 United Nations Secretary General launched a global Initiative to achieve Sustainable Energy for All by the year 2030. The key objectives under this goal are: i) ensuring universal access to modern energy services; ii) doubling the rate of improvements in energy efficiency; and iii) doubling the share of renewable energy in the global energy mix.

Following the launching of the initiative, 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.

Under the initiative, countries are expected to undertake: i) a rapid assessment and gap analysis with baseline data on sustainable energy access, including an assessment of

national initiatives on: a) universal access to electricity; clean fuels and devices for cooking/heating; and mechanical power; b) improvements in energy efficiency; and c) increasing the share of renewable energy in the national energy mix; and ii) 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.

The Kingdom of Swaziland is one of the Sub-Saharan countries which embraced the United Nations initiative and it embarked on the Sustainable Energy for All (SE4ALL) Rapid Assessment and Gap Analysis and subsequently developed a Country Action Plan on SE4ALL in Swaziland. This report presents the SE4ALL) Rapid Assessment, Gap Analysis and Country Action Plan of Swaziland.

## **1.2 METHODOLOGY**

The SE4ALL Rapid Assessment, Gap Analysis and Country Action Plan of Swaziland was conducted through a comprehensive desk review and stakeholder consultations covering government ministries and departments, utilities, non-governmental organisations, the private sector and development partners in Swaziland. The list of stakeholders who participated in the consultations is presented in the Appendix. The activity included a situation analysis, with baseline data on sustainable energy production, distribution and utilisation, and covered an assessment of national initiatives on: i) universal access to electricity; clean fuels and devices for cooking/heating; and mechanical power; ii) improvements in energy efficiency; and iii) increasing the share of renewable energy in the national energy mix, The assessment and analysis also covered the strengths and weaknesses of the energy sector in specific areas relevant to the sector such as policy, planning, institutions, finance, monitoring (data and accountability), capacity and partnerships.

## 2. COUNTRY OVERVIEW

### 2.1 GEOGRAPHY AND SOCIO-ECONOMIC INDICATORS

Swaziland is located in the Southern African region between the 25<sup>th</sup> and 28<sup>th</sup> parallels and 31° and 32° longitudes east, and covers an area of 17,364 square kilometres. The country has no coastal line. It is “sandwiched” between South Africa and Mozambique, where it shares about three quarters of its boundary with South Africa along the south, west and north, and Mozambique in the east. Its altitude ranges from 1,850 metres at the highest point to a low of 200 m above sea level. A map of Swaziland is presented in Figure 2.1.



**Figure 2.1: Map of Swaziland**

The population of Swaziland was estimated to be 1,080,337 in 2012, with an annual growth rate of 1.2%. The country is classified as a lower middle-income country with a per capita GDP of US\$3,816 in 2012. Its economy is mainly based on agriculture and forestry, with industries for processing forestry resources and agricultural products. A summary of the socioeconomic indicators of Swaziland is presented in Table 2.1.

Swaziland’s economy is highly dependent on South Africa with the Swazi Lilangeni pegged to the South African Rand. South Africa accounts for 90% of Swaziland imports. Swaziland’s exports to South Africa amounts to 60% and it imports 80% of its electricity from South Africa. Until 2010 the Southern Africa Customs Union (SACU) returns used to account, on average, for 60% of total government annual revenue and have since been reduced to

below 60%. The manufacturing sector has diversified since the mid-1980s. Sugar remains important foreign exchange earner. In 2007, the sugar industry increased efficiency and diversified in response to a 17% decline in EU sugar prices.

**Table 2.1: Swaziland’s Socio-Economic Indicators**

Socio-economic indicators	Value
Population (2012est.)	1,080,337
Population growth rate (in %, 2012 est.)	1.177
Area (in sq km)	17,364
Rural population (2012)	833,896
Poverty line (in %, 2010)	63
GDP (in billion USD, 2011)	4.074
GDP per capita (in USD, 2012 est.)	3,816
GDP real growth rate (in %, 2012 est.)	1.7
Electrification rate (in %, 2013)	61
GINI index (2010)	0.483
Human Development Index (2011)	0.547

Sources: Central Bank of Swaziland, Swaziland Central Statistics Office, Ministry of Natural Resources and Energy

The agricultural sector’s share of GDP decreased from over 30% at independence to 13% in 1989 and to 10% in 2009. However, agriculture is more important for Swaziland’s population and national economic development than its contribution to GDP suggests. Agricultural output forms the raw material base for about one third of value added goods within the manufacturing sector and contributes substantially to national export earnings. Livestock production is a major agricultural activity with small farmers owning about 77% of the total cattle population. The number of livestock has been declining in recent years due to droughts and overgrazing of rangelands resulting in less productivity, and to some extent also because of the population increases and thereby increasing demand for resources.

## 2.2 DEVELOPMENT PRIORITIES

The development priorities of Swaziland are outlined in the National Development Strategy (NDS) which was completed in 1997 and launched in 1999 by the Ministry of Economic Planning and Development, to address development issues in the time period from 1998 to 2022. The NDS document states that “The purpose of the NDS is to formulate a Vision and Mission Statement with appropriate strategies for socio-economic development for a period of 25 years and provide a guide for the formulation of development plans and for the equitable allocation of resources.” It covers all development aspects including agriculture, forestry, environment management, energy, water and sanitation, land, rural development, health, and research and development.

Some of the development priorities relevant to energy issues are found in documents such as the National Energy Policy 2003, National Forest Policy 2002, Poverty Reduction Strategy and Action Programme 2006, Draft Land Policy 1999, National Health Policy 2007, National



Disaster Management Policy 2004, Waste Regulations 2000, Environmental Management Act 2002, the Flora Protection Act 2000, and the Livestock Development Policy 2001.

## 2.3 ENERGY SITUATION

### 2.3.1 Overview of the National Energy Consumption Patterns

National energy issues are administered by the Energy Department of the Ministry of Natural Resources and Energy (MNRE). This Department is responsible for the energy policy, energy strategies, energy action plans, and overall management of energy resources in the country. Swaziland, like any other country, needs modern energy resources for development and the sustenance of livelihoods. The main energy resources currently used in the country include coal, traditional and industrial biomass, electricity, and petroleum products. Table 2.2 shows the energy consumption for Swaziland in the year 2010/2011.

**Table 2.2: Energy Production and Imports for Swaziland, 2010/2011**

Energy Source	Local Production (TJ)	Imports (TJ)	Contribution (%)
Industrial Biomass - Bagasse	4,329.56		10.58
Industrial Biomass - Wood	458.01		1.12
Traditional Biomass	16,346.91		39.6
Hydro Electricity	601.03		1.47
Cogeneration electricity	815.60		1.99
Solar	0.25		0.0
<b>Total Local Production</b>	<b>22,551.2</b>		<b>55.11</b>
Unleaded Petrol		2,597.81	6.35
Leaded Petrol		585.64	1.43
Aviation Gasoline		6.49	0.02
Diesel		4,508.80	11.02
Paraffin		292.87	0.72
LPG		242.93	0.59
HFO		10.31	0.03
Coal		7,223.97	17.65
Imported electricity		2,899.80	7.09
Total Imports		<b>18,368.62</b>	<b>44.89</b>
<b>Total Consumption</b>		<b>40,919.98</b>	

Source: MNRE internal document, 2012

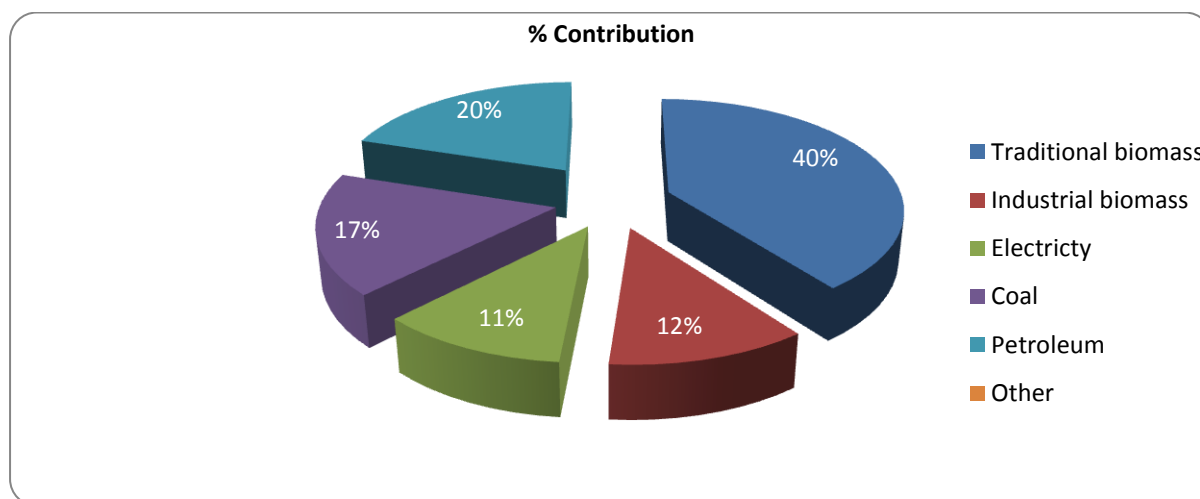
The contribution share of each energy source to the energy consumption for the country is shown in Table 2.3 and Figure 2.1.

**Table 2.3: Contribution of Energy Sources to Energy Consumption in Swaziland, 2010**

Source	% Contribution
Traditional biomass	39.73
Industrial biomass	11.64
Electricity	11.0
Coal	17.6
Petroleum	20.0
Other	0.03

Source: MNRE internal document, 2012

Traditional biomass and industrial biomass make for the largest share of energy consumption in Swaziland. This biomass is used using conventional technologies and therefore not necessarily the best practices. Table 2.4 shows the energy applications in Swaziland at end-use level.



**Figure 2.1: Contribution to Energy Consumption by Energy Source, 2010**

**Table 2.4: Energy Applications and their Energy Sources in Swaziland**

Sector	Application	Energy Resource Options
Urban domestic	Lighting	Electricity, paraffin and candles, solar PV
	Cooking	Electricity, LPG, fuelwood, paraffin and coal
	Water heating	Electricity, fuelwood, paraffin, and solar
	Space heating	Electricity, fuelwood, paraffin and LPG
	Refrigeration	Electricity
Rural domestic	Lighting	Electricity, paraffin and candles, solar PV
	Cooking	Electricity, fuelwood, paraffin, and LPG
	Water heating	Electricity, fuelwood, paraffin and solar
	Space heating	Electricity, fuelwood, paraffin and LPG
	Refrigeration	Electricity and LPG
	Water pumping	Electricity, wind and solar PV
Transport	Vehicle motive power	Diesel and petrol
Industry	Motive Power	Electricity
	Lighting	Electricity
	Refrigeration	Electricity
	Process heat	Bagasse, coal, HFO, LPG, and wood residue
Commercial	Lighting	Electricity
	Air conditioning	Electricity

Source: MNRE internal document, 2012

### 2.3.2 Energy Resources

As mentioned earlier, the main energy sources that contribute to the energy balance in Swaziland are biomass, coal, electricity and petroleum products (see Table 2.5).

**Table 2.5: Energy Balance of Swaziland, 2010 (TJ)**

	COKING COAL	BITUMINOUS COAL	ANTHRACITE	LPG	KEROSENE	LEAD REPLACEMENT PETROL	DIESEL	AVIATION GASOLINE	FURNACE OIL / HFO	LUBRICANTS	NONSPEC PETROLEUM	UNLEADED PETROL	HYDRO	SOLAR	BAGASSE	WOOD AND OTHER WASTES	INDUSTRIAL WASTE	ELECTRICITY	OTHER HEAT	BOILERS	TOTAL	
INDIGENOUS PRODUCTION	-	-	8,539.20	-	-	-	-	-	-	-	-	-	1,037.16	0.25	4,329.56	16,346.91	458.01	-	-	-	-	30,711.09
IMPORT	-	7,223.97	-	242.93	292.87	585.64	4,508.80	6.49	10.31	0.59	0.02	2,597.79	-	-	-	-	-	2,899.80	-	-	-	18,369.21
EXPORT	-	-	-8,539.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-12,519.63
<b>DOMESTIC SUPPLY</b>	<b>-</b>	<b>7,223.97</b>	<b>-</b>	<b>242.93</b>	<b>292.87</b>	<b>585.64</b>	<b>4,508.80</b>	<b>6.49</b>	<b>10.31</b>	<b>0.59</b>	<b>0.02</b>	<b>2,597.79</b>	<b>1,037.16</b>	<b>0.25</b>	<b>4,329.56</b>	<b>12,366.48</b>	<b>458.01</b>	<b>2,899.80</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>36,560.67</b>
STATISTICAL DIFFERENCES	-	-11.63	-	-	-84.59	-	218.65	-10.11	-0.24	0.10	-18.28	-104.90	-	-	20.95	-	-	-99.71	0.04	-0.03	-	-89.75
<b>Transformation</b>	<b>-</b>	<b>-469.51</b>	<b>-</b>	<b>-</b>	<b>-4.22</b>	<b>-</b>	<b>-8.85</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-1,037.16</b>	<b>-</b>	<b>-4,308.61</b>	<b>-</b>	<b>-</b>	<b>2,453.79</b>	<b>0.04</b>	<b>127.97</b>	<b>-</b>	<b>-3,246.55</b>
PUBLIC ELECTRICITY PLANT	-	-	-	-	-	-	-	-	-	-	-	-	-1,037.16	-	-	-	-	1,037.16	-	-	-	-
AUTOPRODUCER CHP PLANT	-	-	-	-	-4.22	-	-8.85	-	-	-	-	-	-	-	-4,308.61	-	-	1,416.63	0.04	127.97	-	-2,777.04
PUBLIC HEAT PLANT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUTOPRODUCER HEAT PLANT	-	-51.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NON-SPECIFIED	-	-62.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHARCOAL PRODUCTION PLANTS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Energy Sector</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
COAL MINES	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OIL AND GAS EXTRACTION	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OIL REFINERIES	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHARCOAL PRODUCTION PLANTS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>FINAL CONSUMPTION</b>	<b>-</b>	<b>6,766.09</b>	<b>-</b>	<b>242.93</b>	<b>373.24</b>	<b>585.64</b>	<b>4,281.30</b>	<b>16.60</b>	<b>10.55</b>	<b>0.49</b>	<b>18.30</b>	<b>2,702.69</b>	<b>-</b>	<b>0.25</b>	<b>-</b>	<b>12,366.48</b>	<b>458.01</b>	<b>5,496.14</b>	<b>-</b>	<b>128.01</b>	<b>-</b>	<b>33,446.72</b>
<b>INDUSTRY</b>	<b>-</b>	<b>51.33</b>	<b>-</b>	<b>0.04</b>	<b>10.20</b>	<b>-</b>	<b>268.30</b>	<b>4.36</b>	<b>0.24</b>	<b>-</b>	<b>-</b>	<b>2.15</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>458.01</b>	<b>2,925.00</b>	<b>-</b>	<b>128.01</b>	<b>-</b>	<b>3,847.64</b>
IRON AND STEEL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61.99	-	-	-	61.99
CHEMICAL AND PETROCHEMICAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NON-METALLIC MINERALS	-	-	-	-	-	-	12.31	-	-	-	-	-	-	-	-	-	-	600.48	-	-	-	612.79
TRANSPORT EQUIPMENT	-	-	-	-	10.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.04
MACHINERY	-	-	-	0.03	-	-	0.75	-	-	-	-	-	-	-	-	-	-	572.40	-	-	-	573.18
MINING AND QUARRYING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FOOD AND TOBACCO	-	51.33	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	465.84	-	-	-	517.18
WOOD AND WOOD PRODUCTS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	458.01	292.61	-	-	-	750.62
CONSTRUCTION	-	-	-	-	0.16	-	249.00	4.36	0.24	-	-	2.15	-	-	-	-	-	931.68	-	-	-	1,187.59
NON-SPECIFIED	-	-	-	-	-	-	6.25	-	-	-	-	-	-	-	-	-	-	-	-	128.01	-	134.26
<b>OTHER</b>	<b>-</b>	<b>6,714.76</b>	<b>-</b>	<b>242.89</b>	<b>350.28</b>	<b>-</b>	<b>1,710.20</b>	<b>4.98</b>	<b>10.30</b>	<b>0.11</b>	<b>18.29</b>	<b>1,146.10</b>	<b>-</b>	<b>0.25</b>	<b>-</b>	<b>12,366.48</b>	<b>-</b>	<b>2,571.14</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>25,135.78</b>
AGRICULTURE	-	6,714.76	-	0.09	80.57	-	474.97	4.18	-	-	-	121.81	-	-	-	-	-	1,804.79	-	-	-	9,882.79
COMMERCE AND PUBLIC SERVICES	-	-	-	-	185.92	-	1,221.64	0.80	10.30	0.09	2.39	1,019.60	-	-	-	-	-	-	-	-	-	4,881.48
RESIDENTIAL	-	-	-	242.80	83.78	-	8.71	-	-	-	-	3.25	-	0.25	-	12,366.48	-	620.26	-	-	-	13,664.07
NON-SPECIFIED	-	-	-	-	-	-	4.88	-	-	0.02	15.90	1.45	-	-	-	-	-	739.92	-	-	-	784.42
<b>TRANSPORT</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>12.77</b>	<b>585.64</b>	<b>2,302.80</b>	<b>7.25</b>	<b>-</b>	<b>0.38</b>	<b>0.01</b>	<b>1,554.44</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>4,463.29</b>
INTERNATIONAL CIVIL AVIATION	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ROAD	-	-	-	-	-	585.64	2,302.80	0.27	-	0.38	0.01	1,554.44	-	-	-	-	-	-	-	-	-	4,443.54
RAIL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DOMESTIC AIR TRANSPORT	-	-	-	-	-	-	-	6.99	-	-	-	-	-	-	-	-	-	-	-	-	-	6.99
PIPELINE TRANSPORT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTERNAL NAVIGATION	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NON-SPECIFIED	-	-	-	-	12.77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.77

Source: IRENA, 2010

### ***2.3.2.1 Traditional Biomass***

Approximately 90% of the total rural energy in Swaziland is provided from fuelwood. The rural population consists of about 70% of the national households. The word “traditional” is used to highlight that the biomass is burnt without any means for optimizing energy extraction from the fuel. Traditional wood biomass is very important since it contributes about 40% of the national energy demand. The source of traditional biomass (fuelwood) is the indigenous forest, where the trees are harvested without following sustainable management practices (IRENA, 2012). The wood from the indigenous forest is also used for income generation, where local people cut live trees to sell to urban dwellers and also to meat roasting establishments. This puts severe pressure on the indigenous forest and threatens the environment. In addition to the unmanaged harvesting of trees in the indigenous forest, unplanned settlements also lead directly to the reduction of these forests.

### ***2.3.2.2 Industrial Biomass***

Solid industrial biomass is produced locally at a relatively large scale in the form of bagasse (by-product from sugarcane juice extraction) in the sugar industry and wood chips from the timber industry. The biomass is used for process heat and cogeneration. The sugar industry has about 110 MW installed cogeneration capacity. This also helps the sugar industries to reduce coal imports whose prices are rising rapidly especially from the increase in demand from China. These companies are also exploring the harvesting of sugar cane trash and tops to increase its fuel conversion for process heat and cogeneration. One of the sugar companies, Ubombo Sugar Limited (USL), has also started green harvesting of sugar cane to increase the biomass available.

There are also two organisations in Swaziland that are considering electricity production from wood residue. The first is a timber company that intends to produce electricity using the gasification of wood residue in one facility, transmit the electricity through the national grid of the Swaziland Electricity Company (SEC) for use in another facility more than 100 km away. The other is a small community called Bulembu Ministries (BM) which is in the process of developing a 2 MW wood residue gasification plant (IRENA, 2012). However, both projects have been put on hold until technology, funding and off-take agreements are in place.

Industrial solid biomass in the short to medium term appears to be sustainable since sugar cane and trees that are cut are replaced on a continuous basis. A sustainability assessment conducted at Usutu Forest over a period of 45 years indicated that wood production from the forest is “demonstrably sustainable” with “yields being maintained or improved over time” (Evans and Masson, 2008).

### ***2.3.2.3 Wind***

The wind potential for power generation is not yet known. There are some isolated small wind turbines around the country. There is one functional wind measurement station with a

mast at 50 m. There are also 5 sites from a previous project with masts at 30 m where wind measurements could be started immediately with the availability of instruments. MNRE intends to establish more sites.

A recent study, under the Southern African Development Community (SADC) Strategy and Action Plan obtained average wind speeds ranging from 0.72 to 4.10 m/s at heights up to 10 m above ground. The SADC study developed a wind resource map, where wind hotspots in Swaziland were identified around Magomba averaging around 9 m/s and in the east of the country and 4 m/s at Lubombo plateau (Location: 31° 51' 45" East, 26° 29' 25" South). However, at this location, there is no wind station and this value was obtained through modeling rather than actual measurement (IRENA, 2012).

#### **2.3.2.4 Solar**

Solar radiation is relatively abundant in the country, but there are limited solar energy assessments. A recent study by SADC has developed a solar resource map. Global solar irradiation of 2,000 kWh/m<sup>2</sup>/year for Swaziland was identified at location: 26°33'44" South, 30°52'17" East, at an elevation of 1,430 m. Assessments are also being carried out at 5 sites in Swaziland which is relatively very limited because of the high variations of insolation from one point of the country to another due to the nature of the terrain. Solar energy in Swaziland is used in a number of ways some of which include crop drying, water heating and solar photovoltaic (PV).

**Solar PV:** The current exploitation of solar PV in Swaziland is still very low, but growing. Solar PV systems are used unsystematically throughout the country to provide energy for low power appliances. There are three institutional solar PV installations in the country rated at 30 kW, 32 kW, 60kW at the Bulembu Village, Mbabane Blood Bank (see Figure 2.2) and the University of Swaziland (Luyengo Campus), respectively.



**Figure 2.2: Solar PV Application at the Mbabane Blood Bank**

The MNRE is currently working on a fourth solar installation project, rated at 32 kW. These projects are aimed at reducing electrical power consumption during the day, and for the Blood Bank and University of Swaziland they provide power during night hours as the systems have some storage capacity. There is also the Gables Shopping Complex that has individual solar panels to light up the entire parking lot at night. In 2011, there was a roll-out of 2 solar PV kits in each of 50 schools identified in the four regions of the country.

**Solar Water Heaters:** Solar water heaters are becoming a common sight in Swaziland. The installations are mainly by individuals who have learnt of the benefits of these heaters. The Energy Department of the MNRE has installed solar water heaters in government institutions, one system at a school and another at a prison. These installations are meant to reduce the energy bills of these institutions. More institutional installations are expected in the near future.

**Solar Food Drying:** It is a common practice in Swaziland to dry food using solar energy. The method used is simply to place the food in the open sun for drying. The technology for large-scale crop drying is not employed yet it could have some positive impacts such as preserving nutrition, colour and taste of food. A solar food dryer project by a student at the University of Swaziland demonstrated the benefits of scientific solar food drying.

#### **2.3.2.5 Other Renewable Energy Resources**

**Geothermal Energy:** There are several hot springs in the country, but their potential as geothermal energy sources has not been assessed. They are currently enjoyed for bathing and for providing warm water for washing.

**Biogas:** There are many sources of biomass that can be used for biogas generation in the country. These include piggeries, chicken and dairy farms, and municipalities. Biogas production is already being demonstrated at a piggery in the country.

#### **2.3.2.6 Petroleum Products**

Petroleum products used in Swaziland includes diesel and petrol for vehicle transport, paraffin and liquefied petroleum gas (LPG) for domestic applications, and heavy fuel oil (HFO) for industry. Paraffin is also used in some industrial boilers. All petroleum products are imported from South Africa and Mozambique.

#### **2.3.2.7 Coal**

Coal is one of the fossil fuels that contribute to the energy balance of Swaziland. The coal used is the bituminous type and is imported from South Africa. The coal is largely used in industry, with very small amounts used for domestic purposes in company towns. The use of coal in company towns is a legacy issue as it was supplied free as a benefit to workers, and cannot be taken away. Otherwise, coal does not play a significant role as an energy source in Swaziland households.

The country also produces anthracite coal. This coal burns cleaner, and is exported since it is a good foreign exchange earner. However, the industrial equipment using coal in Swaziland is not designed to handle anthracite coal. In 2010, an equivalent of 8,539.20 TJ of anthracite was exported. Additionally, the country also has large coal reserves that are currently not exploited.

#### **2.3.2.8 Electricity**

The major demand sectors for electricity in Swaziland are agriculture, industrial, commercial and domestic sectors reaching a maximum demand of 200 MW in 2011 (SEC, 2011). In the same year, 805 GWh of electricity was imported and about 333 GWh was generated locally. Imported electricity decreased by 131 GWh from 2007 while locally generated electricity increased by 162.4 GWh. In the domestic demand sector, the Swaziland Electricity Company (SEC) currently reports a domestic customer base of 120,000. The overall electricity access rate in Swaziland is estimated 61%, with urban and rural households having electricity access of 77% and 50%, respectively. Urban areas Swaziland include the formal city boundary and the peri-urban areas constituting informal settlements very close to the urban areas.

The Swaziland Electricity Company (SEC) mainly operates four hydropower stations; Maguga Hydropower Station, Ezulwini Hydropower Station, Edwaleni Hydropower Station, and Maguduza Hydropower Station. These all serve as peaking and emergency power stations. They are not a constant supply of electricity for normal daily consumption, which is a function of base load power stations like thermal power stations. This is due to the fact that there is limited dam capacity as well as variable and unreliable rainfall patterns and intensity. Subsequently, there is insufficient water to run hydro turbines continuously all year round and ultimately supply the country's total energy demand. The availability factor and load factor of SEC hydropower depends on the time of the year and amount of rainfall.

The hydropower stations have a combined installed generation capacity of 60.4 MW, and contribute (SEC's internal generation) 29% of the total energy consumed in the country. The rest is imported largely from Eskom in South Africa, and a portion of it from Electricidade de Moçambique (EDM) in Mozambique. SEC's installed hydro capacity is distributed amongst the four power stations as follows:

- Maguga Hydropower Station – 2 x 9.9 MW hydro units;
- Ezulwini Hydropower Station – 2 x 10.0 MW hydro units;
- Edwaleni Hydropower Station – 4 x 2.5 MW and 1 x 5.0 MW hydro units; and
- Maguduza Hydropower Station – 1 x 5.6 MW hydro units

In 1999, SEC utilised a loan from the European Investment Bank (EIB) to finance a significant part of its investment in the shares of Companhia de Transmissão de Moçambique, S.A.R.L. (Motraco). Motraco is a joint venture between Electricidade de Moçambique (EDM), Swaziland Electricity Company (SEC) and Eskom of South Africa. The principal objective of

the joint venture is the transmission of electricity via its power transmission system from South Africa to the Mozal Aluminium Smelter.

The total electricity demand in the country through the Swaziland SEC is around 204 MW. The SEC is also undertaking feasibility studies for hydro power plants and review of existing power plants. For economic reasons, the company is interested in hydropower capacities of greater than 1 MW. The SEC currently owns a monopoly on the import, distribution and supply of electricity via the national power grid, and also owns the majority of the country's power stations.

In 2007, a reform of the energy sector was undertaken to reduce the monopoly of the SEC. It included the structural change from a board (Swaziland Electricity Board established in 1963) to a company, the Swaziland Electricity Company (SEC). This resulted in the establishment of a regulatory body called the Swaziland Energy Regulatory Authority (SERA) and converted the generation and distribution part of the Board into a more disciplined body corporate entity.

Swaziland is party to various trade and regional integration agreements such as the Southern African Power Pool (SAPP) - an organisation created to ensure cost-effective electrical power access to member countries, the Southern African Development Community (SADC) Protocol on Energy, as well as its partnership with Mozambican Transmission Company (MOTRACO), the power transmission company that transmits electricity between South Africa, Swaziland and Mozambique.

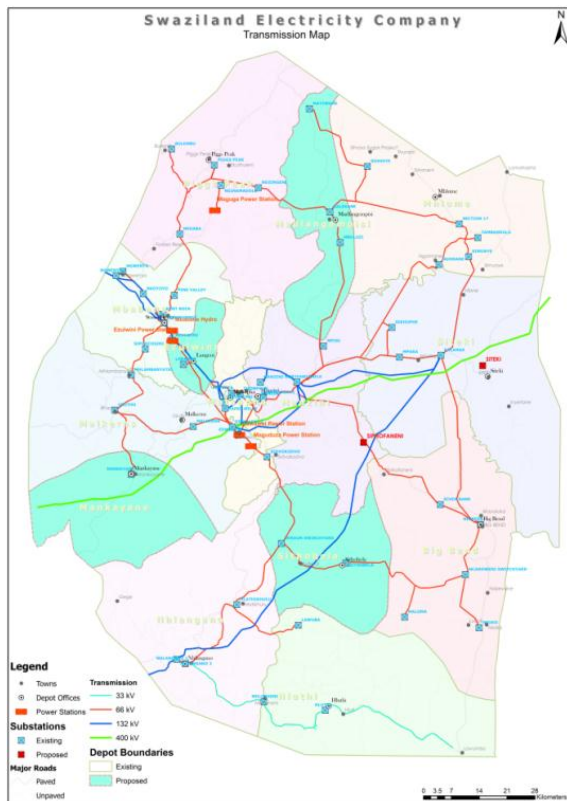
There are current shortages of power in the Southern African region. There are vigorous national campaigns in the SADC region to encourage the reduction of electrical power consumption in all sectors including households. Other SADC Utilities are also applying for double digit annual increases in tariffs over the next five years to build their own power plants, and for upgrading their old and failing infrastructure. Swaziland has to increase its electricity supply to reduce the vulnerability of imported electricity, and to increase its energy security.

One 400 kV transmission line crosses through Swaziland, and connects to the network at the recently-completed Edwaleni II substation. Country-scale transmission occurs via a 132 kV and 66 kV grid distributing to 11 kV lines. Figure 2.3 shows the national high voltage transmission lines in Swaziland, and it also shows how they connect to South Africa and Mozambique. Distribution losses for Swaziland grid network are high compared to other utilities under SAPP, averaging at 14%.

SEC embarked on an extensive maintenance programme to ensure a continuous supply of electrical power and currently SEC is third in SADC in power supply reliability. Line capacity upgrades were implemented in a number of areas throughout the country including Mbuluzi, Mhlume, Khuphuka, Mpolonjeni, Kashoba, Ngogola, Dwaleni, Sigangeni,



Nhlangano and a number of other areas. The upgrades are as a result of the increased electricity usage as a result of the implementation of the rural electrification project.



**Figure 2.3: Electricity Transmission Network in Swaziland**

## 2.4 EXISTING POLICY FRAMEWORK

Swaziland has put in place policies that in one way or the other promote clean and sustainable energy. The policies include:

- Swaziland Utilization of Renewable Action Plan, 1997;
- National Development Strategy – Vision 2022, 1999;
- National Energy Policy, 2003;
- National Energy Policy Implementation Strategy, 2009;
- Electricity Act, 2007;
- Energy Regulatory Act, 2007;
- Petroleum Bill;
- Public Private Partnership (PPP) Policy; and
- Ratification of IRENA Statute, 2011

A number of activities are already ongoing in line with the various policies and strategic plans in place, such as bio-ethanol blending with petroleum, wind resource assessment, distribution of energy efficient woodstoves, co-generation in sugar mills, and utilization of photovoltaics.

The chronology of energy policy development in Swaziland is summarised in Figure 2.4.



**Figure 2.4: Chronology of Energy Policy Development in Swaziland**

Source: IRENA, Swaziland - Renewable Energy Country Profile, 2011

### 2.4.1 National Development Strategy

As previously indicated, the Ministry of Economic Planning developed a National Development Strategy (NDS) which was completed in 1998, and covers a period of twenty five (25) years up to 2022. Government policy is guided by this strategy which is a Development Master Plan for the Government of Swaziland. Amongst other things, it has specific objectives to address environmental protection and compliance with the UN Conventions on the environment. These include: (i) integration of environmental issues in development planning; (ii) coordination and monitoring of environmental activities; (iii) strengthening or development of legislation for enforcement and provision of economic incentives for compliance; (iv) capacity building for individuals and institution; (iv) gender mainstreaming environmental issues; (v) strengthening enforcement of environmental laws; (vi) protection of ecosystems; and (vii) implementation of action plans.

### 2.4.2 The National Energy Policy

The current National Energy Policy was approved by Cabinet in 2003. The policy was developed through stakeholder consultations and participation. The Policy, being the guiding document in setting the mandate for the Energy Department recognizes climate change and environmental protection as important issues to be addressed while ensuring all citizens of the country have access to sustainable energy. The Policy calls for Government to:

- Investigate and promote the use of environmentally friendly fuels, energy products and technologies;
- Investigate opportunities for obtaining energy from waste;
- Formulate and implement programmes on awareness raising and information dissemination on energy savings; and
- Promote energy management skills and energy accountability in organisations across all sectors.

### **2.4.3 National Energy Policy Implementation Strategy**

Further to the Energy Policy, in 2009 the MNRE developed a National Energy Policy Implementation Strategy (NEPIS) to address energy issues as they relate to all national development activities. The Strategy advocates for an enabling environment for the diversification of energy access and cost reductions, for large and small users. Amongst other things it calls for: i) the development of renewable energy action plans and targets; ii) establishment of fiscal incentives to promote renewables; iii) establishment of information resources; iv) development of activities for renewable energy demonstrations; v) establishment of priority energy sector standards; and vi) development of a long-term biomass programme.

### **2.4.4 National Biofuel Development Strategy and Action Plan**

As part of the effort to promote renewable energy, the MNRE engaged consultants in 2008 to develop a National Biofuels Development Strategy and Action Plan (NBDSAP). The consultants worked with a task team that had representation from all key ministries and government parastatals of relevance to biofuels development. The NBDSAP primarily looked at the use of biofuels to replace fossil fuels and as income generation activity for rural farmers. In addition, it addressed issues such as: i) the creation of stakeholder awareness and involvement; ii) establishment of national biofuels institutional and regulatory structures; and iii) devising policies and strategies for the production, processing and marketing of biofuels in the country.

### **2.4.5 Energy Regulatory Act, 2007**

The Energy Regulatory Act, 2007 established the Swaziland Energy Regulatory Authority (SERA) with the functions including:

- to issue licences for undertakings in the energy sector;
- to make and enforce directions to ensure compliance with licences issued in terms of this Act;
- to regulate and approve tariffs, prices and charges and terms and conditions of services provided by licensed entities, according to the requirements and terms established in their licences;
- to receive, investigate and adjudicate complaints from consumers on price adjustments made, or services provided, by any regulated undertaking;
- to encourage the development of uniform industry standards and codes of conduct;
- to develop and enforce performance standards for the licensed activities;
- to promote consumer awareness and education in the energy sector; and
- to establish the controls to ensure legitimate competition in energy production and distribution activities with the aim of securing the interests of all licensees as well as consumers.

#### **2.4.6 Petroleum Bill**

The Ministry of Natural Resources and Energy has updated, amended and consolidated existing pieces of legislation on petroleum, in line with the National Energy Policy to produce an all-embracing and comprehensive draft Petroleum Bill to be presented to Parliament to be passed into the Petroleum Act: The Petroleum Act will address the following issues:

- Regulation and deregulation of the oil industry;
- Ensuring adequate product availability in rural areas;
- Ensuring stable and reliable product availability for the country's economy;
- Achieving regional competitiveness and fair pricing of petroleum fuels;
- Encouraging meaningful and sustainable participation of locals in the industry;
- Imposition of levies and taxes on petroleum products;
- Administration of the Strategic Oil Reserve Fund;
- Development of liquid biofuels; and
- Provision of information concerning motor vehicles.

The draft Bill was developed through consultations with key stakeholders in the fuel sector in Swaziland and the Southern African Customs Union (SACU) region.

#### **2.4.7 Public Private Partnership (PPP) Policy**

A Public Private Partnership (PPP) policy has been established in Swaziland. This policy is an initiative by the government to work hand-in-hand with the private sector on national development programmes. The government intends to implement the development strategies in collaboration with the private sector – the government can source large amounts of funds, while the private sector has the technology and efficient implementation capacity. With transparency, the PPP can result in rapid development services delivery in the country, including interventions in the energy sector.

### 3. CURRENT SITUATION WITH REGARD TO SE4ALL GOALS

#### 3.1 ACCESS TO ELECTRICITY

In 2010, 44% of households had access to electricity – 66% of urban households had access to electricity compared to only 34% rural households having access to electricity. The access of households to electricity had risen from the national average of only 27% in 2001. In 2013 the national electricity access rose to 61%, with urban and rural households having electricity access of 77% and 50%, respectively (MNRE and CSO, Swaziland, 2013).

At the regional level, Hhohho Region had the highest electricity access at 66%, followed by Manzini Region at 64% and Lubombo at 63% (see Figure 3.1). The Shiselweni Region had the lowest access to electricity at 40%. Among the households without electricity, 76% in urban communities and 85% in rural communities indicated they could not afford the cost of connection to the electricity grid and electricity tariffs. 10% urban households and 5% of rural households without electricity attributed the absence of electricity to lack of infrastructure.

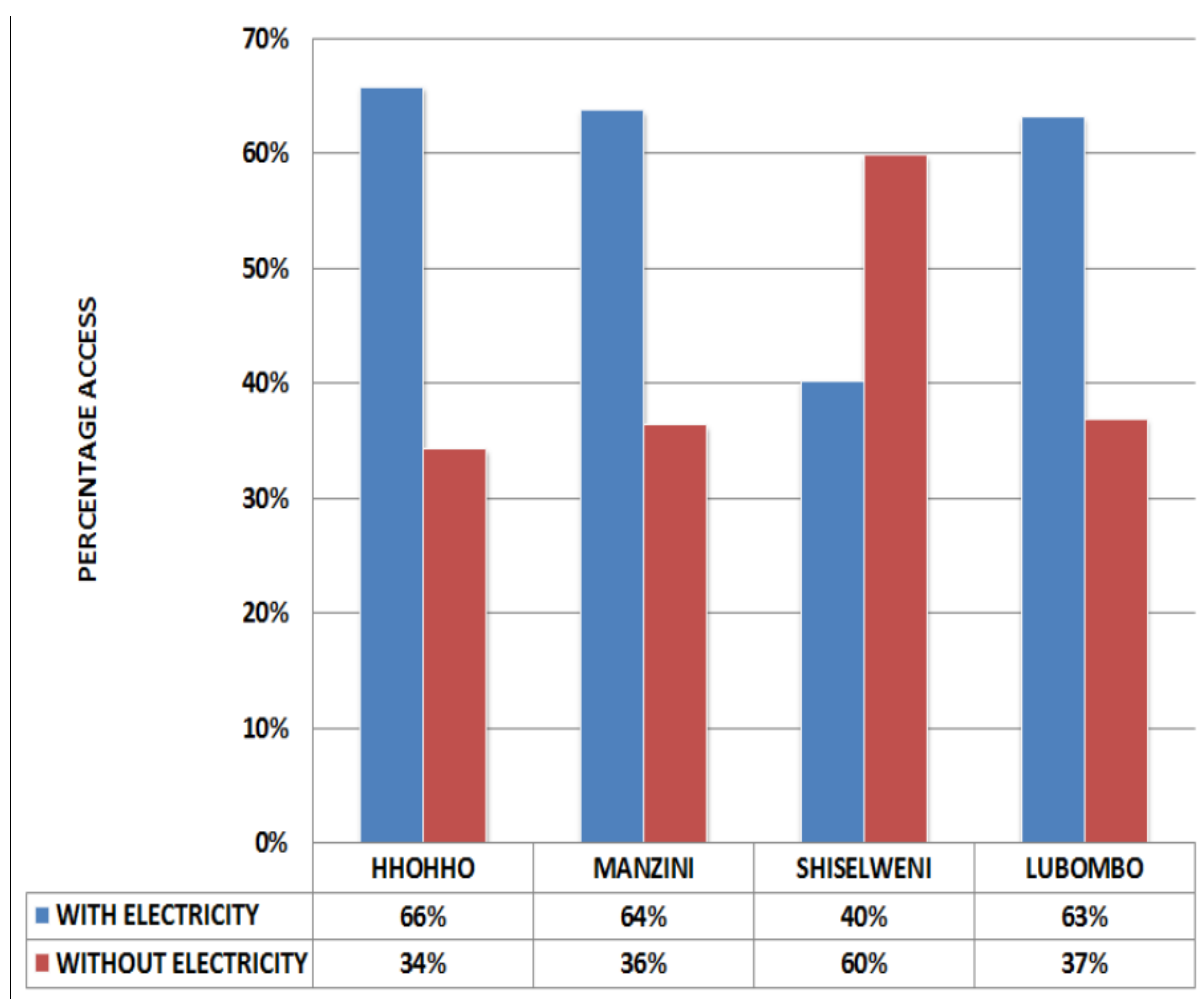


Figure 3.1: National Electricity Access at Regional Level, 2013

## 3.2 ACCESS TO MODERN ENERGY FOR COOKING

### 3.2.1 Fuel for Cooking

Fuelwood is still the major cooking and heating fuel in Swaziland. In 2010, 52% of households used fuelwood for cooking, whilst only 13% used LPG for cooking, as presented in Table 3.1 (CSO, Swaziland, 2011). The use of fuelwood for cooking by households was highest in Shiselweni (69%) and lowest in Manzini (39% households). Conversely, the use of LPG for cooking was highest in Manzini (17% households) and lowest in Shiselweni (7% households).

**Table 3.1: Percentage of Households using Different Types of Energy for Cooking by Region (2010)**

Energy Source	Hhohho	Manzini	Shselweni	Lubombo	Total
Fuelwood	51.6	38.6	69.4	61.6	51.6
Coal	0.0	0.0	7.6	1.8	1.6
Electricity	29.6	36.9	13.7	22.9	28.4
Paraffin	7.7	7.7	2.6	1.1	5.6
LPG	11.1	16.9	6.8	12.7	12.9
Total	100.0	100.0	100.0	100.0	100.0

Source: Computed from the Swaziland Household Income and Expenditure Survey, 2009/10

The use of fuelwood for cooking by households was more predominant in rural communities (75% households) than in urban communities (12% households), as presented in Tables 3.2 and 3.3. On the other hand, more urban households used LPG for cooking (23% households), compared to rural households (8%). There was an increase in the number of households using electricity for cooking, with 28% of households using it for cooking in 2010. This increase indicated increasing accessibility both in terms of affordability and distribution infrastructure. The use of electricity for cooking was higher in urban communities (53% households) than in rural communities (5.4% households). Most high income households used electricity for cooking (43% households), followed by LPG (24% households). However, most low income households used fuelwood for cooking (95% households), followed by paraffin (3.5 households), as presented in Table 3.4.

**Table 3.2: Percentage of Households using Different Types of Energy for Cooking by Region - Urban Areas (2010)**

Energy Source	Urban Hhohho	Urban Manzini	Urban Shselweni	Urban Lubombo	Urban Total
Fuelwood	10.5	9.8	37.5	11.9	11.8
Coal	0.0	0.0	3.3	6.3	1.1
Electricity	54.5	54.2	28.2	53.2	52.7
Paraffin	15.8	11.3	9.8	3.3	11.3
LPG	19.2	24.7	21.2	25.2	23.1
Total	100.0	100.0	100.0	100.0	100.0

Source: Computed from the Swaziland Household Income and Expenditure Survey, 2009/10

**Table 3.3: Percentage of Households using Different Types of Energy for Cooking by Region-Rural Areas (2010)**

Energy Source	Rural Hhohho	Rural Manzini	Rural Shselweni	Rural Lubombo	Rural Total
Fuelwood	75.5	72.2	73.9	80.7	75.3
Coal	0.0	0.0	8.2	0.0	1.9
Electricity	15.1	16.7	11.6	11.2	13.9
Paraffin	3.0	3.4	1.6	0.2	2.2
LPG	6.4	7.8	4.8	7.9	6.7
Total	100.0	100.0	100.0	100.0	100.0

Source: Computed from the Swaziland Household Income and Expenditure Survey, 2009/10

**Table 3.4: Percentage of Households using Different Types of Energy for Cooking by Standard of Living Quintile Group of Household (2010)**

Energy Source	Standard of Living Quintile Group of Households					Total
	Lowest	Second	Third	Fourth	Highest	
Fuelwood	95.4	85.3	67.6	43.9	14.2	51.6
Coal	0.8	2.6	2.3	2.4	0.5	1.6
Electricity	0.8	3.7	13.1	26.6	61.0	28.4
Paraffin	2.8	5.1	5.9	8.9	4.6	5.6
LPG	0.1	3.3	11.0	18.3	19.8	12.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Computed from the Swaziland Household Income and Expenditure Survey, 2009/10

### **3.2.2.1 Use of Fuelwood**

In Swaziland, fuelwood is either used in open fires or in stoves designed for coal. Tests have shown that using a coal stove to cook with fuelwood is less efficient than an open fire; that is, there is a lot of fuelwood used and a lot of smoke emissions. However, consumers appreciate the coal stove, because it seems more modern and solid, and allows cooking of two and more pots, space heating in winter as well as baking in the integrated oven. Over the last ten to twenty years, the increasing population has placed a high burden on the country's indigenous woodlands and forests, and in certain areas, biomass resources have been coming under pressure (GIZ, undated). More and more woodland is being cleared for agricultural production and the grazing of cattle, while at the same time the demand for fuelwood is not decreasing.

Now Swaziland is experiencing a rural energy crisis where demand for household energy has outstripped supply. This combination of high demand aggravated by low end-use efficiency has contributed to environmental degradation, rural poverty and rural energy shortage. Other contributors to fuelwood depletion are institutions that are major users of fuelwood for cooking activities. There are indications that fuelwood shortages exist in the Lowveld, Lubombo and parts of the Upper Middleveld as well as some parts of the Highveld, in particular around dense settlements and arable areas.

### *3.2.2.2 Use of LPG and Paraffin*

There has been an increase in LPG usage which is a much cleaner fuel than wood. Paraffin usage, which is concentrated in Manzini and Hhohho appears to be decreasing. The usage of this fuel has decreased in Swaziland even amongst the lowest two standard of living quintile groups. It can thus be concluded that households are either switching to other efficient energy sources for cooking or this fuel is increasingly becoming inaccessible due to price issues or poor distribution systems. The usage of LPG has decreased amongst the lowest two standard of living quintile groups but has increased for the third, fourth and fifth quintile groups. This highlights that LPG is increasingly becoming accessible to the more affluent and is increasingly becoming unaffordable for the country's poor. Data from LPG suppliers and other sources also reveals that about 50% of the LPG available in Swaziland is sold in retail in cylinders and the rest is supplied in bulk to the various sectors that use LPG in the country.

About 46% of LPG is distributed by general dealers and the remaining 54% is handled by independent LPG marketers. Independent marketers like Swazi Oxygen and Easygas Swaziland who have their major gas storage facilities at Matsapha have smaller regional retail gas sales centres equipped with refilling facilities (see Figure 3.2). Marketers also supply LPG in bulk for use in the industrial, catering and leisure and commercial markets. Swazi Oxygen and Easigas Swaziland import their LPG supplies from South Africa. Galp Energia has also joined this industry.

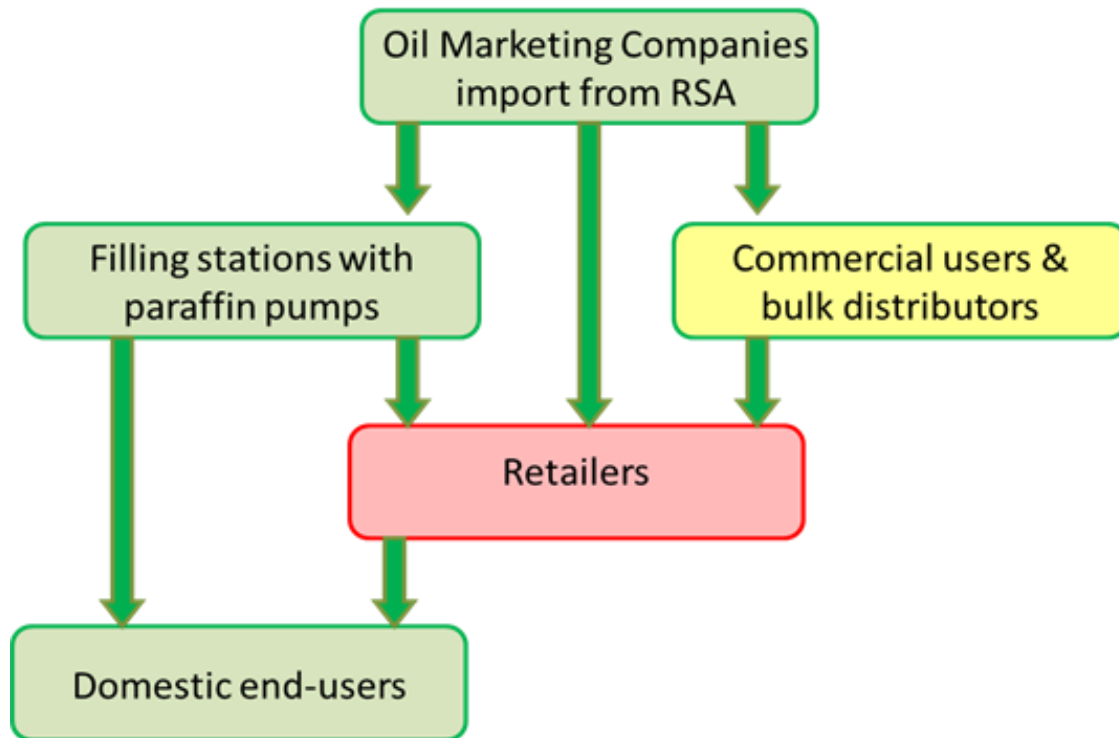
Despite the fact that Government regulates the price of other petroleum products (petrol and diesel), there is currently no regulation of the LPG industry. With regard to paraffin, Government controls the wholesale and retail pump price of paraffin. In addition to that, paraffin is a tax free commodity in Swaziland. This is the case because paraffin is intended for the low and middle income groups. The diagrams that follow show the supply chains for the LPG and paraffin in the country.

The distribution systems of LPG and paraffin are similar, with only one major difference. The paraffin supply chain is one component longer than the LPG supply chain (see Figure 3.3). General dealers and shops as well as Farmers Cooperatives play a role in the distribution of paraffin in Swaziland. These shop owners provide paraffin to the final end user, the middle and low income groups living in the rural areas as well as in the country's densely populated settlements. The shop owners act as the middlemen between the final end user and service stations/ bulk distributors.

The LPG supply is also not entirely cast in stone as shown by Figure 3.2 above. Entrepreneurs have identified some of the opportunities and have set up small scale LPG outlets as is the case at Kwaluseni, Maphiveni, Moneni, Ludzeludze as well as some places/shops as one drives along the Mpaka and Siteki road. A lot of LPG outlets are also found in urban areas (Manzini, Mbabane, and Nhlngano) that also provide refilling services.



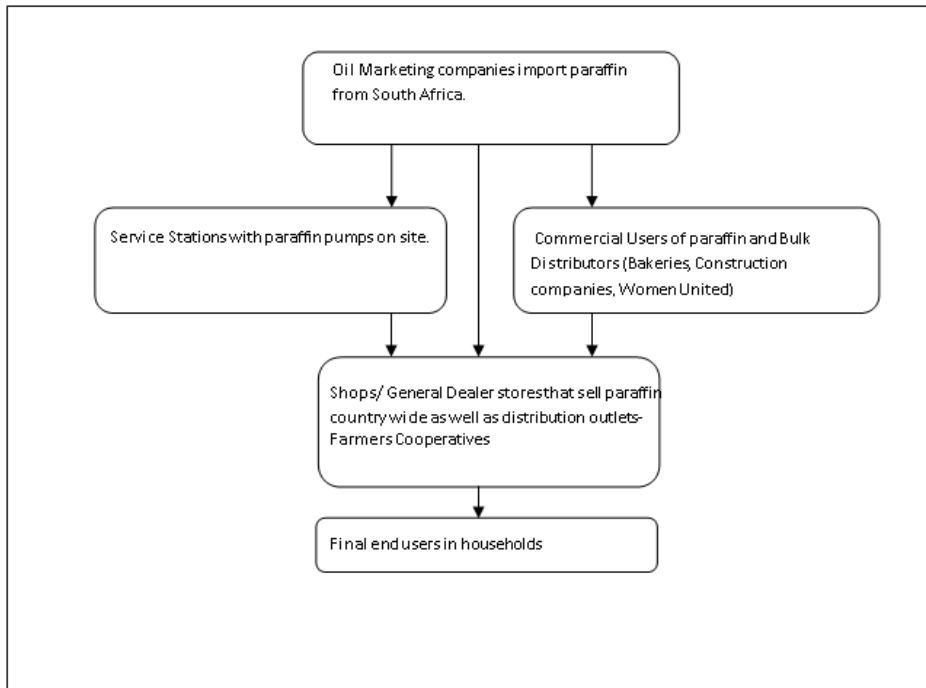
These also act as the middle man between LPG users in remote areas and the major suppliers or distributors.



**Figure 3.2: LPG Supply Chain in Swaziland**

In order for both fuels supply chains to function effectively, they need to be supported by an efficient distribution system and infrastructure. The Oil Marketing Companies (OMCs) and the major gas importers, to some extent, distribute paraffin and LPG nationwide through regional retail outlets/service stations and sales centers. However, owing to a lack of a regulated distribution system, entrepreneurs have filled this gap and charge a margin for bringing these alternative energy sources closer to the end user, resulting in the high cost of these fuels in remote areas. This also results in non-uniformity in terms of the code of practice in this industry, thus compromising the safety of this industry.

With regard to paraffin, there have been concerns reported through the media about high paraffin prices raised by people who live in rural areas as well as those who live on the outskirts of urban areas (Moneni and Ludzeludze). Another concern stems from the fact that paraffin is a tax-free commodity hence some other larger industries use paraffin in their production processes, e.g construction companies, bakeries and supermarkets.



**Figure 3.3: Paraffin Supply Chain in Swaziland**

### 3.2.2 Cookstoves

Localised fuelwood shortages in some parts of Swaziland are having an increasingly negative impact on communities in these areas. Households have to travel further and further to collect fuelwood. This has an immediate impact on the women and children of the households who are frequently responsible for the collection of fuelwood. They have to walk much greater distances and spend more time carrying out this task, at the expense of other activities in the home such as education, income-generating activities and caring for the family. This deforestation is also impacting heavily on the environment, with increasing desertification and soil erosion. This situation justifies the need to promote improved cookstoves in Swaziland.

There are three major types of efficient cookstoves in Swaziland, namely:

- Basinthuthu
- Vesto
- Modified Welcome Dover
- StoveTec (Masheshisa)

Additionally, there is one institutional improved cookstove called the Lion stove or *Libhubesi*.

#### 3.2.2.1 Basinthuthu Cookstove

This fuelwood cookstove is manufactured locally by B.S. Engineering and the retailer is New Dawn Engineering, both in Matsapha. The cookstove is a two-plate stove and it includes an oven for baking or roasting. However, a geyser can be attached at the customer's request.

The key advantage of this stove is that one fire cooks food, heats water, bakes, and heats the room at the same time (see Figures 3.4 and 3.5).



**Figure 3.4: The Basinthuthu Cookstove**



**Figure 3.5: A Woman Baking using the Basinthuthu Cookstove**

### ***3.2.2.2 Vesto Cookstove***

The Vesto cookstove is a fuelwood stove that cooks one pot and also roasts meat. It also heats the room as well (see Figure 3.6). The cookstove also uses other types of biomass such as cow dung or dried grass and these biomass could be used in the absence of wood.

### ***3.2.2.3 Modified Welcome Dover Cookstove***

This fuelwood cookstove is a two-plate stove that cooks, bakes and heats the room. It also has the advantage that its design caters for three-legged pots as well, especially the smaller sizes (see Figure 3.7).



**Figure 3.6: Vesto Cookstove**



**Figure 3.7: Modified Welcome Dover Cookstove**

#### 3.2.2.4 StoveTec or Masheshisa Cookstove

StoveTec or the *Masheshisa* is a fuelwood stove that is centrally manufactured, requires no assembly, can easily be transported, and designed to burn wood in an outdoor environment. The stove is front-loading and the combustion chamber has a ceramic liner (“rocket” stove type) where the fuel is burnt in a single combustion stage (see Figure 3.8). Initial users of the stove noted that the stove saves wood and is fast, hence it was unanimously dubbed as the ‘Masheshisa’ stove, loosely translated to be ‘Make Quick’ or ‘Quick-fix’. The *Masheshisa* cookstove has a metal shelf that sits in front of the stove to support the fuelwood as it sits in the combustion chamber. The stove also comes with a metal skirt designed to fit around the base of the pot. The function of the skirt is to increase heat transfer to the pot and thereby increase the overall efficiency of the stove. The skirt is not integral to the functioning of the stoves, but it has been shown to increase efficiency by approximately 30% in laboratory tests, according to the manufacturers. Based on information from stove retailers, the *Masheshisa* stove has so far been one of the best-selling efficient household stove in Swaziland.

#### 3.2.2.5 Lion or Libhubesi Cookstove

This fuelwood cookstove cooks well for institutions such as schools and Neighbourhood Care Points (NCPs), hospitals and prisons (see Figure 3.9). It is a two-pot stove that only accommodates three-legged pots.



**Figure 3.8: *Masheshisa* Cookstove with skirt**



**Figure 3.9: Libhubesi Cookstove at Ka Schiele High School**

### 3.3 ENERGY EFFICIENCY VIS-À-VIS GOAL OF SE4ALL

The Swaziland Electricity Company is running an extensive demand-side management programme, initiated in 2008. Compact fluorescent lighting is promoted under this programme, and approximately 90% of electrified households are now using pre-paid meters. In addition, to promoting efficiency in the industrial sector, a time-of-use tariff has been introduced for industrial customers (SEC, 2012).

The Swaziland Electricity Company (SEC) has also been promoting the use of energy-efficient compact fluorescent lamps (CFLs) since 2001 through exhibitions and Trade Fairs. Several road shows have been conducted where most domestic customers attend and on average 100 CFLs are distributed. The quantities distributed by the utility are small but most affluent customers are using CFL's for lighting. When deployed on a large scale, CFLs may increase harmonics, which may consequently increase losses on the distribution network. To address this, SEC has installed harmonic filters in some substations.

SEC has also organised public sensitisation campaigns on energy efficiency through various forms of media - newspapers, television, radio and in schools – in collaboration with various stakeholders dealing with energy efficiency issues. The campaign to encourage the public to save electricity included the provision of guidelines (tips) for the public to implement.

### **3.4 RENEWABLE ENERGY VIS-À-VIS GOAL OF SE4ALL**

Swaziland is yet to undertake a comprehensive nationwide renewable energy resource assessment but the following resources have been observed to have potential in the country:

- Biomass (bio) energy (from sugarcane residue and forestry products);
- Small hydro power (especially from the mountainous Highveld);
- Solar (spread across the country); and
- Wind

The major renewable energy targets of the Government are:

- Install solar water heaters in 20% of all public buildings by 2014;
- Develop solar water heater standards by 2012;
- Establish fiscal incentives to promote renewable energy by 2013; and
- Establish a demonstration centre for renewable energy technologies by 2015.

#### **3.4.1 Bio-energy Development**

The timber and sugar industries in Swaziland have great potential to contribute to electricity supply through co-generation. However, the Government should provide an enabling legislative framework to incentivise private forestry participation both at strategic generation and distribution levels.

As indicated in Tables 3.5 and 3.6, the timber industry and sugar industry have potential to provide surplus power of 78 MW and 90 MW, respectively, to the national grid.



**Table 3.5: Potential Power Generation from Timber Industry**

	Location in Swaziland			Total
	North	Central	South	
Forest area, hectares	30,000	50,000	20,000	100,000
Sawmill residues, tonnes	180,000	300,000	120,000	600,000
Forest residues, tonnes	120,000	200,000	80,000	400,000
Potential power production, MW	28	47	18	93
Power consumption of industry, MW	5	7	3	15
Surplus power for the grid, MW	23	40	15	78

Source: Montigny Investments, Swaziland, 2014

**Table 3.6: Potential Power Generation from Sugar Industry**

	Location in Swaziland			Total
	Mhlume	Simunye	Big Bend	
Forest area, hectares	20,000	20,000	20,000	60,000
Sugarcane bagasse, tonnes	520,000	520,000	520,000	1,560,000
Sugarcane trash (leaves, etc), tonnes	200,000	200,000	200,000	600,000
Potential power production, MW	48	54	56	158
Power consumption of industry, MW	22	28	18	68
Surplus power for the grid, MW	26	26	38	90

Source: Montigny Investments, Swaziland, 2014

Ubombo Sugar Limited, Swaziland, which processed 2.08 tons of sugarcane in 2011, has an installed capacity of 39.5MW electricity generation from a co-generating milling facility. The co-generation facility was commissioned in May 2011 after the signing of an agreement with SEC to feed 20 GWh per year of electricity into the grid, increasing to a maximum of 52 GWh in 2015 (Ndhlukula and Sampa, 2012). Royal Swaziland Sugar Corporation's (RSSC) Simunye and Mhlume milling plants collectively handle 3.5 million tons of sugarcane, including 1.2 million tons from out-grower sugarcane production. The potential for co-generation at the two mills is equally high.

Currently, there is a Biomass Group that comprises the two existing sugar companies (Ubombo Sugar Limited and Royal Swaziland Sugar Corporation), representative of Nsoko Msele Integrated Sugar Project in the Lubombo region (a new sugar mill to be established), the Swaziland Sugar Association and three major players in the Forestry sector (including Montigny Investments). In addition to these bodies, there are a number of smaller players and even potential biomass fuel suppliers that still can form part of this Group. The Forestry sector has been supplying the existing sugar mills with forest residues and mill residues (in the form of wood and wood chips) since 2009, and due to this combined effort, the

imported coal as a supplementary fuel to the mills have largely been replaced (Montigny Investments, 2014). The sugar mills have also shown interest in using brown leaves from the sugar cane plantations (often called “trash”) as complementary fuel.

The Biomass Group intends to establish a Control Centre to be responsible for scheduling/accommodating maintenance periods between the biomass-fired power plants and also be a single point of contact if any of the biomass-fired power plants is experiencing difficulty in supplying the agreed capacity. The Control Centre will also be monitoring the quality and the quantity of power fed into the grid.

### **3.4.2 Solar Energy Development**

Swaziland, like almost all sub-Saharan African countries, has abundant solar resource in excess of 2000 kWh/m<sup>2</sup> per year of global irradiance. Both thermal and photovoltaic solar technologies have great potential in Swaziland. The solar thermal technology with ready applications is the low temperature type like domestic solar water heating, pool heating, and agriculture processing. The concentrated solar power (CSP) system has special requirements such as generally flat and open terrain, less than 2° gradient and high DNI averaging 2200 kWh/m<sup>2</sup> per year with low aerosol levels. Flat and open terrains may be limiting factors for CSP development in Swaziland, although parabolic dish and recent advances with power tower technology enable their deployment in less flat terrain.

Photovoltaic (PV) systems have undoubtedly the highest potential on top of solar water heating. Swaziland has a huge rural population (55% of the rural population) that still requires clean and sustainable energy which can be delivered with PV through solar homes systems and minigrids.

### **3.4.3 Wind Energy Development**

Swaziland is yet to undertake a sustained and credible resource assessment exercise to quantify the wind resource available. The mountainous landscape, however, provides suitable sites for siting wind generators because wind speeds increase with altitude but they pose huge logistical challenges related to accessing the sites. If Swaziland is to consider generating power from wind, some actions need to be undertaken which include:

- Potential sites assessment - This is to be done taking into account the wind resource available, and the proximity of suitable grid connections or power evacuation points;
- Climate data assessment - The local long-term wind climate is to be assessed by reference to existing data or by long-term monitoring;
- A number of dedicated wind measurement stations, ideally at minimum 50m high, are necessary to develop a local wind atlas of the planned wind farm. It is necessary to use at least one full year of wind data to take into account seasonal variations; and
- Relevant environmental and planning regulations need to be developed.

Currently, the Environmental Management Act (Act No. 5 of 2002) indicates what processes need to be followed for the development of projects such as wind farms.

#### **3.4.4 Renewable Energy Resources Assessment**

It is very important for the renewable energy system developer to know with a certain degree of accuracy the renewable energy base in a particular location so that the technology to be deployed to harness the resource is properly designed and sized to match the available resource. Technologies such as wind and concentrated solar power (CSP) system are so site-specific that generalization of factors such as wind speed or solar radiation can lead to huge estimation errors in potential energy yield. As previously mentioned, Swaziland is yet to conduct a comprehensive nationwide renewable energy resource assessment, and the knowledge available is for hydro and to a limited extent wind.

In 2008, MNRE commissioned a Pre-feasibility Screening Study which prioritized a list of 26 potential mini and micro hydropower sites in Swaziland. The study which was done by Knight Piésold Consulting went further to conduct preliminary designs for three (on Lusushwana River, Mpuluzi River and Mnjoli Dam) of the four sites identified. Mnjoli Dam has a detailed study that includes designs with potential for 0.5 to 1.5 MW. A detailed study is planned on the recently commissioned Lubovane Dam irrigation referred to as the Lower Usuthu Irrigation Project (LUSIP). Indications are that this dam might have potential of between 3-7 MW.

In 2001, The Danish Cooperation for Environment and Development (DANCED) sponsored wind measurements at five sites (Nhlangano, Siteki, Piggs Peak, Luve and Sithobela) in Swaziland at 30 m height. The results from one year of measurement recorded wind speeds that averaged below 5m/s except for Siteki, which recorded an average annual wind speed of 5.7m/s. MNRE is currently measuring wind parameters on a 50 m mast at Tikhuba (next to Siteki).

Similar efforts of resource assessments should be extended to other renewable energy resources such as solar and all forms of biomass.



## 4. CHALLENGES AND OPPORTUNITIES FOR ACHIEVING SE4ALL GOALS

### 4.1 INSTITUTIONAL AND POLICY FRAMEWORK

#### 4.1.1 National Energy Policy, 2003

The Swaziland National Energy Policy of 2003 has set five key objectives:

- Ensuring access to energy for all;
- Enhancing employment creation;
- Ensuring security of energy supply;
- Stimulating economic growth and development; and
- Ensuring environmental and health sustainability.

To meet the key objectives, the policy states that the restructuring of the electricity supply industry will facilitate access to the market for third party producers by creating a level playing field and as such pave the way for increased security of supply. It also states that increased utilization of indigenous energy resources for electricity will improve security of supply, create job opportunities and stimulate economic growth. Recognizing the role played by renewable energy in contributing to meet the policy objectives, it is also stated in the policy document that Government will support programmes promoting the utilization of renewable energy resources for electricity production. The role of Independent Power Producers (IPPs) in power generation as well as the need to make the electricity tariff cost reflective are also noted.

Appropriate policy instruments are the greatest drivers of renewable energy development worldwide. Renewable energy technologies face many barriers in penetrating the market largely due to high investment costs, lack of information among consumers and generators, institutional barriers, and others. According to UNEP (2012), “the benefits of renewable energy generation tend to materialize in the medium to long term and accrue at the level of the entire economy, country and/or society”. The main reason for the dominance of fossil fuels in the power sector is the fact that their specific upfront costs are lower than those of renewable energy technologies like wind power plants, CSP or PV plants. The market failures are addressed by internalizing external costs of fossil fuel-based generation or by introducing special instruments like special renewable energy tariffs to ensure a greater share of renewable energy in the electricity supply.

Internalizing of external costs would face major challenges in Swaziland, where coal-based power is not generated locally but imported from neighboring countries. The special instruments that are necessary for Swaziland to bring in renewable energy projects driven by Independent Power Producers (IPPs) would need to be crafted in such a way that they fulfill the five policy objectives of the energy sector in an efficient and effective manner.

Policy instruments commonly used to procure renewable energy resources include: i) feed-in-tariffs (FITs); ii) tendering; iii) quota (based on generation technology and source type ) or

renewable portfolio standards (RPS); iv) net-metering; and v) others grouped as tax incentives or rebates, grants and capital subsidies. In 2011, FIT policies were in place in at least 65 countries, with RPS used in 18 countries.

The policy instruments will help in translating the various policy statements - such as “Government will create an enabling environment to allow the establishment of IPPs in the country and support projects to be implemented” - into objectively verifiable indicators of the policy objectives.

#### **4.1.2 Policy Gaps and Barriers**

Currently, electricity from renewable energy sources in Swaziland does not compete favorably in terms of pricing with electricity from existing power plants. The introduction of renewable energy sources - such as biomass, solar, wind and small hydro - for power generation requires deliberate policy or regulatory instruments that guarantee a special tariff and compel utilities to give them preference in dispatch. These market conditions are necessary for grid in-feed of renewable energy technologies developed by IPPs. To address this challenge, the Swaziland Energy Regulating Authority (SERA) is developing feed-in-tariffs (FITs) and Independent Power Producer (IPP) policy. SERA also plans to develop a Grid Code and enforcement framework.

Another barrier to the deployment of renewable energy for power generation is the present power market, which is dominated by SEC as a buyer of power whilst it remains the biggest player in power generation, transmission and distribution. IPPs may feel uncomfortable dealing with their major competitor as a buyer of their power.

Renewable energy policy or regulatory instrument may take any shape from FITs, tendering or quota. Any renewable energy source brought into the market will have an impact on the tariff but the impact differs with the renewable energy technology, its quantity and design policy. For instance, PV and CSP at the current market prices, which are still high, may impact more negatively on the final tariff than bagasse cogeneration. The renewable energy policy or instrument to be introduced will need to be designed with a broader view in mind to address a set criterion, e.g. efficiency, efficacy, employment creation and medium enterprises development. The same view should be considered when selecting the eligible renewable energy technologies to be included in the policy framework.

#### **4.1.3 Key Energy Stakeholders**

The key active energy stakeholders in Swaziland are:

- Ministry of Natural Resources and Energy
- Ministry of Tourism and Environmental Affairs
- Ministry of Agriculture and Cooperatives
- Ministry of Finance
- Ministry of Economic Planning and Development
- Swaziland Electricity Company

- Swaziland Energy Regulating Authority
- Swaziland Environment Authority
- Department of Forestry
- National Meteorological Department
- Swaziland Standards Authority
- University of Swaziland
- Technical Colleges
- Tinkhundla Centres
- Renewable Energy Association of Swaziland
- Federation of Swaziland Employers and Chamber of Commerce
- Private Sector - entrepreneurs and investors
- Community-Based Organisations
- International Cooperation Partner Organisations

**Ministry of Natural Resources and Energy:** National energy issues are administered under the Energy Department of the Ministry of Natural Resources and Energy (MNRE). This Department is responsible for the implementation of the energy policy, energy strategies, and overall management of energy resources in the country. The Government of Swaziland through the MNRE-Energy Department realises that renewable energy could play a much bigger role in the energy mix for the country. This is evidenced by the number of initiatives by the MNRE to support renewable energy at the policy level, strategic level, development of action plans and the implementation on the ground of these plans. Renewable energy technologies are now given special attention at MNRE, where renewable energy officers are now employed.

**Ministry of Tourism and Environmental Affairs:** This Ministry addresses environmental issues, and could be a channel for funding opportunities for renewable energy research, development and deployment.

**Ministry of Agriculture and Cooperatives:** The Ministry of Agriculture and Cooperatives is one of the key ministries in renewable energy production, as the cultivation of renewable energy resources such as bagasse, bioethanol and biogas are within its oversight.

**Ministry of Finance:** The Ministry of Finance is responsible for promoting macroeconomic stability in Swaziland by formulating and implementing fiscal and financial policies that optimize economic growth and improve the welfare of its citizens. In response to changing regional and global environment the ministry strives, among others, to: i) provide a sound regulatory framework for the country's financial sector; ii) collect revenue and manage expenditure efficiently; iii) create an environment which will promote private sector development; and iv) supervise and monitor the nation's public enterprise portfolio.

**Ministry of Economic Planning and Development:** The mandate of the Ministry of Economic Planning and Development is to assist the Government of Swaziland in the formulation, co-ordination and implementation of economic policies and intervention measures that will

effectively and efficiently accomplish the country's major economic and development objectives. Its mission is to promote sound macro-economic management that will provide an enabling environment for sustainable economic growth and efficient and cost effective delivery of services. This ministry and the Ministry of Finance are very important to national development, and are responsible for development priorities, financial planning and budget allocations. The development of a green economy depends on these ministries.

**Swaziland Electricity Company:** The Government of Swaziland has deregulated the electricity industry where the production, purchasing, transmission, marketing, regulation of electricity were under one body, the Swaziland Electricity Board (SEB) which was established in 1963. The deregulation led to the transformation of the SEB into a company status, the Swaziland Electricity Company (SEC). This was done through the Electricity Act 2007 and the Swaziland Electricity Company Act 2007 to allow Independent Power Producers (IPPs) to supply the national grid.

**Swaziland Energy Regulating Authority:** The Swaziland Energy Regulatory Authority (SERA) was established through the Swaziland Regulatory Act 2007. The authority was established to put in place the regulatory framework on electricity matters, issuing of electricity production licences, and regulating electricity tariffs in the local market, and to also deregulate the electricity industry. SERA has already developed the following for the electricity sub-sector: i) electricity regulations; ii) tariff methodologies; iii) compliance monitoring framework; and iv) quality of supply and service standards. As previously mentioned, SERA is currently developing feed-in-tariffs and Independent Power Producer (IPP) policy, and it also plans to develop a Grid Code and enforcement framework.

**Swaziland Environment Authority (SEA):** The mandate of Swaziland Environment Authority includes the coordination of the activities of all bodies working on environmental matters in Swaziland. The Authority is also the Focal Point for liaising with international organisations on environmental matters.

**Department of Forestry:** This is a department under the Ministry of Tourism and Environmental Affairs, and forestry is important in wood-chip production, one of the renewable biomass resources in Swaziland.

**National Meteorological Department (MET):** This Department in the Ministry of and Tourism and Environmental Affairs is responsible for weather and climate, and it is also the Focal Point for climate change issues. Climate change is highly linked to energy issues.

**Swaziland Standards Authority:** The Swaziland Standards Authority (SWASA) is the custodian of issues of product and service standards in the country. The deployment of energy technologies stand to benefit from SWASA.

**University of Swaziland:** The Faculty of Science of the University of Swaziland (UNISWA), has a long-standing relationship with the MNRE. It contributes to energy policy and strategy development, and also assists in the implementation of energy projects on the ground.

**Technical Colleges:** There are a number of technical colleges in the country (including the Swaziland College of Technology) that produce artisans and technicians in a variety of fields including plumbing, electrical works, surveying and building construction. With their technical skills, the graduates from these institutions provide a pool from which people can be selected for training on energy technologies.

**Tinkhundla Centres:** Tinkhundla (constituency) centres are government structures at grass roots level that address community development issues for communities. The deployment of energy projects at community level goes through these centres for effective adoption and sustainable implementation.

**Renewable Energy Association of Swaziland:** In 1998, the MNRE facilitated the establishment of the Renewable Energy Association of Swaziland (REASWA). This is a non-governmental organisation (NGO) whose aim is to “promote the use of renewable energy in an environmentally sustainable manner” in Swaziland.

**Federation of Swaziland Employers and Chamber of Commerce (FSE&CC):** The FSE&CC is an employer and business organisation that is recognised by businesses, organised labour, government and the international community. As the voice of business in Swaziland, the objectives of the organisation are:

- to promote and protect the interests of its members; and
- to encourage industrial harmony, productivity and prosperity for all

Founded in 2003 as a result of a merger, the Federation offers a wide range of products and services specifically designed to deliver sophisticated business development solutions to corporate Swaziland. Other services provided include consultation and advice on industrial relations and other legal matters, employment issues, trade facilitation, training, occupational health and safety, publications and research, and representation on statutory and non-statutory bodies. The Federation also facilitates business linkages with investors from other countries and attends to trade enquiries from the business community. It currently serves over five hundred (500) companies in the Swaziland economy.

**Community-Based Organisations:** At the grass roots, there are community-based organisations (CBOs) that are dedicated to community development (e.g. Women in Development). These CBOs also provide a good entry point for the deployment of energy technologies to the communities. They are usually women dedicated to community development expecting very little in return.

**International Cooperation Partner Organisations:** Swaziland has benefitted tremendously from international donor organisations in addressing environmental issues that have a bearing on sustainable energy directly and indirectly. Amongst others, these organisations include UNDP, UNIDO, the World Bank, Energy and Environment Partnership (EEP), the Government of Taiwan, German International Cooperation (GTZ), and some organisations in Scandinavian countries.

## **4.2 ENERGY PROGRAMMES IN SWAZILAND**

There are some on-going and planned programmes and projects in the energy sector of Swaziland. These programmes and projects are summarized in this section.

### **4.2.1 Promotion of Renewable Energy**

**Wind and Solar Resource Measurement Program** – This project is aimed at collecting data on wind and solar resources throughout the country to identify all areas with wind and solar electricity generation potential. Such data can then be used by organisations and individuals who may have an interest in generating electricity from wind and solar resources, whether for their own use or to sell to the local utility (i. e. the Swaziland Electricity Company).

**Installation of solar photovoltaic and LED lighting** - The key targets of this intervention are public institutions, with the aim to reduce Government’s electricity bill. The project include a 31.2 kW solar PV system at the Blood Bank (completed), 60 kW system at Luyengo Campus of the University of Swaziland (completed) as well as the 30 kW system at Mhlumeni Border Gate (at planning stage). This project will also help to demonstrate off-grid solar PV technologies and promote renewable energy research as well as demonstrate the potential and applicability of renewable energy resources with regard to energy efficiency.

**Installation of wind and solar security lighting** - This is a pilot project where the Ministry is trying to sensitize communities, including rural communities, to use renewable resources (wind and solar) to provide security lighting. Hybrid (wind and solar) security lighting have been installed in eight Tinkhundla Centres. Similar hybrid security lighting has been installed at the military checkpoint along the Siteki-Mhlumeni road to provide adequate light to the security personnel when carrying out their duties of searching vehicles that enter the country.

**Development of IPP policy for renewable energy technologies** – The project is to develop an Independent Power Producers Legal and Regulatory framework with clear and transparent guidelines for all technically feasible renewable electricity generation and supply resources. It is also aimed at developing a sustainable cost reflective Feed-in-Tariff structure for all technically feasible renewable electricity generation and supply resources, to be in harmony with the tariff methodology. This will in turn help to increase the contribution of renewable energy to the local energy mix whilst at the same time reducing the country’s reliance on imported energy. The project is being implemented through the assistance of the USAID’s Southern Africa Trade Hub.

**Development of Solar Technologies Action Plan** – The project is aimed to develop a practical implementable action plan for solar technologies for Swaziland with clearly marked targets.

**Biofuels Development Programme** – A Task Team is working on the rollout of ethanol blended fuel in the country through development of standards, legislation and other logistics.

**Renewable Energy and Energy Efficiency Research and Demonstration Centre** – There are plans to set up this Centre to conduct research on renewable energy - particularly solar and wind energy technologies - and energy efficiency technologies including energy efficient stoves. The Centre will also serve as a demonstration site for the renewable energy and energy efficiency technologies.

#### 4.2.2 Development of Standards

**Adoption of technical standards for petroleum products, LPG safety, solar PV and solar thermal technologies** – The objective of the project is to regulate and control the quality of energy products and energy equipment imported into the country. The project is a collaboration between the Ministry of Natural Resources and Energy, the Swaziland Standards Association (SWASA) and other stakeholders.

#### 4.2.3 Promotion of Energy Efficiency

**Energy Efficiency and conservation** – The project involves the installation of energy saving technologies in public institutions for awareness-raising on energy saving technologies and practices, such as switching off all computers and non-essential lights when the office is not in use for long periods. This expected to reduce the electricity consumed in government buildings and thereby reduce the electricity bill for government.

#### 4.2.4 Energy Data Gathering

**Energy Access Survey** – The Ministry of Natural Resources and Energy is collaborating with a Civil Society Organisation on an Energy Access Survey to establish the true picture of energy mix for different household purposes as well as energy access rate for Swaziland.

### 4.4 GAPS AND BARRIERS IN THE ENERGY SECTOR

#### 4.4.1 Access to Electricity

The **key issues and gaps** to be addressed with respect to access to electricity in Swaziland under the SE4ALL Action Plan are identified and summarised as follows:

- Provision of major incentives for the commercial development of the sub-sector by private sector investment. Increased private sector investment in power generation infrastructure through IPPs will reverse the current situation of the very low proportion of direct investment from the private sector;
- Raising investment funding through carbon credits for green energy generated from sugar cane residue and wood chips;

- Promotion of productive use of electricity to accelerate agricultural and industrial development to address limited productive uses of electricity;
- Improvement of the technical, managerial, financial and regulatory capacity of key institutions in the energy sector in order to address managerial and technical inefficiencies;
- Review of the guideline that requires reapplication of electricity generation licence every 2 years – which creates uncertainty on long term planning and cogeneration expansion programmes; and
- Development of National Integrated Resource Plan clearly outlining generation, transmission and distribution expansion plans and the contribution of renewable energy in the energy mix.

The key issues and challenges identified in the promotion of productive uses of energy (PUE) include the following:

- Development of strategic partnerships with clear roles and responsibilities for key project stakeholders including development partners, Ministries, Departments and Agencies, Town Councils and Tinkhundla Centres, Community-based organisations, financial institutions, NGOs and private sector entrepreneurs and investors;
- Provision of sound business development training for key project implementers/managers, service providers and beneficiaries of PUE projects;
- Introduction of new business-oriented models and more robust results-based planning, monitoring and evaluation indicators and targets for PUE pilot projects, to ensure long term impact and sustainability of the projects;
- Participation of Town Councils and Tinkhundla Centres in the monitoring and evaluation of PUE projects, with the assistance of Implementation Committees that will be formed in the various communities where these projects are identified and implemented;
- Improved efficiency in the operation and maintenance of machinery and equipment, and adoption of technological improvements and upgrades; and
- Better use and leverage of technical and research institutions such as the University of Swaziland and the Swaziland College of Technology.

#### **4.4.2 Modern Energy for Cooking in the Households**

##### **4.4.2.1 Cookstoves**

Most fuelwood and biomass fuels are used in open fires with tripods and three-legged pots. This system has poor conversion efficiency. In higher income households, fuelwood is burned in heavy iron coal stoves imported from South Africa. These stoves are inappropriate for fuelwood and most have lower conversion efficiencies than even the open fire stoves. The uptake of improved cookstoves by households may be enhanced by discouraging the importation of stoves (e.g. coal stoves) that are deemed inefficient (GIZ, undated). The



uptake of improved cookstoves also faces challenges related to the price of the cookstoves and the inefficient distribution network.

**Affordability** – Although some energy efficient cookstoves are manufactured in Swaziland, the cookstoves are expensive for the target group. A possible solution could be for government to provide a grant or subsidy that would keep the price of the cookstoves lower and affordable for the target group, especially at household level.

**Distribution model** – Most retailers in rural areas do not have household efficient cookstoves for the rural population to access and buy. This maybe as a result of lack of incentives for the retailers of the cookstoves.

The interventions being pursued on cookstoves by the Ministry of Natural Resources and Energy include:

**Private sector participation:** The Ministry of Natural Resources and Energy is currently making efforts to pave a way for the private sector to undertake the full uptake of the improved cookstoves market chain. Therefore strategic planning is in progress to encourage the private sector to take over the activities of the market chain of improved cookstoves.

**Quality control:** To enhance quality control on improved cookstoves, some cookstoves fabrication facilities have been assisted to rehabilitate their equipment to improve the quality of their products. Technical assistance is also being provided to some institutions which use improved institutional cookstoves.

**Training of cookstoves fabrication artisans:** Training programmes have been undertaken in the Hhohho region and the Lowveld to build the capacity of local artisans on the construction of improved institutional cookstoves.

**Cookstoves consumer surveys:** A national energy survey has been completed which also covered consumer survey on improved cookstoves. The survey data will assist to assess issues of acceptability and affordability of improved cookstoves as well as the interventions needed to accelerate the uptake of improved cookstoves by households and institutions.

The **key issues and gaps** that need to be addressed in Swaziland’s SE4ALL Action Plan on improved cookstoves are summarised as follows:

- Promotion of technical research and development to adapt cookstoves and programs to the country context;
- Development of performance standards and benchmarks on safety, energy efficiency, emissions, and durability of cookstoves;
- Promotion of awareness raising, consumer research and business development, taking account of consumer preferences and behaviour;
- Development of innovative financing mechanisms that can target subsidies and grants on cookstoves;

- Enhancing the capacity of local and national institutions to promote advanced biomass cookstoves;
- Encouraging the establishment of energy funds to enable financial institutions to effectively administer support to promote biomass cookstoves; and
- Development and implementation of coordination, monitoring and evaluation (M&E) mechanisms on improved cookstoves.

#### *4.4.2.2 Access to LPG*

LPG and paraffin appear to be the most viable sources for substitution of fuelwood. However, because these fuels are currently unregulated, there have been concerns about the high prices imposed by retailers/dealers on consumers specifically in rural communities. A major barrier to the uptake of LPG is the high start-up costs associated with the use of this fuel. Household, particularly those in the low income group, find it difficult to finance LPG cylinder deposits and equipment costs.

Major interventions required include intensification of awareness raising on the use of LPG, and the development of safety standards and specifications on LPG cylinders and equipment to guide the operations of the industry. Development of a local LPG Safety Association may play a major role in ensuring that a forum exists where all the relevant stakeholders may discuss and address issues and challenges faced by the industry to ensure uniformity as well as share insights on how to guarantee that this industry is safe and sustainable. There is also the need for the Ministry to look into the regulation of the LPG retail price in the country to ensure availability of this fuel for all households and institutions at affordable prices.

Opportunities for improvement of the LPG industry in particular exist in Swaziland. The decrease in uptake of LPG over the ten years as indicated by market data can be reversed through the establishment of more efficient distribution systems infrastructure and policies that will ensure that more households have access to this energy source in a safe and sustainable manner. Barriers to LPG uptake are divided into three categories: accessibility, affordability and acceptability. Accessibility and affordability are closely linked, in that supply chain issues inhibiting access to LPG also tend to push up the price, so rendering it unaffordable for low income households. However, perhaps a bigger barrier to affordability is the price of the associated equipment required to use LPG, rather than the price of the fuel itself.

The **key issues and gaps** to be addressed under the Swaziland's SE4ALL Action Plan relating to access of households and institutions to LPG are identified and summarised as follows:

- Awareness raising about the safe use of LPG – compared to the use of paraffin - as well as the benefits associated with its use;
- Creation of a local LPG Safety Association to facilitate a forum for LPG suppliers, end-users and Government to raise and address industry issues collectively for the benefit of all citizens of the country;

- Development of networks of LPG shops and outlets, and development of a new business model to facilitate rapid household/commercial access to LPG as a fuel for cooking;
- Creation of legal and other institutional frameworks that will ensure availability and support enterprises for the distribution of this fuel in the country; and
- Regulation of the maximum retail price of LPG to ensure affordability of this energy source, particularly for low income households.

#### **4.4.3 Energy Efficiency**

In terms of the SE4ALL, the key issues and gaps to be addressed to promote energy efficiency in Swaziland include:

- Intensive and extensive public awareness and education on the benefits of energy efficiency;
- Development of policy and regulatory framework for energy efficiency;
- 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 level of energy efficiency and conservation nationwide, covering domestic, industrial, commercial and agricultural users as well as public services (e.g. health and education).

#### **4.4.4 Increasing Contribution of Renewable Energy**

Renewable energy has a vital role to play in Swaziland's energy future. The country currently imports a large proportion of its power from South Africa and Mozambique, despite the fact that its renewable energy resources—such as solar, wind, small hydro, and residues from the sugar industry—could meet the entire national demand of 200 megawatts if fully exploited. Energy usage is an urgent issue as Swaziland's demand for electricity will continue to rise. A developed renewable energy sector in Swaziland has the potential to increase access to electricity significantly, which would in turn increase energy security, offer environmental benefits and create green jobs, while providing reliable affordable electricity. Recognizing this potential, the Government of Swaziland has requested USAID's Southern Africa Trade Hub to help develop a Renewable Energy and Independent Power Producer (IPP) Policy as well as a Strategic Environmental Assessment of the policy as an urgent priority.

The Renewable Energy and IPP policy is intended to guide and expand the role of the private sector in developing the country's renewable energy sources and diversify the supply and nature of energy production. The policy will provide a clear, easily identifiable roadmap for IPPs with a clear delineation of institutional authority and the Government's policy with regard to power generation by IPPs. Developing a transparent, robust and predictable renewable energy and IPP policy is critical to attracting the investment of IPPs in the sector.

An increase in IPPs' clean electricity generation will contribute to climate change mitigation, economic growth, trade competitiveness and food security.

Biomass, especially sugar cane residues in the form of bagasse and brown leaves should be ranked highly as indigenous energy resources. Cogeneration is a very efficient way of generating electricity. A feed-in tariff needs to be applied to cover biomass co-generation, as this will provide guarantees to the investors who already have the basic technology and resources at their disposal. The recommended approach to be pursued to contract biomass-generated electricity from the private sector is through a negotiated Power Purchase Agreement (PPA). SEC has already set a precedent on this approach with Ubombo Sugar Limited.

Wind and solar energy resources may be procured through competitive bidding and benefit from falling international prices of these technologies especially solar PV. Investment in wind resources assessment is a pre-requisite for the Government for a clear and transparent bidding process.

The dispersed nature of the homesteads in the rural areas of Swaziland poses a challenge to electrification using a grid network, and the provision of decentralized renewable energy systems with the support of Government through subsidies appears to be a more appropriate strategy. Two models are proposed for renewable energy systems, namely ownership and fee-for-service. Fee-for-service requires an energy service company or companies to be set up to operate the service by installing the systems, maintain them and collect a fee for renting the technology. This model is being practiced in Botswana. The ownership model requires that the end-user procures and owns the system and be responsible for its operation and maintenance. This model is being practiced in Namibia.

As consumers become more and more environmentally conscious and seek to contribute to environmental conservation and at the same time secure their electricity supplies, more and more Swazi households are opting to install PV systems on their rooftops. One way to reward such households without prejudicing the utility's revenue streams is to allow net-metering for such technologies. The design of a renewable energy policy must follow the dictates of all the national laws and directives including the Environmental Management Act, 2002.

The **key issues and gaps** related to increasing the contribution of renewable energy in the national energy mix are:

- High initial investment cost of energy generation from solar, wind and small hydro;
- Inadequate statistics and data disaggregation on renewable energy – often leading to under-estimation of the renewable energy potential;
- Barriers to the availability of land with secure tenure for private sector investment in large-scale solar PV development;

- Lack of cost comparison studies on using renewable energy sources vis-a-vis conventional sources of energy; and
- High cost of collection and management of waste (as a renewable resource).

## **5. ACCELERATING SE4ALL PROGRESS – IDENTIFYING SOLUTIONS**

To address the prioritized issues and gaps related to the attainment of the three objectives under the goal of SE4ALL in Swaziland, cost-effective solutions in the three areas have been proposed, based on potential impact (magnitude, speed and sustainability) and feasibility (governance, capacity and funding availability) to drive progress in the attainment of the SE4ALL goal by 2030. These are defined in Table 5.1.

**Table 5.1: Prioritized Solutions for Accelerating Progress towards Sustainable Energy for All in Swaziland**

Priority SE4ALL Goal	SE4ALL Indicators of Progress		
<b>Ensuring Universal Access to Modern Energy Services by 2030</b>	Increase in access to modern energy by households, commercial enterprises, industry and institutions		
SE4ALL Objective	Prioritized Bottleneck	Prioritized Acceleration Solution	Potential Partners
<b>Universal Access to Electricity</b>	AE 1. Insecurity in electricity supply due to high dependence on electricity imports	Develop and implement viable indigenous electricity generation facilities	Federation of Swaziland Employers & Chamber of Commerce – <b>Lead</b> Swaziland Investment Promotion Authority – <b>Co-Lead</b> Private Sector –entrepreneurs & investors Financial Institutions (e.g. Swaziland National Provident Fund (SNPF), Swaziland Development Finance Corporation (Fincorp), Old Mutual) Ministry of Natural Resources & Energy Swaziland Electricity Company
	AE2. Low private sector investment in electricity generation	Strengthen implementation of facilitation mechanisms to attract sector investment in electricity generation	Swaziland Energy Regulatory Authority – <b>Lead</b> Federation of Swaziland Employers & Chamber of Commerce – <b>Co-Lead</b> Swaziland Investment Promotion Authority Private Sector –entrepreneurs & investors Financial Institutions (e.g. Swaziland National Provident Fund (SNPF), Swaziland Development Finance Corporation (Fincorp), Old Mutual) Ministry of Natural Resources & Energy - <b>Co-Lead</b> Swaziland Electricity Company
	AE3. Inadequate technical, managerial, financial and regulatory capacity of key institutions in energy sector	Train officials of key energy institutions on technical, managerial, financial and regulatory capacity	Ministry of Natural Resources & Energy - <b>Lead</b> University of Swaziland – <b>Co-Lead</b> Other technical/management training institutions
	AE4. Predominance of non-productive uses of electricity	(see below)	
<b>Promotion of Productive Use of Energy (PUE)</b>	PUE 1. Weak capacity for project feasibility studies and implementation (including incomplete data, inadequate assessment of capacity gaps of MSMEs and PUE service providers)	Engage qualified experts for business plans on PUE project; train officials of relevant energy institutions on capacity for project feasibility studies and implementation	Ministry of Natural Resources & Energy - <b>Lead</b> Federation of Swaziland Employers & Chamber of Commerce – <b>Co-Lead</b> Swaziland Investment Promotion Authority Financial Institutions (e.g. SNPF, Fincorp, Old Mutua) Swaziland Electricity Company University of Swaziland Business training institutions

	PUE 2. Inadequate awareness of PUE issues and strategies amongst local energy service providers	Raise awareness of PUE programmes among energy service providers; and encourage energy service providers to act as facilitators	Ministry of Natural Resources & Energy <b>Lead</b> Federation of Swaziland Employers & Chamber of Commerce – <b>Co-Lead</b> Renewable Energy Association of Swaziland Swaziland Investment Promotion Authority Swaziland Electricity Company
	PUE 3. Inadequate awareness creation amongst local financial institutions on improving access to finance, including micro-finance, for PUE investments	Raise awareness amongst micro finance institutions; define measures to improve access to loans for productive use investments; and establish partnerships with financial institutions to facilitate access to credit	Federation of Swaziland Employers & Chamber of Commerce – <b>Lead</b> Swaziland Investment Promotion Authority – <b>Co-Lead</b> Financial Institutions (e.g. SNPF, Fincorp, Old Mutual) Private Sector - entrepreneurs & investors Ministry of Natural Resources & Energy - <b>Lead</b> Swaziland Electricity Company
	PUE 4. Inadequate technical assistance for beneficiary MSMEs (including low level of training and business development services)	Provide technical training and business development to meet the needs of target MSMEs involved in PUE programmes	Federation of Swaziland Employers & Chamber of Commerce – <b>Lead</b> Ministry of Natural Resources & Energy – <b>Co-Lead</b> Swaziland Electricity Company Swaziland Investment Promotion Authority University of Swaziland Business Training Institutions Private Sector - entrepreneurs & investors
	PUE 5. Inadequate monitoring and evaluation on PUE programmes (including incomplete baseline data and inadequate research to define results chain, indicators, targets and assess impacts)	Include relevant energy access and utilization data requirements in national living standards surveys and population census	Swaziland Statistics Office - <b>Lead</b> Ministry of Natural Resources & Energy Swaziland Investment Promotion Authority
<b>Access to Modern Energy for Cooking</b>	LPG 1. Lack of regulation of LPG market	Develop and implement regulation structure and mechanism for LPG market chain to ensure uniformity and equity	Swaziland Energy Regulatory Authority – <b>Lead</b> Ministry of Natural Resources & Energy - <b>Co-Lead</b> Oil Marketing Companies (e.g. Swazi Oxygen, Easigas) Private Sector - entrepreneurs & investors
<b><u>Access to LPG</u></b>	LPG 1. Safety concerns of households, institutions and commercial end-users on LPG use for cooking	1. Public education to address perception of high risk of LPG use for cooking	Oil Marketing Companies e.g. Swazi Oxygen – <b>Lead</b> Town Councils (e.g. Mbabane, Matsapha) – <b>Co-Lead</b> Rural Local Authorities – Tinkhundla Centres Ministry of Natural Resources & Energy
		2. Develop LPG Safety Association to facilitate fora for relevant stakeholders to discuss and address issues/ challenges faced by the LPG industry to ensure uniformity and safety	Oil Marketing Companies e.g. Swazi Oxygen - <b>Lead</b> Town Councils (e.g. Mbabane, Matsapha) – <b>Co-Lead</b> Rural Local Authorities – Tinkhundla Centres Ministry of Natural Resources & Energy
	LPG 2.1 Inadequate distribution infrastructure, with over concentration of distribution outlets in major urban settlements	1. Offer incentives to encourage private LPG retail/service companies to build up extensive distribution network and retail outlets	Swaziland Energy Regulatory Authority – <b>Lead</b> Ministry of Natural Resources & Energy – <b>Co-Lead</b> Oil Marketing Companies (e.g. Swazi Oxygen, Easigas) Town Councils (e.g. Mbabane, Matsapha, Ezulwini)



			Rural Local Authorities – Tinkhundla Centres
		2. Create LPG distribution concessions for existing LPG retailers/marketing companies or new actors	Swaziland Energy Regulatory Authority – <b>Lead</b> Town Councils (e.g. Mbabane, Matsapha) – <b>Co-Lead</b> Rural Local Authorities – Tinkhundla Centres Oil Marketing Companies (e.g. Swazi Oxygen, Easigas) Ministry of Natural Resources & Energy
		3. Establish favourable and transparent product pricing regime for LPG, including favourable bulk transportation margins	Ministry of Natural Resources & Energy - <b>Lead</b> Swaziland Energy Regulatory Authority – <b>Co-Lead</b> Oil Marketing Companies (e.g. Swazi Oxygen, Easigas) Town Councils (e.g. Mbabane, Matsapha, Ezulwini) Rural Local Authorities – Tinkhundla Centres
<b>Access to Modern Energy for Cooking</b>  <u>Access to Improved Cookstoves</u>	ICS 1. Lack of national policy and weak regulation of the cooking subsector, including regulation of the fuelwood supply chain	Institute domestic policy for improved cookstoves and advance legislation for promotion and development of the improved cookstove subsector	Swaziland Energy Regulatory Authority – <b>Lead</b> Ministry of Natural Resources & Energy - <b>Co-Lead</b> Women Groups e.g. Women in Development Town Councils (e.g. Mbabane, Matsapha, Ezulwini) Rural Local Authorities – Tinkhundla Centres
	ICS 2. Lack of incentives to promote the improved cookstoves subsector	Institute incentives to promote the improved cookstoves subsector – e.g. reduced import duties and taxes on technologies; and regulation of raw material inputs (scrap metal)	Ministry of Commerce, Industry & Trade – <b>Lead</b> Ministry of Natural Resources & Energy - <b>Co-Lead</b> Federation of Swaziland Employers & Chamber of Commerce Private Sector – entrepreneurs & investors
	ICS 3. Lack of technical standards and quality control for improved stoves, resulting in poor quality of stoves	1. Adopt, implement and enforce quality standards on improved stoves	Swaziland Standards Authority - <b>Lead</b> Ministry of Commerce, Industry & Trade - <b>Co-Lead</b> University of Swaziland Ministry of Natural Resources & Energy
		2. Establish testing and certification facility for improved stoves	Swaziland Standards Authority - <b>Lead</b> Ministry of Commerce, Industry & Trade - <b>Co-Lead</b> University of Swaziland Ministry of Natural Resources & Energy
	ICS 4. Poor design of promotional messages that address gender, cultural and behavioural dimensions of cooking as well as consumer research and input from end users	1. Partner with women’s groups and NGOs to educate households, institutions and commercial end-users on the benefits of improved cookstoves and discuss their cookstove design preferences	Ministry of Natural Resources & Energy - <b>Lead</b> Women Groups e.g. Women in Development – <b>Co-Lead</b> Town Councils (e.g. Mbabane, Matsapha, Ezulwini) Rural Local Authorities – Tinkhundla Centres
		2. Undertake consumer surveys and regional energy needs assessment to map socio-cultural variations and priorities related to cookstoves	Ministry of Natural Resources & Energy - <b>Lead</b> Women Groups (e.g. Women in Development) – <b>Co-Lead</b> University of Swaziland Town Councils (e.g. Mbabane, Matsapha, Ezulwini) Rural Local Authorities – Tinkhundla Centres
		3. Introduce advanced biomass cookstoves for cooking in public institutions, hotels and	Ministry of Natural Resources & Energy - <b>Lead</b> Ministry of Education & Training Ministry of Tourism

		restaurants	Financial Institutions (e.g. SNPF, Fincorp, Old Mutual) Private Sector – entrepreneurs & investors
	ICS 5. Lack of access to finance for producers to improve production capacity, quality and distribution of cookstoves; Limited access of end users to finance for upfront costs of improved cookstoves	Fully engage with financial sector in the design and implementation of cookstove programmes to provide medium to long-term finance for capital investments in production and business growth, and soft loans to end-users	Federation of Swaziland Employers & Chamber of Commerce – <b>Lead</b> Swaziland Investment Promotion Authority – <b>Co-Lead</b> Financial Institutions (e.g. SNPF, Fincorp, Old Mutual) Women Groups e.g. Women in Development Private Sector – entrepreneurs & investors Ministry of Natural Resources & Energy -
	ICS 6. Lack of funding for research and development (R&D), demonstrations, monitoring & Evaluation (M&E) and impact analysis	i) Set up funding for R&D, demonstrations, M&E, and impact analysis – support local institutions; ii) Finance baseline studies and capacity building to leverage carbon financing	Ministry of Natural Resources & Energy - <b>Lead</b> University of Swaziland – <b>Co-Lead</b> Financial Institutions (e.g. SNPF, Fincorp, Old Mutual) Private Sector - entrepreneurs & investors
	ICS 7. Inadequate capacity of key actors across the improved cookstove value chain to promote cookstove technology innovation and adaptation - including researchers, financiers, raw material suppliers, manufacturers and distributors	i) Promote knowledge and experience sharing among stakeholders; ii) Provide capacity building support and training on various technologies	Ministry of Natural Resources & Energy - <b>Lead</b> University of Swaziland <b>Co-Lead</b> Other Training Institutes Women Groups e.g. Women in Development Private Sector - entrepreneurs & investors
<b>Increasing the Contribution of Renewable Energy in the National Energy Mix</b>	RE 1. Lack of policy to govern the procurement of viable renewable energy technologies	Develop the policy instruments to promote the following: <ul style="list-style-type: none"> <li>● Feed-in-tariff for biomass and hydro power</li> <li>● Tendering for solar PV and wind</li> <li>● Net-metering for roof top-based solar PV</li> <li>● Government subsidies for rural electrification with solar PV</li> <li>● Develop National Integrated Resource Plan for energy, including renewable energy</li> </ul>	Swaziland Energy Regulatory Authority – <b>Lead</b> Ministry of Natural Resources & Energy <b>Co-Lead</b> Swaziland Electricity Company Renewable Energy Association of Swaziland Federation of Swaziland Employers & Chamber of Commerce
	RE 2. Lack of awareness of viable renewable energy technologies among the public, private sector investors and financial institutions	Implement demonstration projects on viable technologies on: <ul style="list-style-type: none"> <li>● Solar</li> <li>● Wind</li> <li>● Biomass</li> <li>● Mini-hydro</li> </ul>	Renewable Energy Association of Swaziland – <b>Lead</b> Federation of Swaziland Employers & Chamber of Commerce – <b>Co-Lead</b> University of Swaziland Swaziland Investment Promotion Authority Town Councils (e.g. Mbabane, Matsapha, Ezulwini) Rural Local Authorities – Tinkhundla Centres Ministry of Natural Resources & Energy Swaziland Electricity Company

	RE 3: High initial investment cost of electricity generation from renewable energy	Fully engage with financial sector to provide medium to long-term finance for capital investments in electricity generation from renewable energy	Federation of Swaziland Employers & Chamber of Commerce – <b>Lead</b> Swaziland Investment Promotion Authority – <b>Co-Lead</b> Financial Institutions (e.g. SNPF, Fincorp, Old Mutual) Private Sector – entrepreneurs & investors Ministry of Natural Resources & Energy -
	RE 4: Inadequate statistics and data disaggregation on renewable energy	Intensify and expand gathering of reliable disaggregated data on renewable energy resources	Ministry of Natural Resources & Energy – <b>Lead</b> National Meteorological Department - <b>Co-Lead</b> Swaziland Electricity Company Swaziland Energy Regulatory Authority University of Swaziland
<b>Increasing Energy Efficiency</b>	EE 1. Lack of policy to promote energy efficiency programmes	1. Develop policy and regulatory framework for energy efficiency	Swaziland Energy Regulatory Authority – <b>Lead</b> Ministry of Natural Resources & Energy - <b>Co-Lead</b> Swaziland Standards Authority Swaziland Electricity Company
		2. Adopt and implement Minimum Energy Performance Standards of efficient lamps and refrigerators	Swaziland Energy Regulatory Authority – <b>Lead</b> Swaziland Standards Authority - <b>Co-Lead</b> Ministry of Natural Resources & Energy - Swaziland Electricity Company
		3. Design, adopt and implement mandatory labelling and certification for efficient lamps and refrigerators	Swaziland Energy Regulatory Authority – <b>Lead</b> Swaziland Standards Authority - <b>Co-Lead</b> Ministry of Natural Resources & Energy Swaziland Electricity Company
	EE 2. Lack of awareness of the benefits of efficient use of energy among the public, private sector investors and financial institutions	1. Organize public education and awareness campaigns on the advantages and benefits of efficient use of energy	Ministry of Natural Resources & Energy - <b>Lead</b> Swaziland Electricity Company Swaziland Energy Regulatory Authority University of Swaziland
		2. Organize special education programmes for the youth in schools on the advantages and benefits of efficient use of energy	Ministry of Education & Training– <b>Lead</b> Ministry of Natural Resources & Energy – <b>Co-Lead</b> Swaziland Electricity Company University of Swaziland
		3. Implement demonstration projects on efficient use of energy	Federation of Swaziland Employers & Chamber of Commerce – <b>Lead</b> Ministry of Natural Resources & Energy - <b>Co-Lead</b> Swaziland Electricity Company Swaziland Investment Promotion Authority Financial Institutions (e.g. SNPF, Fincorp, Old Mutual) Town Councils (e.g. Mbabane, Matsapha, Ezulwini) Rural Local Authorities – Tinkhundla Centres University of Swaziland Private Sector – entrepreneurs & investors

		4. Implement free distribution of efficient lamps or at subsidized cost to carefully selected communities (with retrieval and destruction of replaced incandescent lamps)	Ministry of Natural Resources & Energy - <b>Lead</b> Ministry of Commerce, Industry & Trade – <b>Co-Lead</b> Swaziland Electricity Company Financial Institutions (e.g. SNPF, Fincorp, Old Mutual) Town Councils (e.g. Mbabane, Matsapha, Ezulwini) Rural Local Authorities – Tinkhundla Centres
		5. Promote installation of efficient lighting in all new social housing projects of government	Ministry of Housing & Urban Development – <b>Lead</b> Ministry of Natural Resources & Energy - <b>Co-Lead</b> Swaziland Electricity Company Town Councils (e.g. Mbabane, Matsapha, Ezulwini) Rural Local Authorities – Tinkhundla Centres
	EE 3. Lack of incentives for the application of energy efficient technologies and appliances	1. Facilitate development of financing schemes to cover the upfront cost of on-grid and off-grid lighting products (e.g. on-bill financing)	Ministry of Natural Resources & Energy - <b>Lead</b> Financial Institutions (e.g. SNPF, Fincorp) – <b>Co-Lead</b> Swaziland Electricity Company Town Councils (e.g. Mbabane, Matsapha, Ezulwini) Rural Local Authorities – Tinkhundla Centres
		2. Facilitate the availability of good quality on-grid and off-grid lighting products through bulk procurement (e.g. through reducing import duties)	Federation of Swaziland Employers & Chamber of Commerce – <b>Lead</b> Ministry of Commerce, Industry & Trade – <b>Co-Lead</b> Ministry of Natural Resources & Energy Swaziland Electricity Company Financial Institutions (e.g. SNPF, Fincorp, Old Mutual) Town Councils (e.g. Mbabane, Matsapha, Ezulwini)

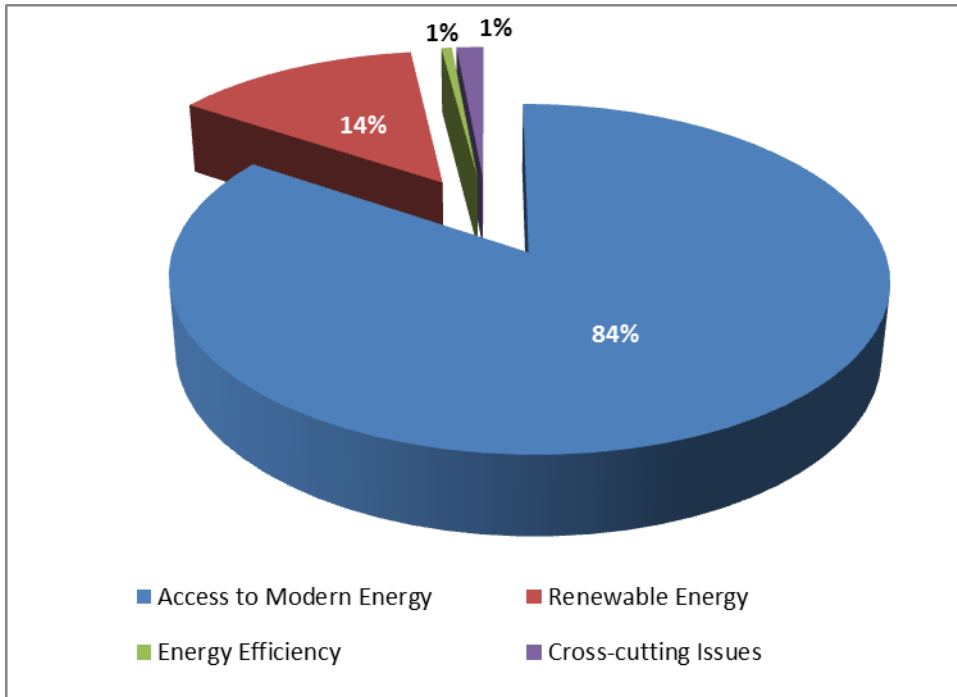
## 6. SE4ALL ACCELERATION PLAN – SWAZILAND COUNTRY ACTION PLAN

Swaziland’s SE4ALL Country Action Plan covers priority intervention areas to accelerate the attainment of the goal of SE4ALL by 2030, where the removal of critical bottlenecks are likely to yield the highest and most widespread impacts on people’s living conditions and economic livelihoods, particularly in under-served rural and peri-urban communities and households. In previous sections, the progress made in the energy sector of Swaziland has been highlighted, and strengths as well as many constraints in the sector have been identified through interactive consultations with energy sector stakeholders.

The stakeholder consultation process helped in collectively devising specific solutions and prioritized actions to accelerate the achievement in Swaziland of positive outcomes towards “Sustainable Energy for All” by 2030. The investment requirement for the Swaziland SE4ALL Country Action Plan is summarised in Table 6.1, whilst the details are presented in Table 6.2. The total cost of the SE4ALL Country Action Plan is estimated to be **US\$1.06 billion (or SZL11.29 billion)** over the period 2014-2022, in consideration of 2022 being the target date of Swaziland’s National Development Strategy. As presented in Figure 6.1, required investment on access to modern energy constitute 84% of the total investment, followed by investment on renewable energy at 14% and energy efficiency at 1%; required investment on cross-cutting issues constitute 1% of the total investment.

**Table 6.1: Summary of Investment Requirement for Swaziland SE4ALL Country Action Plan**

Component of SE4ALL Objectives	Prioritized Interventions	Total Cost, US\$ million
Universal Access to Modern Energy Services	Increasing Local Electricity Generation Capacity	833.00
	Promotion of Productive Use of Energy (PUE)	0.65
	Access to Modern Energy for Cooking - LPG	0.90
	Access to Modern Energy for Cooking – Improved Cookstoves	6.35
	<b>Sub-Total</b>	<b>890.90</b>
Renewable Energy	Increasing the Contribution Of Renewable Energy in The National Energy Mix	142.75
Energy Efficiency	Increasing Energy Efficiency	6.10
Cross-cutting Issues	Cross-Cutting Issues	15.50
	<b>GRAND TOTAL</b>	<b>US\$1.06 billion OR SZL11.29 billion</b>



**Figure 6.1: Distribution of Investment Required for Prioritised Interventions**

Table 6.3 also presents the Country Action Plan Implementation and Monitoring Plan. The costs of the prioritized interventions under the Plan are estimates, and in each instance, comprehensive feasibility studies need to be conducted to confirm the viability of the intervention.

The private sector will be encouraged through enabling mechanisms to uptake the investment projects under the Country Action Plan, under the coordination of Ministry of Natural Resources and Energy. International partnerships will also be sought to enhance the successful implementation of the interventions, taking advantage of knowledge sharing on proven technologies as well as best practices in the rollout of sustainable energy interventions. Notable among these potential partnerships relate to the Global Alliance for Clean Cookstoves, the Global LPG Partnership and the Africa Clean Cooking Initiative.

**Table 6.2: Country Action Plan towards Sustainable Energy for All in Swaziland**

<b>Prioritized Interventions</b>	<b>Prioritized Acceleration Solution</b>	<b>Key Activities</b>	<b>Total Cost US\$</b>
<b>Increasing Local Electricity Generation Capacity</b>	EA 1: Expand local hydropower capacity	Implement following hydropower projects: Mnjoli Dam - 1.5 MW Lower Maguduza Hydro Power – 10MW Mini-Hydroelectric Power Plant at Lubovane Dam at Siphofaneni – 5MW Ngwempisi hydropower cascade (3 dams) – 120MW	3,000,000 22,000,000 8,000,000 150,000,000 700,000,000
	EA 2: Install coal-fired thermal plant	Establish coal-fired thermal plant at Lubhuku near Big Bend – 2x150MW	
		<b>Sub-total</b>	<b>883,000,000</b>
<b>Promotion of Productive Use of Energy (PUE)</b>	PUE 1. Train officials of relevant energy institutions on capacity for project feasibility studies and implementation	Organise training programmes for officials of energy institutions on capacity for project feasibility studies and implementation	250,000
	PUE 2. Provide technical training and business development to meet the needs of target MSMEs involved in PUE programmes	Organise technical training programmes for PUE SMEs	250,000
	PUE 3. Include relevant energy access and utilization data requirements in national living standards surveys and population census	Organise training programmes for officials of Central Statistical Office on gathering data on energy access and utilization	150,000
		<b>Sub-total</b>	<b>650,000</b>
<b>Access to Modern Energy for Cooking - LPG</b>	LPG 1. Develop and implement regulation structure and mechanism for LPG market chain	Conduct consultations with stakeholders in LPG market chain to develop and implement regulation structure and mechanism for LPG market chain	300,000
	LPG 2. Develop LPG Safety Association	Facilitate the formation and operation of LPG Safety Association	100,000
	LPG 3. Offer incentives to encourage private LPG retail/service companies to build up distribution network and retail outlets	Develop and implement incentives to encourage private LPG retail/service companies to build up distribution network and retail outlets e.g. import duties and taxes reduction	200,000

	LPG 4. Create LPG distribution concessions for existing LPG retailers/marketing companies or new actors	Facilitate the creation of LPG distribution concessions for existing LPG retailers/marketing companies or new actors	100,000
	LPG 5. Establish favourable and transparent product pricing regime for LPG	Conduct stakeholder consultations to develop and implement favourable and transparent product pricing regime for LPG	200,000
		<b>Sub-total</b>	<b>900,000</b>
<b>Access to Modern Energy for Cooking – Improved Cookstoves</b>	ICS 1. Institute domestic policy for improved cookstoves and advance legislation for promotion and development of improved cookstoves	Conduct stakeholder consultations to develop and implement domestic policy and legislation for promotion and development of improved cookstoves	200,000
	ICS 2. Institute incentives to promote the improved cookstoves subsector	Develop and implement incentives to promote the improved cookstoves subsector – e.g. reduce import duties and taxes reduction	150,000
	ICS 3. Testing and certification facility for improved stoves	Establish Improved Cookstove Test Laboratory with appropriate equipment and skilled personnel	1,000,000
	ICS 4. Consumer surveys and regional energy needs assessment on cookstoves	Undertake consumer surveys and regional energy needs assessment on cookstoves to map socio-cultural variations and priorities (once every three years)	600,000
	ICS 5. Demonstrate benefits of improved cookstoves	Introduce advanced biomass cookstoves for cooking in public institutions, hotels and restaurants - 50 units/annum	500,000
	ICS 6. Participation of financial sector in the design and implementation of cookstove programmes	Fully engage with financial to provide medium to long-term finance for capital investments in production and business growth, and soft loans to end-users	100,000
	ICS 7. Funding for research and development, demonstrations, M&E, and impact analysis on cookstoves	Set up dedicated fund for research and development, demonstrations, M&E, and impact analysis on cookstoves	3,000,000
	ICS 8. Promote knowledge and experience sharing among stakeholders	Organise annual stakeholder workshops and conferences on improved cookstoves (8 events)	800,000
		<b>Sub-Total</b>	<b>6,350,000</b>



<b>Increasing the Contribution Of Renewable Energy in the National Energy Mix</b>	RE 1. Develop appropriate policy instruments to promote renewable energy	Conduct stakeholder consultations to develop the policy instruments to promote the following: <ul style="list-style-type: none"> <li>• Feed-in-tariff for biomass and hydro power</li> <li>• Tendering for PV and wind</li> <li>• Net-metering for roof top based PV</li> <li>• Government subsidies for rural electrification with PV</li> </ul>	250,000
	RE 2. Develop and implement demonstration projects on viable renewable energy technologies	1. Implement demonstration projects on viable solar, wind and small-hydro technologies	5,000,000
		2. Establish biomass-fired (forestry residues) power plant at Bhunya-35MW	62,000,000
		3. Establish biomass-fired (sugarcane residues) power plant at Mhlume or Simunye – 30MW	75,000,000
	RE 3. Reliable data on renewable energy resources	Intensify and expand gathering of reliable disaggregated data on renewable energy resources	500,000
		<b>Sub-total</b>	<b>142,750,000</b>
<b>Increasing Energy Efficiency</b>	EE 1. Labelling and certification for efficient household appliances	1. Conduct stakeholder consultations to develop, adopt and implement policy and regulatory framework for energy efficiency	400,000
		2. Conduct stakeholder consultations to design, adopt and implement mandatory labelling and certification for efficient lamps and refrigerators	300,000
	EE 2. Demonstrate the benefits of efficient use of energy	1. Implement free distribution of efficient lamps or at subsidized cost to carefully selected communities – 500,000 CFLs per year for 3 years	5,000,000
		2. Promote installation of efficient lighting in all new social housing projects of government	200,000
	EE 3. Incentives to encourage efficient use of energy	Facilitate development of financing schemes to cover the upfront cost of lighting products	200,000
		<b>Sub-total</b>	<b>6,100,000</b>
<b>Cross-Cutting Issues</b>	CCI 1. Gaps in energy data and research (including consumer research) and lack of funding for regular annual surveys to update energy data	Conduct Annual Energy Access and Consumer Research Surveys	3,000,000
	CCI 2. Lack of funding for sustained public education and awareness creation	Prepare and implement Annual Programmes for Public Education and Awareness Creation on Energy Access, Renewable Energy and Energy Efficiency	6,000,000

	CCI 3. Lack of Standards and weak regulatory regimes in energy sector	Develop Standards for energy end-use devices and strengthen regulations in energy sector	3,000,000
	CCI 4. Low level of mainstreaming gender into policies and programmes	Mainstream Gender into policies and programmes and evaluate effectiveness	2,000,000
	CCI 5. Weak integration of Climate Change into programmes and projects	Integrate Climate Change into programmes and projects and evaluate effectiveness	1,000,000
	CCI 6.1 Establish and implement effective national governance and monitoring mechanism for SE4ALL	Organise regular inter-Ministerial and Inter-Agency Meetings to review SE4ALL policies, programmes and projects	500,000
		<b>Sub-total</b>	<b>15,500,000</b>
		<b>GRAND TOTAL</b>	<b>US\$1,055,250,000</b> OR <b>SZL 11,291,175,000*</b>

\* 1US\$ = SZL10.70 (May, 2014)

**Table 6.3: Swaziland Country Action Plan on SE4ALL - Implementation Plan**

ACCELERATION ACTIVITIES	IMPLEMENTATION TIMELINE (2014-2022; 2025-2030)										
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2025	2030
<b>Increasing local electricity generation capacity</b>											
Mnjoli Dam - 1.5 MW											
Lower Maguduza Hydro Power – 20MW											
Mini-Hydroelectric Power Plant at Lubovane Dam at Siphofaneni – 5MW											
Coal-fired thermal plant, Lubhuku near Big Bend – 2x150MW											
Ngwempisi hydropower cascade (3 dams) – 120MW											
<b>Promotion of Productive Use of Energy</b>											
Training programmes for officials of energy institutions on capacity for project feasibility studies and implementation											
Technical training programmes for PUE SMEs											
Training programmes for officials of Central Statistical Office on gather data on energy access and utilization											
<b>Access to Modern Energy for Cooking – LPG</b>											
Conduct consultations with stakeholders in LPG market chain and develop and implement regulation structure and mechanism for LPG market chain											
Facilitate the formation and operation of LPG Suppliers Association and LPG Safety Association											
Develop and implement incentives to encourage private LPG retail/service companies to build up distribution network and retail outlets e.g. import duties and taxes reduction											

Facilitate the creation of LPG distribution concessions for existing LPG retailers/marketing companies or new actors												
Conduct stakeholder consultations and develop and implement favourable and transparent product pricing regime for LPG												
<b>Access to Modern Energy for Cooking – Improved Cookstoves</b>												
Conduct stakeholder consultations and develop and implement domestic policy and legislation for promotion and development cookstoves												
Develop and implement incentives to promote the improved cookstoves subsector – e.g. import duties and taxes reduction												
Establish Improved Cookstove Test Laboratory with appropriate equipment and skilled personnel												
Undertake consumer surveys and regional energy needs assessment on cookstoves to map socio-cultural variations and priorities (once every three years)												
Introduce advanced biomass cookstoves for cooking in public institutions, hotels and restaurants - 50 units												
Fully engage with financial sector in the design and implementation of cookstove programmes												
Set up dedicated fund for research and development, demonstrations, M&E, and impact analysis on cookstoves												
Organise annual stakeholder workshops and conferences on improved cookstoves (8 events)												
<b>Increasing the Contribution Of Renewable Energy in the National Energy Mix</b>												
Conduct stakeholder consultations; develop the policy instruments to promote the following: <ul style="list-style-type: none"> <li>• Feed-in-tariff for biomass and hydro power</li> </ul>												

<ul style="list-style-type: none"> <li>• Tendering for PV and wind</li> <li>• Net-metering for roof top based PV</li> <li>• Government subsidies for rural electrification with PV</li> </ul>												
Implement demonstration projects on viable technologies on: Solar, Wind, Biomass, Mini-hydro												
Establish biomass-fired (forestry residues) power plant at Bhunya– 35MW												
Establish biomass-fired (sugarcane residues) power plant at Mhlume or Simunye – 30MW												
Intensify and expand gathering of reliable disaggregated data on renewable energy resources												
<b>Increasing Energy Efficiency</b>												
Conduct stakeholder consultations to develop, adopt and implement policy and regulatory framework for energy efficiency												
Conduct stakeholder consultations; design, adopt and implement mandatory labelling and certification for efficient lamps and refrigerators												
Implement free distribution of efficient lamps or at subsidized cost to carefully selected communities – 500,000 CFLs per year for 3 years												
Promote installation of efficient lighting in all new social housing projects of government												
Facilitate development of financing schemes to cover the upfront cost of lighting products												
<b>Cross-Cutting Issues</b>												
Conduct Annual Energy Access and Consumer Research surveys (AECRS)												
Prepare and implement Annual Programmes for Public Education and Awareness Creation (APPEDAC)												
Develop Standards for enhanced devices and strengthen regulations												

Mainstream Gender into policies and programmes and evaluate effectiveness												
Integrate Climate Change (CC) into programmes and projects and evaluate effectiveness												
Organise regular inter-Ministerial and Inter-Agency Meetings (IMIAM) to review SE4ALL policies, programmes and projects												

## **7. IMPLEMENTATION ARRANGEMENTS (OVERSIGHT, COORDINATION AND MANAGEMENT OF SE4ALL COUNTRY ACTION PLAN)**

Effective implementation of the Swaziland SE4ALL Country Action Plan requires governance arrangements that reflect cross-sectoral cooperation and inter-ministerial coordination. This will ensure that at the policy level, acceleration of sustainable access to energy as an imperative for sustainable growth, employment and poverty reduction remains a major plank of national strategies for shared growth.

At the programme level, the mobilization and facilitation of the private sector participation, e.g. through investment partnerships, will be critical to the success of the Country Action Plan. SMEs can drive productive uses of energy as well as sustainable penetration of energy services and devices into underserved peri-urban and rural markets. However, it will take the support of the financial sector to develop relevant and innovative credit products to raise the long-term capital needed. Town Councils and Tinkhundla Centres as well as community-based civil society organizations, are prime agents of change at the local level.

The planned institutional arrangements elaborated below therefore reflect the above functional areas of need.

### **7.1 ANNUAL NATIONAL SE4ALL FORUM**

A National Forum on Sustainable Energy for All will be convened every year by the Ministry of Natural Resources and Energy to review progress on the implementation of the Swaziland Country Action Plan. It will serve the SE4ALL “Annual General Meeting” of all stakeholders (government, the private sector, civil society, research community and end-user representatives) and a forum for holding those responsible for implementing the Country Action Plan to account. Presentation of the overall SE4ALL Country Action Plan Monitoring and Performance Assessment Report will be the centre piece of the National Forum, enabling stakeholders to review progress against the targets set. It will also serve as the principal forum for private sector partnership and investment promotion.

### **7.2 INTER-MINISTERIAL COMMITTEE**

An Inter-Ministerial Committee, chaired by the Minister of Natural Resources and Energy, will also be constituted to provide strategic oversight and governance over the implementation of the Country Action Plan. This will comprise of the Ministry of Natural Resources and Energy, Ministry of Tourism and Environmental Affairs, Ministry of Agriculture and Cooperatives, Ministry of Finance, and Ministry of Economic Planning and Development. This Committee, will establish Project Sub-Committees, and co-opt

representatives of civil society, research community and the private sector, especially business associations and financial institutions, as members.

The Inter-Ministerial Committee will meet bi-annually to set overall policy and take responsibility for deploying resources to their most productive use across the various project components outlined in the Country Action Plan. On the other hand, the Project Steering Committees will act as trustees of additional SE4ALL funds mobilized and pooled to fill in the public funding gap.

### **7.3 THE SECRETARIAT**

The Energy Department of the Ministry of Natural Resources and Energy will serve as the Secretariat for the coordination and management of the Country Action Plan. As the management team, the Secretariat will be ultimately responsible and accountable for managing the implementation of the Country Action Plan. This will require the designation of a National SE4ALL Coordinator within the Energy Department of the Ministry of Natural Resources and Energy to serve as the lead programme manager of the Country Action Plan.

The Coordinator will firstly exercise executive stewardship of the Country Action Plan resources in general and advise the Project Sub-Committees where the best opportunities for delivering the SE4ALL outcomes are and how the required investments can be made and managed to ensure maximum returns. Secondly, working with project implementation partners identified in the Country Action Plan, the Coordinator will serve as the lead facilitator of the project interventions, providing technical assistance (TA) or TA funding to implementation partners, including for commissioning feasibility studies, consumer and end-user research, work plan preparation and results monitoring. As the Secretariat, the Energy Department of the Ministry of Natural Resources and Energy will establish the proposed Taskforce of Energy Access Data which will collaborate with the Central Statistical Office and other bodies to incorporate sustainable access to energy into regularly collected and updated data.



## **APPENDIX: PARTICIPATING STAKEHOLDERS IN CONSULTATIONS TOWARDS THE SWAZILAND SE4ALL COUNTRY ACTION PLAN**

### **Ministries**

1. Ministry of Agriculture
2. Ministry of Economic Planning & Development
3. Ministry of Finance
4. Ministry of Health - Environment Health Dept.
5. Ministry of Natural Resources and Energy - Dept. of Water Affairs
6. Ministry of Tourism

### **Government Departments and Agencies**

7. Department of Meteorology
8. Ezulwini Town council
9. Forestry Dept.
10. International Programme on Chemical Safety (IPCS)
11. KOBWA- Komati Basin Water Authority
12. Lower Usutu Sustainable Land Management (LUSLM)
13. Matsapha Town Council
14. Mbabane City Council
15. Swaziland Energy Regulatory Authority
16. Swaziland Environment Authority
17. Swaziland Standards Authority (SWASA)

### **Utilities**

18. Swaziland Electricity Company
19. Swaziland Water Services Corporation

### **Financial Institutions**

20. Old Mutual Swaziland
21. Swaziland Development Finance Corporation (Fincorp)
22. Swaziland Investment Promotion Authority
23. Swaziland National Provident Fund

### **Private Sector**

24. Federation of Swaziland Employers and Chamber of Commerce
25. Aleche Consulting Engineers
26. Chevron
27. Enviro Friendly Tech
28. Evergreen
29. Galp Swaziland

- 30. Green Energy Investment
- 31. LUV Solar Energy Solution
- 32. Manasseh Investment
- 33. Mormond Electrical
- 34. Royal Swaziland Sugar Corporation
- 35. Synchrona Waste Management
- 36. Total Swaziland
- 37. Ubombo Sugar

**Civil Society**

- 38. Renewable Energy Association of Swaziland (REASWA)
- 39. Swaziland Conference of Churches
- 40. Women in Development (WID)

**Academia**

- 41. University of Swaziland (UNISWA)

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