Kingdom of Eswatini National Bioenergy Policy Draft

ICAT Initiative for Climate Action Transparency

Initiative for Climate Action Transparency - ICAT

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DEFINITIONS

Biomass Energy	Biomass is matter from recently living (but now dead) organisms which is used for bioenergy production.
Biofuels	Biofuel is a fuel derived directly from living matter.
Energy Access	Access to modern energy services provided through clean cooking fuels, clean heating and lighting systems, and energy for productive use and community services.
Energy Mix	The Energy Mix of a country is the specific combination of different energy sources it uses to meet its energy consumption needs- often a combination of non- renewable and renewable energy.
Independent Power Producer (IPP)	IPP is a private entity, which generates and supplies power to the state utilities or directly to the end user.
Renewable Energy	Renewable Energy is energy from a source that is not depleted when used.
Out growers	Out growers mean farmers growing crops (plants) to be supplied to a mill or other processing facility.
Wood fuel	Wood fuel (or fuelwood) is a fuel such as firewood, charcoal, chips, sheets, pellets, and sawdust.
Vulnerable Groups	The United Nations defines vulnerable groups as people who are more likely to experience discrimination, harm, or disadvantage due to their social, economic, geographic, or physical circumstances.

Abbreviations

CSER	Centre for Sustainable Energy Research
CCU	Climate Change Unit
CSO	Central Statistics Office
ECGA	Eswatini Cane Growers Association
EEA	Eswatini Environmental Authority
EEC	Eswatini Electricity Company
ESA	Eswatini Sugar Association
ESERA	Eswatini Energy Regulatory Authority
EWSC	Eswatini Water Services Corporation
GHGMI	Greenhouse Gas Management Institute
GoE	Government of Eswatini
ICAT	Initiative for Climate Action Transparency
KoE	Kingdom of Eswatini
MCIT	Ministry of Commerce Industry and Trade
MoA	Ministry of Agriculture
MoF	Ministry of Finance
MNRE	Ministry of Natural Resources and Energy
MTEA	Ministry of Tourism and Environmental Affairs
NBP	National Bioenergy Policy
NDC	Nationally Determined Contributions
PPCU	Policy and Programme Coordination Unit
RES	Royal Eswatini Sugar
SADC	Southern Africa Development Community
SAPP	Southern Africa Power Pool
UNESWA	University of Eswatini
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Project Services

Executive Summary

This National Bioenergy Policy (NBP) is aimed at addressing three main challenges in the Kingdom of Eswatini's (KoE's) energy sector. In electricity supply, the main challenge is reliance on imports and, in this regard, the policy provides a framework for the exploitation of biomass for electricity generation. Biomass electricity has the potential to greatly improve Eswatini's security of electricity supply. In the fuels used for road transport the challenge is reliance on petroleum imports that is a result of having no internal petroleum resources. The policy proposed here provides for a framework for reducing the amount of imported petroleum through ethanol blending, using locally produced ethanol, thereby also reducing greenhouse gas emissions from the transport sector.

The third and final challenge addressed by this policy concerns the high consumption of fuel wood, particularly at a household level. This not only threatens Eswatini's natural forests, but also, when burned in an open, unprotected fire, particularly indoors, has major negative health effects. These health effects are suffered primarily by women who cook on open fires. Secondarily, the effects are suffered by other residents of the house where the open fire is used. The policy provides for a framework to reduce fuel wood consumption through the widespread dissemination of efficient cookstoves coupled with clean alternatives to firewood for cooking.

To address these challenges in the bioenergy subsector, the policy and policy actions set out herein comprise the following objectives, namely to:

1. Improve energy security through exploitation of bioenergy resources for electricity generation and biofuels production;
2. Promote access to affordable and sustainable sources of energy;
3. Accelerate the adoption of efficient biomass cookstoves and clean cooking technologies;
4. Combat the impacts of climate change; and,
5. Provide potential investors with requisite information on viable opportunities for bioenergy development and investment in the Kingdom of Eswatini (KoE).

Implementation of this bioenergy policy will have significant sustainable development impacts. Actions generated by this policy will significantly reduce greenhouse gas emissions in all three of the above-described areas (i.e. electricity generation, reduction of petroleum fuel usage in transport, and reduction of wood fuel for cooking. The actions will also have economic impacts at various levels of the economy, including at the community level. Clean cooking technologies will improve the health of the most vulnerable in society and improve people's quality of life.

Policy Positions

Government will:

1. Create a conducive environment to ensure adequate security of sustainable feedstock supply for biomass electricity generation and biofuel production.

2. Create a conducive environment to ensure efficient and reliable power production from biomass resources.
3. Create a conducive environment to ensure efficient and reliable production of biofuels.
4. Create a conducive environment to ensure minimization of negative environmental impacts in biomass electricity production and biofuel production.
5. Create a conducive environment to ensure minimization of negative social impacts from bioenergy supply chains.
6. Create a conducive environment for fostering investment and ensuring cost-effectiveness in bioenergy electricity generation and biofuel production.
7. Create an enabling environment for the adoption of improved cook stoves in all households, including all vulnerable groups, to reduce overall biomass consumption and associated environmental impacts.
8. Create an enabling environment for the promotion of access to cleaner and more sustainable alternatives for cooking and heating, considering affordability and practicality for all households all vulnerable groups.
9. Prioritize sustainable forest management practices and promote reforestation initiatives to ensure long-term availability of biomass resources.
10. Ensure that there is comprehensive development of national capacities in biomass electricity generation and biofuels production. And Government will ensure that the development of national capacities in the sector is inclusive, with men and women, boys and girls, and all vulnerable involved.
11. Ensure that the public, including men and women, boys and girls, and all vulnerable groups, is educated about the health and environmental impacts of unsustainable biomass use.
12. Ensure that the country advances and keeps up with developments in biomass cook stoves.
13. Create a conducive environment by developing a regulatory framework to ensure that the development and implementation of bioenergy projects contribute to gender equity, youth empowerment, and the inclusion of vulnerable groups.

1. Introduction

The Kingdom of Eswatini (KoE) is heavily dependent on imports to meet its energy demand. All petroleum products are imported and more than half of the electricity consumed is imported. The KoE has no oil reserves. This places a limitation on what can be done to reduce imports of petroleum products.

The KoE is, however, endowed with conventional and renewable energy resources that can boost power generation and improve security of power supply. Biomass residues from the sugar sector (bagasse) and the timber sector (residues and wood chips) are renewable energy resources which have a significant potential to contribute towards meeting the KoE's electricity demand.

By harnessing sustainably grown biomass residues for electricity generation, the KoE can reduce, if not eliminate, its reliance on imported electricity. This will not only enhance energy security, but will also mitigate against price fluctuations associated with imported fuels. Additionally, biomass electricity plants can provide a stable and renewable source of energy, thereby contributing to the country's developmental and environmental goals. The increase in local generation of electricity will enhance and diversify local economic development and growth by reducing the amount spent on imported electricity by utilizing locally sustainably grown biomass residues. The large number of smallholder farmers involved in the value chain of biomass production will also generate significant socio-economic impacts and rural development through the production and sale of local biomass for electricity generation.

In addition, the production of bioethanol (from sugar processing) for blending with imported petroleum fuels can reduce the amount of petroleum products currently imported. The most appropriate bioenergy policies can unlock the KoE's potential for biomass electricity generation, biofuel production, and efficient use of wood fuel in households. This will not only reduce greenhouse gas emissions but will also lead to an increase in domestic energy production thereby creating jobs, generating money for local use (by reducing imports), improving health, and stimulating and boosting the local economy, particularly in rural areas.

At the household level, the Bioenergy Policy recognizes the importance of wood fuel for cooking and heating. It aims to promote sustainable wood fuel production practices to minimize deforestation, improve health through better air quality from the use of improved stoves (cooking and heating) and protect indigenous forests by sustainably managing and utilizing invasive non-indigenous tree species (e.g. ***Acacia mearnsii*** or "black wattle").

This bioenergy policy can contribute to efforts aimed at protecting the natural, indigenous forest, while, at the same time, from a global greenhouse gas perspective, boost the KoE's carbon stock and reduce its greenhouse gas (GHG) emissions, by managing, harvesting and utilising the KoE's non-indigenous biomass stock, thereby reducing

climate change. By promoting initiatives such as efficient wood stoves to replace open fires, improved management and sustainable harvesting of invasive tree species, and reforestation of indigenous tree species, the KoE can further improve and expand its indigenous tree stocks and, again, reduce its GHG emissions.

Sector Vision

The Bioenergy sub-sector is part of the wider energy sector. The energy sector vision draws from the National Development Plan whose vision encapsulates the following; economic growth, improved quality of life in a peaceful environment, access to health and education, a competitive private sector that creates jobs, and preservation of the environment for the present and future generations. The outcomes set in the NDP include:

- An enhanced and more dynamic private sector that supports employment while growing the economy; recognizing that energy security is important, the NDP prioritizes increasing domestic energy generation. The country plans to reduce its reliance on imported electricity by generating its own power, with bioenergy being a primary focus in the Short-term Generation Expansion Plan (SGEP).

- Managing the country's natural resources to reverse environmental degradation, build resilience and adapt to climate change with entrenched ideas of disaster risk management and environmental sustainability. A key strategy is to increase the share of renewable energy in the electricity mix to 50%, with bioenergy playing a significant role. Additionally, the NDP captures the plan to introduce ethanol blending to reduce greenhouse gas emissions and promote efficient cook-stoves to mitigate deforestation.

The energy sector vision, as stated in the National Energy Policy reads "To meet the energy needs of the Country in a sustainable manner that contributes to economic growth and well-being of the population".

1.1. Policy Formulation Process

The Bioenergy Policy is borne upon the completion of the ICAT project in the KoE titled ***"Technical support to increase the overall transparency capacity and set-up of sectoral MRV systems in the KoE: Activity 5 Renewable electricity policy scenario assessment and impact modelling with recommendations for implementing NDC targets".*** In the project, the biomass electricity potential for the KoE was determined, hence the need to develop a Bioenergy Policy.

Discussions between MTEA, MNRE and ICAT culminated in ICAT advertising a call for proposals for a grant to conduct a study titled ***Measurement, Reporting, and Verification (MRV) for Adaptation in preparation for Biennial Transparency Report (BTR) and Expansion of Biomass-generated Electricity in the KoE***. The National Bioenergy Policy development is part of this latter ICAT Eswatini study which the University of Eswatini's Centre for Sustainable Energy Research (UNESWA CSER) conducted after receiving the ICAT grant.

The work on the policy formulation began in September 2023 with kick-off meetings between the CSER (grantee), MTEA, MNRE and the Green House Gas Management Institute (GHGMI). GHGMI's role in the process is to provide technical support. The Kick-off meetings leading to the inception workshop discussed steps towards the establishment, by MNRE, of a Bioenergy Task Force (BTF). The composition and terms of reference for the BTF were discussed at the inception workshop. The inception workshop brought together stakeholders from government, the energy regulator, the electricity company, the private sector, sugar cane out-growers among others. The task force is made up of three officers from MNRE, three officers from MTEA, two officers from the Ministry of Agriculture (MoA), two officers from Eswatini Energy Regulatory Authority (ESERA) and a representative of the Biomass group. The biomass group is made up of private sector players in the sugar and timber sectors.

The BTF held several meetings to work on the policy, and the process has been consultative, and has involved the participation of key stakeholders and decision makers at various stages. This was done through stakeholder workshops and bilateral meetings with key stakeholders to engage on specific policy issues. The draft policy structure was discussed in a BTF meeting and in bilateral meetings with the Public Policy Coordination Unit (PPCU). The draft policy document will be finalized by circulating it among stakeholders before a validation workshop.

The Bioenergy Policy is thus a product of extensive policy analysis, taking account of international trends and best practices, specific KoE considerations and the views of a diverse range of key stakeholders.

1.2 Key Stakeholders consulted in the policy development

The key stakeholders who were consulted during the development of this Eswatini National Bioenergy Policy include:

1. Ministry of Tourism and Environmental Affairs (MTEA) – Meteorology Department and Forestry Department.
2. Ministry of Agriculture (MOA)
3. Ministry of Finance(MOF)
4. Ministry of Economic Planning and Development (MEPD)
5. Ministry of Public Works and Transport (MWPT)
6. Ministry of Commerce Industry and Trade (MCIT)
7. Policy and Programme Coordination Unit (PPCU)
8. Eswatini Energy Regulatory Authority (ESERA)
9. Eswatini Electricity Company (EEC)
10. Eswatini National Petroleum Company (ENPC)
11. Eswatini Revenue Service (ERS)
12. Royal Eswatini Sugar Corporation (RES Corp)
13. Ubombo Sugar Limited (USL)
14. Eswatini Sugar Association (ESA)
15. Eswatini Cane Growers Association (ECGA)
16. USA Distillers
17. Montigny Investments

18. Shiselweni Forest-Peak Timbers
19. Tambankulu Estate

2. Problem Statement and Rationale

2.1. Overview of the Energy Sector

2.1.1. Energy Supply

In 2022 the total primary energy supply consisted of coal, biomass, hydro, imported electricity and imported oil products. The country imported 870.6 GWh and generated 709.9 GWh electricity in 2022/2023 (local electricity generation was higher due to more than usual rainfall leading to above average local production from hydropower stations). While 2022/2023 is a specific year, it demonstrates the lack of security of supply in the energy sector. This is further demonstrated by the picture painted in the Energy Masterplan 2050.

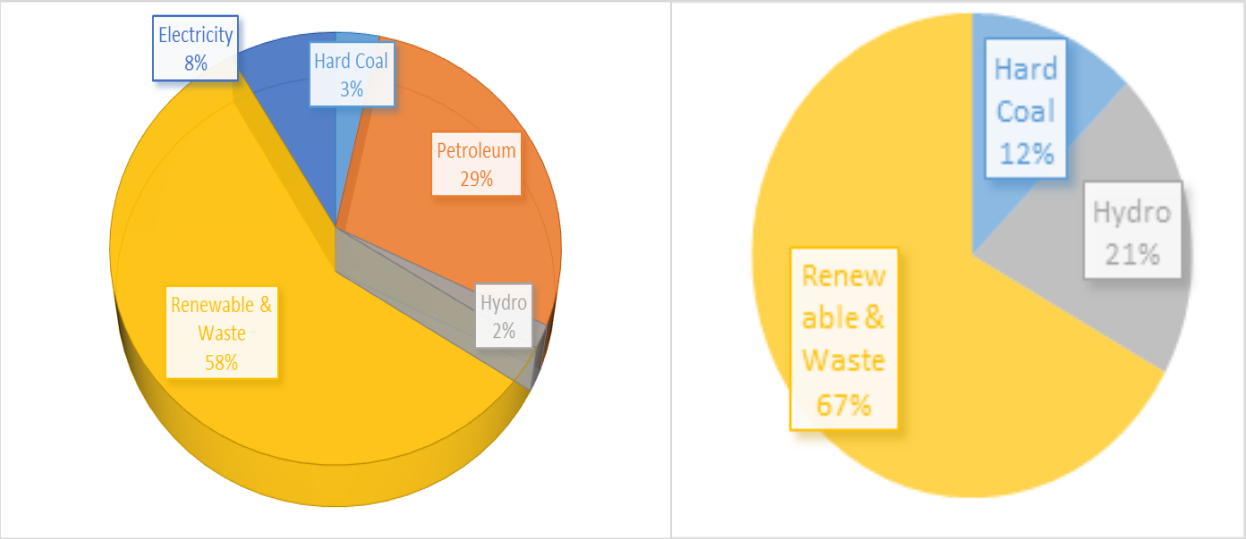

Figure 1: Total primary energy supply (left) and fuel mix for electricity and heat production in 2018 (right) from Energy Master Plan 2050.

The challenges with the KoE's energy supply can be inferred from the following, which indicates that energy consumption is mostly unsustainable (fuel wood) or imported (electricity and oil products):

- Supply of wood for domestic use is mostly unsustainable (limited replanting of trees).
- Oil products are all imported. The possibility to produce ethanol for blending and biodiesel are potential solutions to this total import dependency.
- Use of bagasse is mostly for industrial purposes. The country is currently procuring

40 MW and planning to procure an additional 80MW more biomass electricity for the grid.

- Bituminous coal is imported (new mining operations are in the pipeline), mostly by industry, with locally-mined anthracite coal exported.
- Electricity represents the rest of the energy supply, with about 70% imported.

The KoE's energy sector is at a crossroads. While heavily reliant on imported electricity and oil products the country possesses significant potential for domestic renewable energy generation. Hydropower currently accounts for most of the electricity generated in the KoE, but the country has significant potential to generate electricity from solar, wind, and especially biomass from resources such as sugarcane bagasse and timber residues.

Ethanol blending of gasoline (petrol) is the main potential liquid bioenergy option in the KoE, given that the sugar industry is well developed and is already producing ethanol for the export market from molasses. Ethanol Production is currently 254, 000 litres/day, however, most of the ethanol is exported. None of the ethanol produced is currently used for energy or blending purposes in the KoE, but the KoE has been exploring the possibility of blending locally-produced ethanol with petrol.

2.1.2. Energy Demand

The KoE's energy demand can be grouped into six sectors: Industry, Residential, Transport, Agriculture, Commerce and Public Services. The transport sector relies on imported oil products with the situation unlikely because there are no known oil or natural gas reserves in the KoE. It is noted that biofuel blending would help reduce reliance on petroleum imports, by reducing the volumes of imported fuels but not eliminating imported petroleum fuels.

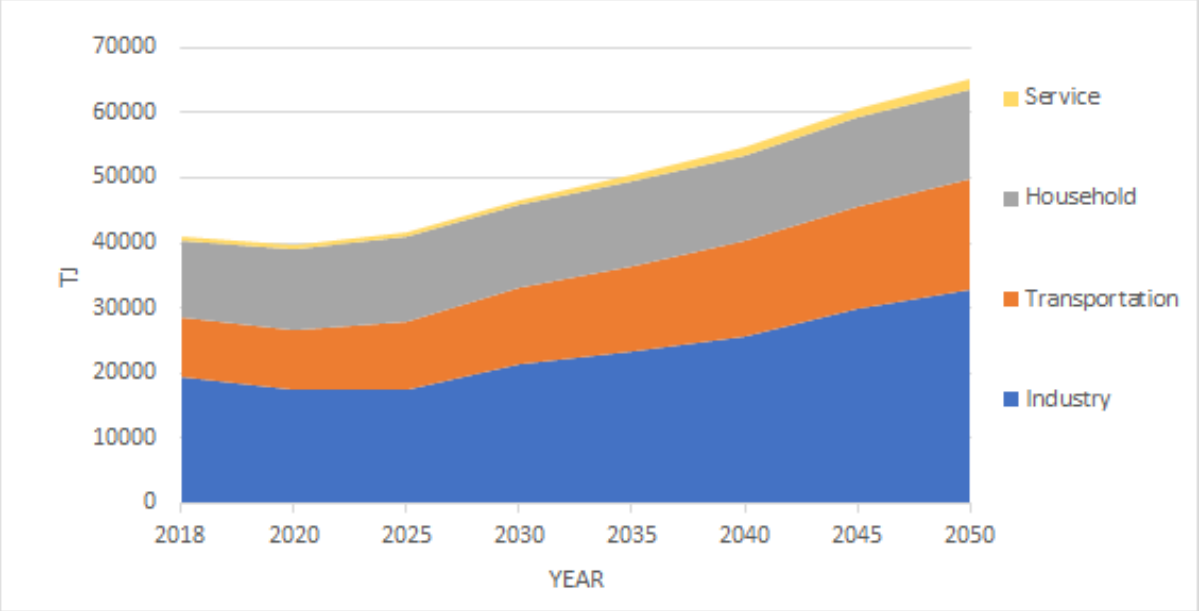

Figure 2: Energy demand by sector with projections up to 2050 (from Energy Master Plan

2050)

The industrial sector represents the largest user group of energy and is closely followed by the residential sector (households). The residential sector is subdivided into households living in extreme poverty, which accounts for one third of the population, and the other households living in either middle class or high-income households. The main sources of energy in households include electricity, solar, wood fuel, LPG and paraffin (kerosene).

The agriculture sector does not contribute much to the total energy demand in the KoE when compared to industry, residential and transport. However, the cumulative consumption of electricity and petroleum products is high which translates into a high level of imported energy at a significant cost to the country.

The agriculture sector is very important for the economy of the country. Agriculture outputs form the raw material base for almost one third of the value-added for goods in the manufacturing sector. Commerce and Public Services also do not contribute much to the total energy demand in the KoE but electricity consumption is significant. Figure 2 shows projections of energy demand by the different sectors up to 2050 (here industry also includes Agriculture).

2.1.3. Biomass Resources in the Kingdom of Eswatini

Table 1 is a summary of the bagasse resources available annually in the KoE. The tonnage of bagasse was provided by the sugar companies (Ubombo Sugar Limited (USL) and Royal Eswatini Sugar Corporation (RESC)). The amount of sugar cane trash is estimated using an 8 percent trash to sugar cane ratio[1]**.** It is important to note that some trash must be retained in the field to help reduce soil moisture losses during the early days of the new sugar cane crop, hence not all the trash would be available for energy generation if green harvesting were to be adopted in the sugar industry.

The KoE's biomass resource availability is expected to increase substantially by 2030, with bagasse expected to increase by over 300,000 tonnes coming from new investment in estate sugar cane and out-grower sugar cane. The timber resource has potential to increase as well if more wattle (***Acacia mearnsii***) "jungles"[2] (over 30,000 hectares in the south of the KoE) become managed woodlots. In addition, timber companies have

[1] *Data provided by Industry expert. It should be noted that the ratio of cane tops to sugar cane is higher than 8 percent, however, some of the cane tops must be left in the field to help retain moisture in the early days of a new crop*

[2] ***Acacia mearnsii*** *("black wattle") was introduced in Eswatini in the early-20th Century for producing tannin, a biological chemical – tannin – which was used extensively for tanning animal hides, and, to a certain extent, still is. Its main market is for high-grade filtration from household water systems to industrial chemicals. However, wattle is extremely invasive if not controlled. "Wattle jungles" have become common in many areas of southern and eastern Africa. Organizing its harvesting and management has become a major source of income in a number of countries, and it could be a major contributor to woody biomass supply for generating heat and electricity (combined heat and power/CHP) in Eswatini.*

indicated that they could switch parts of their plantations to energy timber crops to boost production if the market was established and expanded.

Table 1: Summary of the annual sugar biomass resource in Eswatini[3]

	Bagasse (tons)	**Sugar cane trash (leaves, cane tops)(tons)**
RESC	1 024 000	283 000
USL	667 000	184 000

Table 2: A summary of the annual timber biomass resource in Eswatini.[4]

	Wood Chips (tons)	**Other wood Residues (tons)**
Peak Timber / Shiselweni Forest	72 000	12 000
Montigny	400 000	200 000

2.1.4. Policies and Instruments the Bioenergy Policy Aligns with

The Eswatini National Bioenergy Policy draws from the vision, goals, objectives and aspirations outlined in the KoE's key national development plans and policies, most notably:

1. The National Development Plan (2023-2028)
2. The National Energy Policy (2018)
3. Poverty Reduction Strategy and Action Plan
4. Sustainable Energy for All and Country Action Plan
5. Energy Master Plan (2018)
6. Biofuel Strategic Plan
7. National Determined Contributions (2021)

The National Development Plan (NDP) sets out the national Vision and Mission Statement and provides strategies for planning and achievement of socio-economic

[3] *The tonnage in bagasse produced annually is provided by the companies. Additional bagasse at RESC will be about 200 000 more tonnes by 2025. Additional sugar cane from other projects by ESWADE is estimated at 500 000 tonnes (145 000 tonnes of bagasse) by 2030.*

[4] *Tonnages of wood chips produced annually, and other residues provided by the timber companies*

development goals of the country. The NDP further indicates that, among sector strategies, the energy sector should contribute to socio-economic development through:

- Reducing reliance on imported electricity.
- Ensuring that renewables are at least 50 percent of the total electricity generation mix by 2030. Increasing biomass electricity generation is a huge step towards achieving this outcome.
- Promoting energy development programmes aimed at increasing access and consumption of clean energy. Expected results include: increase in primary energy consumption; increase in the proportion of population accessing electricity; reduction in the share of biomass energy used for cooking; increase in transmission capacity; and enhanced grid reliability;
- Development of suitable and environment-friendly alternative energy sources.

The Bioenergy Policy will significantly contribute towards these national goals.

The KoE through the Nationally Determined Contribution, NDC, is planning to adopt several mitigation measures in the energy sector that include:

- Increasing the share of renewable energy to 50% in the electricity mix by 2030 relative to 2010 levels through the adoption of solar, wind, biomass, hydro, and solar water heater technologies.
- Introducing commercial use of 10% ethanol blend in petrol by 2030 and conducting studies to assess the adoption of electric mobility options.
- Achieving 100%[5] access to clean modern energy for cooking at household-level by 2030
- Improving by 50%, uptake of energy efficient biomass stoves used for cooking by 2030
- Replacing inefficient wood-based water heating with energy efficiency options to reduce its share by 13% by 2030
- This policy will create an enabling environment to achieve these goals.

The National Energy Policy vision represents a key aspiration of the government of the KoE upon which all the country's energy policy goals are based; to meet the energy needs of the country in a sustainable manner that contributes to economic growth and wellbeing of the population. The National Energy Policy goals include:

- Ensuring access to clean and affordable energy for all.
- Enhancing employment creation.
- Security of energy supply.
- Stimulating Economic Growth and Development.
- Ensuring environmental and human health sustainability.

The bioenergy policy will create an enabling environment for activities that will contribute

[5] In 2010, access to clean fuels and technologies for cooking (% of population) was 33.0%.

towards achieving these goals.

International Context Climate Change

Climate change mitigation remains high on the agenda for most countries, and that is the case with the KoE. The deployment of renewable energy solutions has accelerated to the extent that the world is now adding more capacity for renewable energy each year than coal, natural gas, and oil combined and the KoE is beginning to experience an increase in renewables through Solar Photo-voltaic (PV) installations. Increasing biomass electricity generation, biofuels, and cleaner cooking in the KoE will contribute to increasing renewable energy generation and reduction of net emissions. The Bioenergy Policy aligns with the United Nations Sustainable Development Goals (SDGs) by promoting access to clean energy, enhancing economic development, and mitigating climate change. Table 3 shows list of impacts that implementation of this policy will have on different SDGs.

Table 3: SDGs impacts

	SDG	Impact
3.	Good Health and well-being	Policy position 8 and 9 on promoting clean and efficient cooking technologies can have a positive impact on the lives of many Emaswati, improving their health and well-being. By improving air quality in reducing indoor air pollution, it reduces a range of health problems: respiratory illnesses, eye diseases, heart diseases and reduces the risk of burns and improves mental health.
4.	Education	Policy position 11 on advancing knowledge and empowering the workforce in the biomass sector can have a positive impact on Emaswati advancing their education.
6.	Clean water and Sanitation	Policy Position 1 on ensuring biomass feedstock supply can have a negative impact on the lives in the communities with the sugar plantations. Lot of water in these communities will be used for irrigation, reducing water supply for the communities.
7.	Affordable and Clean Energy	Policy position 2 on generating biomass electricity decreases the amount of electricity imported, ensuring the country's energy security and increasing the country's access to clean energy. Policy position 3 on ethanol blending will decrease import in petroleum products, increasing the country's access to clean energy.

		Policy position 9 on increase access to electricity for rural communities, and advocating for alternative clean energy sources will have a positive impact on many lives.
8.	Decent Work and Economic Growth	Policy position 2 and 3 on generating biomass electricity decreases the amount of electricity imported, ensuring the country's energy security and increasing the country's access to clean energy. Energy security will place the KoE in a good position for investors thus having a positive impact on economic growth. Decreasing electricity and petroleum products imports will have a positive impact on economic growth.
10.	Reduce Inequality	Policy position 8, 9 and 13 on promoting clean and efficient cooking technologies. Traditionally, the burden of fetching wood fuel and cooking falls on women and girls. Efficient cooking technologies can save time and energy, freeing up women and girls to pursue other activities such as education and work. This reduces inequality in a household.
13.	Climate Action	All three sections of the policy; biomass electricity generation, biofuels and efficient use of wood fuel reduce GHG emissions thus have a positive impact. Electricity generated from biomass is renewable electricity and it has less GHG emissions. Transport sector is one of the leading sectors in GHG emissions in the KoE, ethanol blending will decrease this. Efficient cooking technologies and cleaner fuels will reduce emission.

2.1.5. Regional Energy Cooperation

The Southern Africa Development Community (SADC) has devised a number of plans and policy tools in recent years that govern energy sector planning and interventions in the region, which demonstrate a shift towards renewable energy development in the regional energy agenda. These are:

1. Regional Energy Access Strategy and Action Plan (2010)
2. SADC Biofuel Decision Making Tool (2010)
3. Framework for Sustainable Biofuels (2010)
4. Renewable Energy Strategy and Action Plan (in draft, 2011)
5. Regional Infrastructure Development Master Plan (RIDMP): Energy Sector Plan (2012)

Concerted efforts have been employed across the SADC member states to exploit the opportunities associated with renewable energy resources. A significant number of SADC member states are setting targets for renewable energy generation and SADC is

developing a Renewable Energy Support Program for the member states.

2.2. Institutional Framework

The Bioenergy Policy is an additional instrument among a broad spectrum of instruments available to the energy sector's "Institutional, Legal and Regulatory Framework". At the core of the country's institutional framework is the Ministry of Natural Resources and Energy (MNRE) which is responsible for energy. However, the bioenergy resources are derived from agricultural residues and timber residues, bringing the Ministry of Agriculture (MoA) and the Ministry of Tourism and Environmental Affairs (MTEA), Forestry Department, at the forefront of the bioenergy policy's institutional framework. Other key institutions for the bioenergy policy in Eswatini are:

1. Eswatini Energy Regulatory Authority (ESERA);
2. Eswatini Electricity Company (EEC);
3. Eswatini National Petroleum Company (ENPC); and,
4. Eswatini Sugar Association (ESA).

In addition to these key institutions for bioenergy development, other institutions that can play significant roles in the implementation of the policy are:

1. The Ministry of Finance (MOF);
2. The Ministry of Economic Planning and Development (MEPD);
3. The Ministry of Commerce Industry and Trade (MCIT);
4. Ministry of Public Works and Transport (MPWT);
5. The Ministry of Tinkhundla Administration and Development (MTAD);
6. Ministry of Health (MH)
7. Eswatini Investment Promotion Authority (EIPA);
8. Policy and Programme Coordination Unit (PPCU)
9. Forestry Department, Ministry of Tourism and Environmental Affairs
10. Eswatini Millers Association (who are members of ESA);
11. Eswatini Cane Growers Association (ECGA, who are members of ESA);
12. Wattle Growers Association;
13. Business Eswatini; and
14. Renewable Energy Association of Eswatini (REASWA).

2.3. Key Drivers and Benefits

As stated in the problem statement, the KoE has significant biomass resources that can be utilized to decrease the country's energy imports. In addition to growing the energy sector in the KoE, developing the bioenergy sector will lead to a number of direct and indirect economic benefits such as local job creation in both small and medium enterprises, increased security of energy supply, and potentially more tax revenue for socio-economic programmes.

The social impacts of this policy are also significant. These include increased access to clean energy in rural communities through clean cooking technologies, improvement of living standards through increased economic activity, and community empowerment

through financial stability of households. Additionally, improved cook stoves can have a positive impact on public health by reducing indoor air pollution, which is especially beneficial to women and children who typically spend more time in kitchens. It is also noted that improved cook stoves will require less firewood, significantly reducing the amount of time spent collecting the resource, giving the girl child more time to study and giving women more time for engaging in small business enterprises or other work.

In the context outlined above, it is evident that the bioenergy policy espouses the principles and fundamentals of a **Just Transition**. The fundamental principle of a Just Transition and any Just Transition policies in the KoE is ensuring that benefits of the green economy envisaged in the NDP benefits society at all levels. The Bioenergy Policy incorporates the fundamental principles of a Just Transition within the context of expanding bioenergy use in the electricity sector and bioenergy use in biofuels, contributing to a transition to a low carbon future in the KoE.

A just transition puts people at the centre of decision-making, especially those most impacted (the poor, women, people with disabilities, and the youth), and empowers and equips them for new opportunities in the future. The Bioenergy Policy considers how benefits and burdens will be distributed and how the quality and longevity of future employment will be addressed.

Even though the Bioenergy Policy has overwhelming positive impacts, proponents and advocates also acknowledges the need for careful management and monitoring to ensure sustainability of biomass resources. Sustainable harvesting practices and responsible residue and waste management are essential to minimizing potential negative environmental outcomes such as land, forest and water systems degradation. Public education and awareness campaigns will play a key role to promote responsible biomass production, transport, conversion and utilisation across all sectors.

Key drivers that highlight the need to develop the Bioenergy Policy to enable local industry to grow in the KoE include:

1. High dependence on electricity imports from South Africa, Mozambique and the Southern African Power Pool (SAPP), despite a wide range of renewable energy resources in the KoE which could supply energy in excess of national demand and generate export opportunities;
2. The need to attract private sector capital and skills to develop new generation capacity;
3. High percentage of the population relying on unsustainable, inefficient use of wood fuel for cooking and heating with low uptake of efficient cooking stoves.
4. Deforestation in some parts of the country.
5. A high poverty rate, that can partly be addressed by encouraging growth in the local bioenergy sector, which will create considerable employment and improve livelihoods.

3. Overall Policy Goal & Objectives

Vision

The Vision of the Bioenergy Policy represents the fundamental aspirations of the Government of the KoE in improving energy security as well as expanding the green economy. The policy positions are based on the overall vision and goal, which are:

“To enhance energy security of Eswatini through sustainable integration of bioenergy resources to drive economic growth and mitigate the impacts of climate change, while improving the quality of life of Emaswati.”

Bioenergy Policy Goal

“To establish a robust and sustainable bioenergy sector that ensures energy security, promotes access to clean and affordable energy, contributes to climate change mitigation, and drives economic development and opens considerable employment opportunities, particularly in rural areas.”

Objectives of the Bioenergy Policy

In support of the national goal stated above, the main objectives of the bioenergy policy are:

1. To improve energy security through exploitation of bioenergy resources for electricity generation and biofuels production;
2. To promote access to affordable and sustainable sources of energy;
3. To accelerate the adoption of efficient biomass cook stoves and clean cooking technologies;
4. To combat the impacts of climate change;
5. To generate employment and income-generating opportunities, particularly to rural people in the bioenergy sector; and,
6. To provide potential investors with requisite information on viable, profitable opportunities for bioenergy investment and income generation in the bioenergy sector in, the KoE.

4. Scope of the Policy

The primary objective of the Bioenergy Policy is to improve energy security in the KoE by promoting the development and utilization of sustainable bioenergy sources.

Specific Areas of Focus:

1. Electricity Generation:
    - Explore opportunities to generate electricity from sustainable biomass resources, particularly agricultural residues and forest waste;
    - Engaging Eswatini's largest forestry/wood producers and timber out-grower programmes/associations which could use lessons learned from the sugar sector and engage more out-growers which will end up providing more wood to generate electricity;
    - Develop policies and incentives to encourage investments in biomass power plants and grid integration; and,
    - Promote research and development in advanced biomass technologies to enhance efficiency and reduce environmental impacts.

2. Biofuels for Ethanol and Petrol Blending:
    - Develop regulations and standards for ethanol production and blending with gasoline; and,
    - Implement policies to promote the use of ethanol-blended fuels in the transportation sector.

3. Efficient Cooking Technologies:
    - Encourage the adoption of efficient biomass cook stoves and clean cooking technologies to reduce dependence on traditional, polluting methods;
    - Develop incentives and subsidies for households and communities to adopt these technologies; and,
    - Promote research and development of improved cook stoves that are affordable, efficient, and environmentally friendly.

4. Climate Change Mitigation:
    - Develop policies to ensure that bioenergy production is sustainable and does not contribute to deforestation or land degradation; and,
    - Promote the use of bioenergy as a carbon-neutral alternative to fossil fuels.

5. Investment Promotion:
    - Conduct feasibility studies and assessments of bioenergy projects to identify viable opportunities;
    - Develop a comprehensive investment framework, including regulatory guidelines, incentives, and dispute resolution mechanisms; and,
    - Promote the KoE as a favorable destination for bioenergy investments.

5. Guiding Principles

The guiding principles and values underpinning this policy are:

1. **Sustainability:** Bioenergy production and utilization should be environmentally sustainable, minimize negative impacts on land, water, and biodiversity. The policy prioritizes the use of sustainable feedstock, such as agricultural residues and energy crops, that do not compete with food production.

2. **Affordability:** Strive to ensure that bioenergy-derived products and services are affordable to consumers, particularly vulnerable groups. Implementing policies and programs to reduce the cost of bioenergy production and distribution is important so that energy is accessible to all.
3. **Efficiency:** Promote the development and adoption of efficient bioenergy technologies to maximize energy output and minimize waste. The policy aims to encourage research and development to improve the conversion efficiency of biomass into energy products.
4. **Gender Equity and Vulnerable groups:** Ensure the benefits of bioenergy development are distributed equitably among different stakeholders, including communities, businesses, and the government. The policy aims to address potential social and economic impacts of bioenergy projects, such as job creation, land use change, and community development.
5. **Low Carbon Emissions:** Bioenergy should be produced and used in a way that reduces greenhouse gas emissions compared to fossil fuels. Implementing policies and standards to ensure that bioenergy projects meet sustainability criteria and contribute to climate change mitigation is important to reduce the country's GHG emissions.
6. **Just Transition:** Supports a just transition to a low-carbon economy by providing assistance to workers and communities affected by the shift towards renewable energy. Developing policies and programs to create new jobs and economic opportunities in the bioenergy sector supports a just transition to a low-carbon.
7. **Empowerment:** Empower local communities and marginalized groups to participate in bioenergy development and benefit from its economic, livelihood and social opportunities. The policy aims to promote the development of community-based bioenergy projects.
8. **Innovation:** Foster a culture of innovation and entrepreneurship in the bioenergy sector. The policy aims to support research and development activities to develop new technologies and applications.
9. **Collaboration:** The policy encourages collaboration among government agencies, private sector entities, research institutions, and civil society organizations. It aims to facilitate knowledge sharing and capacity building to support the development and implementation of bioenergy projects.
10. **Policy Coherence:** The bioenergy policy is aligned with other relevant national policies, such as the National Development Plan, the National Energy Policy, and climate change mitigation strategies.

6. Policy Alignment

a. Domestic Legal and Regulatory Framework

The current legal and regulatory framework of the KoE relevant to bioenergy includes the following main elements:

1. Electricity Act 2007;
2. Swaziland Electricity Company Act 2007;
3. Energy Regulatory Act 2007;
4. Grid Code and Quality of Supply Standard (SZNS 028);

5. Eswatini Independent Power Producer (IPP) Policy 2016;
6. Sugar Act 1967;
7. Cane Growers Act 1967;
8. Petroleum Act 2020;
9. Flora Protection Act 2001;
10. Biodiversity Conservation and Management Bill 2008; and,
11. Access and Benefit Sharing of Genetic Resources Bill 2006.

i. The Electricity Act 2007

The **Electricity Act** reforms and consolidates the laws regulating the generation, transmission, distribution and supply of electricity in the KoE. It sets the obligation to hold licenses for the generation, transmission, integrated operation, distribution, supply, off-grid and mini-grid supply as well as import and export of electricity. The Electricity Act also defines the tendering procedures for the procurement of new generation, transmission and distribution capacity.

The **Electricity Act** also ensures the regulation of prices by the Energy Regulatory Authority. The Electricity Act specifies that in regulating prices, the Authority shall:

1. Allow a licensee that operates efficiently to recover the full costs of its business activities, including a reasonable return on the capital invested in business;
2. Provide incentives for the continued improvement of the technical and economic efficiency with which the services are provided; and,
3. Provide incentives for the continued improvement of quality of services.

ii. Swaziland Electricity Company Act 2007

The **Swaziland Electricity Company Act 2007** primarily focused on establishing the **Eswatini Electricity Company (EEC)** and potentially allowing for other companies to generate electricity. The mandates of the Company include:

1. The generation, transmission, distribution and supply of electricity;
2. The import and export of electricity into and from the Kingdom of Swaziland; and
3. To meet the objectives of the Government in the generation, transmission, distribution and supply of electricity.

iii. Energy Regulatory Act 2007

The **Energy Regulatory Act of 2007** is the legal instrument establishing the Eswatini Energy Regulatory Authority (ESERA) with the mandate to administer the Electricity Act. The functions of ESERA that relate to biomass electricity generation include, but are not limited to:

1. Issue licenses for undertakings in the energy sector;
2. 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 licenses; and,
3. Receive, investigate and adjudicate complaints from consumers on price adjustments made, or services provided, by any regulated undertaking;
4. Encourage the development of uniform industry standards and codes of conduct.

In exercising its powers and functions under this Act or the Electricity Act or other energy laws the Authority shall:

1. Promote the interests of consumers of goods and services provided by regulated entities with respect to prices and charges and the continuity and quality of supply; and,
2. Promote and maintain the integrity and sustainability of regulated undertakings and seek to ensure that regulated undertakings, whilst providing efficient service, are able to finance the carrying on of the activities which they are licensed or authorized to carry on.

iv. Independent Power Producer (IPP) Policy

The **Independent Power Producer (IPP) Policy (IPPP)** creates an enabling environment to promote the establishment of sustainable renewable electricity generation and provides the framework for IPPs to contribute to electricity supply. Its main objectives are:

1. Increase the utilization of the KoE's extensive local conventional and renewable energy resources including biomass, solar (both Photo-Voltaic (PV) and Concentrated), wind and geothermal resources;
2. Promote the deployment of IPP capacity to meet the KoE's electricity needs and enhance energy security and self-sufficiency by reduced reliance on imports;
3. Stimulate and enable the deployment of embedded generation and mini-grid solutions to diversify the KoE's energy mix and increase energy access for rural households;
4. Identify and facilitate access to various funding sources to overcome renewable energy and IPP financing constraints;
5. Contribute to the creation of employment possibilities for all residents regardless of sex, either directly in the power sector or created indirectly as a result of the economic activities of the sector;
6. Contribute to environmental sustainability and achievement of the green agenda of the NDS and the NEP; and,
7. Promote access to affordable and sustainable sources of energy to support poverty reduction and economic development.

v. Grid Code and Quality of Supply Standard (SZNS 028)

The **Grid Code** is a set of documents that legally establish technical and other requirements for the connection to, and use of an electrical grid in a manner that ensures reliable, efficient, and safe operation. The quality of supply standard SZNS 028 specifies the voltage characteristics, compatibility levels, limits and assessment methods for the

quality of electricity supplied by Licensees to consumers.

vi. Sugar Act

The **Swaziland Sugar Act of 1967**, primarily regulates the sugar industry in the KoE, establishing a framework for sugar production, marketing, and export. The Sugar Act 1967 part 49 (2) does state, however, that ***"whenever a miller directly turns to account commercially or directly and deliberately employs for his own benefit a by-product, then the value to be attributed to such by-product shall, as far as practicable, be assessed, and the cane growers attached to that mill shall be entitled to a share in the proceeds or value to be attributed"***.

What this means, in practice, is that the Sugar Act obliges sugar millers to share the benefits (revenues) that accrue from the sale of by-products generated by the use of the sugar cane suppliers (namely out-growers) with the cane suppliers (out-growers).

vii. Cane Growers Act

The **Cane Growers Act of 1967** is the legal instrument establishing the Eswatini Cane Growers' Association (ECGA). The objectives for which the Association was established, include, but are not limited to:

1. To promote and foster the mutual interests of the members of the association as growers of sugar cane in the KoE; and,
2. To promote and foster the progress and interests of the KoE sugar industry, whether in its agricultural, manufacturing, refining, by-product producing, marketing or any other aspects or as a whole.

viii. The Petroleum Act, 2020

The **Petroleum Act** provides for the reconnaissance, exploration, production and disposal of petroleum products, their administration and management and for incidental matters.

Petroleum Act 18(f) states that **"The type of licenses for downstream activities that may be granted under this act shall be: … (f) Blending Licence, (g) Liquefied Petroleum Gas (LPG) Licence."**

The Petroleum Act 21(1) highlights that "The objects of the National Oil Company are: … **(h) to carry out the blending of fuel for the production of biofuels such as the blending of unleaded petrol with ethanol."**

ix. Environment Management Act 2002

The **Environment Management Act of 2002**, which is the supreme law governing environmental matters in the KoE, is **to promote the enhancement, protection and conservation of the environment and where appropriate, the sustainable management of natural resources.**

Environment Management Act of 2002 5(h) states that in **"achieving the purpose of this Act, the following principles shall be applied: renewable resources and ecosystems should only be used in a manner that is sustainable and does not prejudice their viability and integrity."**

x. Flora Protection Act 2001

The **Flora Protection Act of 2001** provides protection for plant species and requires that an **Environmental Impact Assessment (EIA) be carried out in respect of any activity that impacts indigenous flora.**

xi. Biodiversity Conservation and Management Bill 2008

The **Biodiversity Conservation and Management Bill of 2008** is intended to provide for the management of biodiversity in the KoE and **to give effect to ratified international agreements affecting biodiversity in the country** and **to matters connected therewith and incidental thereto enacted with the framework of the Environment Management Act of 2002**

xii. Access and Benefit Sharing of Genetic Resources Bill 2006

The **Access and Benefit Sharing of Genetic Resources Bill of 2006** captures issues on the access and use of biological diversity. It deals with such issues as **community rights, including plant breeders' rights**. It **provides institutional arrangements for the management of ABS issues**. It further **protects the country's indigenous knowledge and establishes a certification system.**

b. Regional Energy Cooperation

SADC has devised a number of plans and policy tools in recent years that govern energy sector planning and interventions in the region, which demonstrate a shift towards renewable energy development in the regional energy agenda. These are:

1. Regional Energy Access Strategy and Action Plan (2010)
2. SADC Biofuel Decision Making Tool (2010)
3. Framework for Sustainable Biofuels (2010)
4. Renewable Energy Strategy and Action Plan (in draft, 2011)
5. Regional Infrastructure Development Master Plan (RIDMP): Energy Sector Plan (2012)

Concerted efforts have been employed across the SADC member states to exploit the

opportunities associated with renewable energy resources. A significant number of SADC member states are setting targets for renewable energy generation and **SADC is developing a Renewable Energy Support Program for the member states**.

7. Policy Matters and Statements

a. Feedstock Supply

As of 2023, bagasse and wood chips are the only feedstock resources that are used for biomass electricity generation, and only molasses is used in the production of bioethanol. Bagasse and molasses are made available through the milling of sugar cane grown by the big sugar estates as well as thousands of small-to-large sugar out-growers. Timber resources are made available by sawmill operations at the various timber companies, with an increasing amount of the timber milled at their sawmills coming from out-growers. The sugar out-growers are well-organized through an association called the **Eswatini Cane Growers Association (ECGA)**.[6] The wattle out -growers also have an association, the Wattle Association, which can be improved by further organization into an association of all timber out-growers in a model similar to the ECGA.

Planned strategy to ensure a reliable and sustainable supply of biomass electricity and biofuels:

- Guarantee a reliable and consistent supply of sustainably-produced biomass feedstock to meet the growing demand for biomass-based electricity and biofuels. This can be achieved through sugar plantations and forest plantations maintaining their operations, and also allowing farmers to introduce new energy plants. In introducing new energy plants, the Ministry of Agriculture (MoA) and the Ministry of Tourism and Environmental Affairs (MTEA), through MTEA's Forestry Department, will safeguard against uncontrollable invasive species.
- Ensure that feedstock supply for electricity generation is guaranteed and reliable through long-term contracts with out-growers of up to 20-25 years.
- Promote sustainable practices throughout the biomass supply chain to protect the environment and demonstrate social responsibility, ensuring the long-term availability of biomass resources. Some of the practices to be encouraged are:
    a. Sustainable harvesting practices as well as employing systems to minimize deforestation or land degradation.
    b. Promoting efficient irrigation and water source protection practices.
    c. Promoting the introduction of renewable energy for out-growers (mini or

[6] Both the members of the ECGA and the two sugar estates in the KoE comprise the membership of the Eswatini Sugar Association (ESA) which is a major agro-industrial association that represents and advocates for the KoE's sugar sector, collects and publishes sugar statistics, promotes Eswatini sugar internationally, sets standards for best practice amongst its members, publishes national sugar statistics, among other activities.

micro grids) to help decrease energy costs for farmers, in turn unlocking enhanced production to realize an increase in biomass resource availability.

- Enhance economic opportunities for local communities through feedstock production and management.

Policy Position 1: Government will create a conducive environment to ensure adequate security of feedstock supply for biomass electricity generation and biofuel production.

a) Promote a diversified feedstock portfolio that prioritizes utilization of agricultural residues, commercial and industrial by-products (particularly wood residues/waste from Eswatini's wood processing companies), and as well as organic waste, while exploring dedicated energy plants.
b) Promote good agricultural practices such as efficient use of water, good harvesting techniques and practices that minimize soil erosion and nutrient depletion while maximizing biomass yield, among others.
c) Establish a monitoring framework to track progress towards achieving secure feedstock supply, regularly assess the effectiveness of implemented policies and adjust strategies as needed, encourage transparency in the biomass supply chain to ensure responsible sourcing practices.

b. Electricity Generation

The KoE imports about 70% of its electricity, and hence an increase in biomass electricity generation, a technology that can run as base load, can significantly decrease the country's dependency on imported electricity. The strategy to ensure a reliable and sustainable supply of biomass electricity would be to:

- Promote high efficiencies in biomass power plants (both sugar mills and timber mills) to convert feedstock into electricity with minimal energy losses, targeting the procurement of capacity from biomass sources for the national grid in the short term.
- Promote the use of advanced biomass conversion technologies for cleaner and more efficient power generation.
- Ensure reliable and stable electricity supply from biomass power plants by considering only proven technologies, contributing to a robust national grid.

Policy Position 2: Government will create a conducive environment to ensure efficient and reliable power production from biomass resources.

a) Establish minimum efficiency standards for biomass power plants to maximize energy output and minimize waste.
b) Strengthen existing dispatch frameworks to ensure biomass power plants contribute to base load requirements.

It is noted that sugar mills operate seasonally, mostly during the winter months, raising a concern about their use for baseload power. Strategies will have to be devised to extend the power generation component of the sugar mills in order for them to provide for baseload. Timber mills, on the other hand, can generate electricity year round (from the wood residues that are produced in their saw mills and residues that come from wood harvesting), so long as their wood supplies are available.

c. Biofuel Production

The KoE's quest for a secure and environmentally conscious energy future necessitates innovative solutions. Biofuels, derived from biomass like agricultural residues or dedicated energy plants, offer a promising alternative to traditional fossil fuels. The KoE imports all its oil products and all the locally produced ethanol is exported. Biofuel (e.g., ethanol) blending offers a promising solution to decrease oil products imports. This would boost the local economy and also decrease GHG emissions as the transport sector is one of the leading sectors contributing to emissions (NDC 2021) in the country. However, maximizing the biofuel potential requires a focus on efficiency and responsible development. To achieve this goal, the key objectives are:

- **Optimizing Efficiency:** Aim to maximize the efficiency of biofuel production processes. This translates to maximizing biofuel output from a given amount of feedstock, minimizing waste, and ensuring the long-term sustainability of the biofuel program.
- **Embracing Technological Advancements:** Actively promote the use of advanced biomass conversion technologies in biofuel production. These technologies offer greater efficiency, cleaner outputs, and the potential to utilize a wider range of biomass feedstock, though this might increase the capital cost.
- **Ensuring Reliable Supply:** Establish a reliable and stable biofuel supply from diverse biomass sources. This includes exploring various feedstock options and promoting responsible cultivation practices to guarantee long-term biofuel availability.

By prioritizing efficiency, advanced technologies, and a secure supply chain, the KoE can create a biofuel sector that not only reduces dependency on fossil fuels but also

minimizes environmental impacts and promotes sustainable development.

Policy Position 3: Government will create a conducive environment to ensure efficient and reliable production of biofuels.

a) Encourage the development and adoption of advanced biofuel production technologies that are efficient and minimize environmental impacts.
b) Introduce mandatory fuel blending. (energy policy position 13, page 42)
c) Establish quality standards for biofuels and blending standards to ensure they meet performance criteria and minimize engine wear in vehicles.

d. Environmental Considerations

As the KoE becomes more ambitious in the utilization of biomass resources in electricity generation, it is important to ensure that it is done in an environmentally responsible manner to ensure this progress doesn't come at the expense of the environment. There will be a need to prioritize environmental protection while harnessing the potential of biomass. This can be achieved by setting emission standards for biomass power plants, with the aim of minimizing air and water pollution, safeguarding public health and safeguarding natural ecosystems.

The objectives for environmental considerations are to:

- Minimize air, water, and soil pollution associated with biomass production, conversion, and power generation.
- Promote sustainable land-use practices to prevent deforestation, biodiversity loss, and soil degradation.
- Ensure responsible management of biomass resources to safeguard the environment for the benefit of future generations.

Policy Position 4: Government will create a conducive environment to ensure minimization of negative environmental impacts in biomass electricity production and biofuel production.

a) Set emission standards for biomass power plants and biofuel production plants to regulate air and water pollution.
b) Promote the use of efficient pollution control technologies.

e. Social considerations

Developing secure feedstock supply chains has potential social impacts, such as land-

use changes and potential disruptions to community wellbeing. The KoE must address these challenges to ensure they are mitigated against in its development of a robust biomass energy sector.

Policy Position 5: Government will create a conducive environment to ensure minimization of negative social impacts from bioenergy supply chain.

a) Develop regulations that address potential social impacts such as land-use changes and community wellbeing.

f. Economic Incentives

Biomass energy holds tremendous promise for the KoE to secure a stable and sustainable energy future, one that balances economic growth with environmental responsibility. However, realizing this potential requires a two-pronged approach: fostering investment and ensuring cost-effectiveness.

A comprehensive review of existing tax and customs frameworks that affect biomass electricity generation investments must be conducted to achieve cost-effectiveness and a reasonable tariff. This review, undertaken in collaboration with industry leaders, environmental experts, and the public, will explore opportunities for:

- Streamlining tax obligations and customs procedures.
- Implementing targeted deductions, exemptions, and special incentives to make biomass a more attractive investment option.

By combining a focus on fiscal attractiveness with cost-efficiency analysis, the aim is to create a thriving biomass sector, with the objectives of:

- Attracting investment in biomass power generation projects through competitive financial incentives.
- Promoting the development of a sustainable domestic biomass supply chain which creates economic opportunities.
- Ensuring the long-term economic viability of biomass electricity generation to contribute to the KoE's energy security and economic growth.

Policy Position 6: Government will create a conducive environment for fostering investment and ensuring cost-effectiveness in bioenergy electricity generation and biofuel production.

a) Review the various tax obligations as well as deductions, exemptions and special incentives/both fiscal and non-fiscal for biomass electricity generation investments and biofuel production investments. (IPP policy position 17 page 51)

g. Wood fuel

Wood fuel, a natural resource derived from trees and woody plants, remains a vital source of energy for the majority of households in the KoE, particularly in rural areas. While providing essential energy for cooking and heating, its unsustainable use can lead to deforestation, land degradation, and air pollution. The KoE faces a critical challenge: balancing the essential needs of its citizens for cooking and heating with the environmental consequences of widespread wood fuel dependence.

While acknowledging the critical role wood fuel plays in meeting the basic energy needs of a significant portion of the population, protecting the environment and ensuring the long-term availability of this resource remains very important. The KoE aims to provide essential energy for cooking and heating while protecting the environment, through the following objectives:

a. **Promoting Clean and Efficient Cooking Technologies:** Encourage the adoption of cleaner and more efficient cook stoves and alternative fuels such as LPG to ensure that by 2050 100 percent of households, with particular emphasis to those headed by women, use clean cooking technologies. An adoption of clean and efficient cooking technologies will reduce the amount of wood fuel needed for cooking, minimizing deforestation and air pollution in kitchens.

Policy Position 7: Government will create an enabling environment for the adoption of improved cook stoves in all households, including all vulnerable groups, to reduce overall biomass consumption and associated environmental impacts.

a) Mobilize funds to provide affordable, clean-burning cook stoves with higher efficiency in heat transfer, reducing reliance on fuelwood.
b) Support training programs on proper stove use and maintenance for maximizing efficiency and minimizing emissions.

Policy Position 8: Government will create an enabling environment for the promotion of access to cleaner and more sustainable alternatives for cooking and heating, considering affordability and practicality for all households including all vulnerable groups.

a) Expand access to electricity for households, particularly in rural areas, where grid extension is feasible and through mini-grids.
b) Promote use of liquefied petroleum gas (LPG) as a cleaner cooking fuel option, considering affordability and distribution infrastructure.
c) Explore the feasibility of introducing biogas digesters for all households with organic waste resources, promoting renewable energy production at the household level.

b. **Promoting Sustainable Biomass Use:** Prioritizing responsible forestry practices and the development of efficient wood fuel production systems is key to sustainable biomass use. Some of the activities that should be undertaken include encouraging tree planting initiatives (NDC 2021, plant 10 million trees), supporting sustainable harvesting techniques, and exploring the use of wood residues or invasive species as fuel sources.

Policy Position 9 Government will prioritize sustainable forest management practices and promote reforestation initiatives to ensure long-term availability of biomass resources.

a) Implement regulations and enforcement mechanisms to prevent illegal logging, deforestation, and cutting indigenous trees.
b) Support reforestation initiatives to replenish wood resources and improve environmental health.

h. Capacity Building, Public Awareness and Education

The KoE's journey towards a sustainable energy future hinges on harnessing the potential of biomass, a renewable and domestically available resource. However, unlocking the true power of biomass requires investment in the nation's human capital. There is a need for a comprehensive capacity-building program that is inclusive of women and all other vulnerable groups, in collaboration with relevant stakeholders, aligned with the following objectives:

a. **Advancing Knowledge:** Develop a skilled workforce with the technical expertise

required for all stages of biomass electricity generation, through promoting research institutions to delve into the science behind biomass. This research will focus on identifying and developing sustainable biomass production methods, ensuring long-term resource availability with minimal harm to the environment. Additionally, research will explore advanced conversion technologies to maximize energy output and minimize environmental impacts.

b. **Empowering the Workforce:** Enhance knowledge and awareness about sustainable biomass practices among stakeholders involved in the sector, through promoting targeted training programs. For farmers, training in sustainable biomass management practices, ensuring a reliable and responsible feedstock supply, is necessary. For technicians and engineers, training expertise in operating and maintaining biomass power plants efficiently is essential.

c. **Building Public Support:** Foster a culture of innovation and continuous learning to promote advancements in biomass technologies, through awareness campaigns to educate the public about the benefits of biomass energy, such as reduced reliance on imported fuels and a cleaner energy mix. Open discussions of the potential challenges and addressing public concerns on bioenergy is key to fostering broad-based support for this crucial energy initiative.

d. **Public Awareness and Education:** Raising public awareness about the negative impacts of wood fuel dependence and the benefits of cleaner alternatives is crucial. Educational campaigns would empower citizens to make informed choices about their energy use.

Investing in research, workforce training, and public awareness, will pave a way for a skilled and informed citizenry. An empowered community will be the cornerstone of a thriving biomass energy sector, driving the KoE toward a secure, sustainable, and prosperous energy future.

Policy Position 10: Government will ensure that there is comprehensive development of national capacities in biomass electricity generation and biofuels production. Government will ensure that the development of national capacities in the sector is inclusive, with men and women, boys and girls, and all vulnerable groups involved.

a) Mobilize funds for research institutions to study sustainable biomass production methods and advanced conversion technologies.
b) Support training programs for farmers, technicians, engineers and other related professions on sustainable biomass management and power generation technologies and biofuel production.
c) Raise public awareness about the benefits and potential challenges of biomass energy to encourage public support.

Policy Position 11: Government will ensure that the public, including women and vulnerable groups, is educated about the health and environmental impacts of unsustainable biomass use.

a) Raise public awareness about the health and environmental impacts of unsustainable biomass use and promote the benefits of cleaner cooking and heating alternatives, targeting both men and women.

Policy Position 12: Government will ensure that the country advances and keeps up with developments in biomass cook stoves.

a) Support research, development and demonstration efforts to explore cleaner and more efficient biomass conversion technologies.

By ensuring responsible wood fuel management and promoting cleaner alternatives, the KoE can protect its environment, safeguard public health, and ensure long-term energy security for all Emaswati.

i. Gender, Youth, and Vulnerable Groups

Equitable access to resources, opportunities, and benefits is essential for sustainable development and social justice. To ensure that the development and implementation of bioenergy projects contribute to gender equity, youth empowerment, and the inclusion of vulnerable groups, the KoE will continue to:

a) **Promote Gender Equality**: Ensure that bioenergy projects contribute to the empowerment of women and address gender-specific needs and challenges.
b) **Empower Youth**: Engage young people in bioenergy development by providing opportunities for education, employment, and entrepreneurship.

c) **Inclusion of Vulnerable Groups**: Ensure that marginalized and vulnerable groups, including people with disabilities, indigenous communities, and the economically disadvantaged, benefit from bioenergy initiatives.

Policy Position 13: Government will create a conducive environment by developing a regulatory framework to ensure that the development and implementation of bioenergy projects contribute to gender equity, youth empowerment, and the inclusion of all vulnerable groups.

a) Support equity and ensure inclusiveness in the bioenergy sector in ways that promote equitable access to benefits and resources for men and women, boys and girls, and all vulnerable groups.
b) Encourage active participation of men and women, boys and girls, and all vulnerable groups in decision-making processes related to bioenergy development.
c) Invest in capacity-building programs that enhance the skills and knowledge of men and women, boys and girls, and all vulnerable groups in the bioenergy sector.

8. CROSS CUTTING ISSUES

a. Gender Mainstreaming

The policy promotes efficient cook-stoves, which will improve health and quality of life for women and girls. Traditional cook-stoves contribute to indoor air pollution, causing respiratory illnesses that disproportionately affect women and girls who spend more time cooking. Cleaner cook-stoves can significantly reduce these health problems. It also reduces the workload for women as time spent collecting firewood can be a significant burden for women in rural areas.

The policy also promotes economic empowerment for women. Women out-growers participating in the supply chain for biomass electricity generation can gain financial independence. This can improve their decision-making powers within households and communities.

b. Poverty Alleviation

The policy promotes rural development through economic opportunities. In biomass production the out-grower programs create income opportunities for rural communities, through cultivating and supplying feedstock for biomass electricity generation. Access to reliable electricity allows for starting small businesses, improving education through better lighting, and promoting diversification of income sources beyond traditional

agriculture.

In the communities where biomass power plants are located, they create jobs and stimulate local economies. Associated infrastructure upgrades like improved roads can benefit surrounding communities. The policy promotes sustainable biomass production practices to avoid deforestation and land degradation. This ensures the long-term viability of the program.

The policy also promotes community empowerment. Financial independence gained through out-grower programs allows rural communities to invest in education, healthcare, and essential services, fostering overall development. Training programs for out-growers can equip them with knowledge on sustainable farming practices and potentially basic business skills, leading to a more empowered rural population.

9.Guidelines for Implementation

To effectively implement the bioenergy policy, a comprehensive strategic and action plan is attached. The implementation of the bioenergy policy will require coordinated efforts from various government agencies and stakeholders. The Ministry of Natural Resources and Energy, Energy Department, will lead in coordinating the implementation, working closely with other relevant ministries and the private sector. Specific responsibilities are listed in Table 4.

Table 4: Roles and responsibilities for institutions for successful implementation of the bioenergy policy

Agency	**Role/Responsibility**
MNRE	Lead policy implementation
Ministry of Tourism and Environmental Affairs (MTEA)	Ensure alignment of the commitments to the UNFCCC policy with the country's
EIPA	Development of Investor handbook
ESERA	Provide license application process and forms Receive, evaluate and grant/decline license or license exemption Apply license review guidelines
EEC	Conduct grid integration studies Check compliance with Grid Code and associated Standards Provide (Standardized) Network Connection Agreement Provide Standardized PPA
Ministry of Agriculture (MOA)	Oversee agricultural activities leading to biomass resource while ensuring food security
MTEA, Department of Forestry	Oversee timber plantation activities leading to biomass resources ensuring that the natural forest is protected. Using lessons learnt from the Sugar industry in organizing out-growers, oversee the organization of timber out-growers, leading to a substantial increase in biomass resources.
Ministry of Finance (MOF)	Evaluate project criteria Negotiate and agree incentive package Engage on project funding and bankability

Ministry of Tinkhudla Administration and Development	Work with MNRE and MTEA when they need to work with communities
Ministry of Health (MOH)	Work with Energy department in developing public awareness materials on health benefits of clean cooking technologies and efficient cook-stoves
Eswatini Environment Authority (EEA)	Provide Environmental approval/ permit Evaluate and rule on ESIA process application
MNRE, Department of Water Affairs	Evaluate and grant water use License
Land Management Board	Provide land use rights
Eswatini Sugar Association (ESA)	Work with millers and out-growers to ensure due proceeds from biomass energy are shared accordingly
Renewable Energy Association of Eswatini (REASWA)	Promote renewable energy

Resource Mobilization

The Energy Department will lead resource mobilization for the actions in the policy. Financial and human resources required for full implementation will be sourced locally and internationally. It is anticipated that NGO's and industry players will contribute to the implementation of the Policy. Internationally, it is anticipated that the KoE's development partners and climate change funding programs will assist with some of the resources.

Monitoring and Evaluation

Monitoring and evaluation of the bioenergy policy will require coordinated efforts from various government agencies and stakeholders. The Ministry of Natural Resources and Energy, energy department will also be responsible for coordinating the monitoring and evaluation of the policy.

The bioenergy policy will be reviewed five years after its implementation.