

**Biomass Electricity Prospects
in Eswatini and Preliminary
Results of LULUCF GHG
Inventory Update for
Eswatini:**

**Workshop report
(7-8 April 2022)**

Initiative for Climate Action Transparency - ICAT

Workshop Report: Biomass Electricity Prospects in Eswatini and Preliminary Results of LULUCF GHG Inventory Update for Eswatini

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ABBREVIATIONS

CSO	Central Statistics Office
CBIT	Capacity Building Initiative for Transparency
CSER	Centre for Sustainable Energy Research
EEA	Eswatini Environmental Authority
EEC	Eswatini Electricity Company
ESA	Eswatini Sugar Association
ESERA	Eswatini Energy Regulatory Authority
ETF	Enhanced Transparency Framework
GHG	Greenhouse Gas
GHGMI	Greenhouse Gas Management Institute
GoE	Government of Eswatini
ICAT	Initiative for Climate Action Transparency
IPCC	Intergovernmental Panel on Climate Change
MNRE	Ministry of Natural Resources and Energy
MoU	Memorandum of Understanding
MRV	Measurement, Reporting and Verification
MTEA	Ministry of Tourism and Environmental Affairs
NC	National Communication
NDC	Nationally Determined Contributions
NEP	National Energy Policy
NIR	National Inventory Report
QA	Quality Assurance
RE	Renewable Energy
SRA	Eswatini Revenue Authority
UNESWA	University of Eswatini
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Project Services

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1. INTRODUCTION

1.1. Background

The Government of Eswatini has prioritized enhancing national capacities to meet its reporting obligations under the enhanced transparency framework (ETF) of the Paris Agreement under the UNFCCC. The Ministry of Tourism and Environmental Affairs (MTEA) has received support from the Initiative for Climate Action Transparency (ICAT) to improve institutional arrangements and data collection processes to assist Eswatini to meet the accelerated reporting requirements under its Nationally Determined Contributions (NDC) under the Paris Agreement.

The University of Eswatini's (UNESWA's) Centre for Sustainable Energy Research (CSER) was hired by ICAT (through UNOPS) to complete the ICAT Eswatini Project which includes the following main activities:

- Activity 1: Adaptation scoping and gap analysis for the health and water sector.
- Activity 2: Energy sector GHG (greenhouse gas) inventory institutional arrangements and data collection roadmap.
- Activity 3: Agriculture sector GHG inventory institutional arrangements and data collection roadmap.
- Activity 4: Incorporation of timber and sugarcane plantation data into the LULUCF (Land Use, Land Use Change and Forestry) sector GHG inventory.
- **Activity 5: Renewable electricity policy scenario assessment and impact modelling with recommendations for implementing NDC (Nationally Determined Contributions) targets.**

1.2. Objectives of the Workshop

The main aim of Activity 5 is to quantify, under various policy and institutional scenarios, the amount of biomass renewable electricity that can be generated in Eswatini and carry out climate and sustainable development impacts with recommendations for implementing NDC targets. Additionally, the workshop will review updated activity data on land use, land use change and forestry for the period 1990-2020 as well as discuss the drivers and expected changes in land use for the future.

The objectives of the workshop:

- Consider the various policy scenarios obtained from numerous stakeholder meetings undertaken during this ICAT project.
- Have smallholder farmers in both sugar and timber engage the corporations in supplying the biomass necessary to generate new, expanded renewable electricity in Eswatini.
- Engage stakeholders to determine what it would take (e.g. policies, supports, enabling environment, etc.) to enable biomass renewable electricity to make a significant contribution to electricity generation in Eswatini.
- Share the updated land use change maps and the results on the identification of the drivers of land use change in Eswatini.
- Share preliminary findings on the updated emissions trajectories for the LULUCF sector shown by the work undertaken under Activity 4 of the ICAT Eswatini Project.

1.3. Format of the Workshop

The workshop was conducted over 2 days – April 7th and 8th, 2022 (see agenda in Annex 1). The first day was predominantly used to introduce the ICAT Project and to gain an understanding of activity 4 and activity 5. The second day primarily focused on stakeholder discussion on policy framework for electricity production from biomass, availability of biomass resource and enablers and barriers in electricity production from biomass.

The morning of the first day started with introductory remarks by the MTEA-Climate Change Unit. The introductory remarks were followed by introduction of the ICAT Eswatini Activity 4 and 5 by GHGMI and introduction of the workshop by UNESWA. By mid-morning, several presentations relevant to biomass electricity were made by government ministries, the power utility and the energy regulator. The mid-morning session concluded with a presentation by Activity 4 on the preliminary results of the LULUCF inventory update.

Starting after lunch on Day 1 (Thursday 7th of April), then in the morning of Day 2 (08.00 to 11.00, Friday 8th of April) the physical participants broke out into three (3) groups to discuss key issues on biomass electricity including:

- Demand for electricity in Eswatini.
- Potential for utilising Eswatini's extensive biomass resources to meet some or all of the country's electricity demand.
- The role of the Eswatini private sector, particularly the sugar mills, sugar growers and timber sectors, could play in generating sustainable biomass electricity for Eswatini.
- The role of Eswatini's numerous sugar smallholder out-growers and timber smallholder out-growers in meeting bagasse (and other sugar residues) and wood/timber (wood chips, sawdust and other timber off-cuts) to supply the biomass for large-scale electricity generation
- The model for the EEC obtaining this renewable electricity, e.g., through Feed-in-Tariffs, Auctioning for supply from Independent Power Producers (IPPs) in the sugar and timber sectors, renewable electricity obligation on EEC to procure biomass electricity to meet Eswatini's UNFCCC Paris Agreement commitments, among other procurement mechanisms/policies.
- The proportion (and absolute amount) of Eswatini's electricity needs that could be met through biomass electricity in 5, 10, 15 and 20 years.

1.4.Expected Outcomes

The workshop was expected to produce the following outcomes:

- Policy scenarios for biomass renewable electricity in Eswatini;
- Draft assessment of barriers and solutions to biomass renewable electricity in Eswatini; and
- Information on LULUCF activity data improvements and future land use change scenarios and emissions trends

1.5.Workshop participation

A total of 26 stakeholders were invited to attend the Workshop. This included the Ministry of Tourism and Environment Affairs (MTEA), which includes the Department of Forestry and Department of Meteorology, with its Climate Change Unit, and government personnel within the respective project thematic areas including Ministry of Agriculture (MOA), Ministry of Natural Resources and Energy (MNRE), with its Department of Energy, Ministry of Finance (MOF), Ministry of Economic Planning and Development (MEPD), sugar companies, timber companies and both sugar and timber out-growers. In addition, the state-owned electricity utility, Eswatini Electricity Company (EEC), and the Eswatini Energy Regulatory Authority (ESERA)¹ were also invited.

Compared to the number of invites, 24 participants attended physically, and two participants attended online. Of the 24 physical participants, 18 were males and 6 were females. It is worth noting that the online participant were not part of the list of physical participants, instead were project counterparts from GHGMI and ICAT. It is also worth noting that only one invited organisation was not represented, the Ministry of Economic Planning

¹ A statutory Energy Regulatory Body established through the Energy Regulatory Act, 2007 (Act No.2 of 2007).

and Development, which was holding its own workshop on the same days. The list of workshop participants appears in Annex 2.



Figure 1: Workshop participants Day 2.

1.6. Day 1: Thursday April 7, 2022

1.6.1. Morning Session Presentations

The workshop was opened by Ms. Khetsiwe Khumalo, the government officer responsible for the Climate Change Unit (CCU) at the Ministry of Tourism and Environmental Affairs (MTEA). She described Eswatini as being in an exciting moment with numerous large climate change projects currently underway and stressed that it was a good time to ensure synergies between the projects. Stakeholders should continue to be willing to help with other ongoing projects. As an example of such projects, she cited the ongoing work on an implementation strategy for the NDC. She went on to note that the workshop is for work done in partnership with GHGMI (Greenhouse Gas Management Institute) and ICAT (Initiative for Climate Actions Transparency).² She described the ICAT project to “be invaluable in addressing gaps in Eswatini’s climate change reporting process.”

Ms Khumalo further noted that Eswatini submitted her NDC in October 2021. This ICAT project addresses how various stakeholders can collectively contribute to the commitments that the country has made and how to track progress to know where we are in the NDC. This project will also help the country to be transparent in reporting its progress in NDC. Ms Khumalo was very excited by the prospect for examining potential for Eswatini to generate green electricity from biomass, and indicated she was forward to discussions.

² The Initiative for Climate Action Transparency (ICAT) is an organisation based in Bonn, Germany, supported by a large number of government, institutional and private donors (<https://climateactiontransparency.org/>). The GHGMI (<https://ghginstitute.org/>) is a non-government organisation registered in the USA, but with over 50 professionals associated with it working throughout the world on a number of climate change projects, ranging from distance training to training and working with individuals and groups on capacity-building in climate change.



Figure 2: Ms. Khetsiwe Khumalo from MTEA making her welcoming remarks

Mr. Mike Bess introduced the ICAT project and gave a brief summary on activity 4 and 5. He noted that activity 4 is focused on quantifying GHG emissions from land use and land use change (LULUCF) inventory compilation to Tier 2 under the IPCC (Intergovernmental Panel on Climate Change, UN) with extensive spatial mapping of Eswatini and development of a detailed data base for emission factors. On activity 5, he presented that it is an activity focussed on policy options for biomass electricity in Eswatini.



Figure 3: Mr. Mike Bess (GHGMI) making his opening remarks

Dr. Gcina Mavimbela (UNESWA/CSER) then introduced the workshop and its objectives. The presentations highlighted that Eswatini has biomass resources that can be used to provide base load power, displacing Eskom's imports into Eswatini. Furthermore, the private sector companies in the sugar and timber industries have a lot of experience with combined heat and power (CHP) plants. Therefore, there is only a need to upscale their activities.



Figure 4: Dr Gcina Mavimbela from CSER/UNESWA presenting the objectives of the workshop

Mr. Saneliso Makhanya (ICAT Eswatini) then gave a short presentation on GHGs Inventory Compilation and Mitigation commitments through the NDC. Mr Makhanya noted that, in the NDC, the country has committed to developing at least 40MW of biomass electricity to reduce its GHG mitigation emissions.



Figure 5: Mr. Saneliso Makhanya making his presentation

1.6.2. Mid-Morning Session Presentations

This session focused on the Eswatini National Government's perspective with each ministry and department providing an overview of the government stand on renewable electricity production. Mr. Mzwandile Ndzinisa, Ministry of Natural Resources and Energy (MNRE), Energy Department, gave an overview of government's plans for the electricity sector. He noted that the country's current peak electricity demand is about 246 MW of which 80% is met through imported electricity from ESKOM South Africa. The 20% local supply is 60.4 MW produced through hydro (used only from peaking plants), and 10MW produced through solar.



Figure 6: Mr. Mwzandile Ndzinisa (MNRE, Energy Department) making his presentation

In addition, in the sugar industry, three CHP plants (two under Royal Eswatini Sugar Corporation/RESC and one plant under Ubombo/Illovo) produce electricity with total capacity of some 105 MW. Of the 105 MW, about 15 MW supplies the grid (contributing to the 20% local supply to the grid) and the rest is for own use in the industry. Other industries and agricultural companies have solar plants whose combined capacity is 13 MW (not connected to the grid) and one thermal plant (coal) with a capacity of 2.2 MW for its own use.

Government plans to add at total of 80MW renewable electricity through government tender, namely 40MW through solar PV power plants (tender with the Eswatini Energy Regulatory Authority/ESERA since 2019) and 40 MW through biomass power plants (using both bagasse and woodchips as feedstock, tender also with ESERA since 2020) to come online by 2025. The government also plans to expand the existing Maguga hydro power plant by 10MW and the existing Maguduza hydro power plant by 13MW. Both expansions would be through water cascade systems.

The country's biggest challenge is providing the country's 80% base load (currently supplied almost entirely by Eskom South Africa) as the plans for a coal-fired thermal plan have now been deferred due to environmental issues (among others). Hydropower is also seasonal and is not available in sufficient quantities to meet national demand. Solar electricity requires huge storage capacity as it only generates when the sun shines. Natural gas might be too costly. In light of these constraints, Eswatini's extensive biomass resources, and its extensive experience in generating electricity with its biomass resources, might be the best solution if available. The ministry is looking for information on available biomass resources.

MNRE's presentation was followed by a group discussion:

- The MNRE was asked to clarify if the coal power plant that was to come online in 2026 is still planned for construction and generation.
- ESKOM (where most of the imported electricity comes from) is also short by over 200MW and have no capacity on the ground to add more power plants, so would they be willing to continue to supply Eswatini after the 2025 contract expires?
- For biomass, the main issue for the sugar and timber industries is that developing the electricity generating capacity from readily available biomass will require significant amounts of money to develop. Currently, there is no sound policy framework to enable this or encourage the private sector to make such large investments. How can Government take care of the uncertainty in the sugar and timber industry to enable and encourage the sector to commit to expanding biomass energy production?
 - ESERA explained that a framework for power purchase agreements (PPAs) exists, and the policy does need to be fine-tuned for biomass framework.
- How much feedstock is needed to supply the base load and how much is available in the country?
 - MNRE explained that before the 40MW bidding was called, companies were asked how much feedstock they have available. However, only a few companies provided that information.
 - ESERA explained that the 40MW biomass procurement will not be given to only one company. Instead the tender will be split. If there are few suppliers, the price will go up. ESERA also

highlighted that four companies have been shortlisted in the Request for Qualification (RFQ) phase and the process is now proceeding to a Request for Proposals (RFP).

- A strong direction from Government is needed for a way forward. When asking for data: The data can be given in terms of tonnes of bagasse, but if the method of harvesting changes this will be taken into consideration. Certainty in the availability of a market to purchase electricity from biomass would motivate the change in processes and this applies to many other processes in the sugar production. There is need for a study to determine accurate information on available resource.
- MNRE is working on TORs for a biomass feedstock study.
- A small biomass power plant cannot compete with a big biomass power plant. There is no sense for a big biomass power plant when the framework is for a 40MW bid.
- A strong lead from government and transparency is needed for a biomass power plant and a strong partnership between government and private sector in order to access funds like the Green Climate Fund (GCF).³

Mr. Sonkhe Dlamini from ESERA gave a short presentation (Annex 3.7) on the future of the Eswatini electricity market. There are currently two ongoing procurement activities through bidding; 40MW solar PV and 40 MW biomass. Other projects include 13.6 MW hydro (Maguduza expansion) and 10 MW solar in Lavumisa (Operational). They will be introducing a framework on net-metering⁴ for small, embedded generation (SEG) where units will not be transferred to the following year. The SEG might start in September 2022.



Figure 7: Mr. Sonkhe Dlamini from ESERA making his presentation.

ESERA's presentation was followed by a discussion:

- Sugar cane growers noted that for the 40MW biomass bid, TORs were sent only to sugar millers and not to growers. Communication should be with the sugar industry, that includes the growers so that they are involved in the processes.
- Participants also queried the inclusion of advisors after concluding the RFQ process. It was noted that it could lead to changing the RFQ?
 - ESERA does not think RFQ will change after consultation with the advisor, but this will help with the RFP process.

³ GCF is a unique global platform to respond to climate change by investing in low-emission and climate-resilient development

⁴ Net metering is when a special meter, which measures both the electricity an entity (company, household, government building, etc.) consumes (which standard electricity meters do) as well as any electricity the entity generates and puts on the grid. Net metering is intended to encourage households, businesses, etc. to install renewable electricity generation (e.g., solar panels) that, when the installation (household, business, etc.) generates more than it consumes, the electricity is sent into the grid while the net meter records the amount of net excess electricity is generated to the grid, and the customer-suppliers are credited for the electricity they send to the grid.

Mr Joseph Ncwane from EEC gave a short presentation on the positives and negatives of locally generated power. He made the following points:

- EEC as planners, need all the information to make informed decisions. It is important to know how much feedstock is available locally for each type of electricity generation (e.g., solar, hydro, biomass, etc.).
- ESKOM has plants that are very old, and new power plants will come in at a higher cost and cannot compete with old power plant in market.
- Gas power plants might be too expensive for the country and the gas might not be available. Using local feedstock is very important.



Figure 8: Mr. Joseph Ncwane from EEC making his presentation.

EEC's presentation was followed by a discussion:

- Is EEC considering using renewable energy off grid to supply remote areas instead of spending on infrastructure (lot of poles, lines and transformer) to provide for one homestead.
- The wheeling framework which might enable electricity suppliers to put their electricity on the EEC grid, and "wheel" it (i.e. use the grid to transport their electricity to another consumer) is still being developed. Other electrification methods that are off grid solutions are being considered but there are challenges in convincing people to use off grid. A study using solar in 26 households in Sigcineni has been done, EEC absorbed the costs. A mechanism for financing such projects and how they can be sustainable is needed.

Mr. Jele from the MTEA's Forestry Department made a short presentation on impacts of additional revenue through optimal use of timber residue from the timber sector. He highlighted that:

- The department is trying to collect data.
- A study to supply the grid using timber residues was done by Montigny.

The Forestry Department's presentation was followed by a discussion:

- It is not only the Montigny contract that was not successful. There were other producers that could not compete with the ESKOM electricity price. Mr Jele suggested that the EEC, private sector generators (i.e. RESC, Ubombo, Montigny, perhaps other timber companies with CHP), ESERA and MNRE should come together and to figure out a way forward that would help decrease imports by enabling power to be produced locally in large quantities and sold to the grid, or 'wheeled' to major consumers.
- The country should find a way to reduce dependency on imports from ESKOM, given that South Africa is experiencing significant load shedding.
- There is a very strong need to present options for Government to move from import from other countries, to locally-generated electricity.



Figure 9: Mr. Nkosinathi Jele MTEA/Forestry Department, making his presentation

Mr. Christopher Mthethwa from the Ministry of Agriculture (MOA) made a short presentation on impacts of additional revenue through optimal use of sugar bagasse from the sugar sector. He emphasised the need for a clear market in order to improve processes that will produce more electricity.

Mr. Siphe-okuhle Fakudze from the Ministry of Finance (MOF) made a short presentation (Annex 3.7) on common tax incentives in Eswatini and possibilities for power plant investments. He highlighted that Eswatini has investment incentives as well as commodity incentives. The two investment incentives are the Development Approval Order (DAO) and the Special Economic Zones (SEZs) which are provided for in the Income Tax Order 1975 (as amended) and the Special Economic Zone Act 2018, respectively. He noted that electricity generation can be considered under these incentives, since it is generating electricity is an economic activity classified under manufacturing under Eswatini laws.



Figure 10: Mr. Siphe-okuhle Fakudze from the Ministry of Finance making his presentation

The Ministry of Finance's presentation was followed by a discussion:

- **Q1:** What is the time frame to correct the commodity tax?
 - Answer 1: It is still in process.
- **Q2:** The TAX you pay when importing machinery for power plant does the government have power to reduce that?
 - Answer 2: Duty is in customs which is part of SACU (Southern Africa Customs Union); the incentive will only apply when it comes to Eswatini in other borders it will not apply.
- **Q3:** What qualifies someone the DAO incentive?
 - Answer 3: There is a committee that looks at applications for DAO. In 2020 about 15 companies were awarded the DAO incentive.

Dr. Wisdom Dlamini from the UNESWA CSER team presented on LULUCF inventory and projections results. The presentations highlights are:

- Changes in land use are tracked and mapped from 1990 to 2020
- Projections are up to the year 2050
- The methods used are Tier 2 (2006 IPCC Guidelines for National GHG Emissions, UNFCCC)
- Natural forest declines the most in this timeframe with most being converted to irrigated cropland. This largely driven by expansions in land under sugar cane and other disturbances.

The presentation was followed by discussions:

- The NDC targets do not look attainable given the countries actions?
 - The country needs to upscale its renewable energy.
 - As a country, our emissions are very low because we have forest carbon sink.



Figure 11: Dr Wisdom Dlamini from UNESWA making his presentation

1.6.3. Afternoon Break Out Session Presentations

Dr. Gcina Mavimbela from the UNESWA CSER introduced RE policy options to be discussed in groups and biomass resources in Eswatini (presentation attached, Annex 3.2). He presented that based on data from the

sugar industry, bagasse in the sugar industry was in excess of 175,000 tonnes (equivalent to over 12 million GJ) for the last year. He also presented that at the moment the team only has an industry estimate of 600,000-800,000 tonnes (equivalent to 10 million- 13 million GJ) of wood-chips production capacity. The estimate will be improved by considering all residue streams in timber harvesting and processing. Policy options that were presented for consideration in break-out groups were:

- Feed in tariff policy
- Auction/bidding policy
- Tax incentive policy
- Obligation policy

Participants then divided into three Break Out Groups which were charged with coming up with recommendations on possible trajectories in the development of biomass power plants in Eswatini. The participants and discussion in each group are summarised below

Breakout Group 1:

No	Break Out Session 1	Name	Position
1	MNRE/Energy Department	Mzwandile Ndzinisa	Senior Energy Officer
2	MOF	Siphe-Okuhle Fakudze	Economist
3	RESC	Bongumusa Tfwala	Energy Manager
4	ECGA	Bruce James	Branch Chair, Mhlume ECGA
5	Montigny Timbers	Ndumiso Dlamini	Electrical Engineer
6	MTEA/Met	Thembelihle Maseko	Intern
7	UNESWA	Dr Gugu Msane	Activities 2 & 5 Team Specialist & UNESWA - MTEA Liaison

In the discussion, Group 1 noted that Eswatini's peak demand of 246 MW has an underlying baseload that can be met in part or even in full by maximum exploitation of the country's biomass resource in the sugar and timber industries. Break Out Group 1 noted that while there is an estimate of 670 GWh of potential production from biomass, there is still a need for a study to quantify the amount of biomass resources available in Eswatini. The group further observed that, from the discussions with Montigny Senior Management with the Activity 5 Group at Montigny (25th January) there was potential **to** increase biomass availability (both timber residues and sugar residues) through expansion.

On the timber sector, the group observed that community programmes similar to the Montigny Investments "wattle jungle community development programme" can be promoted more widely amongst potential farmer out-growers, resulting in significant increases in available biomass feedstock for power plants.

The group concluded that it was possible for the country to have 4 operating biomass power plants: One at Bhunya for the timber residues, and the other three at Big Bend, Simunye and Mhlume for sugar out-grower bagasse. While the timber biomass plant can easily operate year-round, storage will be required to extend the operational time of the bagasse plants during the year. In concluding its discussions, Break Out Group 1 recommended that a **feed-in-tariff be considered in obtaining biomass power from IPPs to the national utility**. Minutes of the discussions can be found in Annex 3.

Breakout Group 2:

8	MNRE/Energy Department	Thembinkosi Ndzimandze	APEO
9	EEC	Joseph Ncwane	Manager, Planning Senior Engineer
10	RESC	Oloff Marais	HOD – Engineering Services & Projects
11	ECGA	Nokuphila Mabuza	GIT
12	Montigny	Ian Nsibandze	Head, Forestry Extension
13	ECGA	Musa Hlatjwako	Agricultural Services Manager
14	MOA	Christopher Mthethwa	Seed Quality Control Services
15	ICAT UNESWA Activity 4	Wisdom Dlamini	Forestry & Agriculture Specialist
16	UNESWA	Thembelihle Dlamini	Activity 5 Team Specialist

The group broke down the 246 MW Eswatini's peak demand into **base load**, **cyclic load** and **peak load**, noting that **the base load is 110 MW**. The group concluded that the **base load can be supplied by biomass power plants by targeting producing 800 GWh of electrical energy**. This would be possible if all the industry players contributed to the effort. While the group observed that Government should enable the private sector to freely generate electricity to be purchased by the utility. There is need for government to help them access funding, particularly climate finance. They also observed that diversifying the generation mix through other renewables can result in the country being too self-sufficient.

The group observed that out-growers faced challenges in terms of costs of pumping power for irrigation. They concluded that farmers needed assistance in accessing climate and sustainable development funds that can help farmers improve their farms in line with green initiatives. The group also noted that while mechanical harvesting can significantly increase the biomass resource, it can also lead to increase in poverty as the labourers who work in harvesting would be put out of work.

Break Out Group 2 made **two major recommendations**:

- A paper should be written to Eswatini's Government motivating the development of biomass power for the baseload.
- An industry team be formed to advise government on biomass power.

Minutes of the discussions can be found in Annex 3.

Breakout Group 3:

17	ESERA	Ntokozo Sonke Dlamini	Technical Regulation Manager - Electricity & Capacity Generation Manager
18	Ubombo Sugar	Hlelile Ginindza	SHERQ Manager, Environmental Services
19	ESA	Dr Nkululeko Dlamini	Irrigation Systems Engineer
20	ECGA	Sipho Velaphi Nkambule	Chief Executive Officer (CEO)
21	MTEA/Forest Department	Nkosinathi Jele	Forestry Officer
22	Peak Timber/Shiselweni Forest	Nhlanhla Nxumalo	Risk Manager
23	MTEA/Met	Sandile Bhembe	PA
24	UNESWA	Nosiphiwo Zwane	Activities 2 & 5 Team Specialist

The group noted that there is a need for a holistic view to the development of electricity power plants instead of comparing tariffs from new power plants to ESKOM tariffs. In this consideration, **local power generation should be favoured because of the economic value when more money circulates in the country and because**

it will eliminate the risks inherent in depending on imports. The group noted that the country can consider the following in a quest to promote local generation:

- Develop a policy that balances energy security and self-sufficiency.
- The country must be prepared to pay premium to promote local generation.
- Have a policy that state how much percentage of electricity should be supplied locally.

The group also observed that a policy on the country's energy mix would help with the uncertainty on the market for biomass. In line with this observation, guidelines on the generation mix should be developed. Additionally, the group pointed out that the lack of clarity on the coal power plant is discouraging investments in the biomass power sector. The group also noted that government can save resources by investing in off-grid renewable solutions rather than extending the grid to remote areas.

On the sugar sector, the group raised a concern that consultation is usually with the millers, disregarding the out-grower sugar cane and bagasse suppliers. They observed that through negotiation with both millers and growers, power production can be optimized using the following:

- Changing mode of harvesting
- Changing variety of cane grown
- Increasing efficiency of boilers in the mills
- Increasing feedstock going to energy production

The group also suggested the introduction of smaller power plants in remote places for feedstock that's left in the fields (this is usually burnt).

Finally, the group considered the current procurement process by ESERA and observed that the ongoing bidding-based process will not work for large power plants. The 40 MW in which individual investors can only bid for 20 MW is restrictive. The group recommended that an obligations policy be developed for renewables and a hybrid policy be developed for biomass power procurement. The hybrid policy would be partly auction and partly feed in tariff.

Minutes of the discussions can be found in Annex 3.

1.7. Day 2: Friday April 8, 2022

The second day began with a recap of day 1 given by Mr. Mike Bess. After the brief recap, the Break Out Groups continued their discussions. Once the group discussions were concluded, Mr. Mike Bess kicked off the plenary discussion with a presentation on things to remember as the possible trajectories of biomass electricity development are considered. He highlighted that setting a feed-in-tariff that is not too high and not too low (since adjustments cannot be done too often to ensure market stability) is important. He further noted that when using feed in tariff, the following should be done at reasonable intervals:

- Supply rectifications
- Demand rectifications
- Investors rectifications

Mr Bess went on to discuss competitive bidding. He noted that when using competitive bidding the market must give a good, positively competitive price. In addition, Mr Bess made note of the following:

- The country is currently using bidding for 40 MW solar and 40 MW biomass (SGEP 2018) while the medium-to-long term energy generation plan is not well-articulated.

- An integrated resource plan (IRP) might be too big for the country and yet the master plan is not providing enough guidance to potential investors both in electricity generation plant and suppliers of biomass.

After the remarks by Mr Bess, the three groups gave their presentations. Minutes of the discussions by the groups are in Annex 4 and power point presentations in annex 5. The following were noted by the plenary while reacting to the presentations and in closing the discussions of the workshop:

- Eswatini is a small country **and has three major players in the sugar and timber sector**. Perhaps auctioning/bidding is not the best way to bring on new, sustainable generation and electricity supply. A round table with all the players might work better in getting good, sustainable electricity tariffs for supplying the EEC. Auctions might kill the interest. Another option would be to have the amount of feedstock known and have outside (world) investors bid to come and generate.
- Currently, all the power used in sugar manufacturing is renewable but if a coal plant were to be built the sugar industry might have problems selling their sugar internationally since renewable energy is required to reduce the product's carbon footprint for export to overseas market.
- ILLOVO has new boilers; hence, it is more efficient in electricity generation than RESC, which currently uses older boilers that are less efficient. A good electricity market might motivate all players to get new boilers with higher efficiency.
- A concern was recorded over the roll-out of the ongoing procurement of 40 MW biomass electricity. The sugar out-growers were not involved when the TORs for biomass electricity production were given to the sugar millers. The sugar out-growers urged that they should be included in these processes because they are the producers of the feedstock.
- Eswatini Sugar Association (ESA) is currently introducing improved irrigation programs and software for irrigation and lobbying for more dams for irrigation. But all these improved systems need electricity which is expensive for some farmers (especially smallholder farmers).
- World Bank has an ongoing project to highlight the energy challenges that the country currently has, the document will be available in two weeks.
- It was noted that it might be easier to get funding for renewable energy power plants than a coal power plant, for example financing in the SADC region is possible from the Green Climate Fund through the Development Bank of Southern Africa (DBSA). Hence, including plans for renewable power plants in the National Development Plan (NDP) would help in getting them funded.
- It was suggested that a committee led by government with participation from the private sector should be set up to ensure that the country has its own energy supply. MNRE said such a committee would be great but pleaded with the private sector to participate since a few years back such a committee existed, but all private sector members later pulled out.

1.8. Conclusion

The workshop participants made the following recommendations during the Workshop's Plenary Session, Friday, 8th April 2022 afternoon:

1. **A government-led committee should be formed with representatives from the stakeholder groups represented at the workshop**, namely central government, the sugar, timber and electricity industry, the sugar and timber out-growers and their membership bodies (specifically ESA and ECGA in the sugar sector) and the energy regulator to consider the issues around biomass electricity with the intent to consider if and how the legal, regulatory, administrative and other arrangements could be put in place to encourage and promote investment in biomass electricity generation.

2. **A Working Paper on biomass electricity should be prepared by government in conjunction with the key stakeholders, representing the sugar out-growers (ECGA), the sugar companies (RESC, Ubombo Sugar Ltd), the timber companies (at minimum Montigny and Peak Timber/Sheselweni forest).**

1.9. Proposed Scenarios

After concluding the workshop, Mr Mike Bess and Dr Gcina Mavimbela drafted the following scenarios. The scenarios are based on the information collected in the interviews with various stakeholders before the workshop as well as information gathered in the discussions during the workshop.

1. **Base Case Scenario (Business-As-Usual/BAU):** This scenario effectively represents the current situation in Eswatini with bulk of electricity imported from Eskom in South Africa. This is characterised by:
 - a. Sugar companies generate almost all their electricity (105 MW CHP) with Ubombo exporting 14 MW to the grid (Eswatini Electricity Company/EEC). There is some self-generation from small, combined heat and power (CHP) units at two of the timber companies (Shiselweni Forest-Peak Timbers and Montigny) burning timber residues primarily for heat for curing their timber.
 - b. EEC owns a handful of power plants (mostly hydro)
 - i. 60.4 MW hydro (peaking plants)
 - ii. 10 MW Solar (Lavumisa)
 - c. USA Distillers has 2.2 MW Thermal Plant (Coal).
 - d. Wundersight (IPP) owns a 0.85 MW solar plant which is experiencing some operational problems.
 - e. Several companies own solar plants (distributed generation, not grid-connected) for own use whose combined capacity is approximately 13 MW.
2. **Scenario 2: BAU Plus Scenario:** This scenario incorporates projects whose plans are either at tender stage or construction is about to begin to the base case.
 - a. Lower Maguduza Hydro Power Plant: 13 MW cascade extension of the existing Maguduza Hydro Power Plant
 - b. 10 MW cascade extension of the existing Maguga Hydro Power Plant
 - c. ESERA Call for Proposals for 1) a 40 MW solar; and 2) 40 MW Biomass Electricity (which have been out on tender since 2019 and 2020, respectively).
3. **Scenario 3: Major Thermal Generation Investment:**
 - a. This envisages investment in a minimum of 100MW of thermal for sale to EEC.
 - b. Thermal generation could be from oil, coal, diesel or gas.
 - c. This scenario could come into play if Eskom either reduces or eliminates its exports to Eswatini. The thermal investment could be greater than 100MW depending upon how much Eskom cuts its sales to EEC and how high the Eswatini grid load/demand is when Eskom's current contract ends in 2025.

4. Scenario 4: Major investment in Biomass Electricity Generation (i.e. Biomass Electricity Scenario)

- a. This scenario envisages major expansion and upgrading/replacing of sugar thermal generation primarily from bagasse in RESC and Ubombo, with investment in larger-scale CHP from wood residues/waste (e.g. trimming, cuttings and sawdust) at Montigny and at Shiselweni Forest-Peak Timbers with total biomass electricity generation from all sugar and timber sources at a minimum of 110 MW.

Annexures

Annex 1: Workshop Agenda: 7th and 8th April 2022 Hilton Garden Inn Mbabane

Day 1

Time	Activity	Responsibility
08:00 – 08:30	Arrival and Registration	All Participants
08:30 – 08:45	Welcome Remarks	MTEA
08:45 – 09:00	Introduction of the ICAT project and a brief on activity 4 and activity 5	UNESWA
09:00 – 09:10	Introduction the Workshop and its objectives	UNESWA
09:10 – 09:35	GHGs Inventory Compilation & Mitigation commitments through the NDC	MTEA
09:35 – 10:00	Government's plan for the power sector	MNRE
10:00 – 10:15	The future of the Eswatini electricity market	ESERA
10:15 – 10:30	Positives and Negatives of locally power generation	EEC
10:30 – 10:45	Impact of additional revenue through optimal bagasse utilisation in the sugar sector	MOA-Crops/Sugar Companies
10:45 – 11:00	Impact of additional revenue through optimal use of timber residues to the timber sector	MTEA-Forestry/Timber Companies
11:00 – 11:20	Tea Break	All Participants
11:20 – 11:35	Common Tax Incentives in Eswatini: Possibilities for Power Plant Investments	MOF
11:35 – 11:50	Economic impacts of locally operated power plants	MEPD
11:50 – 13:00	LULUCF results, discussion and data needs	UNESWA
13:00 – 14:00	Lunch Break	All Participants
14:00 – 14:30	Introduction RE policy options for discussion in groups and the biomass resource in Eswatini	UNESWA
14:30 – 15:45	Breakout Sessions (3 groups) focusing on three policy options, possible scenarios of biomass electricity generation under each policy option and business case for each policy option: G1. Feed-in Tariff Policy framework G2. Bidding/Auction Policy framework G3. Obligation Policy framework	All participants
15:30 – 15:45	Tea Break	All Participants
15:45 – 16:30	Breakout Sessions continue discussions	All participants
16:30 – 16:45	Closing Remarks for day 1	MTEA/UNESWA

Day 2

Time	Activity	Responsibility
08:00 – 08:30	Arrival and registration	All Participants
08:30 – 09:00	Recap on Day 1 Discussions	UNESWA
09:00 – 10:30	Stakeholder engagement: Breakout sessions continue discussions	All participants
1030 – 11:00	Tea Break	All Participants
11:00 – 11:30	Group 1 reports on its recommendations	G1
11:30 – 12:00	Group 2 reports on its recommendations	G2
12:00 – 12:30	Group 3 reports on its recommendations	G3
12:30 – 13:30	Plenary discussion	All participants
13:00 – 14:00	Lunch Break	All Participants

Annex 2: ICAT Eswatini Biomass Electricity Policies Workshop Participants

Name	Organisation	Position
Bess, Mike	GHGMI - ICAT	Economist, RE & Climate Specialist
Bhembe, Sandile	MTEA/Met	PA
Borde, Alexandre	MOF/UNDP	Financial Consultant
Dladla, Nompumelelo	MOF	Economist
Dlamini, Dr, Nkululeko	ESA	Irrigation Systems Engineer
Dlamini, Ndumiso	Montigny Timbers	Electrical Engineer
Dlamini, Ntokozo Sonke	ESERA	Technical Regulation Manager - Electricity & Capacity Generation Manager
Dlamini, Dr. Thembelihle	UNESWA-ICAT Biomass Electricity	Activity 5 Team Specialist
Dlamini, Dr. Wisdom	UNESWA-ICAT	Forestry & Agriculture Specialist, Activity 4 Lead (LULCF)
Fakudze, Siphe-okuhle	MOF	Economist
Ginindza, Hlelile	Ubombo Sugar	SHERQ Manager, Environmental Services
Hlatjwako, Musa	ECGA	Agricultural Services Manager
James, Bruce	ECGA	Branch Chair, Mhlume ECGA
Jele, Nkosinathi	MTEA/Forest Department	Forestry Officer
Khumalo, Ms Khetsiwe	MTEA, Met Department, Climate Change Unit	Director
Mabuza, Nokuphila	ECGA	GIT
Makhanya, Saneliso	MTEA-UNESWA/CSER	ICAT Eswatini Project Facilitator
Marais, Oloff	RESC	HOD – Engineering Services & Projects
Maseko, Thembelihle	MTEA, Met Department	Intern
Mavimbela, Dr Gcina	UNESWA/CSER	Prof of Physics, - ICAT Lead Activity 5 (Biomass Electricity)
Msane, Dr Gugu	UNESWA/CSER	Activities 2 & 5 Team Specialist & UNESWA - MTEA Liaison
Mthethwa, Christopher	MOA	Seed Quality Control Services
Ncwane, Joseph	EEC	Manager, Planning Senior Engineer
Ndzimandze, Thembinkosi	MNRE/Energy Department	Energy Officer
Ndzinisa, Mzwandile	MNRE/Energy Department	Senior Energy Officer
Nkambule, Sipho Velaphi	ECGA	Chief Executive Officer (CEO)
Nsibandze, Ian	Montigny	Head, Forestry Extension
Nxumalo, Nhlanhla	Peak Timber/Shiselweni Forest	Risk Manager
Pullanikkatil, Deepa	MTEA/UNDP	NDC Co-ordinator
Tfwala, Bongumusa	RESC	Energy Manager
Zwane, Nosiphiwo	UNESWA/CSER	Activities 2 & 5 Team Specialist

Annex 3: Breakout Minutes

Group 1:

Participants

1. Mzwandile Ndzinisa (MNRE/Energy Department)
2. Siphe-Okuhle Fakudze (MOF)
3. Bongumusa Tfwala (RESC)
4. Bruce James (ECGA)
5. Ndumiso Dlamini (Montigny Timbers)
6. Thembelihle Maseko (MTEA)
7. Dr Gugu Msane (UNESWA)

The discussion was centred around 6 guiding questions

1. Demand for electricity in Eswatini

- 246 MW is maximum demand.
- The baseload demand high, introduction of biomass can help meet this demand, instead of relying on ESKOM.
- Coal is used to fuel 'baseload' power stations, which run continuously and provide reliable continuous power outputs to the whole country.
- Can biomass electricity reliably supply this baseload demand? There is a strong feeling from the public that renewable options are unsuitable for baseload supply, therefore fossil power and nuclear power are needed. The group felt that this critique is misleading.
- There is a need for Base load biomass (or other renewable energy) power plants that will generate dependable power to consistently meet this demand

2. Potential for utilising Eswatini's extensive biomass resources to meet some or all the country's electricity demand

- Mr Bruce from ECGA emphasised that the amount of biomass the country has need to be quantified.
- Mr Ndumiso Dlamini and Mr Tfwala said the estimate is 670 GWh

3. The role of Eswatini's numerous sugar smallholder out-growers and timber smallholder out-growers in meet bagasse (and other sugar residues) and wood/timber (wood chips, sawdust and other timber off-cuts) to supply the biomass for large-scale electricity generation

- There are 400 sugar cane out growers that supply the mills currently their bagasse plus the miller plant bagasse is used to manufacture sugar, there is potential for the small growers to produce additional biomass
- Ubombo currently exporting to the grid
- Montigny has community forestry programme that has transformed invasive Wattle Jungles into smallholder plantations, the wattle biomass will provide additional feedstock

- Wattle community programme needs to be promoted to stimulate interest in farmers, new out growers, increasing the biomass availability
- Mr Ndzinisa from MNRE stated that currently conducting a study with the World Bank- to determine how much electricity can be generated from bagasse and timber we have in the country.

4. The role of the Eswatini private sector, particularly the sugar mills and timber sectors, could play for generating sustainable biomass electricity for Eswatini

- Power plant investment in the sugar and timber industry offers a realizable alternative for biomass electricity generation
- Storage of large quantities of bagasse for off-season power generation to ensure sustainable feedstock throughout the year
- Timber industry harvests all year round, can maintain sustainable supply biomass electricity
- Between the timber and sugar industries about? MW could be sustainably produced from biomass each year.
- 3 biomass power stations can be set up (Bhunya, Illovo and Simunye/Mhlume) to supply to the grid
 - There is a need for technology improvements that can be made in the sugar sector to improve process and energy efficiency for the purposes of becoming an independent power producer that supplies power to the grid continuously throughout the year. There is a need to upgrade the boilers. Mr Tfwala said the prices for boilers for the power plants are in the range of billions of Emalangeni.
 - Switch to mechanical harvesting or green cane harvesting of sugar cane to get more biomass. However, this increases growers' costs and need to be compensated from the sale of electricity
 - Our government need to demonstrate commitment to the development of biomass energy.
 - Government needs to offer biomass subsidies
 - Huge funding to boost biomass, Green Climate Fund
- Mr Bruce emphasised on the importance of an agreement between sugar cane out growers and the mills that need to be established on sharing of profits of sales of excess electricity to the grid equitably.

5. The model for the EEC obtaining this renewable electricity

- Feed-in-tariffs to accelerate investment in biomass energy technology
- A guaranteed price established for anyone who wants to sell renewable electricity to the grid, and a guarantee that they will have access to the grid to do so.
- Prices are regularly reviewed for new projects and reduced to encourage technical innovation and reflect falling costs.
- Feed-in mechanisms achieve larger deployment at lower costs
- Feed-in tariffs reward actual production
- Government to come up with tariff expectation
- Bidding minimizes development investment risks.
- Long-term contracts facilitate access to financing
- Feed-in tariffs do not involve government spending, but only the political will to implement them.

The group further discussed the risks of biomass electricity:

- Political unrest
- Extensive drought
- Vandalism
- Forest fires

On expansion, Mr Dlamini said Montigny plans to grow gum (eucalyptus) trees which are a good biomass resource.

Group 2:

Date: Thursday/Friday, April 07-08, 2022

Time: 15:00-16:45 hours (SAST)

Venue: Hilton Garden Hotel (Mbabane, Eswatini)

Present

1. Mr. Joseph Ncwane (EEC)
2. Ms. Nokuphila Mabuza (ECGA)
3. Dr. Wisdom Dlamini (UNESWA, Activity 4, Lead)
4. Dr. Thembelihle Dlamini (UNESWA, Activity 5, Member)
5. Mr. Oloff Marais (RESC)
6. Mr. Ian Nsibande (Montigny)
7. Mr. Musa Hlatjwako (ECGA)
8. Mr. Thembinkosi Ndzimandze (MNRE)
9. Mr. Christopher Mthethwa (MOA)

Minutes:

The following contributions comes group 2 members who were responsible for discussion the following points and provide recommendations:

1. Demand for electricity in Eswatini.

- Mr. Joseph Ncwane shared detailed information about the load demands for the country. He reported that currently the demand stands at 241.6 MW. He also highlighted that in our energy analysis we must always consider the baseline, cyclic load, and peak load.
- Mr. Oloff Marais then outlined the energy demand from the sugar manufacturing side. He stated that usually the energy is used for irrigation and household purposes. During off-season, the demand is around 12 MW and during the growing season the demand is around 24 MW.
- Overall, the group suggested that if the millers and timber companies can contribute towards generating energy that contributes significantly to the base load, then the amount of energy being imported can be reduced.

2. Potential for utilising Eswatini's extensive biomass resources to meet some or all the country's electricity demand.

- It was suggested that energy demand must be used as measure so that the country can know how much energy must be generated through biomass resources.
- The energy demand target for energy to be generated was set to 800 GWh.

3. The role of the Eswatini private sector, particularly the sugar mills and timber sectors, could play in generating sustainable biomass electricity for Eswatini.

- The members of the group suggested that the government must open the private sector to competition such that the three companies (2 sugar cane, 1 timber) freely generate electricity that will be bought by the utility company at an agreed amount.
- The private sector needs financial support so that they can also partake in the green initiatives. So the companies require government assistance when it comes to accessing the financial resources that are available from the green fund.
- In addition, it was suggested that if there is energy diversity (generate energy from biomass, solar, wind), then the country can be self-sustainable.
- One challenge that was noted, is the issue of transport cost. The cost of transporting the biomass resources (wood chips, bagasse) to the power plant seems to be costly.

4. The role of Eswatini's numerous sugar smallholder out-growers and timber smallholder out-growers in meeting bagasse (and other sugar residues) and wood/timber (wood chips, sawdust and other timber off-cuts) to supply the biomass for large-scale electricity generation.

- The smallholder out-growers shared their experience in relation to the escalating cost of electricity that is going to put them out of business if the electricity price is not capped.
- The issue of harvesting was put up in relation to the use of fire. It was noted that there are benefits of using mechanical harvesting, however, when this is adopted by all farmers other job alternatives must be provided to the labourers. If the energy uptake is high, local farmers can diversify their crops by growing energy crops that can be used as a biomass resource.
- Again, it was noted that farmers must be assisted in accessing the green fund so that they can improve their farms in line with the green initiatives.

5. The model for the EEC obtaining this renewable electricity, e.g., through Feed-in-Tariffs, auctioning for supply from Independent Power Producers (IPPs) in the sugar and timber sectors, renewable electricity obligation on EEC to procure biomass electricity to meet Eswatini's UNFCCC Paris Agreement commitments, among other procurement mechanisms/policies.

- It was noted that the use of feed-in-tariffs is no longer suitable. Other alternatives must be used.

6. The proportion (and absolute amount) of Eswatini's electricity needs that could be met through biomass electricity in 5, 10, 15 and 20 years.

- This requires first the liberalization of the energy sector so that other players can come in to sell energy to the utility.

- This can be achieved through a micro study.

Recommendations:

- the group recommended that a paper motivating the uptake of biomass be written to government.
- form an industry team that will assist in advising government on issues related to biomass.

Group 3**Participants:**

1. ESERA – Mr. Sonkhe Dlamini
2. ILLOVO – Ms. Hlelile Ginindza
3. ESA – Dr. Nkululeko Dlamini
4. ECGAS – Dr. Siphon Nkambulo
5. Forest Department – Mr. Nkosinathi Jele
6. Peak Timber – Mr. Nhlanhla Nxumalo
7. MTEA – Mr. Sandile Bhembe
8. UNESWA – Dr. Nosiphiwo Zwane

Mr Dlamini (ESERA) There is a need for a holistic view, not to just compare prices with ESKOM but must consider that local power plants will keep money in the country and reduce risks that come with depending on import.

(Dr. Nkambule) For this to work a policy that balances energy security and self-sufficiency should be in place. The country must be prepared to pay premium to promote local generation. Have a policy that state x% should be supplied locally.

(Ms. Ginindza) Diversity of supply would minimize risk if market were guaranteed.

(Dr. Nkambule) A policy on energy mix would help with the uncertainty on the market for biomass.

(Mr. Dlamini) The country seems to have no guidelines for energy mix for now but have various scenarios in energy master plan.

(Dr. Nkambule) Clarity on the coal power plant to come online in 2026 will it be coming online? (Ms. Ginindza) This information is important when looking for investors.

(Dr. Nkambule) Government and Utility/Utilities should encourage renewable instead of installing elaborate grid infrastructure (poles and one transformer) to supply just one home.

(Dr. Dlamini) Communication should be with the industry players not just individual millers and let the industry use existing framework and structures to implement or negotiate. Growers and millers can agree on how to maximize electricity generation:

- Mode of harvesting
- Variety of cane grown
- Increase efficiency of boilers
- Make sure all feedstock goes to energy production

(Dr. Nkambule) Introduce small plants for remote places for feedstock that's left in the fields. For now this is usually burnt.

(Mr. Dlamini) ESERA is using bidding to obtain solar and biomass, this is will not work for big power plants.

(Dr. Nkambule) Consider having an obligation for utility/utilities to procure renewable (biomass, solar etc.) electricity in order to meet the commitments the country has made and having a hybrid using both audition and tariff.