# BIOMASS COGENERATION PLANT BY SCOUL

Document Prepared By:

**LGAI Technological Center, S.A.** (Applus+ Certification)

| | |
|---|---|
| Project Title | Biomass Cogeneration Plant by SCOUL |
| Report Title | Validation and Verification of Biomass Cogeneration Plant by SCOUL |
| Version | 2 |
| Report ID | VCS_VAL_VER_10922_VCS_ID_2977 |
| Verification Period | 19/07/2021 to 31/12/2021(including both the dates) |
| Client | Enen Green Services Private Limited |
| Pages | 99 |
| Date of Issue | 15/04/2023 |
| Prepared By | LGAI Technological Center, S.A. (Applus+ Certification) |
| Contact | Campus UAB – Ronda de la Font del Carme, s/n<br>08193 Bellaterra – Barcelona (Spain) |

**Summary:**

M/s LGAI Technological Center, S.A. (hereafter referred to as Applus+ Certification) has been contracted by M/s Enen Green Services Private Limited to conduct the joint validation and verification of the project "Biomass Cogeneration Plant by SCOUL", VCS PL ID 2977, against VCS Standard Version 4.3.

The validation and verification include confirming the project's design description, project's baseline, monitoring plan and the project's compliance with relevant VCS and host party criteria and implementation of the monitoring plan of the Joint PD and MR (Project ID 2977) and the application of the monitoring methodology as per VCS methodologyACM0006 version 15.0 " Electricity and heat generation from biomass "/6/. The validity of Methodology version 15 which is valid from 14/12/2020 to 10/03/2022 and can be submitted for registration till November 2022. A site visit was conducted to verify the data submitted by PP.

The project activity involves using the bagasse that is already on hand in the SCOUL sugar factory to generate steam and power. The project is a cogeneration facility with a 30 MW capacity (and 150 TPH steam generation) that is situated in Lugazi, Uganda. The sugar mill will get steam and electricity from the bagasse-based cogeneration facility, which will also export any excess energy to the national grid. The current project activity has chosen fixed crediting period of 10 years as per the Tool 23 version 3.0.

The estimated annual average emission reductions over a 10 year period of the crediting period are 18,861 $tCO_2e$/year. The total emission reductions for the crediting period will be 188,610 $tCO_2e$. Total GHG emission reduction in first monitoring period 19/07/2021 to 31/12/2021(including both the dates)is 7,221 $tCO_2e$.

The review of the project design documentation, monitoring report and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and stakeholders have provided Applus+ Certification with sufficient evidence to validate

the fulfillment of the stated criteria.

The purpose of the validation is to have a thorough and independent assessment of the proposed project activity against the applicable VCS requirements, in particular, the project's baseline, monitoring plan and the project's compliance with relevant VCS and host party criteria. These are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of emission reductions. Applus+ Certification's objective is to perform a thorough, independent assessment of the validation of the project activity.

The validation scope is defined as an independent and objective review of the Joint PD & MR. The Joint PD & MR is reviewed against the relevant criteria and guidance documents provided by VCS which included: VCS Program Guide (v4.2, dated 22/06/2022), VCS Standard (v4.3, dated 22/06/2022, Program Definitions (v4.2, dated 22/06/2022), Registration & Issuance Process (v4.1, dated 20/01/2022)/07/ applicable at the time of validation and verification in order to confirm that the project meets the applicability conditions of the selected baseline and monitoring methodology namely ACM0006, Version 15 whose validity is from 14/12/2020 to 10/03/2022/06/ and also assess the claims and assumptions made in the Joint PD & MR without limitation on the information provided by the project proponents.

The purpose of the verification is to review the Joint VCS PD & MR for the monitoring results and verify that monitoring methodology was implemented according to monitoring plan and monitoring data, further based on review of ER sheet confirm that the reductions in anthropogenic emissions by sources is sufficient, definitive and presented in a concise and transparent manner. In particular, monitoring plan, Joint VCS PD & MR, ER sheet and the project's compliance with relevant VCS, UNFCCC and host party criteria are verified in order to confirm that the project has been implemented in accordance with design and conservative assumptions, as documented.

The scope of the verification included as verification of project implementation and operation with respect to the Joint PD & MR, implemented monitoring plan with the Joint PD & MR and applied baseline and monitoring methodology, the actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan , Evaluation of the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement, confirmation of reported GHG emission data is sufficiently supported by evidence.

A risk-based approach has been followed to perform this verification. In the course of validation and verification, 04 Corrective Action request (CARs) and 01 Clarification request (CRs) were raised and successfully closed. There is no FAR raised.

Applus+ Certification confirms that the project is meeting the criteria specified by Joint PD & MR template version 4.1, VCS Standard version 4.3 and applied methodology ACM0006, Version 15 valid from 14/12/2020 till 10/03/2022, hence be successfully validated, verified and further certified for emission reductions under VCS. Further confirms a combined positive validation and verification opinion confirming that the project complies with the applicable VCS requirements, thus recommending the project for registration and issuance.

Our opinion relates to the projects GHG emissions and the resulting GHG emission reductions reported and related to the valid project baseline and monitoring and its associated documents. Based on the information seen and evaluated we confirm that the emission reductions from the project activity "Biomass Cogeneration Plant in SCOUL" during the period 19/07/2021 to 31/12/2021 (including boththe days) amount to 7,221tonnes of $CO_2e$.

## CONTENTS

# 1 INTRODUCTION

## 1.1 Objective

M/s Applus+ Certification have been contracted by M/s Enen Green Services Private Limited, (project proponent), to undertake the validation and verification of the energy efficiency improved project titled "Biomass Cogeneration Plant by SCOUL". The assessment team have reviewed the GHG data collected to date for the monitoring period from 19/07/2021 to 31/12/2021 (including both the dates) covered in this verification.The objective of the combined validation and verification is to have an independent third-party assessment of the Joint PD & MR/1/ and supporting documentation to ensure compliance with the rules, regulations and guidelines by CDM and VCS requirements. In particular;

- The project's baseline is assessed against "ACM0006: Consolidated methodology for electricity and heat generation from biomass residues" version 15.0whose validity is from 14/12/2020 till 10/03/2022/06/
- The project's emission factor is assessed against "Tool to calculate the emission factor for an electricity system"-Version 07.0/06/
- The project's baseline scenario and additionality justification are assessed against "Combined tool to identify the baseline scenario and demonstrate additionality, Version 7.0" /06/
- The projects compliance with, the requirements of Article 12 of the Kyoto Protocol, the CDM Modalities and Procedures as agreed in the Marrakech Accords under decision 3/CMP.1, the annexes to this decision, subsequent decisions and guidance made by COP/MOP & CDM Executive Board and other relevant rules, including the Host Country legislation and sustainability criteria along with VCS standard version 4.3
- CDM project standard for project activities Version 03.0
- CDM project cycle procedure for project activities Version 03.0
- VCS standard v4.3
- VCS guideline v4.2

Validation and verification are a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of verified carbon units (VCUs). This report contains the findings and resolutions from the validation and verification of the project activity.

## 1.2 Scope and Criteria

**For validation**

The validation scope is given as an independent and objective review of the project design, the project's baseline study and monitoring plan (ACM0006 "Consolidated methodology for electricity and heat generation from biomass residues" Version 15.0 valid from 14/12/2020 till

10/03/2022/06/which are included in the VCS joint PD & MR/1/ and other relevant supporting documents. The scope of work covered in the validation is described below:

- To validate whether the project activity meets the requirements of VCS Standardand VCS program guide including additionality, proof of title and compliance with local laws.
- To evaluate whether the baseline and monitoring plan are in conformance with the applied methodology from the VCS approved GHG program
- To confirm that the information presented are complete, consistent, transparent and free of omission or material error
- Background investigation and follow up interviews
- Issuance of draft validation report with CARs, CRs & FARs, if any
- Final validation opinion

The information in the VCS joint PD & MR/1/ is reviewed against the criteria of VCS Standard/4/; the VCS program guide and the applied consolidated baseline and monitoring CDM methodology.

Applus+ Certification has performed validation based on a risk-based approach focusing mainly on the significant risks to meet the qualification criteria and the ability to generate Verified Carbon Units (VCUs).

**For Verification:**

The scope of the verification was the independent and objective review and ex-post determination of the monitored reductions in GHG emissions from "Biomass Cogeneration Plant by SCOUL". The verification of this project was based on the validated VCS joint project description & monitoring report and supporting documents submitted by the project proponent to the verification team. The documents were reviewed against the following guidance and protocols:

- VCS Program Guide (v4.2, dated 22/06/2022)/04/
- VCS Standard (v4.3, dated 22/06/2022)/04/
- VCS Program Definitions (v4.2, dated 22/06/2022)/04/
- VCS Registration & Issuance Process (v4.2, dated 22/06/2022)/04/
- CDMapprovedconsolidated methodology ACM0006 (version 15, valid from 14/12/2020 to 10/03/2022)/06/

The validation & verification is not meant to provide any consulting towards the client. However, stated request for clarifications and/or corrective actions may provide input for improvement of the project design

## 1.3 Level of Assurance

The level of assurance of the verification report falls under reasonable assurance engagements as selected by the Client. The verification team verified the complete monitoring data for all the parameters of the monitoring plan and confirms that the reported emission reductions are free from any type of material errors.

## 1.4 Summary Description of the Project

The project activity's goal is to use the bagasse that is already present in the SCOUL sugar plantto generate steam and energy. The project is a cogeneration facility with a 30 MW capacity (and 150 TPH steam generation) that is situated in Lugazi, Uganda. The sugar mill will get steam and electricity from the bagasse-based cogeneration facility, and it will export any extra power to the national grid.

The project activity entails the installation of a module made up of a turbo-generator with a 37.5 MVA output, or 30 MWe, and a high-pressure boiler capable of producing 150 tonnes of steam per hour at 87 bar and 525 °C. The bagasse leftover from the sugar milling process will be used to fuel the power plant. Based on the Power Purchase Agreement/19/, SCOUL will supply a 15 MW of power to UETC, with the maximum power supply upto 22 MW.

In the baselinescenario, the sugar mill continues to produce steam and power needed for on-site process requirements, and no excess electricity is transferred to the national grid, in accordance with the forecasted sugar production. Because this power was drawn from a grid that relied on fossil fuels in the baseline, PP will only make an emission reduction claim for power that was exported to the grid during project activity. The production of sugarcane is currently close to 1,400,000 tonnes annually, and it will gradually rise to 1,650,000 tonnes annually by the sugar season of 2025.

The project activity will swap out the equivalent quantity of electricity that would have been produced in the nation by fossil fuel-based plants with surplus electricity produced using biomass and exported to the national grid. In this way, the project will prevent the emission of an average of 18,861 tCO2e per year, totaling 188,610 tCO2e throughout the course of the crediting period. The project has achieved an ER of 7,221 tCO2e from 19/07/2021 to 31/12/2021(including both the dates) during the present monitoring period.

This was confirmed based on review of Joint PD & MR/1/, ER verification spreadsheet/02/ and technical specifications of the boiler and turbine

The project will generate enough total energy to run the sugar factory process using the sugarcane bagasse that was obtained from the sugar mill. In this way, the current boilers and turbine will be gradually removed and the new project will be responsible for all the energy generation. Additionally, the project plans to export a sizable amount of excess electricity to the national grid. On 19/07/2021 saw the installation of the project activity with a 37.5 MVA capacity, producing an estimated 238 GWh/y of gross electricity. One high-pressure boiler with a capacity of 150 tonnes of steam per hour at 87 bar and 525 °C was installed during phase I.

The efficiency of the new cogeneration power plant will be roughly 71.4%, which is comparable to that of the new boiler (boiler 3) from the baseline scenario. The efficiency of the new turbo will be 3.82 kg/kWh in condensing mode and 4.96 kg of superheated steam per kilowatt-hour in extraction cum condensing (crop season) (off-season). The bagasse leftover from the sugar mill operation will be used to power the project.

This project is not a grouped project activity because it does not combine GHG initiatives with other project types. There are no other project participants involved because it is a single project.

The technical specification of the boiler/14/ and turbine are given below:

**Technical Specification of Boiler**

| | |
|---|---|
| Make: | ISGEC Heavy Engineering Limited |
| Design capacity | 150 TPH |
| Design pressure | 87 bar |
| Steam temperature | 525 ± 5 ºC |
| Thermal Efficiency (%) | 71.4% |
| Fuel used | Bagasse |
| Purchase date | 19/04/2019 |
| Life Span | 30 years |

**Technical Specification of Turbine /13/**

| | |
|---|---|
| Make | Shin Nippon Machinery Company ltd. |
| Manufacturer's Model no. | C9-R14-ER |
| Design capacity | 30MW |
| Speed (turbine/generator) | 4900/1500 rpm |

| | |
|---|---|
| Inlet Steam Temperature: | 520°C |
| Inlet Steam Pressure: | 85 bar |
| Exhaust steam pressure | 0.10 bar |
| Purchase date: | 18/04/2019 |
| Life span | 50 years |

Ash from bagasse contains potash, making it suitable for use as manure. In the majority of sugar mills, it is combined with filter cake and applied to the cane fields as manure.

# 2 VALIDATION AND VERIFICATION PROCESS

## 2.1 Method and Criteria

Validation and Verification was conducted using Applus+ Certification's procedures in line with the requirements specified in the VCS standard Requirements, CDM M&P, the latest version of the CDM Validation and Verification Standard, and relevant decisions of the COP/MOP and the CDM EB and applying standard auditing techniques.

In case of the current validation & verification, being in Uganda, a physical site visit/5/ was undertaken on 09/06/2022 & 10/06/2022 to assess the claims made in the Jt PD and MR regarding baseline, project design, boundary, monitoring systems and the like. During the site visit/5/, it was found that the claims made in the Jt PD and MR were in consonance with the activities in the field.

The site visit team comprised of Team Leader who is also a sectoral scope expert, who conducted interviews and made observations regarding the operation of the plant and its compatibility and applicability with respect to the methodology, tools, VCS standards and found them to be in line with the requirements.

However, 4 CARs and 1 CLs were raised with the PP to clarify on the apparent non compatibility observed during the course of site visit and the desk review.

The elaboration of the same is given in Appendix 3 of this report

## 2.2 Document Review

The verification is performed primarily as a document review of the joint PD and MR and associated documents as stated in detail in Appendix 1 of this document. The assessment is performed by a verification team using a protocol. The cross checks between information provided in the Joint PD and MR and information from sources other than those used, if available, were used as well as leveraging the team's sectoral or host country expertise and, where necessary, independent background investigations.

## 2.3 Interviews

On-site inspection has been performed by the assessment team. The representatives of the PP and users were interviewed on 09/06/2022&10/06/2022. The details of the people interviewed are mentioned in the table

| S N | Name | Role | Organization |
|---|---|---|---|
| 1 | Ms. Ruchika Sharma | Project Consultant | Enen Green services Private Limited |
| 2 | Mr. Abhishek Kumar Srivastav | Project Consultant | Enen Green services Private Limited |
| 3 | Mr. VP Singh , | PP Representative | SUGAR CORPORATION OF UGANDA LIMITED |
| 4 | Mr. Sumit Sharma | PP Representative | SUGAR CORPORATION OF UGANDA LIMITED |
| 5 | Mr. Sirkumar | PP Representative | SUGAR CORPORATION OF UGANDA LIMITED |
| 6 | Mr. Murali | PP Representative | SUGAR CORPORATION OF UGANDA LIMITED |
| 7 | Mr. Manoj | PP Representative | SUGAR CORPORATION OF UGANDA LIMITED |

The topics covered during interview ranges from general features and implementation of project to project technical details of the project like design & technical specification, project implementation status, project start date, location, baseline identification, monitoring survey, data recording and archiving procedures, baseline stove use. The assessment was drawn based on the feedback received during interview coupled with the documentation and observations.

## 2.4 Site Inspections

Site Location visited: SCOUL plant, Lugiazi, Uganda

A site visit was undertaken by the verification team on 09/06/2022 & 10/06/2022 to carry out the following;

- An assessment of the project design and technical specification, project location, implementation status and operation of the project activity as per the Joint PD and MR /1/;
- A review of information flows for generating, aggregating and reporting the monitoring parameters;
- Interviews with relevant personnel to determine whether the operational and data collection procedures are implemented in accordance with the monitoring plan in the Joint PD and MR;
- A cross check between information provided in the monitoring report and data from other sources such as feasibility study reports/8/, PPA/19/, grid connection permission/24/, power generation report/26/, calibration certificates/27-32/, and invoices/33/or similar data sources
- A check of the cogeneration plant viz., the new boiler and turbines working and observations of monitoring practices against the requirements of the Joint PD and MR, the applied methodology including applicable tool(s), and, where applicable, the applied standardized baseline;
- A check of technical specifications of the equipment/21/, turbine efficiency certificate/34/, cogeneration plant commissioning/23/, power and thermal energy generation report/26/, local authority approvals etc/12/,/20/,
- A review of calculations and assumptions made in determining the GHG data and emission reductions and IRR sheets/2/;
- An identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.
- Cross checking the employment details/25/ against the targets under SDG

The assessment team has verified sufficiently appropriate audit evidences, to reduce audit risk to an acceptable plinth or datum as required to achieve reasonable level of assurance for the current verification.

## 2.5 Resolution of Findings

The objective of this step is to identify, discuss and conclude on the issues related to the project description, technical specification, baseline and additionality, monitoring parameter and monitoring plan, implementation status and operations of the registered project activity that could impair the capacity of the registered project activity to achieve emission reductions or influence the monitoring and reporting of emission reductions. This is done based on the desk review and site assessment. The verification team prepares and/or updates a validation and verification protocol (internal document) that records the conformities and non-conformities, which may be of following types;

CAR (Corrective Action Request) is raised if one of the following occurs:

Non-compliance with the project description, applicability of monitoring methodology and its tools, additionality tools and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;

Non-compliance with the monitoring plan, the methodology or the standardized baseline are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;

Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants;

Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions;

Issues identified in a FAR during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.

Clarification request (CR) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements or VCS requirements have been met. All CARs and CRs raised by the Applus+ Certification during validation and verification shall be resolved prior to submitting a request for registration and issuance.

During the current validation and verification, 04 Corrective Action request (CARs) and 01 Clarification request (CRs) were raised and successfully closed.

All the findings that are raised and communicated to project participant during the validation and verification are included under Appendix 3. The section also includes the response, if provided, by the project participants and an assessment by the verification team if it was closed out or otherwise.

### 2.5.1 Forward Action Requests

The project activity is undergoing Joint validation and Verification under VCS; there were no FAR raised during the current Joint validation and verification.

# 3 VALIDATION FINDINGS

## 3.1 Project Details

The present project activity is a Lugazi sugar mill located in Lugazi, Uganda operated by M/s Sugar Corporation of Uganda Ltd (hereafter SCOUL), that has a daily processing capacity of 4,600 tonnes of sugarcane.

The project is undertaken as a cogeneration plant of capacity 30 MW having 150 TPH steam generation. Bagasse that is used as the fuel will supply both heat to the plant and electricity to the national grid.

The technical details of the project activity relevant to the VCS validation and verification, involves one high pressure boiler of 150 tonnes of steam per hour at 87 bar and 525 deg Celsius. It also has a turbo generator of 37.5 MVA corresponding to 30 MWe.

Assessment team verified the project design by checking the following evidences

i. Power purchase agreement between the state UETCL and SCOUL

ii. Plant log books viz., steam generation log, energy units generation log, bagasse generation and utilization within the plant, plant operation hours. Breakdown logs

iii. Name plate capacity reading of the high pressure boiler, cogeneration plant energy capacity of 30 MWe, Turbo Generator of capacity 37.5 MVA

iv. Interviews with plant officials

The factory has excess bagasse at the current production capacity of 200 TCH (4600 TCD) of sugarcane processing, but there is no local market for it, thus it has no economic value. In addition to costing a lot of money to stockpile during the season, safeguard against fires, etc., the excess bagasse is raising serious questions about environmental protection. There is also a potential annual cane supply of roughly 1,400,000 tonnes. Based on the DPR it is projected based on the current situation that the sugar cane production will progressively reach close to 1,650,000 tonnes per year by 2025. Cogeneration plants based on bagasse are not only environmentally benign, but they also have the benefits of a short gestation period and a relatively low capital cost.

Co-generation in the sugar industry has emerged as one of the most practical and environmentally benign methods of generating power due to the ongoing depletion of fossil fuels, increasing population demands, and renewed concern for the environment. Co-generation has gained acceptance as a dependable method of generating extra electricity all around the world.

According to the baseline scenario, the same amount of sugar cane will be processed, and as a result, the same amount of bagasse will be available for use in cogeneration. In terms of the utilisation of fossil fuels, only in the absence of biomass could coal and gas be used in an emergency. These eventualities have been taken into account while designing the cogeneration facility. However the PP is claiming VCUs to the tune of 18,861 per year that are due to energy export to grid, which is being replaced with cogeneration. In the baseline the equivalent amount of energy was utilized from the grid that are largely fossil fuel based power plants.

Technology and know-how for the project activity are transferred from a number of sources:

- Internal resources and professionals with decades of experience in both the sugarcane industry and the energy generation industry give the consulting skills.
- German and British manufacturers provided the equipment's technology. A highly reputedmultinationalEngineering Procurement and Contracting (EPC)vendoris responsible for providing installation, operation, and maintenance assistance, with the help of in-house technical resources.
- The high efficiency cogeneration plant's construction and operation pose no environmental risks. According to the EIA, burning biomass wastes to produce energy is an environmentally sound and safe technology.

SCOUL are the owners of the project activity upon checking certificate of ownership, purchase order of boilers and power purchase agreements

The project proponent involved in this project are as follows:

| | |
|---|---|
| Organization name | Sugar Corporation of Uganda Limited |
| Role in the project | Project Proponent |
| Contact person | Vijay Dongare |
| Title | Deputy Chief Executive (Projects) |
| Address | P.O. Box 1, Lugazi, Uganda |
| Telephone | Tel : 256 312555500, +256 312555219, Fax : +256 312555248, Mob : +256 703444904 |
| Email | vijaydongare@mehtagroup.com |

| | |
|---|---|
| Organization name | Enen Green Services Private Limited |
| Role in the project | Project participant |
| Contact person | Ruchika Sharma |
| Title | Ms. |
| Address | 506,T4, RPS Savana, sector 88,Faridabad |
| Telephone | +91-9953935506 |
| Email | enengreen@gmail.com |

The estimated annual GHG emission reductions of the project per year is:

< 20,000 tCO2e

Hence based on the clause 3.9.1 (1) of VCS standard v4.2 the scale is projects as the annual emission reduction is less than 300,000 tCO2e.

**Eligibility under VCS Program**

For a project activity to be eligible it must be noted that it needs to comply with section 2.1 of the scope of VCS program under VCS standard v4.2. The scope includes the following:

i. The six Kyoto Protocol greenhouse gases

ii. Ozone depleting substances

iii. Project activities supported by a methodology approved under the VCS program through the methodology approval process

iv. Project activities supported by a methodology approved under an approved GHG program, unless explicitly excluded

v. Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS program document *Jurisdictional and Nested REDD+ (JNR) requirements*

For the present project activity sl no (v) is not applicable as this is sectoral scope 1 and not a REDD+ project. Similarly,sl no (ii) is not applicable as the present project activity tries to reduce GHG emissions and it is not an ozone depleting substance project activity.

This project avoids emission of CO2 which is one of the six Kyoto Protocol GHG, through the operation of bagasse-based cogeneration plant and supplying energy to the national grid.

The project activity uses ACM 006 version 15.0 which is an approved methodology under UNFCCC CDM GHG program, whose applicability conditions has been discussed in the section 3.4.2 below and found to be meeting the requirements.

Based on the assessment viz, field visits, extensive documentation and internal technical expertise related to cogeneration, it is confirmed that the project activity avoids GHG that would have been otherwise generated in the baseline. In the baseline, the PP was taking the equivalent amount of energy from the fossil fuel dominated national grid of Uganda. The baseline conditions are extensively discussed under section 3.4.4 of this report.

Since the GHG avoidance is due to change of energy source ie., importing energy from national grid of Uganda to the cogeneration unit supplying energy to the grid, GHG are not generated in baseline, to be claimed subsequently as a project activity.

The project activity is located in Uganda which is classified as LDC as per UN website[1]. Hence as per Table 1 of the VCS standard v4.2, cogeneration project activities are eligible under VCS program.

**Scenario existing prior to the implementation of project activity:**

The grid supplied the sugar mill with the necessary amount of energy, while coal-fired boilers produced the necessary amount of steam. In the baseline scenario, coal was used to generate thermal energy. PP operated a low-pressure boiler and a back pressure turbine in the pre-project scenario. In the pre-project scenario, the power and steam generated were exclusively used for internal use; additional power was obtained from the grid. In the project scenario, PP claims that

[1]https://www.un.org/ohrlls/content/list-ldcs

the electricity it supplies to the national grid has less emissions, since the power generated is from a renewable energy source- bagasse.
The baseline scenario was assessed through interviews during site visit /5/, baseline scenario description and confirmation via EIA report[2] as well as through the techno feasibility study[3] report /8 /. Based on these evidences, the baseline scenario was found to be in line with the description stated in the Jt PD and MR/1/

The development of a cogeneration plant and the construction of a 33 kV power evacuation line from the cogeneration plant to the switch yard were part of the project activity that obtained EIA permission/9/,/10/ from The National Environment Management Authority (NEMA) on 19/05/2016. The EIA clearance makes it clear that the cogeneration power plant complies with all EIA regulation 1998 standards of Uganda.

## 3.2 Participation under Other GHG Programs

The present project activity has not registered under any other GHG program. Since it is not registered under any other project activity, it was not rejected by any other GHG program. This was verified by checking the project credentials as well as project proponent's by searching the websites such as UNFCCC,CDM, GS4GG websites/35/,/36/,/37/. This claim of PP was verified and found to be true.

The project activity by SCOUL has not been registered and is not seeking registration under any other GHG emission program to avail carbon benefits during the crediting period of the project activity. The PP has submitted undertaking/38/ regarding the same and that none of the VCUs& creation of another form of environmental credit will be used to avoid double counting. This was checked and confirmed by reviewing the undertaking letter /38/, hence accepted.

## 3.3 Safeguards

### 3.3.1 No Net Harm

[2]Provided in page 31 of the EIA report

[3]Section 3.0 in page 18/297

No potential negative environmental and socio-economic impacts have been identified by the project proponent. The project activity promotes environmental and socio-economic well-being as it results in zero GHG emissions due to installation and operation of clean technology.

This is as per the requirements of the VCS Standard (version 4.3) /4/ and deemed acceptable to the assessment team based on site visit/5/ and document review.

### 3.3.2 Local Stakeholder Consultation

SCOUL distributed invitations to the stakeholder consultation gathering via email and public announcement. Stakeholders were defined as individuals who will be impacted by project activities and those whose actions directly or indirectly affect the project.

Stakeholder consultation was held by PP on 25/02/2022 at 10 AM in Lugazi, Uganda's SCOUL Pentagon.

The grid authority representative, community residents, a local government representative, and representatives from nearby NGOs all attended the meeting. The purpose of the conference was to explore any concerns that the stakeholders might have had about the project's environmental and social implications. Throughout the stakeholders meeting, opinions and recommendations were welcomed.

All invited parties gave the initiative an optimistic and good reception overall. In general, no negative feedback, explanations, or concerns were provided during the stakeholder consultation process. The PP did not see a requirement to alter the project design or monitoring strategy. Stakeholders were given drafts of the PD and MR during the stakeholder consultation.

An open invitation to feedback and criticism helps to sustain ongoing communication with stakeholders and interested parties. A complaint and feedback register/39/ is kept at the entrance of SCOUL for stakeholder comments and to let them know what actions were done in response to such remarks. A display is kept to explain the register's objectives and to urge stakeholders to provide SCOUL with any feedback they may have.

The general reaction of all invited parties to the initiative, was generally positive with no adverse comments received. It should be remembered that this status is up till the time JtPD and verification report was submitted to VVB for assessment

### 3.3.3 Environmental Impact

- **Environmental Benefits**: Generation of clean and affordable energy to the grid and lower emissions than baseline.
- **Economic Benefits**: Increased renewable energy power supply to the grid at reduced prices, increased local employment opportunities
- **Social Benefit**:Skill development accorded to local population due to setting up of the bagasse to energy project.

The National Environment Management Authority (NEMA) granted EIA approval for the project activity on 19/05/2016, in order to develop a cogeneration plant and a 33 kV power evacuation line from the cogeneration plant to a switch yard. Cogeneration power plant's EIA approval demonstrates that it complies with all EIA regulation 1998 standards.

### 3.3.4 Public Comments

The project has undergone Public Comment period from 29/04/2022-29/05/2022[4]. No comments received during public commenting period.

### 3.3.5 AFOLU-Specific Safeguards

This project is not an AFOLU project. This section is not required for non-AFOLU projects.

## 3.4 Application of Methodology

### 3.4.1 Title and Reference

**Title:**Consolidated methodology for electricity and heat generation from biomass residues

**Type**:Type I – Energy industries (renewable -/ non-renewable sources)

**ACM0006:** Electricity and heat generation from biomass, Version 15.0 (valid from 14/12/2020 to 10/03/2022)

**SectoralScope**: 01

**Methodological tool**:
Combined tool to identify the baseline scenario and demonstrate additionality (version 7.0)
Tool to calculate the emission factor for an electricity system (Version 7.0)
Project and leakage emissions from biomass (Version 5.0)

The methodology is valid at the time of joint validation and verification of the project activity have been checked and confirmed by the assessment team. The methodology can be submitted to requests for registration till 05/11/2022[5] as per the CDM website. This was checked and confirmed.

### 3.4.2 Applicability

[4]

[5]https://cdm.unfccc.int/methodologies/DB/2IE2L3F73E90999CBVWXZ8WL40J819

The project activity applies CDM methodology; ACM0006, Version 15 /06/. The validity of Methodology is from14/12/2020 to 10/03/2022

Applicability criteria for the baseline methodology are assessed by the validation team by means of document review and interview. Validation team confirms that the project activity meets the criteria of the applied methodology.

| S. N. | ACM0006, Version 15Requirements | Project activity applicability | Means of verification |
|---|---|---|---|
| 1. | Biomass used by the project facility is limited to biomass residues, biogas, RDF and/or biomass from dedicated plantations; | The project uses the excess bagasse which is a byproduct of sugar production as biomass residue as fuel feed. No dedicated plantation are used. | This was verified during the site visit /5/ as well as verifying plant records for fuel feed to confirm the same |
| 2. | Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired does not exceed 80% of the total fuel fired on energy basis; | No activity of the project uses fossil fuels. In the event of an emergency or in the absence of biomass, the use of fossil fuels (such as coal or natural gas) has only been considered. | This was verified during site inspection /5/ as well as checking plant records for non-bagasse fuel use for production process.The applicability was confirmed thus. |
| 3. | For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project does not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other | There is no significant change or increase in the raw input processing capacity as a result of the project's implementation (identical volumes of resulting sugar production). | This was checked through interviews during site visit/5/ and cross checking the techno economic feasibility report [6] // calculations. The design capacity was arrived at 127.99 tph while actual capacity was fixed at 150 tph for 404,077 TPY as per boiler capacity |

[6]17-19 of the report

| S. N. | ACM0006, Version 15Requirements | Project activity applicability | Means of verification |
|---|---|---|---|
| | substantial changes (e.g. product change) in this process; | | specifications/8/. This was found to be appropriate and not designed for over capacity as excess boiler capacity of 20-25% is normative in industry. |
| 4 | The biomass used by the project facility is not stored for more than one year; | In order to ensure that there will be enough bagasse to begin the milling process the following year, the sugar cane bagasse will not be held for more than a few months (in smaller amounts during the off-season). | This was checked during site visit/5/ and verifying the storage yard stock records/40/regarding the maximum stock time for bagasse. The claims of the PP was found to be true. |
| 5 | The biomass used by the project facility is not obtained from chemically or biologically (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio-or chemical degradation etc) prior to combustion. Thermal degradation, drying and mechanical processing, such as shredding and pelletisation are allowed. | The pre-combustion preparation of the biomass does not require any chemical processes. The boilers receive it straight from the crushing mills' outlet. | During the site visit/5/ it was observed by the verification team that no such facilities or inventory records were maintained to suggest that chemical or pre combustion techniques were adopted. Hence the claims of the PP was accepted. |
| 6 | In the case of fuel switch project activities, the use of | Not applicable as no fuel switch is happening at the project | This was checked during site visit/5/ as |

| S. N. | ACM0006, Version 15Requirements | Project activity applicability | Means of verification |
|---|---|---|---|
| | biomass residues or the increase in the use of biomass residues as compared to the baseline scenario is technically not possible at the project site without a capital investment in:<br><br>• The retrofit or replacement of existing heat generators/boilers; or<br>• The installation of new heat generators/boilers; or<br>• A new dedicated biomass supply chain established for the purpose of the project (e.g. collecting and cleaning contaminated new sources of biomass residues that could otherwise not be used for energy purposes); or<br><br>• Equipment for preparation and feeding of biomass residues. | activity. | no facilities was found that could lead to fuel switch activities of biomass residues. Hence this condition is not applicable to the project activity |
| 7 | If biogas is used for power and/or heat generation, the biogas must be generated by anaerobic digestion of wastewater, and:<br>• If the wastewater generation source is registered as a CDM project | Not applicable as no biogas is recovered from the project activity. | This was checked during site visit/5/ by the assessment team who found no equipment or mechanism was presentwhich could possibly harvest the methane for power or heat generation. Hence |

| S. N. | ACM0006, Version 15Requirements | Project activity applicability | Means of verification |
|---|---|---|---|
| | activity, the details of the wastewater project shall be included in the PDD and emissions reductions from biogas energy generation are claimed using this methodology;If the wastewater source is not a CDM project, the amount of biogas does not exceed 50% of the total fuel fired on energy basis. | | this condition is not applicable |
| 8 | In the case biomass from dedicated plantations are used the applicability conditions of the methodology tool "project and leakage emissions from biomass" apply. | Not applicable | This condition was confirmed to be not applicable during the site visit /5/. It was found by assessment team that bagasse generated as by product of sugar production alone was used as fuel during the project activity. The material entry records/41/ was further checked to confirm the statement of the PP. |

The baseline scenarios have been identified and analyzed in line with the "Combined tool to identify the baseline scenario and demonstrate additionality", version 2.2 /6/, as stipulated by the

methodology ACM0006, version 15.0 valid from 14/12/2020 to 10/03/2022. The proposed project being biomass-based cogeneration power plant located in a sugar factory, the project proponent has evaluated all alternatives to identify the plausible baseline scenario to the proposed project activity based on:

i. Realistic alternatives for the power generation in absence of the CDM project activity.

ii. Realistic alternatives for heat generation in absence of the CDM project activity.

iii. Biomass residue utilization in absence of the proposed CDM project activity.

From the statements and independent assessment of the primary documents as well as through the physical site visit/5/, the assessment confirms the applicability of the applicable methodology.

The 3 alternative scenarios stated above as part of the methodological requirements are further elaborated in section 3.4.4.

### 3.4.3 Project Boundary

The components in the system boundary includes the cogeneration facility which consists of 1 numbers of 150TPH boiler, pressure 87 bar, temp – 515 +/- 5 ºC, 1 no 30 MWe DEC turbine. The spatial boundary of the project activity includes the national Uganda grid.

The project boundary includes the following emission sources and gases:

| | Source | GHGs involved | Description | Means of Verification/ Justification |
|---|---|---|---|---|
| **Baseline emissions** | Electricity and heat generation | $CO_2$ | Emissions equivalent to the amount of net electricity generated by the project activity that would otherwise be generated by Uganda national grid.<br><br>This is included | This is elaborated under baseline alternative scenario in section 3.4.4 |
| | | $CO_2$ | Emission equivalent to the net amount of heat generated by the project activity used for the process in the sugar factory, that would have been generated by coal fired boiler in absence of the project.<br><br>This is included | This is elaborated under baseline alternative scenario in section 3.4.4 |

| | | | | |
|---|---|---|---|---|
| | | N2O and others | Coal burning usually generates N2O emissions.<br>This is excluded as it is conservative | This is accepted as N2O emissions due to decay of biomass is not applicable to the project activity |
| | Emissions due to aerobic decomposition of biomass residue (bagasse) or uncontrolled burning | $CH_4$ | Emissions due to methane emissions due to aerobic decomposition of bagasse in baseline | This is accepted as CH4 emissions due to decay of biomass is not applicable to the project activity |
| | | CO2 | CO2 emissions due to aerobic decomposition of bagasse in baseline | This is excluded for simplification as this does not lead to change in LULUCF carbon pools and exclusion is conservative with respect to emission reduction calculations |
| | | N2O and others | Natural decay does release N2O and other GHG emissions | This is again excluded for simplification, as emissions from natural decay of biomass are not part of the carbon pool of GHG inventory |
| **Project emissions** | On site fossil fuel and electricity consumption due to the project activity (stationary or mobile) | $CO_2$ | Emission from the consumption of fossil fuel as supporting fuel for the project activity. | This is included on account of onsite fossil fuel consumption whenever they are consumed as emergency measures |
| | | $CH_4$ | Any methane generation on account of fossil fuel use is not included | This is accepted as CH4 emissions due to decay of biomass is not applicable to the project activity |
| | | N2O and others | Any N2O emissions on account of fossil fuel usage is not included | This is accepted as N2O emissions due to decay of biomass is not applicable to the project activity |
| | Grid Electricity generation | CO2 | Main source | This is included |

| | | | | |
|---|---|---|---|---|
| | | N2O, CH4 and others | The non-CO2 GHG emissions from grid | This exclusion is acceptable as grid emissions are limited to CO2 as per methodology and tools |
| | Off site transportation of biomass residues | CO2 | The emissions due to use of fossil fuel in transportation vehicles | This is excluded as there is not transportation of biomass residues from and to the project boundary |
| | | CH4 | The emissions due to use of fossil fuel in transportation vehicles | This is excluded as there is no transportation of biomass residues from and to the project boundary |
| | | N2O and others | The emissions due to use of fossil fuel in transportation vehicles | This is excluded as there is notransportation of biomass residues from and to the project boundary |
| | Combustion of biomass residues for electricity and/or heat generation | CO2 | The emissions due to combustion of biomass residues in project activity | Not applicable as combustion of biomass residues does not occur in project activity |
| | | CH4 | | |
| | | N2O and others | | |
| | Storage of biomass residues | CO2 | The emissions caused by storage of biomass residues due to project activity | Not applicable as storage of biomass residues does not occur in project activity |
| | | CH4 | | |
| | | N2O and others | | |

Thus the assessment team concludes that the inclusion and exclusion of emission sources along with the attendant GHG gases are most conservative and justified for the project activity.

### 3.4.4 Baseline Scenario

**Plausible or Credible Alternatives for Heat Generation**

Identified baseline alternatives in accordance to the alternatives for the **power** generation in absence of the CDM project activity:

**P1: The proposed project activity not undertaken as a CDM project activity**

While the scenario is in line with the present regulation of the host country, it has been demonstrated that the project encounters technological barriers, has an IRR of 16.37% against 24.27% IRR /2/ for a reference plant of comparable specifications and project design in Uganda. This is further elaborated in section 4.4 of the validation report and hence this scenario is a plausible alternative

P2: The continuation of power generation in an existing biomass residue fired powerplant at theproject site, in the same configuration, without retrofitting and fired with thesame type of biomass residues as (co-)fired in the project activity

The project activity is located atthe premises of the SCOUL, Uganda which was confirmed through commercial operation letter issued by UETCO ltd and no objection certificate issued by electricity regulatory authority. Besides the pre project scenario of operating with old turbine of capacity 9.5 MW is not a feasible condition, as the power supply is inadequate to the project's operational needs. Thus, this scenario is deemed not feasible. This was verified during site visit and upon cross checking the documents as mentioned above.

P3: If applicable, the continuation of power generation in existing power plants at the project site.*The existing plants would operate with different conditions from those observed in the most recent three years prior to the starting date of the project activity*

The proposed project activity is located within the premises of SCOUL sugar production unit and the pre-project scenario of supplying power through 9.5 MW turbine is not sufficient considering the fuel load generated as per the TEFR/8/ and projected sugar production. Thus, this scenario is deemed not feasible.

P4: If applicable, the retrofitting of existing power plants at the project site. *The retrofitting may or may not include a change in fuel mix.*

This is not a plausible baseline alternative for power generation, as in absence of the project activity, the old turbine with capacity 9.5 MW is not sufficient to fulfill the energy needs of the project activity. Since a new turbine with boiler is in place, to handle bagasse as input fuel, there is no retrofitting of existing boiler-turbine unit is taking place. Thus this scenario is not feasible.

**P5: The installation of new power plants at the project site different from those installed under the project activity**

This alternative is feasible, due to new boiler-turbine installation in place which is a newer installation compared to the baseline unit. This was cross checked during site visit and statutory documents like commissioning letter/23//24/, NOC /17//18/, PPA/19/

P6: The generation of power in specific off-site plants, excluding the power grid

Not a credible alternative considering that there is no specific off-site plants nearer the plant nor planned in future. This was cross checked during the site visit/5/.

**P7: The generation of power in the power grid**

The project activity generates 30 MW power out of which8 MW is used for captive use while 22 MW is supplied to grid. Thus, this scenario is feasible to the current project activity.

**Plausible or Credible Alternatives for Heat Generation**

Identified baseline alternatives in accordance to the alternatives for the **heat generation** in absence of the CDM project activity:

**H1: The proposed project activity not undertaken as a CDM project activity:**

This scenario is in line with the present project activity. It is a feasible project, although highly unlikely that it would have occurred in the absence of project activity, owing to lower returns of 16.37 % against 24.27% IRR /2/ from a reference project of comparable size and project design. This is pronounced as the PP has not claimed credits for heat generation due to heat being generated in baseline situation as per the Jt PD and MR/1/.

H2: If applicable, the continuation of heat generation in existing plants at the project site; *The existing plants would operate at the same conditions (e.g. installed capacities, average load factors, or average energy efficiencies, fuel mixes, and equipment configuration) as those observed in the most recent three years prior to the starting date of the project activity;*

This is not plausible scenario as in the absence of the project activity, ie., in the baseline as the operating parameters are suitable for the capacities of the plant initially designed. However, in the project scenario, the operating parameters change drastically due to increased capacity of plant, thus making the same operating parameters three years prior no longer applicable.

H3: If applicable, the continuation of heat generation in existing plants at the project site. *The existing plants would operate with different conditions from those observed in the most recent three years prior to the CDM project activity;*

The present project activity involves installation of boiler and turbine, verified based on site visit/5/and commissioning certificates/23//24/, PPA/19/ that generates heat and power to handle increased capacity to utilise the bagasse generated as a by product. Since the project activity is not continuation of existing systems i.e., as per baseline conditions, this alternative scenario is not applicable.

H4: If applicable, the retrofitting of existing plants at the project site.*The retrofitting may or may not include a change in fuel mix;*

The present project activity is a newly installed boiler and turbine facility to consume the bagasse as fuel, that is generated as by product of sugar production. Since no retrofitting of the existing system is in place, as verified during the site visit/5/ and as per commissioning certificates/23//24/ and PPA/19/, this alternative scenario is not applicable.

**H5: The installation of new power plants at the project site different from those installed under the project activity**

This is a feasible baseline since a new 150 tph boiler was installed in order to generate more heat than that of baseline condition as verified during the site visit/5/. This was further cross checked with commissioning certificates/23//24/ of boilers

H6: The generation of heat in specific off-site plants:

This condition does not arise as the excess electricity is connected to the grid via 33kv evacuation line and there are no other electrical lines supplying to off-site plants presently available or foreseeable future. Hence this baseline scenario does not arise.

H7: The use of heat from district heat:

The project activity utilizes the heat and electricity generated from bagasse fed boiler for meeting the internal steam and electricity demand. Moreover, it has been addressed that there is no external source of heat supply in the project site's vicinity and is beyond the scope of the project proponent. Such district level heating system is more common in colder climes like in Europe than in Africa. Thus, H7 is deemed not feasible.

Identified baseline alternatives in accordance to the alternatives for the **biomass usage** (for slop and rice husk, as required by the methodology ACM0006, version15 valid from 14/12/2020 to 10/03/2022 in absence of the CDM project activity:

**B1: The biomass residues are dumped or left to decay under mainly aerobic conditions.This applies, for example, to dumping and decay of biomass residues on fields:**

It has been verified from the biomass availability assessment/42/ that in the baseline, the baseline turbine had limited capacity to utilize biomass residue and major portion of the bagasse due to non-utilization of the bagasse which isleft to decay in an uncontrolled manner under mainly aerobic conditions, which is the usual practice in the region. This is confirmed during the site visit/5/

Thus, B1 is a plausible baseline alternative.

B2: The biomass residues are dumped or left to decay under clearly an aerobic conditions.

This does not apply, as in the absence of the project activity, bagasse would have been disposed in aerobic condition (as described in B1). Thus, B2 is not a plausible baseline alternative.

B3: The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes:

Based on the documentary evidences discussed above, it can be seen that this situation does not arise. Thus, B3 is deemed not feasible.

B4: The biomass residues are used for energy or non-energy applications, or the primary source of the biomass residues and/or their fate cannot be clearly identified. For example, this scenario

can be used if biomass residues are purchased from biomass processing plants which are not included in the project boundary

Plant consumption records/44/, material register for identifying any incoming biomass residues from external sources was checked during the site visit/5/. Since records show no biomass residues were purchased, the B4 scenario is deemed not feasible.

**B5: The biomass residues are used for power generation, at the project site in new/or existing plants**

The feedstock record for the bagasse boiler was checked/41/ and it was confirmed during site visit/5/ that this is a likely baseline scenario, since biomass feed register show use of biomass from the storage yard used as feed in the bagasse boiler. Thus scenario B5 is a feasible option.

VVB considers the list of realistic and credible alternatives to be complete.

The baseline scenario, as per the methodology ACM0006, version 15.0 /4/, the baseline scenario based on the above discussions is as follows:

| Power Generation | Heat Generation | Biomass Residues |
|---|---|---|
| P1, P5 and P7 | H1 and H5 | B1 and B5 |

As per section B.5 of the methodology para 117, the category of biomass residues needs to be classified as per the category table. Since the baseline for the present project activity for biomass residue scenario is already fixed as B1 and B5, the following category table is prepared and found to be appropriate by the assessment team. The appropriateness was confirmed through feedstock biomass stock register/44/ during the site visit/5/. It should also be remembered that the power and heat generation baseline scenarios remain fixed as per the conclusions drawn above.

| Data/Parameter | Data Unit/Description | Means of Verification |
|---|---|---|
| **Biomass Categories** | Bagasse | Physical check during site visit/5/<br>Test reports of bagasse/43/ |
| **Source of Biomass** | By product sugar generation- inhouse | Production process during site visit/5/<br>Techno Economic Feasibility Report/8/<br>Sugar Production Data Sheet/8 / |
| **Fate in the absence of project activity** | Left to decay in aerobic conditions in the baseline scenario | Verified through interviews as part of site visit/5/<br>Survey reports/45/ |

| | | |
|---|---|---|
| **Use in project activity** | Used as feedstock or fuel for biomass boiler to generate process heat and excess heat for captive and grid power | Verified during site visit/5/ through physical inspection<br>Feedstock records/44/<br>Material usage records/41/ |

As per combined tool to identify the baseline scenario and demonstration of additionality version 07.0, after identifying the alternative scenarios under step 1a- define alternative scenarios to the proposed CDM project activity, we need to proceed to step 1b- Consistency with mandatory applicable laws and regulations

The conclusions drawn after step 1a is as follows:

| Power Generation | Heat Generation | Biomass Residues |
|---|---|---|
| P1, P5 and P7 | H1 and H5 | B1 and B5 |

The regulatory frameworks which need to be followed to comply with the conditions of step 1b are as follows:

| Identified Baseline Scenario | Frameworks and Statutory Compliance | Whether compliance is achieved or not | Means of Verification |
|---|---|---|---|
| P1,H1 | Compliance related approvals and documents obtained from regulatory agencies | Yes | The documents related to statutory approvals<br>i.Certificate of approval of EIA for the proposed 33KV power evacuation line (7km)<br>ii.Evacuation of SCOUL Cogeneration (15MVA)<br>iii.Grid Connection Permission<br>iv.NOC For Intended Application from ERA<br>v.PPA (Final Agreement)<br>vi.UIA Investment License<br>vii.25MW co-generation plant commissioning protocol<br>viii.Commercial Operationsdated |

| | | | |
|---|---|---|---|
| | | | Letter - 5th AUG 2021 (1) |
| P7 | The Uganda Electricity Transmission Company Ltd. (UETCL), an agency of the Government, is in charge of managing and controlling the current grid-connected power plants in accordance with the law. | Yes | Refer sl no (iii), (v),(viii) above |
| B1, B5 | In the present sugarcane plantations, the biomass wastes are used to generate electricity or heat at the project site in a plant and are then allowed to decompose aerobically:<br><br>This alternate scenario conforms with all obligatory applicable legal and regulatory criteria, as shown by the present sugar mill operation permits. | Yes | Refer sl no (iv), (vii) in the first row |

Based on the above analysis the following conclusions can be drawn as per discussions under step 1 b as far as alternative scenarios that are compliant with regulations in Uganda are concerned

| Power Generation | Heat Generation | Biomass Residues |
|---|---|---|
| P1, P5 and P7 | H1 and H5 | B1 and B5 |

Within the identified alternative scenarios, the following 2likely scenarios emerge to establish the baseline situation

a) **P1,H1, B5**; The project is undertaken as a non CDM project activity for generating power and heat(P1,H1) from bagasse ie., biomass (B5) which is a byproduct of sugar production.However this scenario is **not plausible**asinstallation of high efficiency biomass residues

cogenerationplantfor export to grid and for greater autonomy is not the purpose of the project activity.

b) **P5&P7, H5, B1&B5**: The project would have been undertaken with enhanced power (P5) and heat generation (H5) due to forecasted sugarcane production based on demand. The power would have been produced in the grid (P7) which is largely supplied by the fossil fuel-based power plants which would have been used by the plant, as it was connected to it in the baseline situation. In the baseline it is likely that the biomass residues (B1) from the sugar plant would be used to cover plant energy needs.At the same the unused bagasse would have been left to decay in aerobic conditions (B5) in the baseline scenarios.

The second condition is an example of low-medium generation sugar plant which is a common practice in Uganda as far as cogeneration plants are concerned. So it is more likely that the second condition would have been the baseline in the absence of the project activity.

As per "Combined tool to identify the baseline scenario and demonstrate additionality" version 07.0/4/, a scenario is considered as baseline, if no barriers exist to prevent the project activity based from operation, then that scenario can be considered as the baseline scenario

So based on the guidance of the tool and the conclusions stated above, the case (b) is considered as the baseline scenario for the project activity.

### 3.4.5 Additionality

According to ACM0006, version 15.0 valid from 14/12/2020 till 10/03/2022/4/, which was accepted by the CDM-EB, the additionality of the project has to establish using the "Combined tool to identify the baseline scenario and demonstrate additionality," version 2.2/4/. The first of kind in geographic region chosen, lack of common practice for the adoption of given technology, and investment analysis are chosen by the PD as additionality arguments for the given project activity

So applying stepwise approach as per the tool to demonstrate additionality, we proceed as follows:

**Step 0: Demonstration whether the proposed project activity is the first-of-its-kind**

This step needs to fulfill the conditions laid out in section 4.1 of the Tool 02: Methodological Tool-Combined Tool to identify the baseline scenario and demonstrate additionality (version 7.0) and Tool 23: Methodological Tool-Additionality of first-of-its-kind project activities.

As per Tool 23, the project which wants to demonstrate that the project activity is first-of-its-kind need to fulfill the following conditions

- Clearly define the geographical boundaries where the project activity is located
- The measure for ER activities should among other things demonstrate that it is a fuel switch project activity
- Output can be products generated from project activity such as steam or electricity among others

- Uses a different technology than the baseline to deliver the services or output to the project activity
- Size of installation can be micro, small and large scale
- Should have fixed crediting period
- Should have commenced operations before publishing in VCS/CDM website for global stakeholder comments or before the start of the project activity
- The project implements one or more measures as stated above

The baseline entails installing a low-pressure boiler with lesser efficiency, while the project activity involves installing a high-pressure boiler. The project activity is used for the first time the specific technology has been used in the designated geographic area. No sugar industry in Uganda has installed an 87-bar high pressure boiler using bagasse as an input fuel. Therefore, project activity is a first of its kind in the locality. This was cross checked by the list of sugar industries present[7] in Uganda and their various capacities of the boiler used before the project activity.

The geographical region chosen is the entire country of Uganda, since the legal and statutory norms for governing sugar industry is enforced at the country level and not at the provincial level

Based on the interviews with the plant officials stakeholders and document review, it was assessed by the assessment team that the project is first-of-its-kind project. It also fulfils the criteria set out in para 12(a) of the Tool 23 and by extension requirements under step 0 of the Tool 2. Thus, the step 0 of the Combined Tool to identify baseline scenario and demonstrate additionality is fulfilled.

**Step 1: Identification of alternatives to the project activity consistent with current laws and regulations**

**Sub-Step 1a: Define alternatives to the project activity**

It may be recalled that the previous discussion in section 3.4.4 above extensively deliberated about various alternatives to the project activity and concluded the following scenarios to be plausible and legally consistent

**Power-P4 and P5:** The construction of new power plants at the project site in addition to those already present and that were built as part of the project activities and the production of power for the grid.

**Heat H5:** Generation of heat using biomass residues

**Biomass-B1 and B4:** Biomassleft to decay in aerobic conditions

Outcome of step 1a is identification of the plausible and credible alternatives to the project activity i.e., P4,P5, H5, B1 and B4

**Sub-Step 1b: Consistency with mandatory laws and regulations**

[7]https://www.era.go.ug/index.php/stats/generation-statistics/energy-generated-by-utility

The above scenarios are all compliant and follow the legal requirement of the host country which was cross checked with extensive document review and interview with the personnel. The means of verification are mentioned under section 3.4.4.Thus, the conclusion of sub-step 1b is the alternatives identified are not only credible and plausible but also in line with the legal requirement of operating such plants in Uganda. Further this is in line with the EB decisions on national and/or sectoral policies.

**Step 2: Investment Analysis**

As per Tool 3, investment analysis can be used as one of the means to demonstrate additionality. In continuation of step wise discussion regarding demonstration of additionality, the investment analysis also follows the condition that outcomes from previous steps should pass the investment analysis conditions. A specific tool Tool 27: Investment analysis is used to demonstrate financial additionality version 5.0/6/

It needs to be stated that despite being the first of its type to employ 87 bar capacity biomass boiler andfacing technological barriers, the project activity has undertaken an investment analysis to further support the additionality of the project.

**Sub-Step 2a: Choice of Approach-As per methodological tool**

An investment comparison analysis in accordance with the "Combined tool to identify the baseline" (Tool 27 version 5.0) is applicable because the reference co-generation plant that the PP had identified would have been installed in the absence of the project activity. Therefore, even if the planned carbon project hadn't been created, the project participant would still have invested in building the baseline reference plant. As a result, benchmark analysis has not been deemed suitable according to the guidelines, and the project participant has used investment comparison analysis to show additionality. The most likely baseline scenario has been discussed extensively in section 3.4.4 and the choice of investment analysis by the PP is consistent with the conclusions drawn under section 3.4.4

The assessment team found the choice of investment comparison analysis appropriate and in line with the Guidelines on the assessment of investment analysis (EB 62 Annex 5) para 19.

**Sub-Step 2b: Investment Comparison Analysis based on Option II**

The PP has chosen the Internal Rate of Return (IRR) for the present project activity to demonstrate financial additionality. The reasons are two-fold: the project would have been set up anyways (even without the carbon financing) and revenues are generated through sale of electricity to the grid. Hence the PP undertakes project IRR and compares it against baseline project IRR to show that the project is additional. This has been found appropriate as the comparison has been made between the IRR from a baseline scenario and IRR from the project activity as per the para 3 of the guidance document (EB62 annex 5).

**Sub-Step 2c: Calculation and comparison of financial indicators**

The IRR of the project activity works out to be 16.37% while the reference baseline plant comes to 24.27%. The input values used towards calculation of the financial indicators are given in the table below (including technical parameters):

Steam Extraction- Generation Capacity at Operational Parameters

| Sl No | Operational Parameter | Units | Values Used | Verified Values | Means of Verification |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| **Flow Parameters** | | | | | |
| 1. | At boiler outlet | TPH | 150.00 | 150 | Purchase order of boiler/14/ |
| 2. | HP heater 01 | TPH | 13.50 | 13.50 | Purchase order of boiler/14/ |
| 3. | HP heater 02 | TPH | 0.00 | 0.00 | Purchase order of boiler/14/ |
| 4. | Sugar Process Flow | TPH | 82.00 | 82.00 | Plant design/8/ |
| 5. | Condenser | TPH | 52.91 | 52.91 | Purchase order of boiler/14/ |
| 6. | Ejector | TPH | 0.50 | 0.50 | Purchase order of boiler/14/ |
| 7. | Leakage | TPH | 1.09 | 1.09 | Purchase order of boiler/14/ |
| **Pressure Parameters** | | | | | |
| 1. | At boiler outlet | atm | 87.00 | 87.00 | Purchase order of boiler/14/ |
| 2. | HP heater 01 | atm | 8.00 | 8.00 | Purchase order of boiler/14/ |
| 3. | HP heater 02 | atm | 0.00 | 0.00 | Purchase order of boiler/14/ |
| 4. | Sugar Process | atm | 2.75 | 2.75 | Purchase order of boiler/14/ |
| 5. | Condenser | atm | 0.09 | 0.09 | Purchase order of boiler/14/ |
| 6. | Ejector | atm | - | - | |
| 7. | Leakage | atm | - | - | |
| **Temperature Parameters** | | | | | |
| 1. | At boiler outlet | ° C | 525.00 | 525.00 | Purchase order of boiler/14/ |
| 2. | HP heater 01 | ° C | 240.00 | 240.00 | Purchase order of boiler/14/ |
| 3. | HP heater 02 | ° C | 0.00 | 0.00 | Purchase order of boiler/14/ |
| 4. | Sugar Process | ° C | 130.00 | 130.00 | Purchase order of boiler/14/ |
| 5. | Condenser | ° C | 43.00 | 43.00 | Purchase order of boiler/14/ |
| 6. | Ejector | ° C | - | - | Purchase order of boiler/14/ |
| 7. | Leakage | ° C | - | - | Purchase order of boiler/14/ |
| **Enthalpy Parameters** | | | | | |
| 1. | At boiler outlet | kJ/kg | 3464.00 | 3464.00 | Purchase order of boiler/14/ |
| 2. | HP heater 01 | kJ/kg | 2928.00 | 2928.00 | Purchase order of boiler/14/ |
| 3. | HP heater 02 | kJ/kg | 0.00 | 0.00 | Purchase order of boiler/14/ |

| | | | | | |
|---|---|---|---|---|---|
| 4. | Sugar Process | kJ/kg | 2707.57 | 2707.57 | Purchase order of boiler/14/ |
| 5. | Condenser | kJ/kg | 2580.00 | 2580.00 | Purchase order of boiler/14/ |
| 6. | Ejector | kJ/kg | - | - | |
| 7. | Leakage | kJ/kg | - | - | |
| **Power Parameters** | | | | | |
| 1. | At boiler outlet | kW | - | - | Purchase order of boiler/14/ |
| 2. | HP heater 01 | kW | 2010.00 | 2010.00 | Purchase order of boiler/14/ |
| 3. | HP heater 02 | kW | 0.00 | 0.00 | Purchase order of boiler/14/ |
| 4. | Sugar Process | kW | 17229.79 | 17229.79 | Purchase order of boiler/14/ |
| 5. | Condenser | kW | 12992.34 | 12992.34 | Purchase order of boiler/14/ |
| 6. | Ejector | kW | - | - | |
| 7. | Leakage | kW | - | - | |
| **Total Generation Capacity (MW)** | | | | **32.23** | |

Steam Extraction- Maximum Generation Capacity

| Sl No | Operational Parameter | Units | Values Used | Verified Values | Means of Verification |
|---|---|---|---|---|---|
| **Flow Parameters** | | | | | |
| 1. | At boiler outlet | TPH | 183.41 | 183.41 | Purchase order of boiler/14/ |
| 2. | HP heater 01 | TPH | 3.00 | 3.00 | Purchase order of boiler/14/ |
| 3. | HP heater 02 | TPH | 0.00 | 0.00 | Purchase order of boiler/14/ |
| 4. | Sugar Process | TPH | 110.60 | 110.60 | Purchase order of boiler/14/ |
| 5. | Condenser | TPH | 67.89 | 67.89 | Purchase order of boiler/14/ |
| 6. | Ejector | TPH | 0.30 | 0.30 | Purchase order of boiler/14/ |
| 7. | Leakage | TPH | 1.62 | 1.62 | Purchase order of boiler/14/ |
| **Pressure Parameters** | | | | | |
| 1. | At boiler outlet | atm | 45.00 | 45.00 | Purchase order of boiler/14/ |
| 2. | HP heater 01 | atm | 9.00 | 9.00 | Purchase order of boiler/14/ |
| 3. | HP heater 02 | atm | 0.00 | 0.00 | Purchase order of boiler/14/ |

| | | | | | |
|---|---|---|---|---|---|
| 4. | Sugar Process | atm | 2.80 | 2.80 | Purchase order of boiler/14/ |
| 5. | Condenser | atm | 0.07 | 0.07 | Purchase order of boiler/14/ |
| 6. | Ejector | atm | - | - | Purchase order of boiler/14/ |
| 7. | Leakage | atm | - | - | Purchase order of boiler/14/ |
| **Temperature Parameters** | | | | | |
| 1. | At boiler outlet | ° C | 420.00 | 420.00 | Purchase order of boiler/14/ |
| 2. | HP heater 01 | ° C | 230.00 | 230.00 | Purchase order of boiler/14/ |
| 3. | HP heater 02 | ° C | - | - | Purchase order of boiler/14/ |
| 4. | Sugar Process | ° C | 130.00 | 130.00 | Purchase order of boiler/14/ |
| 5. | Condenser | ° C | 38.65 | 38.65 | Purchase order of boiler/14/ |
| 6. | Ejector | ° C | - | - | Purchase order of boiler/14/ |
| 7. | Leakage | ° C | - | - | Purchase order of boiler/14/ |
| **Enthalpy Parameters** | | | | | |
| 1. | At boiler outlet | kJ/kg | 3253.4 | 3253.4 | Purchase order of boiler/14/ |
| 2. | HP heater 01 | kJ/kg | 2901.9 | 2901.9 | Purchase order of boiler/14/ |
| 3. | HP heater 02 | kJ/kg | - | - | Purchase order of boiler/14/ |
| 4. | Sugar Process | kJ/kg | 2720.50 | 2720.50 | Purchase order of boiler/14/ |
| 5. | Condenser | kJ/kg | 2571.50 | 2571.50 | Purchase order of boiler/14/ |
| 6. | Ejector | kJ/kg | - | - | Purchase order of boiler/14/ |
| 7. | Leakage | kJ/kg | - | - | Purchase order of boiler/14/ |
| **Power Parameters** | | | | | |
| 1. | At boiler outlet | kW | - | - | Purchase order of boiler/14/ |
| 2. | HP heater 01 | kW | 292.92 | 292.92 | Purchase order of boiler/14/ |
| 3. | HP heater 02 | kW | 0.00 | 0.00 | Purchase order of boiler/14/ |
| 4. | Sugar Process | kW | 16371.87 | 16371.87 | Purchase order of boiler/14/ |
| 5. | Condenser | kW | 12858.55 | 12858.55 | Purchase order of boiler/14/ |
| 6. | Ejector | kW | - | - | Purchase order of boiler/14/ |
| 7. | Leakage | kW | - | - | Purchase order of boiler/14/ |

| Total Generation Capacity (MW) | 29.52 | |
|---|---|---|

Investment Comparison- Assumptions

| Sugar Plant Parameters | | | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|---|---|
| Sl No | Parameters-Operational | Units | Values Used | Values Used | |
| 1. | Sugar Plant Capacity | TCD | 4,600 | 6,000 | Plant records and interviews of personnel at site visit/5/ |
| 2. | Bagasse to Cane ratio | % | 38 | 30 | Plant recordsand interviews of personnel at site visit/ 5/ |
| 3. | Days of operation | days | 322 | 322 | Plant records and interviews of personnel at site visit/5/ |
| 4. | Gross captive consumption inclusive of auxiliary consumption | MW | 9.50 | 9.50 | Plant records and interviews of personnel at site visit/ 5/ |

| Power Plant Parameters | | | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|---|---|
| Sl No | Parameters-Operational | Units | Values Used | Values Used | |
| 1. | Power Plant Capacity | MW | 30 | 30 | As per calculation |
| 2. | Plant Load Factor | % | 95 | 95 | Plant records and interviews of personnel at site visit/5/ |
| 3. | Days of operation | days | 330 | 330 | Plant records and interviews of personnel at site visit/5/ |
| 4. | Auxiliary consumption | % | 10 | 10 | Plant records and interviews of personnel at site visit/5/ |

| Steam Parameters | | | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|---|---|
| Sl No | Parameters-Operational | Units | Values Used | Values Used | |
| 1. | Pressure | bar | 87 | 45 | Plant records and interviews of personnel at site visit/5/<br>The reference value are as per common practice in Uganda |
| 2. | Temperature | °C | 525 | 420 | Plant records and interviews of personnel at site visit/5/<br>The reference value are as per common practice in Uganda |
| 3. | Enthalpy | kJ/kg | 3464 | 3253.4 | Steam table |

| Project Cost | | Units | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|---|---|
| Sl No | Financial Parameters | | Values Used | Values Used | |
| 1. | Total Project Cost | Million USD % | 47 | 47 | Financial Documents/20/ and interviews of personnel at site visit/5/ |
| 2. | Debt | % | 95 | 70 | Financial Documents and interviews of personnel at site visit/5/ |
| 3. | Equity | % | 5 | 30 | Financial Documents/20/ and interviews of personnel at site visit/5/ |
| 4. | Interest on Long Term Debt | % | 6 | 6 | Financial Documents/20/ and interviews of personnel at site visit/5/ |

| Operational Cost | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|

| Sl No | Financial Parameters | Units | Values Used | Values Used | |
|---|---|---|---|---|---|
| 1. | O & M Cost | USD | 1,611,936 | 1,611,936 | FSR page no 26/8/, interviews with the plant personnel/5 / |
| 2. | Escalation | % | 5 | 5 | Based on interviews with the plant personnel /5/ and financial statements/20/ |
| 3. | Manpower cost-1st year of operation | USD | 870,000 | 870,000 | FSR page no 118/8/, interviews with the plant personnel/5/ and based on Financial Documents/20/ |

| Fuel Related Costs | | | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|---|---|
| Sl No | Fuel Related Parameters | Units | Values Used | Values Used | |
| 1. | Cost of inhouse bagasse | USD | 0 | 0 | Interviews with the plant personnel/5/ and financial statements/20/ |
| 2. | Cost of procured biomass | USD/Ton | 30 | 30 | Interviews with the plant personnel/5/ and financial statements/20/. It must be noted that this value is used in the investment analysis as cash outflow, even though it does not have market value per se. In the baseline scenario as well as project scenario PP has considered normative values towards IRR determination. |
| 3. | Escalation | % | 5 | 5 | Interviews with the plant personnel/5/ and financial statements/20/ |

| | | | | | |
|---|---|---|---|---|---|
| 4. | Calorific value of bagasse | Kcal/kg | 2270 | 2270 | Interviews with the plant personnel/5/ and financial statements/20/ |
| | | GJ/ton | 9.50 | 9.50 | |
| 5. | Calorific Value of biomass | Kcal/kg | 3000 | 3000 | Interviews with the plant personnel/5/ and financial statements/20/ |
| | | GJ/ton | 12.56 | 12.56 | |

| Tariff | | | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|---|---|
| Sl No | Tariff related Parameters | Units | Values Used | Values Used | |
| 1. | First 10 years of operation | USD/kWh | 0,095 | 0,095 | PPA/19/ |
| 2. | Escalation from 11th to 20th year | % | 10.00 | 10.00 | This is higher than the market escalation, hence is conservative for the given analysis |

| Tax | | | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|---|---|
| Sl No | Tax related Parameters | Units | Values Used | Values Used | |
| 1) | Minimum Alternate Tax | % | 10 | 10 | This is as per IT Act (https://taxsummaries.pwc.com/uganda/corporate/taxes-on-corporate-income) and assessed by the assessment team |
| 2) | Corporate Tax | % | 30 | 30 | This is as per IT Act (https://taxsummaries.pwc.com/uganda/corporate/taxes-on-corporate-income) and assessed by the assessment team |
| 3) | Tax Holiday Period | Years | 0 | 0 | This is as per IT Act (https://taxsummaries.pwc.com/uganda/corporate/taxes-on-corporate-income) and assessed by the assessment team |

| Depreciation as per Companies Act | | | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|---|---|
| Sl No | Tax related Parameters | Units | Values Used | Values Used | |
| 1) | Land | % | 0 | 0 | This is as per IT Act (https://taxsummaries.pwc.com/uganda/corporate/taxes-on-corporate-income) and assessed by the assessment team |
| 2) | Civil Works | % | 10.00 | 10.00 | This is as per IT Act (https://taxsummaries.pwc.com/uganda/corporate/taxes-on-corporate-income) and assessed by the assessment team |
| 3) | Mechanical and Electrical Equipment | % | 5 | 5 | This is as per IT Act (https://taxsummaries.pwc.com/uganda/corporate/taxes-on-corporate-income) and assessed by the assessment team |

| Salvage Values | | | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|---|---|
| Sl No | Tax related Parameters | Units | Values Used | Values Used | |
| 1) | Plant, Machinery and Electrical equipments | % | 10 | 10 | This is as per IT Act (https://taxsummaries.pwc.com/uganda/corporate/taxes-on-corporate-income) and assessed by the assessment team |

| Savings | | | Project Activity | Reference Plant | Means of Verification |
|---|---|---|---|---|---|
| Sl No | Tax related Parameters | Units | Values Used | Values Used | |
| | HT Tariff (Energy charges) | USD/kWh | 0.095 | 0.10 | As per https://www.umeme.co.ug/umeme_api/wp-content/uploads/2022/01/Tariffs-1.pdf<br>https://www.era.go.ug/index.php/tariffs/generation-tariffs/feed-in-tariff |
| | Demand Charges | USD/kWh | 3.17 | 3.17 | As per https://www.umeme.co.ug/umeme_api/wp-content/uploads/2022/01/Tariffs-1.pdf |

**Breakup of Project Plant Cost and Reference Plant Cost (USD)**

| Sl No | Description | Project Plant Cost in million USD | Percentage of total cost | Reference Plant Cost=As per tables above * percentage from project cost heads in USD |
|---|---|---|---|---|
| 1. | Optimisation of Sugar factory for steam economy | 2.14 | 5.96 | 2.68 |
| 2. | Bagasse Handling System | 1.55 | 4.31 | 1.94 |
| 3. | Steam generation system | 13.58 | 37.83 | 17.02 |
| 4. | Power generation system | 8.45 | 23.53 | 10.59 |
| 5. | Power Distribution system | 1.11 | 3.10 | 1.40 |
| 6. | Automation | 0.99 | 2.75 | 1.24 |
| 7. | Plant water system | 2.00 | 5.59 | 25.15 |
| 8. | Fire fighting system | 0.15 | 0.42 | 0.19 |
| 9. | Erection | 1.46 | 4.08 | 1.84 |
| 10. | Factory buildings and foundation | 4.46 | 12.42 | 5.59 |

| | | | |
|---|---|---|---|
| **Total** | **35.90** | | **45.00** |

The means of finance are as follows

| Sl No | Means of Finance | Project Case (in million USD) | Reference Project Case (in million USD) |
|---|---|---|---|
| 1 | Debt | 34.10 | 42.75 |
| 2 | Equity | 1.79 | 2.25 |

Based on the above the PP performed the IRR for the project activity case and reference project case

The IRR derived are presented below

Project Case – 16.37 %

Reference Project Case – 24.27%

The above values were independently verified by the assessment team by putting the input values listed above into the IRR sheet shared. The IRR calculation was based on the normative practice in the market and accordingly the steps involved were followed. The steps involved towards IRR estimation are as follows:

i. The profit after tax, depreciation, interest on long term debt and capital expenditure are considered as cash outflow

ii. Tax shield, capital subsidy, salvage value, gross cash accrual is cash inflow.

iii. The cash flow was then estimated till the year 2040 starting from 2020 and IRR determined using the above approach.

Based on the para 28 under section 7 as per Tool 27 on investment analysis, the PP is required to perform sensitivity analysis on the calculated IRR.

The following parameter are critical on the financial performance of the project activity as per IRR sheet

i. Project Cost

ii. Price of Biomass

iii. Tariff Escalation

iv. PLF

v. Calorific value

vi. Steam to fuel ratio

The following table presents the values in base case as well as effect for critical conditions as above by 10% as per the guidance, applied critically to the parameters to see the effect on the IRR

| Sl No | Description | Base Case | IRR in Reference | IRR in Proposed Project |
|---|---|---|---|---|

| | | when variation | Project Case in % | Case in % |
|---|---|---|---|---|
| 1. | Project Cost | 0% | 24.27 | 16.37 |
| 2. | Biomass Price | 0% | 24.27 | 16.37 |
| 3. | Tariff | 0% | 24.27 | 16.37 |
| 4. | PLF | 0% | 24.27 | 16.37 |
| 5. | Calorific Value | 0% | 24.27 | 16.37 |
| 6. | Steam to fuel | 0% | 24.27 | 16.37 |

| Sl No | Description | Hypothetical Case (sensitivity analysis) when variation | IRR in Reference Project Case in % | IRR in Proposed Project Case in % |
|---|---|---|---|---|
| 1. | Project Cost | 10% | 21.52 | 16.42 |
| 2. | Biomass Price | 10% | 21.52 | 16.42 |
| 3. | Tariff | 10% | 21.52 | 16.42 |
| 4. | PLF | 10% | 21.52 | 16.42 |
| 5. | Calorific Value | 10% | 21.52 | 16.42 |
| 6. | Steam to fuel | 10% | 21.52 | 16.42 |

| Sl No | Description | Hypothetical Case (sensitivity analysis) when variation | IRR in Reference Project Case in % | IRR in Proposed Project Case in % |
|---|---|---|---|---|
| 1. | Project Cost | -10% | 27.60 | 16.31 |
| 2. | Biomass Price | -10% | 27.60 | 16.31 |
| 3. | Tariff | -10% | 27.60 | 16.31 |
| 4. | PLF | -10% | 27.60 | 16.31 |
| 5. | Calorific Value | -10% | 27.60 | 16.31 |
| 6. | Steam to fuel | -10% | 27.60 | 16.31 |

From the tables above it can be seen that IRR of the proposed project case is always lower than the reference plant finalised as per the baseline identification stated earlier. So as can be seen the project activity has lower IRR than the reference baseline project which indicates that the project activity is less financially attractive to the PP than the baseline reference project. Even with such low returns the PP has proceeded to go ahead with the biomass-based project activity.

So the outcome of the step 2 analysisie., investment analysis, and performing sensitivity analysis the proposed project is not financially/commercially attractive to the project proponent

**Step 3: Barrier Analysis**

**Sub-step 3a: Identify barriers that would prevent the implementation of alternative scenarios**

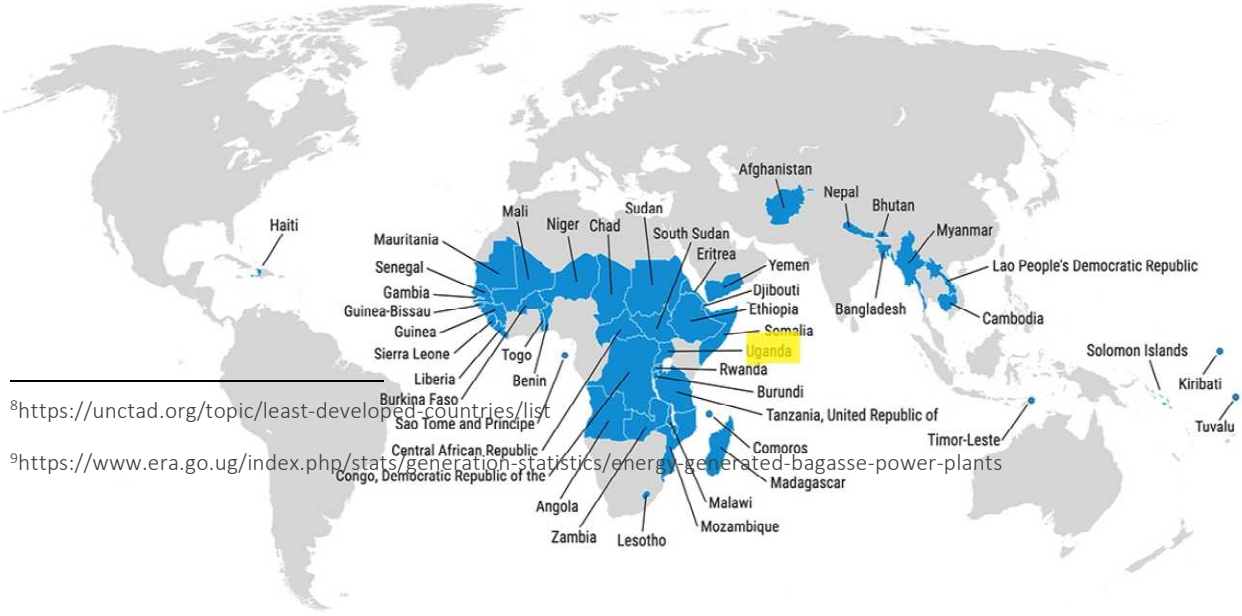
The major barrier that affects apart from first of its kind and investment barriers, is the lack of prevailing practice in the geographical region where it operates. As elaborated in section 3.4.4 and 3.4.5 on the alternative baseline and additionality sections, the project activity of utilizing the bagasse produced from the plant is not a common practice in Uganda. The reasons are manifold viz., the project uses the bagasse not only to fulfill the thermal and energy needs of the plant, but also to export the excess energy to the grid. This is possible due to the installation of 87 bar bagasse boiler which is not a common practice in Uganda. This was elaborated under first of its kind barrier analysis previously where the assessment team had provided evidences provided by the PP and how it was accepted.Therequirements of the tool to fulfill specific steps like common practice analysis steps are elaborated in the subsequent paragraphs.

In addition to above, as per "Guidelines for Objective Demonstration and Assessment of Barriers" EB 50 annex 13, para 10, for LDCs: "*For projects in Least Developed Countries it is sufficient to transparently describe the relevant barriers, as less stringency is needed with regards to data availability in the actual demonstration of barrier, as compared to the projects in other countries. Projects in Least Developed Countries are not bound by the provisions in this guideline and may use other approaches that are more adapted to the local circumstances.*"

As per UNCTAD report[8] Uganda is a least developed country (LDC) and is one among the 33 LDCs in Africa. The representation is shown in terms of highlighted countries in a map as per the report and reproduced below (with Uganda highlighted done by assessment team).

Further as per the example quoted in the guidance, "*For a co-generation project in a Least Developed Country it may be sufficient to demonstrate a history of non-implementation of co-generation over a long time period to demonstrate the relevance of the barrier to implementing co-generation technology"*

As per the latest publication of Electricity Regulatory Authority[9] as on 28/01/




[8]https://unctad.org/topic/least-developed-countries/list

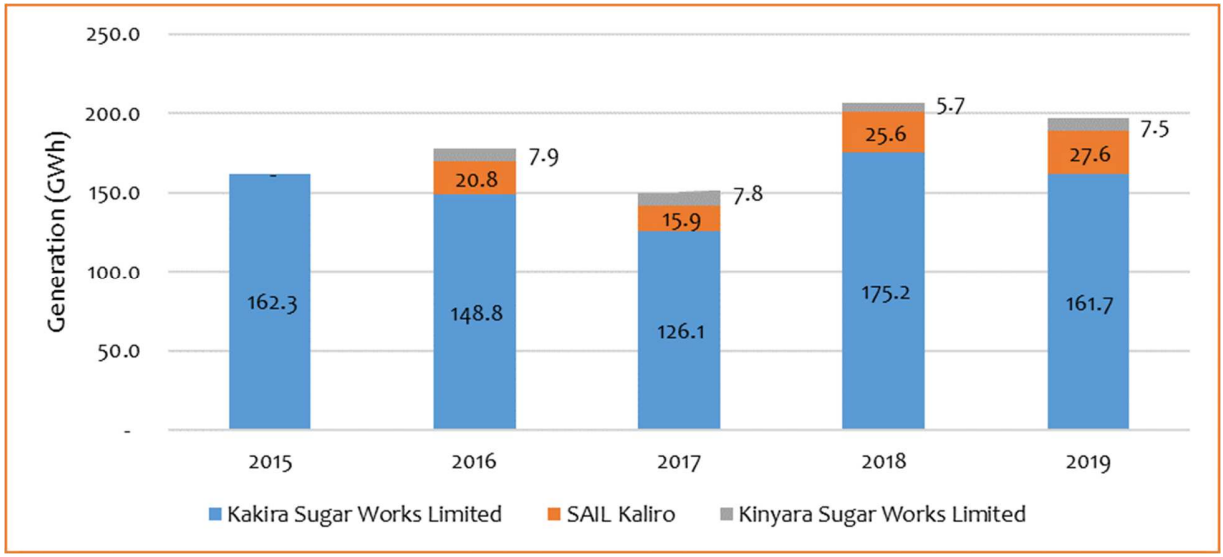
[9]https://www.era.go.ug/index.php/stats/generation-statistics/energy-generated-bagasse-power-plants

Theutilization of bagasse to generate electricity, known as bagasse technology, has been employed in Uganda in a very limited as per the latest information published by ERA. The Authority has granted licenses for five bagasse cogeneration power plants, which collectively have an installed capacity of 96.2MW. However, only three of these plants currently supply electricity to the national grid. The graph is reproduced below

The capacity of the boiler and the companies involved in cogeneration units are provided at the end of the steps.

Thus it can be seen that the prevailing practice in Uganda a LDC is to install much lower boiler capacity and steam generation than what is installed in this project. The PP faces prevailing practice barriers as per the discussion presented above and subsequent sections. This is consistent with

1. CDM Tool for demonstration and assessment of additionality, version 07.0.0
2. CDM Guidelines for objective demonstration and assessment of barriers, version 1.0;




The outcome of this step 3a leads us to conclude that the identified barrier is prevailing practice.

**Sub-step 3b: Eliminate alternative scenarios which are prevented by the identified barriers**

To reiterate the statements in section B.4.4 wherein the most realistic baseline scenario was identified, is reitrated below

- For Power

  - P5: The generation of heat in a new cogeneration plant at the project site
  - P7: The generation of power in the power grid
- For Heat
  - H5: The generation of heat in a new cogeneration plant at the project site.
- For biomass
  - B1: The biomass residues are left to decay in open under aerobic conditions
  - B4: The biomass residues are used for power or heat generation at project site in new/existing power plants

The above scenario is actually the baseline scenario that any PP would have undertaken with the project design like SCOUL, which is the only alternative. As per the tool for additionality if there is just one possible alternative that is not prevented from operating under baseline, then it is chosen as the baseline scenario. Additionally, if the proposed project activity is not carried out without being registered as a VCS project activity. The execution of the baseline reference plant with lesser efficiency may be inferred from the discussion above as the baseline for the project.

**Step 4: Common Practice Analysis**

This step uses heavily the recommendations laid out in Tool 24: Common Practice Analysis version 3.1 to make essential distinctions between a given project activity and similar project activities in the geographic region, that makes it not a common practice analysis.

The tool provides step wise approach to perform common practice analysis and draw conclusions accordingly.

**Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity**

As per the tool, PP needs to identify project activities which are within +/-50% of the project capacity in the given geographic region. The project activity is a 30 MW bagasse power plant, so as per tool identify projects with biomass based turbo power generator whose capacities are between 15 MW and 45 MW.

**Step 2: Identify similar projects (both CDM/non-CDM) which fulfill the conditions as below**

i. The projects are located in the applicable geographical area;
ii. The projects apply the same measure as the proposed project activity;
iii. The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
iv. The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;
v. The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
vi. The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity,

**Selection of Geographical Area**

As per the tool," Project participants may provide justification that the applicable geographical area is smaller than the host country for technologies that vary considerably from location to location depending on local conditions."

The relevant sector applicable to the given project activity is renewable energy and sugar industry. It was checked by the assessment team from relevant statutory norms of Uganda that Uganda has policies and laws governing sugar industry at national level. Since provincial laws have lesser significance over laws governing at national level, the geographical area chosen is the entire national boundary of Uganda.Hence the region selected is line with the guidance of the tool stated above.

The following table lists the projects both CDM and non CDM that commenced operation before the start date of the present project activity. The assessment team cross checked the data provided in the website: https://www.era.go.ug/index.php/stats/generation-statistics/energy-generated-by-utility and found the start date requirement in line with the above conditions

| Company | Location | Capacity (MW) | Date of commissioning | Plant details |
|---|---|---|---|---|
| Kakira Sugars Ltd | Jinja, Uganda | 52MW (22MW + 30MW) | 2008 & 2012 | 100 TPH (2X50) boiler, 45 bar<br>160 TPH, 67 bar |
| Kinyara Sugar works limited | Masindi, Uganda | 14.5 MW | 2015 | |
| Sugar and Allied Industries Uganda limited | Kaliro, Uganda | 11.9 MW | 2014 | 110 TPH boiler, 45 bar |
| Mayuge Sugar Limited | Mayuge, Uganda | 9.2 MW | 2018 | 90 TPH boiler, 45 bar |

**Step 3: Within the Projects identified in step 2, identify those that are neither registered as CDM project activities, project activities submitted for registration nor undergoing validation.**

It must be noted that none of the projects are registered or undergoing validation or submitted for registration. This was assessed by checking the websites of CDM. Verra and GS4GG where projects of similar project design, project owners were checked. Since the results did not show up any projects matching these criteria it was concluded that none of the projects are even registered or are undergoing validation.

Hence as per the tool $N_{all} = 4$

**Step 4: Within similar projects identified in step 3, identify that apply technologies that are different to the technology applied in the proposed project activity. Note their number as Ndiff**

Therefore Ndiff = 4. Since the present project activity uses high pressure boiler, while the table in the Jt PD and MR has boilers which are low pressure, PP has identified 4 projects which are different from the project activity.

**Step 5: Calculate factor F= 1 – Ndiff/Nall, representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity**

F = 1 – 4/4 = 0

The proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and Nall-Ndiff is greater than 3.

In the project activity F < 0.2 and Nall-Ndiff = 0 < 3. Hence the project is not a common practice analysis which is as per the common practice requirement tool.

To conclude, it is reiterated that in Uganda the common practice is to install LP boiler in sugar factories and no project activity listed in the table above have installed 87 bar HP boiler. So the present project activity conclusively proves that it is not a common practice.

### 3.4.6 Quantification of GHG Emission Reductions and Removals

The equations and choices provided in the applied methodology ACM 006 ,Version09 /06/ is correctly quoted in the Joint PD & MR /01/. The emission reductions of the project would be calculated using the formulae mentioned in the applied methodology /06/.

Validation team based upon the review of the Joint PD & MR /01/ confirms that the formulae are correctly presented for the determination of emissions reductions. The parameters and equations presented in the Joint PD & MR /01/, as well as other applicable documents, have been compared with the information and requirements presented in the applied methodology/06/. An equation comparison has also been made to ensure consistency between all the formulae presented in the Joint PD & MR/01/ and ER validation spreadsheet /02/ and the applied methodology /06/.

The baseline Emissions are calculated as follows:

$$BE_y = EL_{BL,GR,y} \times EF_{EG,GR,y} + \sum_f FF_{BL,HG,y,f} \times EF_{FF,y,f} + EL_{BL,FF/GR,y} \times min\left(EF_{EG,GR,y}, EF_{EG,FF,y}\right) + BE_{BR,y} \quad \text{Equation (1)}$$

Where:

| | | |
|---|---|---|
| $BE_y$ | = | Baseline emissions in year *y* (t $CO_2$) |
| $EL_{BL,GR,y}$ | = | Baseline electricity sourced from the grid in year *y* (MWh) |
| $EF_{EG,GR,y}$ | = | Grid emission factor in year *y* (t $CO_2$/MWh) |
| $FF_{BL,HG,y,f}$ | = | Baseline fossil fuel demand for process heat in year *y* (GJ) |
| $EF_{FF,y,f}$ | = | $CO_2$ emission factor for fossil fuel type *f* in year *y* (t $CO_2$/GJ) |
| $EL_{BL,FF/GR,y}$ | = | Baseline uncertain electricity generation in the grid or on-site or off-site power-only units in year *y* (MWh) |
| $EF_{EG,FF,y}$ | = | $CO_2$ emission factor for electricity generation at the project site or off-site plants in the baseline in year *y* (t $CO_2$/MWh) |

| | | |
|---|---|---|
| $BE_{BR,y}$ | = | Baseline emissions due to disposal of biomass residues in year *y* (t CO2e) |
| $f$ | = | Fossil fuel type |

**Step 1: Determine the total baseline process heat generation (HCBL,y), electricity generation and capacity constraints, and efficiencies**

**Step 1.1: Determine the total baseline process heat generation**

The amount of the process heat is calculated as the difference between enthalpy of process steam and enthalpy of feed water. The apparent simplification in calculation is introduced by the methodology which assumes that the quality of steam in baseline process and project activity is same taken through the steam header

**Step1.2: Determine the baseline capacity of electricity generation ($CAP_{EG,total,y}$)**

$$CAP_{EG,total,y} = LOC_y \times \left[ \sum_i \left( CAP_{EG,CG,i} \times LFC_{EG,CG,i} \right) + \sum_j \left( CAP_{EG,PO,j} \times LFC_{EG,PO,j} \right) \right]$$ Equation (2)

Where

| | | |
|---|---|---|
| $CAP_{EG,total,y}$ | = | Baseline electricity generation capacity in on-site and off-site plants in year y (MWh) |
| $CAP_{EG,CG,i}$ | = | Baseline electricity generation capacity of cogeneration-type heat engine *i*(MW) |
| $CAP_{EG,PO,j}$ | = | Baseline electricity generation capacity of power-only-type heat engine *j* (MW) |
| $LFC_{EG,CG,i}$ | = | Baseline load factor of cogeneration-type heat engine *i*(ratio) |
| $LFC_{EG,PO,j}$ | = | Baseline load factor of power-only-type heat engine *j* (ratio) |
| $LOC_y$ | = | Operation of the industrial facility using the process heat in year *y* (hour) |
| $i$ | = | Cogeneration-type heat engine in the baseline scenario |
| $j$ | = | Power-only-type heat engine in the baseline scenario |

**Step 1.3: Determine the efficiencies of heat generators, and efficiencies and heat-to-power ratio of heat engines**

**Heat Generators**

The approach allows for a variety of parameters to be utilised to calculate the efficiency of the heat producers. The following factors have been taken into account:

**Option 1 (Default values):** In the baseline scenario, a new boiler would be built and run at the project site.

For the boiler that will be installed, a value of 90% has been utilised. This rating is equivalent to the boiler efficiency value for the project activity.

**Option 2 (Manufacturer's data):**For the currently installed boilers, which were in use before the project activity was carried out. This choice is appropriate since heat engines and heat generators were used at the project site before the project activity was carried out (no new equipment would be constructed and operated at the project site in the baseline scenario). Based on manufacturer statistics on efficiency under ideal working circumstances, the effectiveness of the heat generator or heat engine is calculated, taking into account the actual conditions of the fuel utilised (including moisture content of biomass residues).

Boiler have an efficiency of 80% which is conservative of the two based on manufacturer's datawhich is assumed to be the efficiency both for the baseline and project activity.

**Heat to Power Ratio**

The corresponding heat to steam ratio of the above efficiency comes to $h_{high}$7.71 tonnes of steam / MWh and the engine efficiency is 0.038 MWh/GJ

According to Case 2 of the methodology, the heat-to-power ratio for heat engines should be computed in accordance with the design conditions of the plant, for the configuration designated as the baseline scenario in the selection of the baseline scenario and demonstration of additionality.

Based on the above conditions, expected quantity of process heat extracted ($h_{low}$= 2.727 kJ/kg) to the heat energy efficiency expressed as 7.71 tonnes / MWh of steam. This results in the ratio : 5.935

**Step 2: Determine the baseline electricity generation in the grid and emission factors**

**Step 2.1: Determine the baseline electricity generation ($EL_{BL,y}$)**

The amount of electricity that would be generated in the baseline in year *y* equals the amount of electricity

generated in the project scenario as follows:

$$EL_{BL,y} = EL_{PJ,gross,y} + EL_{PJ,imp,y} - EL_{PJ,aux,y} \quad \text{Equation (3)}$$

Where:

$EL_{BL,y}$ = Baseline electricity generation in year *y* (MWh)

| | | |
|---|---|---|
| $EL_{PJ,gross,y}$ | = | Gross quantity of electricity generated in all power plants included in the project boundary in year *y* (MWh) |
| $EL_{PJ,imp,y}$ | = | Project electricity imports from the grid in year *y* (MWh) |
| $EL_{PJ,aux,y}$ | = | Total auxiliary electricity consumption required for the operation of the power plants in year *y* (MWh) |

$EL_{PJ,aux,y}$ includes all electricity needed to run machinery used to prepare, store, and transport biomass residues (such as conveyor belts, driers, and other mechanical equipment), as well as electricity needed to run any power or heat generating facilities that are situated on the project site and are included in the project boundary (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.).

**Step 2.2: Determine the baseline electricity sourced from the grid ($EG_{BL,GR,y}$)**

The amount of electricity that would be sourced from the grid in the baseline is calculated under the assumption that the installed capacity of power generation available in the baseline scenario (on-site and off-site) will serve as a cap on the amount of electricity generated both on-site and off-site:

Where: Equation (4)

| | | |
|---|---|---|
| $EL_{BL,GR,y}$ | = | Baseline electricity sourced from the grid in year *y* (MWh) |
| $EL_{BL,y}$ | = | Baseline electricity generation in year *y* (MWh) |
| $CAP_{EG,total,y}$ | = | Baseline electricity generation capacity in on-site and off-site plants in year *y* (MWh) |

**Step 2.3: Determine the emission factor of grid electricity generation (EFEG,GR,y)**

The grid emission factor ($EF_{EG,GR,y}$) shall be determined using the latest approved version of "TOOL07: Tool to calculate the emission factor for an electricity system".

**Step 2.4: Determine the emission factor of on-site electricity generation with fossil fuels (EFEG,FF,y)**

Since no fossil fuel based power generation was identified as part of the baseline scenario, $EF_{EG,FF,y}$= $EF_{EG,GR,y}$.

Step 3: Determine the baseline biomass-based heat and power generation

$$HG_{BL,BR,y} = \sum_{h}\sum_{n}\left(BR_{B5,n,h,y} \times NCV_{BR,n,y} \times \eta_{BL,HG,BR,h}\right)$$ Equation (5)

Where:

| | | |
|---|---|---|
| $HG_{BL,BR,y}$ | = | Baseline biomass-based heat generation in year *y* (GJ) |
| $BR_{B5,n,h,y}$ | = | Quantity of biomass residues of category *n* used in heat generator *h* in year *y* with baseline scenario B5 (tonne on dry-basis) |
| $NCV_{BR,n,y}$ | = | Net calorific value of biomass residue of category *n* in year *y* (GJ/tonne on dry-basis) |
| $\eta_{BL,HG,BR,h}$ | = | Baseline biomass-based heat generation efficiency of heat generator *h* (ratio) |

Where:

| | | |
|---|---|---|
| $HG_{BL,BR,y}$ | = | Baseline biomass-based heat generation in year *y* (GJ) |
| $BR_{B5,n,h,y}$ | = | Quantity of biomass residues of category *n* used in heat generator *h* in year *y* with baseline scenario B5 (tonne on dry-basis) |
| $NCV_{BR,n,y}$ | = | Net calorific value of biomass residue of category *n* in year *y* (GJ/tonne on dry-basis) |
| $\eta_{BL,HG,BR,h}$ | = | Baseline biomass-based heat generation efficiency of heat generator *h* (ratio) |

**Step 3.2: Determine the baseline biomass-based heat generation ($HG_{BL,BR,y}$)**

Based on the quantity of heat used in the heat engine the biomass-based cogeneration electricity and heat have been estimated as follows

$$EL_{BL,BR,CG,y} = \frac{1}{3.6} \times \sum_i \left( \frac{1}{(HPR_{BL,i} + 1)} \times \eta_{BL,EG,CG,i} \times HG_{BL,BR,CG,y,i} \right)$$ Equation (6)

$$HC_{BL,BR,CG,y} = \sum_i \left( \frac{HPR_{BL,i}}{(HPR_{BL,i} + 1)} \times \eta_{BL,EG,CG,i} \times HG_{BL,BR,CG,y,i} \right)$$ Equation (7)

Where:

| | | |
|---|---|---|
| $EL_{BL,BR,CG,y}$ | = | Baseline biomass-based cogenerated electricity in year *y* (MWh) |
| $\eta_{BL,EG,CG,i}$ | = | Baseline electricity generation efficiency of heat engine *i*(MWh/GJ) |
| $HG_{BL,BR,CG,y,i}$ | = | Baseline biomass-based heat used in heat engine *i*in year *y* (GJ) |
| $HC_{BL,BR,CG,y}$ | = | Baseline biomass-based process heat cogenerated in year *y* (GJ) |
| $HPR_{BL,i}$ | = | Baseline heat-to-power ratio of the heat engine *i*(ratio) |

**Case 3.2.3 :** $HG_{BL,BR,y} > \sum_i HG_{BL,BR,CG,y,i}$ and $HC_{BL,y} \geq HC_{BL,BR,CG,y}$ is verified

The need for process heat might be satisfied and there would still be biomass-based heat in the baseline. Therefore, it is envisaged that this balance of biomass-based heat would be drawn from the heat header and used to satisfy the requirement for process heat without involving power generation.

According to scenario 3.2.3.2, the residual demand for process heat is smaller than the balance of biomass-based heat (right-hand side of equation 14). (left-hand side of the equation). The requirement for process heat must still be satisfied after all biomass-based heat has been spent. However, the two remaining boilers, which directly feed the sugar mill process without cogeneration, provide this deficit of biomass-based heat.

Additionally, there is no consumption of fossil fuels in the existing baseline for business as usual.

$$HC_{BL,y} - HC_{BL,BR,CG,y} > \frac{h_{LOW,y}}{h_{HIGH,y}} \times \left( HG_{BL,BR,y} - \sum_{i} HG_{BL,BR,CG,y,i} \right)$$

As a result, the little change that results ($HC_{balance,FF,y}$), as well as $EL_{balance,FF,y}$, and step 4, are conservatively ignored and attributed to incorrect default assumptions.

**Step 4: Determine the baseline demand for fossil fuels to meet the balance of process heat and the corresponding electricity generation**

This step is neglected as this is not applicable as per the statement mentioned in step 03 above

**Step 5: Determine the baseline emissions due to uncontrolled burning or decay of biomass residues**

Project participants decided not to include these emission sources which was accepted as it would lead to conservative estimate of emission reductions. Therefore, $BE_{BR,y}$= 0.

**Baseline emissions**

$$\boldsymbol{BE_y = EL_{BL,GR,y} \times EF_{EG,GR,y} + \sum_f FF_{BL,HG,y,f} \times EF_{FF,y,f} + EL_{BL,FF/GR,y} \times min\left(EF_{EG,GR,y}, EF_{EG,FF,y}\right) + BE_{BR,y}}$$

Where:

| | | |
|---|---|---|
| $BE_y$ | = | Baseline emissions in year *y* (t $CO_2$) |
| $EL_{BL,GR,y}$ | = | Baseline electricity sourced from the grid in year *y* (MWh) |
| $EF_{EG,GR,y}$ | = | Grid emission factor in year *y* (t $CO_2$/MWh) |
| $FF_{BL,HG,y,f}$ | = | Baseline fossil fuel demand for process heat in year *y* (GJ) |
| $EF_{FF,y,f}$ | = | $CO_2$ emission factor for fossil fuel type *f* in year *y* (t $CO_2$/GJ) |
| $EL_{BL,FF/GR,y}$ | = | Baseline uncertain electricity generation in the grid or on-site or off-site power-only units in year *y* (MWh) |
| $EF_{EG,FF,y}$ | = | $CO_2$ emission factor for electricity generation at the project site or off-site plants in the baseline in year *y* (t $CO_2$/MWh) |

$BE_{BR,y}$ = Baseline emissions due to disposal of biomass residues in year *y* (t CO2e)

$f$ = Fossil fuel type

The amount of electricity that would be generated in the baseline in year *y* equals the amount of electricity generated in the project scenario as follows:

$$EL_{BL,y} = EL_{PJ,gross,y} + EL_{PJ,imp,y} - EL_{PJ,aux,y} \quad \text{Equation (8)}$$

Where:

$EL_{BL,y}$ = Baseline electricity generation in year *y* (MWh)

$EL_{PJ,gross,y}$ = Gross quantity of electricity generated in all power plants included in the project boundary in year *y* (MWh)

$EL_{PJ,imp,y}$ = Project electricity imports from the grid in year *y* (MWh)

$EL_{PJ,aux,y}$ = Total auxiliary electricity consumption required for the operation of the power plants in year *y* (MWh)

$$EL_{BL,y} = 1{,}377{,}272\ MWh$$

BEy = $EL_{BL,y}$ X $EF_{gridCM,y}$ = 1,377,272 X 0.137 = 188,681 tCO2e

In pre project scenario PP was operating low pressure boiler and back pressure turbine. In pre project scenario power and steam generated, utilize for inhouse consumption only and additional power procure from grid. Therefore, in project scenario PP is claiming emission reduction on power supplied to national grid and considering only parameters relevant for power supplied to national grid.

**Project Emissions**

Project emissions are calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GR1,y} + PE_{GR2,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y} + PE_{BG2,y} + PE_{BC,y} \quad \text{Equation (9)}$$

**Determination of $PE_{FFy}$**

When calculating $PE_{FF,y}$, the following emission sources should be taken into account:

Emissions caused by the on-site burning of fossil fuels to produce heat and electricity. This includes emissions from on-site fossil fuel consumption of auxiliary equipment & systems connected to the creation of electric power and heat, as well as all fossil fuels utilized at the project site in heat generators (such as boilers) for the generation of electric power and heat.

This includes fossil fuels needed to operate auxiliary equipment for power and heat plants (such as pumps, fans, cooling towers, instrumentation and control, etc.) that are not included in the first bullet, as well as fossil fuels needed to operate machinery for the preparation, storage, and transportation of fuels (such as machinery for mechanically treating fuels).

It needs to be noted there will be minor usage of fossil fuel for boiler initiation and in a remote scenario of no availability of bagasse. This term **$PE_{FFy}= 0$** is generally considered, however will be monitored in case fossil fuel are used in the event of usage during the project activity.

At the time of PDD elaboration DG set used in project boundary as a back up. Amount of diesel consumption considered as part of project emission. Tool 3: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" used to calculate $PE_{FF,y}$ .

$PE_{FF,y} = Q_{diesel} \text{ X } EF_{diesel} \text{ X } \rho_{diesel} \text{ X } NCV_{diesel}$

$PE_{FF,y} = 25001 \text{ X } 43 \text{ X } 0.83 \text{ X } 74.1 \text{ X } 10^{-6} =$ **71 $tCO_2e$**

**Determination of $PE_{GR1,y}$**

If electricity is imported from the grid to the project site during year *y*, corresponding emissions should be accounted for as project emissions, as follows:

$$PE_{GR1,y} = EF_{EG,GR,y} \times EL_{PJ,imp,y} \qquad \text{Equation (10)}$$

Where:

| | | |
|---|---|---|
| $PE_{GR1,y}$ | = | Emissions during the year *y* due to grid electricity imports to the project site (t $CO_2$) |
| $EL_{PJ,imp,y}$ | = | Project electricity imports from the grid in year *y* (MWh) |
| $EF_{EG,GR,y}$ | = | Grid emission factor in year *y* (t $CO_2$/MWh) |

Except in the improbable event that the turbo-generator fails, no electrical imports from the grid are planned. If this scenario occurs, grid power usage will be tracked, and project-related emissions will be taken into consideration. Ex-ante estimates in the PDD is taken as $PE_{GR1,y} = 0$, for these purposes.

**Determination of $PE_{GR2,y}$**

In the event when EL (balance,PO,y)EL (BL,BR,PO,y) (Step 3.3.2) or EL (balance,FF,y)EL (BL,FF,y) (Step 4.2.2), the baseline scenario generates more power on-site than the project scenario does. In these situations, it is expected that an equivalent quantity of power is produced during year y to make up for this decrease in energy production at the project site. The following should be considered project emissions for the corresponding emissions:

$$PE_{GR2,y} = EF_{EG,GR,y} \times EL_{PJ,offset,y} \quad \text{Equation (11)}$$

Where:

| | | |
|---|---|---|
| $PE_{GR2,y}$ | = | Emissions due to a reduction in electricity generation at the project site in year *y* ($tCO_2$) |
| $EF_{EG,GR,y}$ | = | Grid emission factor in year *y* ($tCO_2$/MWh) |
| $EL_{PJ,offset,y}$ | = | Electricity that would be generated in the baseline that exceeds the generation of electricity during year *y* (MWh) |

The amount of electricity generated on-site in the baseline does not exceed the amount of electricity generated in the project scenario, therefore **$PE_{GR2,y}$= 0**.

**Determination of $PE_{TR,y}$**

Project participants must calculate the CO2 emissions attributable to the transportation of biomass residues to the project plant when the residues are not produced directly at the project site.

➔ Since no biomass residues are carried from the fields for use in the project activity compared to baseline practise, no project-related emissions are taken into consideration, and $PE_{TR,y}$ = 0.

**Determination of $PE_{BR,y}$**

If the project's proponents choose to factor emissions from uncontrolled burning or decay of biomass residues ($BE_{BR,y}$) into the computation of baseline emissions, then the project scenario must also factor emissions from the combustion of biomass residues. If not, this emission source could be disregarded. This is not considered for the computation and hence taken as $PE_{BR,y}$ = 0

**Determination of $PE_{WW,y}$**

When wastewater from the treatment of biomass is (partially) handled anaerobically and the methane from the waste water is not trapped and vented or burned, this emission source should be evaluated.

Due to project activities, there is no anaerobic wastewater treatment, hence $PE_{WW,y}$ = 0.

**Determination of $PE_{BG2,y}$**

When making biogas, this emission source is taken into account. Due to project activities, there is no biogas generation, hence $PE_{BG2,y}$ = 0.

**Determination of $PE_{BC,y}$**

The methodology states that the related project emissions must be estimated using the methodological tool "Project and leakage emissions from biomass" if the project comprises biomass from dedicated plants.

Also as per the tool 5 "Project and leakage emissions from biomass" para 9, "The tool is also applicable if biomass residues are consumed in a CDM project activity, and the biomass residues can be utilized after processing or without processing.

These could be:

(a) Procured by the project proponents; or

(b) The result of an agro-industrial process under the control of the project proponents." Since PP does not procure the bagasse, the condition (b) is applicable.

Hence based on the equation (10) provided by the tool in section 5.3, the project emissions are expressed as:

$PE_{BRP,y} = PE_{BRP,electricity,y} + PE_{BRP,fuel,y} + PE_{BRP,CH4,y} + PE_{BRP,COMP,y} + PE_{BRP,AD,y} + PE_{BRP,ww,y} + PE_{BP,additives,y}$

Where

a) $PE_{BRP,electricity,y}$ = Project emissions resulting from the consumption of electricity due to thermo-chemical, biological and mechanical processing of the biomass residues in year y (tCO2e)
b) $PE_{BRP,fuel,y}$ = Project emissions resulting from the consumption of fossil fuels due to thermo-chemical, biological and mechanical processing of the biomass residues in year y (tCO2e)
c) $PE_{BRP,CH4,y}$ = Project methane missions resulting from the decay of biomass residues under anaerobic conditions due to thermo-chemical, biological and mechanical processing in year y (tCO2e)
d) $PE_{BRP,COMP,y}$= Project emissions associated resulting from composting due to thermochemical, biological and mechanical processing of the biomass residues in year y (tCO2e)
e) $PE_{BRP,AD,y}$ = Project emissions resulting from the anaerobic digester due to thermochemical, biological and mechanical processing of the biomass residues in year y (tCO2e)
f) $PE_{BRP,ww,y}$= Project emissions resulting from wastewater treatment due to thermochemical, biological and mechanical processing of the biomass residues in year y (tCO2e)
g) $PE_{BP,additives,y}$ = Project emissions resulting from the use of additives to process the biomass residues in year y (tCO2e)

As per the discussions earlier under the additionality section and barrier analysis it is clear that

i. No Grid power is consumed, hence $PE_{BRP,electricity,y} = 0$
ii. No fossil fuel is consumed during the project activity, hence $P_{EBRP,fuel,y} = 0$
iii. No biomass residue processing is happening at site, hence $PE_{BRP,CH4,y} = 0$
iv. The Biomass residue is not used for composting purposes, hence $PE_{BRP,COMP,y} = 0$
v. The Biomass residue is not used by any anaerobic digester, hence $PE_{BRP,AD,y} = 0$
vi. The biomass residue is not processed in a wastewater treatment plant, hence $PE_{BRP,ww,y} = 0$
vii. The biomass residue is not processed with additives, hence $PE_{BP,AD,y} = 0$

For the time being, no land is being farmed to create biomass in accordance with the baseline scenario described in the section above; as a result, $PE_{BC,y}$=0 can be used.

Based on the discussions it can be concluded that $PE,_{BRP,y}$ = 0

Thustheprojectemissions:

$PEy = PE,_{FF,y} +PE_{GR1,y}+PE_{GR2,y}+PR,_{TR,y}+PR_{BR,y}+PE_{ww,y}+PE_{BG2,y}+PE_{BC,y}$

$PE_y$ = 71+0+0+0+0+0+0+0 = 71 tCO2e. Hence the assessment team found the project emissions calculations as per the Tool 5 para 9 and equation 10.

**Leakage**

The methodological tool "Project and leakage emissions from biomass" must be used to determine the leakage emissions caused by diverting biomass wastes from other applications.

The methodological tool "Project and leakage emissions from biomass" must be used to determine leakage emissions resulting from a change in pre-project activity. $LE_y$ = 0 because there are no possibilities for biomass leftovers employed in the project activity that might leak.

**Estimated Net GHG Emission Reductions and Removals**

Emission reduction:

**$ER_y = BE_y – PE_y – LE_y$**

**Where:**

$ER_y$ = Emission reductions in year y (t CO2e)

$BE_y$ = Baseline emissions in year y (t CO2e)

$PE_y$ = Project emissions in year y (t CO2)

$LE_y$ = Leakage emissions in year y (tCO2)

The detailed calculation has been provided in the emission reduction spreadsheet.

| Year | Estimated baseline emissions or | Estimated project emissions or removals | Estimated leakage emissions | Estimated net GHG emission reductions or |
|---|---|---|---|---|

| | removals ($tCO_2e$) | ($tCO_2e$) | ($tCO_2e$) | removals ($tCO_2e$) (Rounddown values) |
|---|---|---|---|---|
| 19/07/2021-31/12/2021 | 8,528 | 4 | 0 | 8,524 |
| 01/01/2022-31/12/2022 | 18,985 | 7 | 0 | 18,978 |
| 01/01/2023-31/12/2023 | 18,985 | 7 | 0 | 18,978 |
| 01/01/2024-31/12/2024 | 18,985 | 7 | 0 | 18,978 |
| 01/01/2025-31/12/2025 | 18,985 | 7 | 0 | 18,978 |
| 01/01/2026-31/12/2026 | 18,985 | 7 | 0 | 18,978 |
| 01/01/2027-31/12/2027 | 18,985 | 7 | 0 | 18,978 |
| 01/01/2028-18/07/2028 | 9,288 | 4 | 0 | 9,281 |
| Total | **188,681** | **71** | **0** | **188,610** |

The assessment team confirms that the applied methodology and the referenced tools have been applied appropriately to calculate baseline emissions and net GHG emission reductions for the project crediting period.

### 3.4.7 Methodology Deviations

Not applicable

### 3.4.8 Monitoring Plan

The project employs CDM Approved Consolidated Methodology ACM0006, Version 15 and in accordance with the same, the parameters to be monitored ex-post are given below:

**(i) Parameters to be monitored ex post**

| Parameter (s) | Units | Description | Source of monitoring data | Means of Verification |
|---|---|---|---|---|
| $EL_{PJ,gross,y}$ | MWh | Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh) | Plant records of the energy generation based on meter readings | Plant records of energy meter readings and inspection of meters at site |
| $EL_{PJ,imp,y}$ | MWh | Project energy imports from grid | Measured value from energy meters | Plant records of energy meter readings and inspection of meters at site |
| $EL_{PJ,aux,y}$ | MWh | Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y (MWh). | Measured value from energy meters | Plant records of energy meter readings and inspection of meters at site |
| $Q_{Diesel}$ | Litre | Quantity of diesel consumption | Measured from plant log books | Checked the log books as well as physical inspection of the DG set |
| $EF_{grid,CM,y}$ | $tCO_2e/MWh$ | Combined Margin Emission Factor of the national grid | *As per the guidance, for Uganda for non-solar, non-wind power project, the grid emission factor is 0.1370 tCO2e/MWh. This is applicable till 09/08/2025. The same has been updated in the Jt PD and MR from the initial submission. This was found in line with section 3.1.2 of VCS standard v4.3* | As per the guidance, for Uganda for non-solar, non-wind power project, the grid emission factor is 0.1370 tCO2e/MWh. This is applicable till 09/08/2025. The same has been updated in the Jt PD and MR from the initial submission. This was found in line with section 3.1.2 of |

| | | | | |
|---|---|---|---|---|
| | | | | VCS standard v4.2 |

(i) Parameters fixed ex ante

| Parameter (s) | Value available at validation | Units | Description | Source of monitoring data | Means of Verification |
|---|---|---|---|---|---|
| $EF_{diesel}$ | 74.1 | tCO2e/TJ | Emission factor of diesel | 2006 IPCC Guidelines for National Greenhouse Gas Inventorieshttps://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf | 2006 IPCC Guidelines for National Greenhouse Gas Inventorieshttps://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf |
| $\rho_{diesel}$ | 0.83 | Kg/Litre | Density of diesel fuel | CO2 Baseline Database for the Indian Power Sector by the Central Electricity Authority, Ministry of Power, Government of India: http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf | https://unfccc.int/files/national_reports/non-annex_i_natcom/cge/application/pdf/energy_ps_lesotho_2016.pdf (page no16) |
| $NCV_{i,y}$ | 43 | TJ/Gg | Net calorific value of the diesel fuel in year 'y' | *2006 IPCC Guidelines for National Greenhouse Gas Inventories*<br>*https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf* | *2006 IPCC Guidelines for National Greenhouse Gas Inventories*<br>*https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf* |

Thus, the parameter to be monitored gross energy, import energy, auxiliary energy, diesel consumption as well as updating combined margin EF from grid.

It must be noted that the PP is claiming emission reductions only from the energy supplied to grid generated by biomass, thus the parameters assessed is sufficient and appropriate. The number of parameters mentioned in the table are thus assessed to be in line with project design as well as the requirements of the methodology.

Based on the review of the Joint PD & MR/1/, the assessment team confirms that detailed monitoring procedures, monitoring structure, management team, monitoring items and functions have been clearly demonstrated.

*It is concluded on the basis of the interviews and document review during site inspection, that the Supervisors are responsible for taking measurements and recording data for the parameters specified. The management of SCOUL ensures that the necessary equipment required for measurements is provided to the Supervisors. The measuring instruments, namely Weigh Bridge and energy meters, are calibrated once in three years from third party instrumentation labs, and records of these calibrations are maintained.*

*All monitoring equipment required for the calculation of emission reductions has been installed after procedural checks, ensuring minimal possibility of defects. This is established, by the concerned operator who inspects all equipment daily while taking readings. In the event of any irregular or unexpected readings, the shift in charge is informed for further inspection and calibration of equipment. Moreover, all equipment is calibrated once every three years to ensure proper data value.*

*An internal audit is conducted by the top management through a management appointed experts every three months, and any corrective or preventive action taken will be reviewed during the next internal audit. The responsibility and competence of personnel taking measurements, as well as the time at which measurements should be taken and control of records, has been verified based on the competency statements of the personnel at site.*

*Data collected is safely stored, and records such as log books, purchase receipts, calibration records of measuring devices, and public data such as IPCC are maintained for two years post the crediting period . Data of inputs and outputs are summarized on a monthly basis based on daily recording, and calculations of emission reduction are updated.*

Based on the above assessment the validation team concludes that the PP is capable to implement the monitoring plan and hence confirms compliance of VCS guidelines/4/ and the applied methodology /06/.

## 3.5 Non-Permanence Risk Analysis

Not applicable

# 4 VERIFICATION FINDINGS

## 4.1 Project Implementation Status

During the onsite audit with PP representative, it was concluded that the project is implemented as perthe joint VCS PD & Monitoring plan.

SCOUL, the Sugar Corporation of Uganda Ltd in Lugazi, operates a sugar factory with a capacity of processing 3,500 tons of cane per day. Currently processing sugarcane at a rate of 200 TCH (4600 TCD), the factory has excess bagasse, which has no local market and no economic value. This surplus bagasse incurs high costs for stockpiling during the season and fire protection, while also posing environmental concerns. With a potential cane supply of about 1,400,000 tons per year, SCOUL plans to establish a bagasse-based cogeneration project.

Cogeneration plants based on bagasse are environmentally friendly, have relatively low capital costs, and a short gestation period.

The cogeneration plant has been designed to process the same quantity of sugarcane as the baseline scenario, with fossil fuels such as coal and gas being used only in emergencies. The technology and know-how for the project activity are sourced from internal resources, experts with decades of experience in sugarcane and electricity generation, British and German equipment manufacturers, and a highly qualified international EPC contractor company.

Installation and operation of the high-efficiency cogeneration plant do not pose any environmental hazards. The technology of generating electricity through biomass residue combustion is environmentally safe and sound, as confirmed by the EIA. The project activity involves the commissioning of a biomass-based cogeneration project.

The technical parameters have been verified with the name plates as well as with the technical specifications of turbine and boiler and also cross checked from the technical manual of the Manufacture. Assessment team confirms that the technical parameters are consistent with the VCS joint PD & MR /3/. The major technical specifications of the boiler and turbine are as follows:

**Table 1: The key parameters of boiler**

| | |
|---|---|
| Make: | ISGEC Heavy Engineering Limited |
| Design capacity | 150 TPH |
| Design pressure | 87 bar |
| Steam temperature | 525 ± 5 °C |
| Thermal Efficiency (%) | 71.4% |

| | |
|---|---|
| Fuel used | Bagasse |
| Purchase date | 19/04/2019 |
| Life Span | 30 years |

**Table 2: Key Parameters of Turbine**

| | |
|---|---|
| Make: | Shin Nippon Machinery Company ltd. |
| Manufacturer's Model no. | C9-R14-ER |
| Design capacity | 30MW |
| Speed (turbine/generator) | 4900/1500 rpm |
| Inlet Steam Temperature: | 520°C |
| Inlet Steam Pressure: | 85 bar |
| Exhaust steam pressure | 0.10 bar |
| Purchase date: | 18/04/2019 |
| Life span | 50 years |

.

The PP verified the location of the project with GPS coordinate map app and found the description correct.

The latitudes and longitudes are confirmed below:

| Mark | Latitude | Longitude |
|---|---|---|
| A | 0°22'55.70''N | 32°56'49.31''E |
| B | 0°22'51.01''N | 32°56'50.03''E |
| C | 0°22'50.1''N | 32°56'48.77''E |
| D | 0°22'48.31''N | 32°56'49.92''E |
| F | 0°22'53.58''N | 32°56'58.77''E |
| G | 0°22'56.74''N | 32°56'57.44''E |

The location of SCOUL sugar plant in Uganda from google map is as given below


Commissioning date of the plant is 19/07/2021 as this is the date on which the project starts supplying power to the grid ie., Uganda Electricity Transmission Company Ltd (UETCL). This was checked with the help commissioning certificates and found acceptable. This is same as the project start date as well.

The assessment team confirmed through onsite visit it was observed that the monitoring plan was implemented as per the VCS joint PD& MR /3/ and applied methodology ACM0006, Version 15.0. The organizational role and responsibility as mentioned in the VCS joint PD&MR is followed onsite. Meters, monitoring of diesel tank in the DG set are calibrated as per calibration frequency in VCS joint PD& MR. All the emergency preparedness as mentioned in the registered VCS joint PD& MR is followed onsite and no discrepancies were found regarding the same.

Based on the discussions earlier in section 3.2, it is confirmed that the project has not participated or rejected in other GHG programs and has not sought any other form of environmental credit. Assessment team further confirms that the project has not participate in other environmental credit programs or emissions trading programs that includes GHG allowance trading. A self declaration letter was received from the PP on the above. The assessment team also checked various registries viz., CDM, GS4GG, GCC, REC, iREC websites and found that no projects with the same project title as this project or with the same project proponent was mentioned.

Assessment team concludes the following:

a) There are no material discrepancies between project implementation and the project description provided in the Joint VCS PD & MR.
b) The monitoring plan is implemented completely and monitoring system (i.e., process and schedule for obtaining, recording, compiling and analysing the monitored data and parameters) is appropriate.
c) There are no material discrepancies between the actual monitoring system, and the monitoring plan set out in the project description and the applied methodology.
d) The GHG emission reductions or removals generated by the project have not been included in any emissions trading program or any other mechanism that includes GHG allowance trading.
e) The project has not received or sought any other form of environmental credit, or has become eligible to do so since validation or previous verification.
f) The project is registered under VCS only,However, PP has submitted the declaration stating, they will not claim same GHG emission reductions of the project from any other GHG program for the current monitoring period when project is seeking to get GHG emission reduction from VCS. Audit team also checked the REC mechanism which was verified from the REC website Renewable Energy Certificate Registry of India (Renewable Energy Certificate Registry of INDIA - Registered RE Generator List (recregistryindia.nic.in))
g) The project activity complies with indicators for sustainable development in which SDG indicator taken by PP are;
    - **7.1.2 i.e. (Proportion of population with primary reliance on clean fuels and technology)**-So far52,788.24 MWh renewable electricity has been supplied to Ugandana grid that helps to increase the renewable energy share in the energy mix.
    - **8.6.1(Proportion of youth (aged 15-24 years) not in education, employment and training)-**
      PP has appointed 155 indigenous persons to manage project activity, thus increasing employment.
      PP has also provided skilled training to 120 persons in order to enhance their technical and management skills. This was achieved through a single training program during the present monitoring period.
    - **13.0 i.e. (Total greenhouse gas emissions avoided or removed)**- By supplying 52,788.24MWh of clean electricity to Ugandan grid, the project avoided release of 7,221 $tCO_2e$ in to the atmosphere during the reporting period.

In view of the information's as verified above the assessment team is able to conclude that the project has been implemented as described in the project description, All the above stated information was verified by VVB during onsite visit and onsite personnel interviews.

The project activity comprises WTG's by Gamesa India Limited G 97
Technical details for Gamesa G 97

| | | |
|---|---|---|
| 1. | Main Data | |
| | Rated Power | 2000 kW |
| | Rotor Diameter | 97 m |
| | Hub height (including foundation) | Approximately 78.5 m |
| | Rotational Speed | 9.6 to 17.8 rpm |
| 2. | Rotor | |
| | Swept area | 7,390m2 |
| | Rotor Orientation | Upwind |
| | Material | fibre glass pre impregnated with epoxy resin + carbon fibre |
| 3. | Gear Box | |
| | Type of Gear Box housing | One planetary stage / Two parallel shaft stages |
| | Ratio | 1: 106.8 |
| 4. | Generator System | |
| | Generator type | Double Fed Generator |
| | Power factor | 0.95 CAP- 0.95 IND |
| | Rated voltage | 690 V AC (phase to phase) |
| | Frequency | 50 Hz |
| 5. | Tower | |
| | Tower Height | 120 m |

The assessment team confirmed through onsite visit/17/ it was observed that the monitoring plan was implemented as per the registered VCS joint PD& MR /3/ and applied methodology ACM0002, Version 16.0/7/. The organizational role and responsibility as mentioned in the registered VCS joint PD& MR /3/ is followed onsite. Meters are calibrated as per calibration frequency in registered VCS joint PD& MR/3/. All the emergency preparedness as mentioned in the registered VCS joint PD& MR is followed onsite and no discrepancies were found regarding the same.
Assessment team concludes the following:

h) There are no material discrepancies between project implementation and the project description provided in the registered Joint VCS PD & MR /3/.
i) The monitoring plan is implemented completely and monitoring system (i.e., process and schedule for obtaining, recording, compiling and analysing the monitored data and parameters) is appropriate.
j) There are no material discrepancies between the actual monitoring system, and the monitoring plan set out in the project description and the applied methodology/7/.

k) The GHG emission reductions or removals generated by the project have not been included in any emissions trading program or any other mechanism that includes GHG allowance trading/13/.

l) The project has not received or sought any other form of environmental credit, or has become eligible to do so since validation or previous verification/13/

m) The project is registered under VCS only,However, PP has submitted the declaration stating/13/, they will not claim same GHG emission reductions of the project from any other GHG program for the current monitoring period when project is seeking to get GHG emission reduction from VCS. Audit team also checked the REC mechanism which was verified from the REC website Renewable Energy Certificate Registry of India (Renewable Energy Certificate Registry of INDIA - Registered RE Generator List (recregistryindia.nic.in))/25/

n) The project activity complies with indicators for sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India as discussed under section 1.11 of MR. In which SDG indicator taken by PP are;

- **7.2 i.e. (Renewable energy share in the total final energy consumption)**-Overall 77,426.94 MWh renewable electricity has been supplied to Ugandan grid that helps to increase the renewable energy share in the energy mix. As no SDG reporting has been done previously, therefore current and overall project contributions are same.
- **13.0 i.e. (Total greenhouse gas emissions avoided or removed)**- By supplying 52,788MWh of clean electricity to Ugandan, the project avoided release of 7,221 $tCO_2e$ in to the atmosphere during the reporting period.
- . **8.6.1(Proportion of youth (aged 15-24 years) not in education, employment and training)**-

  PP has appointed 155 indigenous persons to manage project activity, thus increasing employment.

  PP has also provided skilled training to 120 persons in order to enhance their technical and management skills. This was achieved through a single training program during the present monitoring period.

In view of the information's as verified above the assessment team is able to conclude that the project has been implemented as described in the project description, All the above stated information was verified by VVB during onsite visit/17/ and onsite personnel interviews /22/.

The data and parameters used to calculate the GHG emission reductions and removals have been listed below:

| Parameters with Default Values (ex-ante parameters): | Values Applied | Units | Description | Source of monitoring data |
|---|---|---|---|---|
| $EF_{diesel}$ | 74.1 | tCO2/TJ | Emission factor of diesel | 2006 IPCC Guidelines for National Greenhouse Gas Inventorieshttps://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf |
| $\rho_{diesel}$ | 0.83 | Kg/Litre | Density of diesel fuel | CO2 Baseline Database for the Indian Power Sector by the Central Electricity Authority, Ministry of Power, Government of India: http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf |
| $NCV_{i,y}$ | 43 | TJ/Gg | Net calorific value of the diesel fuel in year 'y' | 2006 IPCC Guidelines for National Greenhouse Gas Inventories<br>https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf |
| $EL_{PJ,gross,y}$ | 202,800 | MWh | Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year y (MWh) | On Site measurement |
| $EL_{PJ,imp,y}$ | 0 | MWh | Project electricity imports from the grid in year y (MWh) | On Site measurement |
| $EL_{PJ,aux,y}$ | 64.220 | MWh | Total auxiliary electricity consumption required for the operation of the power plants at the | On site measurement |

| | | | | |
|---|---|---|---|---|
| | | | project site in year y (MWh). | |
| $Q_{Diesel}$ | 2.500 | Litre | Quantity of diesel consumption | On Site measurement |
| $EF_{grid,CM,y}$ | 0.1370 | tCO2e/MWh | Combined Margin Emission Factor of the national grid | CDM standardized baseline<br>https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20220811154530340/ASB0054-2022_PSB0058.pdf<br>As per the guidance of linked above, the grid emission factor is applicable for all non solar non wind power projects in Uganda.The same has been updated in the latest version ofJt PD and MR from the initial submission. This was found in line with section 3.1.2 of VCS standard v4.3 |

| Sr. No. | SDG Target | SDG Indicator | Current Project contribution | Verified document |
|---|---|---|---|---|
| 1 | 7.1.2 | 7.1.2 Proportion of population with primary reliance on clean fuels and technology | PP has supplied 52,788.24 MWh renewable energy to the grid between 19/07/2021 to 31/12/2021 (including both the dates). | Energy invoice presented to the utility agencies |
| 2 | 8.6.1 | 8.6,1 Proportion of youth (aged 15-24 years) not in education, employment and training | PP has appointed 155 indigenous people to manage the project activity therefore Increase the employment. | Employment and salary records/20/ |
| 3 | 8.6.1 | 8.6,1 Proportion of youth | PP has provided | Skilled training |

| | | | | |
|---|---|---|---|---|
| | | (aged 15-24 years) not in education, employment and training | skilled training to 120 person increase their technical and management skills. Only one training organized in monitoring period. | records/19/ |

**Parameter(s) monitored ex-post at the time of verification**

<table>
<tr><td>Parameter</td><td colspan="2">$EL_{PJ,gross,y}$ - Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year y (MWh)</td></tr>
<tr><td>Means of verification</td><td colspan="2"><table>
<tr><th>Criteria/Requirements</th><th>Assessment/Observation</th></tr>
<tr><td>Measuring /Reading /Recording frequency</td><td>Aggregated annually while measured on a continuous basis</td></tr>
<tr><td>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)</td><td>Yes. The monitoring period is annual and is as per the monitoring methodology</td></tr>
<tr><td>Monitoring equipment</td><td>Energy Meters installed at Turbo Generator and DG</td></tr>
<tr><td>Value applied</td><td>77,917.77 MWh</td></tr>
<tr><td>How were the values in the monitoring report verified?</td><td>From the energy meter readings installed by the SCOUL and whose accuracy class is 0.5s or higher and the calibration is performed once in 3 years by accredited agency</td></tr>
<tr><td>Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?</td><td>Yes. Daily reading of the energy generation is performed by the QA/QC staff at plant and recorded diligently</td></tr>
</table></td></tr>
<tr><td>Findings</td><td colspan="2">CL #1 raised and closed successfully</td></tr>
<tr><td>Conclusion</td><td colspan="2">The parameter has been monitored appropriately, in accordance with the monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan.</td></tr>
</table>

<table>
<tr><td>Parameter</td><td>$EL_{PJ,imp,y}$ - Project electricity imports from the grid in year y (MWh)</td></tr>
<tr><td>Means of verification</td><td>
<table>
<tr><th>Criteria/Requirements</th><th>Assessment/Observation</th></tr>
<tr><td>Measuring /Reading /Recording frequency</td><td>Aggregated annually while measured on a continuous basis</td></tr>
<tr><td>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)</td><td>Yes. The monitoring frequency is as per the monitoring plan and the applied methodology</td></tr>
<tr><td>Monitoring equipment</td><td>Energy Meters installed by the UETCL of accuracy class 0.5s and higher. Calibrated once in 3 years</td></tr>
<tr><td>Value applied</td><td>994.95</td></tr>
<tr><td>How were the values in the monitoring report verified?</td><td>The daily generation report of the plant and the bills raised by the state utility towards energy consumption</td></tr>
<tr><td>Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?</td><td>Yes. The energy consumption is based on the meters installed by the state utility and the bills are issued by the state utility of Uganda. This is diligently record kept by the PP</td></tr>
</table>
</td></tr>
<tr><td>Findings</td><td>CAR#2 raised and resolved successfully</td></tr>
<tr><td>Conclusion</td><td>The parameter has been monitored appropriately, in accordance with the monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring</td></tr>
</table>

| | |
|---|---|
| | plan. |

| | |
|---|---|
| **Parameter** | $EL_{PJ,aux,y}$ -Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y (MWh). |
| **Means of verification** | |

| Criteria/Requirements | Assessment/Observation |
|---|---|
| Measuring /Reading /Recording frequency | Monitored continuously and aggregated annually |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes and it is as per the approved methodology |
| Monitoring equipment | Calibrated energy meters installed by SCOUL and calibrated once in 3 years of accuracy class 0.5s and above |
| Value applied | 26,123.88 MWh |
| How were the values in the monitoring report verified? | They are monitored continuously and aggregated as per the requirements |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes. The energy consumption is based on the meters installed by the state utility and the bills are issued by the state utility of Uganda. This is diligently record kept by the PP |

| | |
|---|---|
| **Findings** | CAR#3 raised and resolved successfully |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. |

<table>
<tr><td>Parameter</td><td>$Q_{Diesel}$ - Quantity of Diesel consumption</td></tr>
<tr><td>Means of verification</td><td>
<table>
<tr><th>Criteria/Requirements</th><th>Assessment/Observation</th></tr>
<tr><td>Measuring /Reading /Recording frequency</td><td>Recorded Monthly manually</td></tr>
<tr><td>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)</td><td>Yes. The monitoring frequency is as per the approved methodology</td></tr>
<tr><td>Monitoring equipment</td><td>Monitoring monthly by field staff and recorded in the log books</td></tr>
<tr><td>Value applied</td><td>2,780Litres</td></tr>
<tr><td>How were the values in the monitoring report verified?</td><td>The values were checked from the log books where the diesel consumed is recorded on a monthly basis</td></tr>
<tr><td>Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?</td><td>Yes. The diesel consumption is based on the difference between the diesel reading of the scale attached to the diesel tank diligently recorded by the PP</td></tr>
</table>
</td></tr>
<tr><td>Findings</td><td>CL#1 raised and resolved successfully</td></tr>
<tr><td>Conclusion</td><td>The parameter has been monitored appropriately, in accordance with the monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan.</td></tr>
</table>

| Parameter | $EF_{grid,CM,y}$ - Combined Margin Emission Factor of the national grid- tCO2e/MWh |
|---|---|

**Means of verification**

| Criteria/Requirements | Assessment/Observation |
|---|---|
| Measuring /Reading /Recording frequency | NA |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes. This is as per the values given in CDM standardized baseline |
| Monitoring equipment | NA |
| Value applied | 0. 1370 tCO2e/MWh |
| How were the values in the monitoring report verified? | The latest version of the CDM standardized baseline was published on 10/08/2022.<br>https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20220811154530340/ASB0054-2022_PSB0058.pdf<br>As per the guidance, for Uganda for non-solar, non-wind power project, the grid emission factor is 0.1370 tCO2e/MWh. This is applicable till 09/08/2025. The same has been updated in the Jt PD and MR from the initial submission. This was found in line with section 3.1.2 of VCS standard v4.3 |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes. Since this value is taken by the standardised baseline value given by CDM, the QA/QC procedures are found to be acceptable |

| | |
|---|---|
| **Findings** | CL#1 raised and resolved successfully |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. |

The equations for calculation of emission reduction as provided in the Joint PD & MR /01/ and confirmed with the applied methodology ACM 006 Version 15 applicable from 14/12/2020 till 10/03/2022 /06/ have been checked and found to be correct. The values as provided in the Joint PD & MR /01/ have been compared with ER verification sheet /02/. Moreover, the formulae applied in the ER spreadsheet /02/ were also reviewed and found to be consistent with the applied methodology. The verification team confirms that all parameters are used correctly in the calculations, all results are verifiable and transparent, all assumptions are described and based on verifiable evidence and calculations are done in accordance with the formulae laid out in the applied methodology ACM0006 Version 15 /06/ and requirements of the monitoring plan.

The total number of emission reductions for the monitoring period from 19/07/2021 to 31/12/2021 is 7,221 $tCO_2e$. The calculation of emission was checked in ER sheet and found to be correct, hence accepted.

| Year | Baseline emissions or removals ($tCO_2e$) | Project emissions or removals ($tCO_2e$) | Net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|
| 19/07/2021-31/12/2021 | 7,231 | 10 | 7,221 |
| **Total** | **7,231** | **10** | **7,221** |

## 4.2 Accuracy of GHG Emission Reduction and Removal Calculations

**Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in PD:**

Based on review of ER sheet/2/, the comparison between actual GHG emission reductions with estimated in PD is done

| Period | No of days | Estimated emission reduction (tCO2e) | Actual Emission Reduction considering leakage (tCO2e) |
|---|---|---|---|
| 19/07/2021-31/12/2021 | 166 | 8,578 | 7,221 |

There is around 18.79% lesser emission reduction achieved during the current monitoring period as compared to the projected ERs of equivalent period because project was under implantation during the monitoring period.

## 4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

The quality of supporting documents that are provided by the PP as evidence is adequate. Plant, records/40//41//44/, Fuel Records/47/,are provided, which tallies with the data provided in the ER verification spreadsheet /2/.

Competent employees are recruited for the management and operation of the project. The quality of supporting evidences submitted to VVB for verification is adequate and found to be verifiable. Employment details and Skill development details/46/ were checked by the assessment team to confirm the authenticity of the documents and to check the correctness of the calculations. The verification team for the records and future reference also obtains copies of these documents. The detailed information flow with the roles and responsibilities of the individuals and the monitoring system have been discussed and found to be appropriate.

Based on the above, the assessment team confirms the sufficiency and appropriateness of the quality of evidence provided by the PP to determine the GHG reductions and further deems them to be acceptable.

# 5 VALIDATION AND VERIFICATIONCONCLUSION

M/s LGAI Technological Center, S.A. (also referred to as Applus+ Certification), contracted by M/s Enen Green Services Private Limited, to perform a joint validation and verification of the VCS project activity “Biomass Cogeneration Plant by SCOUL”.

The joint validation and verification process were performed on the basis of all guidance and criteria as provided in VCS Standard (version 4.3), VCS Program Guide (version 4.2)and Registration & Issuance Process (version 4.2) /4/.

The conclusions of validation and verification process can be individually summarized as follows:

**Validation Conclusion:**

The project activity provides the information in Joint PD & MR /01/ as required by VCS Standard, version 4.3 /4/ and in Applus+ Certification's opinion meets the requirements of the applied baseline and monitoring methodology, ACM0006, Version15 /06/. The validity of Methodology version 15 is valid from 14/12/2020 till 10/03/2022.The validation has been performed using a risk-based approach, as described above. The expected emission reductions from the project activity during the crediting period will be188,610 tCO2e.

Applus+ Certification concludes the validation with a positive opinion and confirms that the VCS Project Activity "Biomass Cogeneration Plant by SCOUL", as described in the Joint PD & MR /1/ meets all applicable VCS requirements, including those specified in the CDM Project Standard /4/, relevant methodologies, tools and guidelines.

The selected baseline and monitoring methodology ACM0006, Version 15valid from 14/12/2020 till 10/03/2022/06/ is applicable to the project and correctly applied. Applus+ Certification therefore requests the registration of the project as a VCS project activity.

**Verification Conclusion:**

Applus+ Certification verification approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. Applus+ Certification planned and performed the verification by obtaining evidence and other information and explanations that Applus+ Certification considered necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG reported for the project activity for the period 19/07/2021 to 31/12/2021 (including both the dates) are fairly stated in the joint PD and MR/01/. The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology and the VCS standard.

Verification period: From 19/07/2021 to 31/12/2021 (including both the dates). Verified GHG emission reductions and removals in the above verification period:

| Year | Baseline emissions or removals (tCO2e) | Project emissions or removals (tCO2e) | Leakage emissions (tCO2e) | Net GHG emission reductions or removals (tCO2e) |
|---|---|---|---|---|
| 19/07/2021 to 31/12/2021 (including both the dates) | 7,231 | 10 | 0 | 7,221 |
| **Total** | 7,231 | 10 | **0** | 7,221 |

# APPENDIX 1: DOCUMENT REFERENCES

| S. No | Title of Document | Version | Date |
|---|---|---|---|
| 1. | i.Jt PD and MR<br>ii.Jt PD and MR | V1.1<br>V2.1 | 25/07/2022<br>29/09/2022 |
| 2. | i. IRR<br>ii. IRR | V1<br>V2 | 25/07/2022<br>29/09/2022 |
| 3. | Emission Reductions sheet | V1.1<br>V2.1 | 25/07/2022<br>29/09/2022 |
| 4. | VCS Program Guide | V4.2 | 22/06/2022 |
| 5. | VCS Standard | V4.3 | 22/06/2022 |
| 6. | Program definitions | V4.2 | 22/06/2022 |
| 7. | Registration and issuance process | V4.1 | 20/01/2022 |
| 8. | CDM project standard | | |
| 9. | Physical Site Visit | | 21/06/2022 to 22/06/2022 |
| 10. | ACM0006 | V15.0.0 | 14/12/2020 till 10/03/2022 |
| 11. | Tool to calculate the emission factor for an electricity system | V7.0 | - |
| 12. | Combined tool to identify the baseline scenario and demonstrate additionality | V7.0 | - |
| 13. | Tool 27 Investment analysis is used to demonstrate financial additionality | | - |
| 14. | Project Location - Coordinates, Map | - | - |
| 15. | Feasibility Study Report | | - |
| 16. | Certificate of approval EIA for 26MW Co-gen Power Plant | | - |
| 17. | Certificate of approval of EIA for the proposed 33KV power evacuation line (7km) | | - |
| 18. | EIA Report for 26MW Co-Gen | | - |
| 19. | Local Authority Approval | | - |
| 20. | 25MW TURBINE CONTRACT COMMERCIAL SHIN NIPPON | V1.0 | 18/04/2019 |
| 21. | Boiler Purchase Contract ISGEC - ON TURNKEY BASIS | V1.0 | 19/04/2019 |
| 22. | Construction Starting date evidence | | - |
| 23. | EVACUATION OF SCOUL COGENERATION (15MVA)001 | | - |
| 24. | Grid Connection Permission | | - |
| 25. | NOC For Intended Application from ERA | | - |
| 26. | PPA (Final Agreement) | V1.0 | 05/12/2018 |
| 27. | UIA Investment License | | - |

| | | | |
|---|---|---|---|
| 28. | 25MW TURBINE CONTRACT TECHNICAL SHIN NIPPON & SHIN THERMO | | - |
| 29. | SCOUL TECHNICAL DOC. FOR 25MW COGEN. | | - |
| 30. | 25MW co-generation plant commissioning protocol | | - |
| 31. . | COMMERCIAL OPERATIONS DATE LETTER - 5th AUG 2021 (1) | | 05/08/2021 |
| 32. | Employment Details | | - |
| 33. | Power Generation Report | | - |
| 34. | Conv Trafo EM Test report | | 06/06/2020 |
| 35. | DistTrafo 1 EM Test report | | 06/06/2020 |
| 36. | DistTrafo 2 EM Test Reports | | 06/06/2020 |
| 37. | ICOG Energymeter Test Report | | 06/06/2020 |
| 38. | Sugar Feeder EM Test Report | | 06/06/2020 |
| 39. | IIR-10.588-BS | | 07/09/2020 |
| 40. | i. Energy Bill for the month of July-21<br>ii. Energy bill for the month of August-21<br>iii. Energy bill for the month of September-21<br>iv. Energy bill for the month of October-21<br>v. Energy bill for the month of November-21<br>vi. Energy bill for the month of December-21 | - | 19/07/2021 to 31/12/2021 |
| 41. | 30MW TG Efficiency Calculation | | - |
| 42. | Cdm.unfccc.int | | - |
| 43. | Verra.org | | - |
| 44. | Goldstandards.org | | - |
| 45. | Undertaking regarding double counting | | - |
| 46. | Complaint Feedback register | | - |
| 47. | Stock register log book | | - |
| 48. | Material entry and exit log book | | - |
| 49. | Biomass availability report | | - |
| 50. | i. SGS REPORT BAGASS 21-12-2021<br>ii. SGS REPORT BAGASS 28-07-2021 | | 19/07/2021 to 31/12/2021 |
| 51. | Biomass Stock Register | | 19/07/2021 to 31/12/2021 |
| 52. | Survey Reports on biomass usage | | 19/07/2021 to 31/12/2021 |
| 53. | Employment Details<br>Skill Development Training Details | | - |

| | | | |
|---|---|---|---|
| 54. | Fuel records | | 19/07/2021 to 31/12/2021 |

# APPENDIX 2: ABBREVIATIONS

| Abbreviations | Full texts |
|---|---|
| CAR | Corrective Action Request |
| CDM | Clean Development Mechanism |
| CDM PCP | Clean Development Mechanism Project Cycle Procedure |
| CDM PS | Clean Development Mechanism Project Standard |
| CDM VVS | Clean Development Mechanism Validation and Verification Standard |
| EB | Executive Board |
| ER | Emission Reductions |
| CER | Certified Emission Reduction |
| CR | Clarification Request |
| DOE | Designated Operational Entity |
| DNA | Designated National Authority |
| FAR | Forward Action Request |
| GHG | Greenhouse Gas(es) |
| IPCC | Intergovernmental Panel on Climate Change |
| MCR | Monthly Credit Reports |
| MP | Monitoring Plan |
| MR | Monitoring Report |
| MWh | Megawatt hour |
| PD | Project Description |
| PP | Project Proponent |
| PS | Project Standard |
| TR | Technical Review |
| UNFCCC | United Nations Framework Convention on Climate Change |
| VVS | Validation and Verification Standard |

# APPENDIX 3: Findings Overview

| CAR | CL | FAR |
|---|---|---|
| 04 | 01 | 00 |

Table 1. Remaining FAR from validation and/or previous verification

| ~~FAR ID~~ | | ~~Section no.~~ | | ~~Date :~~ |
|---|---|---|---|---|
| ~~Description of FAR~~ | | | | |
| ~~There is no FAR from the validation of the project activity.~~ | | | | |
| ~~Project participant response~~ | | | | ~~Date :~~ |
| ~~NA~~ | | | | |
| ~~Documentation provided by project participant~~ | | | | |
| ~~NA~~ | | | | |
| ~~DOE assessment~~ | | | | ~~Date:~~ |
| ~~NA~~ | | | | |

Table 2. CL from this verification

| CL ID | 01 | Section no. | ER Sheet | Date :18/07/2022 |
|---|---|---|---|---|
| Description of CL | | | | |
| The ER sheet has provided the grid emission factor of NWWNE grid. Please justify the same and how it is relevant for the present project activity | | | | |
| Project participant response | | | | Date : 19/08/2022 |
| PP has updated an ER sheet. | | | | |

| Documentation provided by project participant | |
|---|---|
| Revised ER sheet version 2 | |
| **DOE assessment** | **Date: 25/08/2022** |
| The revised ER was checked and the required corrections has been incorporated | |

**Table 3. CAR from this verification**

| CAR ID | 01 | Section no. | | Date : 18/07/2022 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| PP is requested to clarify the following points identified in the report<br>i. The joint PD and MR report is not as per the latest template guidance v4.1updated by Verra on 22/02/2022<br>ii. The PP is requested to use consistent formatting throughout the report<br>iii. The PP is requested to use DD/MM/YYYY notations while denoting date as per the instructions to fill latest joint PD/MR released by Verra<br>iv. Section 1.17 SDG contributions section are incomplete in the joint PD and MR<br>v. Under section 3.3, as per the guidance document to fill the PD and MR, a project boundary needs to be shown, however no diagram is presented in the report. PP is requested to clarify on the same<br>vi. Data is incomplete provided under section 6.1 of the joint PD and MR. PD is requested to fill all sections of the report.<br>vii. Sources under Appendix 1 of the project report is not filled. | | | | |
| **Project participant response** | | | | **Date : 19/08/2022** |
| i. PP has updated joint PD & MR template in latest template version 4.1.<br>ii. PP has updated the formatting of report<br>iii. PP has updated date notations as per DD/MM/YYYY.<br>iv. PP has included SDG co-benefits details in section 1.17 and supportings included in Appendix 2.<br>v. PP has updated joint PD & MR section 6.1 with relevant information.<br>vi. PP has updated Appendix 1. | | | | |
| **Documentation provided by project participant** | | | | |
| Revised Joint PD and MR version 2 | | | | |
| **DOE assessment** | | | | **Date: 25/08/2022** |

| | |
|---|---|
| i. | The Joint PD and MR are now as per the latest template version 4.1. Hence closed |
| ii. | The formatting of the report has been updated as per the comments raised in the Jt PD and MR. Hence closed |
| iii. | The date notations are now throughout in the format of DD/MM/YYYY. Hence closed |
| iv. | The appendix 2 of the report was checked and the SDG contribution documents was also checked. They are now in line with the guidance document to fill the Jt PD and MR |
| v. | Section 6.1 is now updated with relevant details and supporting evidences. Hence closed |
| vi. | Appendix 1 is now updated with the calibration details of the energy meters. Hence closed |

| **CAR ID** | 02 | **Section no.** | | **Date :18/07/2022** |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| i. As per the template to fill the joint PD and MR, equipment used in baseline, average age of the equipment and lifetime of equipment is not mentioned in section 1.11. PD is requested to complete this section as per the guidance document to fill PD and MR released by Verra<br>ii. Under section 1.13 of the joint PD and MR, the PD does not mention conditions which existed prior to the project activity and how the present project activity was not implemented to destroy additional emissions by the project activity.<br>iii. Under section 1.18, PD claims that unused biomass residues are left to decay under aerobic conditions. PD is requested to clarify how this was ensured<br>iv. Leakage emissions under section 1.18 is not mentioned as per section 8 of the tool. PD is requested to explain the same | | | | |
| **Project participant response** | | | | **Date : 19/08/2022** |
| i. As per template requirement PP has included life span of boiler and turbine under section 1.11 of PD.<br>ii. PP has updated section 1.13 as per guidance.<br>iii. PP has updated section 1.18, as there is no local market of bagasse which is waste product of PP sugar plant, it was dumped openly and left for decay. It was not treated in baseline situation.<br>iv. PP has updated section 1.18 that as per para 52 e of Tool 16. | | | | |
| **Documentation provided by project participant** | | | | |
| Revised joint PD & MR version 2 | | | | |
| **DOE assessment** | | | | **Date: 25/08/2022** |

| |
|---|
| i. The age of boiler and turbine is now updated and evidences submitted. Hence closed<br>ii. The section 1.13 of the Jt PD and MR is now updated with the prior conditions with evidences and elaboration in line with the methodology and tool. The establishment of the alternative baseline is now complete. Hence closed<br>iii. Since the excess biomass are spread throughout the boundary of SCOUL in open, anerobic conditions does not set in. Hence closed<br>iv. Leakage emissions are now in line with tool 16. Hence closed |

| CAR ID | 03 | Section no. | | Date :18/07/2022 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| i. Under section 3.2 of applicability conditions, it is stated that under emergency conditions fossil fuels are used. PD is requested to submit the records if any when fossil fuels were used. PD is also requested to state the data collection system available when fossil fuels are used under emergency situations<br>ii. Production capacity in baseline and project scenario are to be provided to cross check the claims that excess emissions are not claimed due to higher production under project activity scenario<br>iii. Under section 3.4, the PD is requested to elaborate P1,H1,B1 and how it is consistent with para 27 of the applied methodology<br>iv. The PD is requested to clarify why para 2(a) and 2(b) of the "Combined tool to identify the baseline scenario and demonstrate additionality" was not used while finalising the alternative scenario under the baseline in section 3.4<br>v. The PD mentions under section 3.4 states,"review of the policies concerning these industries indicates that these sectors are governed at a country level and hence varies considerably throughout Uganda". The PD is requested to clarify if sugar industries are governed at country level, how does the policies vary considerably throughout Uganda. Further, does Uganda have additional provincial level approvals/permits to operate? | | | | |
| **Project participant response** | | | | **Date :19/08/2022** |
| i. Under emergency condition DG sets is using by PP , same details has been included in section 3.2 and included under project emissions as well.<br>ii. PP has shared production capacity details with assessment team.<br>iii. PP has updated section 3.4 as per para 27 of the methodology.<br>iv. PP did additionality assessment in section 3.5 and did assessment as per para 2a and 2b there. Section 3.4 is for baseline scenario therefore PP only did alternative baseline scenario assessment in section 3.4.<br>v. PP would like to confirm that PP has taken all government approval for project operation and shared same with assessment team. At country level there is no mandatory requirement by government to commission biomass based cogeneration plant. | | | | |
| **Documentation provided by project participant** | | | | |
| Revised joint PD & MR version 2 | | | | |
| **DOE assessment** | | | | **Date: 25/08/2022** |

| | |
|---|---|
| i. | PP has provided the usage of diesel under emergency situations which forms the project emissions. This is a monitoring parameter and fuel records are provided. Hence closed |
| ii. | The baseline plant's production capacity is now shared which proves that the project scenario is not overclaiming ERs with increased capacity of the boiler. Hence closed |
| iii. | The P1,H1 and B1 scenarios are now presented coherently and in line with the methodology in the Jt PD and MR. Hence proved |
| iv. | The additionality assessment is in line with para 2a and 2b and mentioned appropriately. Hence closed |
| v. | PP has provided suitable documents with reference to geographical boundaries with reference to the legal requirements to consider the project as first of its kind. From the evidences given by the PP it is clear that biomass based power plants are not mandatory and the geographical boundary for consideration of legality is entire Uganda and there is no provincial government approvals required. Hence closed |

| **CAR ID** | 04 | **Section no.** | | **Date :**18/07/2022 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| The PD is requested to provide documents related to the list of sugar mills used under common practice analysis under section 3.5 of the joint PD and MR. Also PD is requested further to fill all columns given in the table in page 37. | | | | |
| **Project participant response** | | | | **Date : 19/08/2022** |
| PP has shared all supporting documents of additionality and common practice analysis with assessment team. | | | | |
| **Documentation provided by project participant** | | | | |
| Supporting documents of additionality and common practice analysis. | | | | |
| **DOE assessment** | | | | **Date: 25/08/2022** |
| The assessment team confirms the supporting documents with respect to additionality and common practice analysis. Hence closed | | | | |

**Table 4. FAR from this validation**

| **FAR ID** | XX | **Section No.** | XX | **Date :** |
|---|---|---|---|---|
| **Description of FAR** | | | | |
| NA | | | | |

| **Project participant response** | **Date :** DD/MM/YYYY |
|---|---|
| *NA* | |
| **Documentation provided by project participant** | |
| *NA* | |
| **DOE assessment** | **Date:** DD/MM/YYYY |
| NA | |

# APPENDIX 4: Competency Statements

According to the sectoral scope / technical area and experience in the sectoral or national business environment, Applus+ Certification has composed a project assessment team in accordance with the appointment rules in the internal Quality Management System of Applus+ Certification.

The composition of audit team shall be approved by the Applus+ Certification ensuring that the required skills are covered by the team.

The four qualification levels for team members that are assigned by formal appointment rules are as presented below:

- Lead Auditor (LA).
- Auditor (A) / Auditor in Training (AiT).
- Technical Expert (TE).
- Technical Reviewer (TR).

The sectoral scope / technical area knowledge linked to the applied methodology/ies shall be covered by the assessment team.

| Name | Qualification | Coverage of scope | Coverage of technical Area | Financial aspect | Host country Experience | Attendance to the Assessment (on-site) |
|---|---|---|---|---|---|---|
| Vivek Kumar Ahirwar | Lead Auditor (LA) | Yes (3) | Yes (3.1) | N/A | Yes | Yes |
| Vivek Kumar Ahirwar | Technical Expert (TE) | Yes (3) | Yes (3.1) | N/A | Yes | Yes |
| Simon Shen | Technical Reviewer (TR) | Yes (3) | Yes (3.1) | N/A | N/A | N/A |

The curricula vitae of the DOE's team members are provided below:

**Vivek Kumar Ahirwar** is a BEE-Certified Energy Auditor by Govt of India with over eight years of relevant experience in energy efficiency, energy audit, thermal and electrical energy generation technology from renewable source and energy conservation in energy intensive industries, designated consumers and commercial buildings, implementation of energy conservation building codes, research, process and green building projects. He is a certified lead auditor for ISO 14001 EMS and 14064. He has experience under various categories of projects stating from renewable to waste to supercritical projects and WCD. He has successfully audited more than 100 GHG (CDM/VCS/GS) projects in different states across the India. He has done Mater in Technology (Energy Management) from a premier

institute, School of Energy & Environmental Studies, DAVV, Indore (M.P.), India and Bachelor of Engineering (Mechanical Engineering) from Govt. Engineering college, Rewa, RGPV, India.

**Simon Shen** (master degree in thermal energy engineering, bachelor degree in environmental engineering) is a lead auditor appointed by Applus+ certification for the GHG project assessment. He is based in Shanghai. He has several years of work experience in environmental protection field. Before he joined Applus+ certification, he had been worked for TÜV SÜD as a GHG validator/verifier and ISO 9001/14001 lead auditor for 3.5years.

-000-