HENAN XINXIANG 24MW BIOMASS BASED COGENERATION PROJECT

Document Prepared by Climate Bridge (Shanghai) Ltd.

Project Title	Henan Xinxiang 24MW Biomass based Cogeneration Project
Version	1.1
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Date of Issue	13-Oct-2021
Project ID	VCS 1140
Monitoring Period	01-Jan-2018 to 31-Jul-2021 (both days included)
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CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Henan Xinxiang 24MW Biomass based Cogeneration Project (hereafter, the project) is located in Huixian County of Xinxiang City, Henan Province, China, and was implemented by Xinxiang Tianjie Bio-Power Generation Co., Ltd.

The project scenario is: the installation of 2*12MW cogeneration plants based on biomass residues; the generation of electricity with 126,709 MWh/yr supplied into Central China Power Grid (hereinafter as CCPG); the generation of heat with 909,200GJ/yr; and the utilization of biomass residues for cogeneration of power and heat. The project doesn't claim the emission reductions due to displacement of heat, therefore, this project will achieve GHG emissions reduction by displacing the equivalent electricity generated by CCPG with biomass residues fired cogeneration plant which has lower CO_2 emission. In addition, CH_4 emissions will be reduced by avoiding dumping of biomass residues. As a result, the project is estimated to achieve 123,858 tCO_2e emission reductions annually in the 1st crediting period. And the estimated annual emission reductions in the 2nd crediting period is 55,874 tCO_2e.

The project started construction in June of 2008, the operation of the first turbine-generator was started on 28-Oct-2009 and the operation of the second turbine-generator was started on 17-Jan-2011. The project has been registered as a CDM project on 11-Jul-2011, the original registered PDD (version 09, dated 28-Feb-2011) has been revised on 05-Mar-2013 and approved on 24-May-2013. The project has been registered as a VCS project (VCS ID 1140) based on the current registered CDM PDD (version 10, dated 05- Mar-2013) on 11-Sep-2013, and the first monitoring report from 28-Oct-2009 to 10-Jul-2011 has been verified by TÜV Rheinland (China) Ltd. on 11-Sep-2013. The second VCS monitoring report from 01-Jan-2013 to 31-Dec-2017 has been submitted to Verra for review. The renewed VCS PD for the 2nd crediting period will be submitted with this monitoring report simultaneously. And these reports are used as basic documents for this verification.

During current monitoring period (from 01-Jan-2018 to 31-Jul-2021), the project has achieved emission reductions of 309,352 tCO_2e.

1.2 Sectoral Scope and Project Type

Sectoral scope: 1. Energy (renewable/non-renewable);

Project type: Biomass power generation project;

The project is not a grouped project.

1.3 Project Proponent

Organization name	Xinxiang Tianjie Bio-Power Generation Co., Ltd.
Contact person	Qingjie Wang
Title	Project manager
Address	Huangli Village, Wucun Town, Huixian City, Henan Province, China
Telephone	+86 21 2301 9950
Email	3542346576@qq.com

1.4 Other Entities Involved in the Project

Organization name	Climate Bridge (Shanghai) Ltd.
Role in the Project	Consultancy
Contact person	Zhiwen Gao
Title	General Manager
Address	Block B, Level 24, Jiangong Mansion, 33 Fushan Road, Pudong New District, Shanghai, 200120
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1.5 Project Start Date

28-Oct-2009 (Project operation date)

1.6 Project Crediting Period

There is a deviation for the crediting period. The project is registered under VCS standard Version 3.3 and completed validation before 19-Mar-2020. thus, as per VCS standard 4.1, registered projects and projects that complete validation on or before 19-Mar-2020 remain eligible to apply the crediting period requirements under VCS standard Version 3.3 which shall be a maximum of ten years and may be renewed at most twice. However, the project is also registered as a CDM project (UNFCCC Ref. 3054) and the crediting period under CDM is 21 years (7*3 renewable), therefore the total length of VCS crediting period should be no more than 21 years which is from 28-Oct-2009 to 27-Oct-2030 and the project is not eligible for VCU issuance beyond 27-Oct-2030. And the first renewable crediting period of the project have been updated to 28-Oct-2009 to 27-

Oct-2019. The second renewable crediting period of the project have been updated to 28-Oct-2019 to 27-Oct-2029. This monitoring period involves both the first and second crediting period.

1.7 Project Location

The proposed project activity is located in Huangli Village, Wucun Town, Huixian County, Xinxiang City, Henan Province of China. The center of the plant has geographical coordinates of 113° 30′40″ east longitude and 35° 19′50″ north latitude.

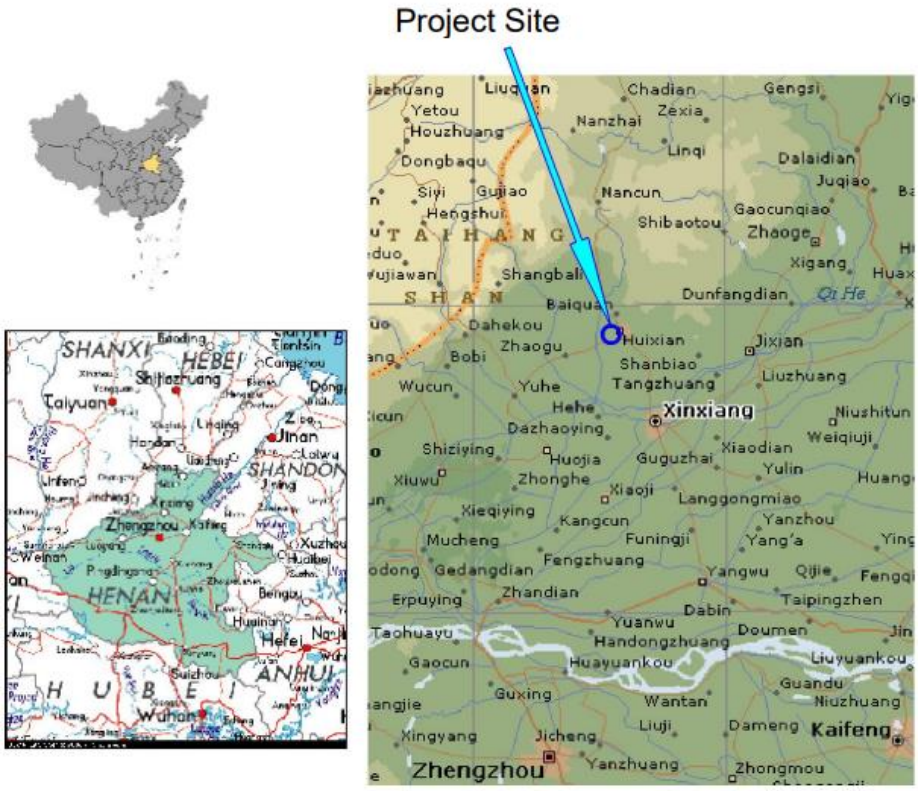


Figure 1 Location of the project

1.8 Title and Reference of Methodology

Following approved baseline & monitoring methodology is applied;

Approved consolidated baseline and monitoring methodology ACM0006: Consolidated methodology for electricity generation from biomass residues in power and heat plants, Version 10 and 15.0[1];

Methodologies and tools which the approved methodology draws upon:

[1] The ACM0006 version 10 and 15.0 are respectively applied in the first and second crediting period.

Approved consolidated baseline and monitoring methodology ACM0002: Consolidated methodology for grid-connected electricity generation from renewable resources, Version 11[2];

Tool 02: Combined tool to identify the baseline scenario and demonstrate additionality, Version 02.2 and Version 07.0[3];

Tool 03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, Version 02 and Version 03.0[4];.

Tool 05: Tool to calculate baseline, project and/or leakage emissions from electricity consumption, Version 01 and Version 03.0[5];

Tool 07: Tool to calculate the emission factor for an electricity system, Version 02 and Version 07.0[6].

Tool 12: Project and leakage emissions from transportation of freight, Version 01.1.0[7];

For more information regarding the methodology, please refer to the link:

https://cdm.unfccc.int/methodologies/PAmethodologies/approved

1.9 Participation under other GHG Programs

The project has been registered as a Clean Development Mechanism (CDM) project in UNFCCC on 11-Jul-2011 (UNFCCC Ref. 3054), with the renewable 7 years crediting period started from 11-Jul-2011. Total GHG emission reductions of 186,473 tCO_2 generated from 11-Jul-2011 to 31-Dec-2012 (both first and last days included) by the project has been issued as CER under CDM program. Please refer to the following link for details.

https://cdm.unfccc.int/Projects/DB/RWTUV1256116990.83/view

The project has been registered as a VCS project (VCS ID 1140) on 11-Sep-2013, Total GHG emission reductions of 153,838 tCO_2 generated from 28-Oct-2009 to 10-Jul-2011 (both first and last days included) by the project has been issued as VCU under VCS program. Please refer to the following link for details.

https://registry.verra.org/app/projectDetail/VCS/1140

[2] ACM0002 version 11 is applied in the first crediting period.

[3] The tool 02 version 02.2 and version 07.0 are respectively applied in the first and second crediting period.

[4] The tool 03 version 02 and version 03.0 are respectively applied in the first and second crediting period.

[5] The tool 05 version 01 and Version 03.0 is respectively applied in the first and second crediting period.

[6] The tool 07 version 02.2 and version 07.0 are respectively applied in the first and second crediting period.

[7] The tool 12 version 01.1.00 is only applied in the second crediting period.

1.10 Other Forms of Credit

Emission Trading Programs and Other Binding Limits

China has a national emissions trading scheme only cover the high-emission industries, such as thermal power generation, petrochemical, chemical, building materials, iron and steel, non-ferrous, paper, aviation and other key emission industries that emitted at least 26,000 tons of CO_2e/year, not including renewable project[8]. And the project activity is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner according to the enforced company list[9] in public information. Hence, it is confirmed that the emission reductions will not be double counted.

The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading.

Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit, including renewable energy certificates, during this monitoring period.

1.11 Sustainable Development

The contributions of this project to sustainable development of the host country and project site are summarized as follows:

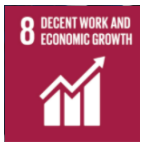
During this monitoring period, 453,652.270 MWh of electricity from renewable sources has been supplied to the power grid. Thus, the project achieved SDG 7 Affordable and Clean Energy[10].

[8] http://www.mee.gov.cn/xxgk2018/xxgk/xxgk05/202103/t20210330_826728.html

[9] http://mee.gov.cn/xxgk2018/xxgk/xxgk03/202012/W020201230736907682380.pdf

[10] https://sdgs.un.org/goals/goal7

The project has achieved a GHG emission reduction of 309,352 tCO_2e during this monitoring period. Thus, the project achieved SDG 13 Climate Action[11].



This project increases income of local farmers and accelerate economy development in rural areas through purchase of agricultural stalks. It also reduces environmental pollution from dumping of biomass residues; During construction and operation of this project, direct and indirect employment opportunities are generated. Thus, the project achieved SDG 8 Decent Work and Economic Growth[12].

2 SAFEGUARDS

2.1 No Net Harm

There are no negative environmental and/or socio-economic impacts due to the project. During this monitoring period, the project as a clean renewable energy project can reduce greenhouse gas emissions and the environmental pollution caused by fossil fuels consumption. Meanwhile, the implementation of the project improved local socio-economic development through creating career opportunities and paying taxes.

2.2 Local Stakeholder Consultation

Local Stakeholder Consultation during the project design stage:

A stakeholders meeting was held by the project owner on 03-Mar-2008 in order to collect the attitude and comments of the stakeholders in local area towards the construction and operation of this project. Before the meeting, the project owner informed the local government about the time and content of the meeting and asked the government to invite representatives of the stakeholders to attend this meeting.

Totally 51 stakeholder representatives participated the meeting, respectively from the local government, surrounding villages (Huangli Village, Xiedian Village, Guandian Village), Huangli Secondary School, and Yanguang Hongtai Bio-product Co., Ltd. (the primary heat consumer). The representatives were selected from different ages, different occupations and different education levels. At this meet, the project owner described this project activity to allow the local stakeholders to understand the project activity

[11] https://sdgs.un.org/goals/goal13

[12] https://sdgs.un.org/goals/goal8

Questionnaire survey: During the survey of stakeholders, the comments from the relevant stakeholders were collected. 51 copies questionnaires were distributed and all of them were collected. The recovery rate is 100%.

In summary, all stakeholders supported the project design and some of the stakeholders pointed out in the questionnaire that the project owner should strengthen the control about smoke, water and noise after this project activity put into production. The project owner has carried out measures in the EIA to reduce impact on the environment and pay attention to the follow-up solution control according to the comment of stakeholders, which solved possible noise pollution the stakeholders considered. Thus, there is no negative comments received during the project preparation stage.

Local Stakeholder Consultation during the project implementation stage:

Communications with Local stakeholders are being carried out at periodic intervals. In this monitoring period, the project owner carried out questionnaire survey for the local stakeholder to collect the relevant comments and suggestions.

Questionnaire was implemented by filling the stakeholder comments investigation. The comments, from the government, environmental protection bureau, local farmers, teachers and other relevant stakeholders, were collected. 30 copies questionnaires were distributed respectively on 25-May-2019, 14-Jul-2021 and all of them were collected. The recovery rate is 100%. There are no negative comments received for the project according to every questionnaire survey.

The basic information about the interviewees in 2019, 2021 is described as following table:

Basic information	Classified items	Person number		Percentage（%）	
	Year	2019	2021	2019	2021
Age	Younger than 30	4	3	13	10
	30-40	11	13	37	43
	41-50	13	12	43	40
	Older than 50	2	2	7	7
Occupation	Officials	3	3	10	10
	Farmers	17	15	57	50
	Workers	5	8	17	27
	Staffs	3	2	10	7
	Others	2	2	6	6
Education	Elementary school and below	5	7	17	23
	Junior middle school	14	16	47	53
	Senior middle school	6	4	20	13
	College and above	5	3	16	11
Gender	Male	20	25	67	83

	Female	10	5	33	17

The questions in the questionnaire including:

Are you familiar with the project?

What is the effect of the project on local employment and social life?

What do you think the influence on the local economic development?

What is the effect of the project on local ecologic environment?

Do you support the construction of the project?

Do you have any suggestions for the project?

Among the total 60 interviewee in 2019 and 2021, 60% persons are familiar with the project totally, 40% know it partly about this project during operation phase. For the impacts on the local employment and social life, 90% think it's positive and 10% think no impact. For the impacts on the local ecologic environment, 50% think it's positive and 50% think no impact. 97% of them think the project have positive impacts on the local economic development, 3% think no impact, none of them think negative. 95% of them think the project has positive impacts on the local environmental development, 5% think no impact, none of them think negative.

In summary, all of them satisfied with the environment maintenance method for the project and there are no negative comments received for the project during this monitoring period. In line with VCS requirements all the processes have been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project construction was commenced on 25-Jun-2008, the operation of the first turbine-generator was started on 28-Oct-2009 and the operation of the second turbine-generator was started on 17-Jan-2011. The project consists of one site only and the implementation is not phased. This project installs two biomass fired boilers of medium temperature and medium pressure with a capacity of 2×75t/h, and the system also includes the 2*12MW medium temperature and medium pressure turbines and generators for power generation resulting in a total Installed capacity of 24MW (2*12MW).

Please see Table 1 below for parameters of the main equipment of the Project.

Table 1 Parameters of the main equipments of the Project[13]

Boiler	
Manufacture: Jinan Boiler Group Co., Ltd.	
Type	YG-75/3.82-T
Quantity	2
Rated evaporative capacity	75t/h
Steam-gas pressure	3.821MPa
Water temperature	150°C
Efficiency	83%
Turbine	
Manufacture: China Changjiang Energy Corp (Group)	
Type	C12-3.43/0.98
Quantity	2
Rated installed capacity	12MW
Inlet pressure	3.43MPa
Inlet temperature	435°C
Rated steam flow	75t/h
Rated revolution	3000r/min
Generator	
Manufacture: China Changjiang Energy Corp (Group)	
Type	QF-15-2
Quantity	2
Rated power	15MW
Rated voltage	6300V
Rated power factor	0.8
Rated revolution	3000r/min

Please refer to Figure 3 in section 4.3 of this report for the technical flow chart of the Project.

During this monitoring period, neither emergencies happened to the monitoring system, nor events or situations occurred, which may impact the applicability of the methodology.

[13] Equipment Purchase Agreements of Xinxiang Tianjie Bio-Power Generation Project.

3.2 Deviations

3.2.1 Methodology Deviations

There is no methodology deviation applied to this monitoring period.

3.2.2 Project Description Deviations

Crediting period

The project is registered under VCS standard Version 3.3 and completed validation before 19-Mar-2020. thus, as per VCS standard 4.1, registered projects and projects that complete validation on or before 19-Mar-2020 remain eligible to apply the crediting period requirements under VCS standard Version 3.3 which shall be a maximum of ten years and may be renewed at most twice. However, the project is also registered as a CDM project (UNFCCC Ref. 3054) and the crediting period under CDM is 21 years (7*3 renewable), therefore the total length of VCS crediting period should be no more than 21 years which is from 28-Oct-2009 to 27-Oct-2030 and the project is not eligible for VCU issuance beyond 27-Oct-2030. And the first renewable crediting period of the project have been updated to 28-Oct-2009 to 27-Oct-2019. The second renewable crediting period of the project have been updated to 28-Oct-2019 to 27-Oct-2029. This monitoring period involves both the first and second crediting period.

Previous monitoring report

There is monitoring plan deviation applied in the last monitoring report, the relevant changes for three monitored parameters are listed as following:

$EG_{projectplant,y}$, net quantity of electricity generated in the project plant during the year y , is the difference between export electricity ($EG_{export,y}$) and import electricity ($EG_{import,y}$) measured by two bi-directional electricity meters M1 (measure meter) and M1' (check meter). On 02-Jun-2015, the local grid company replaced the old meters with two new bi-directional electricity meters with an accuracy of 0.2s and which are installed at supply side of the project site.

$EC_{PJ,y}$, on-site electricity consumption (including the electricity consumption for the mechanical treatment of the biomass in the biomass collection sites and the project site) attributable to the project activity during the year y. Since 10-Mar-2014, this only one stalk collection site has been closed and all biomass is transported directly to the project site. Therefore, M2 installed at the stalk collection sites by power grid company with an accuracy of 1.0s has been dismantled and the electricity consumed by the project activity is 0 from 10-Mar-2014 onward.

$FF_{project\ plant,diessl,y}$, quantity of fossil fuel type i (diesel) combusted in the project plant during the year y, is measured by flow meters (F1) with an accuracy of 0.5. The flow meter F1 has been dismantled on 02-Feb-2013 by the project owner in order to improve efficiency and save the maintenance expense. And for the diesel used in forklifts, the consumption was determined by

the records of diesel purchase and remained, and the measurements were crosschecked by diesel purchase invoice.

And in this monitoring period, for the period from 01-Jan-2018 to 27-Oct-2019 attributed to the 1st crediting period, there are project description deviation for above three monitored parameters based on the registered PDD and which are in line with the revised monitoring plan of the last monitoring report.

For the other period from 28-Oct-2019 to 31-Jul2021 attributed to the 2nd crediting period, there is no deviation happened based on the renewable VCS PD.

As described before, the change of deviation does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario.

3.3 Grouped Projects

The Project is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

The baseline gird emission factor $EF_{grid,CM,y}$ is obtained directly from the official source *Notification on Determining Baseline Emission Factor of China's Grid* by China's DNA. Thus, the relevant basis parameters for calculation of $EF_{grid,CM,y}$ are not described in detail here. With consideration of the fact of the project, data and parameters that are available at validation are summarized in below tables.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2e/MWh
Description	CO_2 emission factor for the electricity displaced due to the project during the year y (1st crediting period) The baseline grid emission factor (2nd crediting period)
Source of data	The registered PDD (1st crediting period) 2019 Baseline Emission Factors for Regional Power Grids (2nd crediting period)
Value applied	0.9735 (1st crediting period) 0.4287 (2nd crediting period)

Justification of choice of data or description of measurement methods and procedures applied	As per the registered PDD (1st crediting period) As per the requirements in "Tool to calculate the emission factor for an electricity system version 07.0" (2nd crediting period)
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	GWP_{CH4}
Data unit	t CO_2e/t CH_4
Description	Global warming potential of CH_4
Source of data	IPCC
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	Default value of 28 from IPCC Fifth Assessment Report (AR5). Shall be updated according to any future VERRA decisions.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{km,CO2}$ (1st crediting period) $EF_{CO2,f}$ (2nd crediting period)
Data unit	g CO_2e/t km
Description	Average CO2 emission factor for the trucks during the year y (1st crediting period) Default CO_2 emission factor for freight transportation activity f (2nd crediting period)
Source of data	The registered PDD (1st crediting period) "TOOL12: Project and leakage emissions from transportation of freight version 1.1.0" (2nd crediting period)
Value applied	1097 (1st crediting period) 245 (2nd crediting period)

Justification of choice of data or description of measurement methods and procedures applied	According to registered PDD, the value used for 1st crediting period is IPCC default value for the US heavy Duty Diesel Vehicle in uncontrolled condition (the highest emission level) which is conservative. For 2nd crediting period, "TOOL12: Project and leakage emissions from transportation of freight version 1.1.0" is used according to the methodology ACM0006 version 15.0, and the default value of emission factors for Light vehicles and Heavy vehicles are 245 (g CO_2e/t km) and 129 (g CO_2e/t km) respectively based on Tool 12. For conservativeness, project proponents use 245 (g CO_2e/t km) for $PE_{TR,y}$ calculations, no matter the freights are transported by Light vehicles or Heavy vehicles.
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	$NCV_k \cdot EF_{burning,CH4,k,y}$ (1st crediting period) $NCV_{BR,n,y} \cdot EF_{BR,n,y}$ (2nd crediting period)
Data unit	tCH_4/t
Description	The CH_4 emission factor for the combustion of biomass residues in the project plant in year y (1st and 2nd crediting period)
Source of data	ACM0006 (Version 10 and 15.0)
Value applied	0.001971 (1st and 2nd crediting period)
Justification of choice of data or description of measurement methods and procedures applied	Default values
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{CH4,BF}$ (1st crediting period) $EF_{CH4,BR}$ (2nd crediting period)
Data unit	$kgCH_4/TJ$
Description	The CH4 emission factor for the combustion of biomass residues in the project plant in year y (1st crediting period) CH_4 emission factor for the combustion of biomass residues in the project plant (2nd crediting period)
Source of data	ACM0006 (Version 10 and 15.0)

Value applied	41.1 (1st and 2nd crediting period)
Justification of choice of data or description of measurement methods and procedures applied	The default CH_4 emission factor of 30 kg CH_4/TJ from 2006 IPCC Guidelines, Volume 2, Chapter 2, Tables 2.2 to 2.6 is used for the project, and the uncertainty is estimated to be 300%, thus a conservativeness factor of 1.37 is applied to the CH_4 emission factor.
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	$NCV_{diesel,y}$
Data unit	GJ/t
Description	The net calorific value (energy content) of diesel
Source of data	China Energy Statistical Yearbook
Value applied	42.652 (1st and 2nd crediting period)
Justification of choice of data or description of measurement methods and procedures applied	Country-specific value
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	$EF_{CO2,diesel,y}$
Data unit	tCO_2/GJ
Description	The CO_2 emission factor of diesel in year y
Source of data	IPCC default values
Value applied	0.0741 (1st crediting period) 0.0748 (2nd crediting period)
Justification of choice of data or description of measurement methods and procedures applied	According to registered PDD, the value used for 1st crediting period is 2006 IPCC default value as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. For 2nd crediting period, according to the tool 03 "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" version 03.0, the value is IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.

Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	TDL_y
Data unit	%
Description	Average technical transmission and distribution losses in the grid in year y for the voltage level at which electricity is obtained from the grid at the project site
Source of data	The registered PDD
Value applied	20 (1st crediting period) In the 2nd crediting period, according to the methodology ACM0006 version 15.0, the calculation formula of the project emissions due to grid electricity imports to the project site do not involve this parameter. Therefore, the parameter is not applied in the 2nd crediting period.
Justification of choice of data or description of measurement methods and procedures applied	As the on-site electricity consumption attributable to the project activity is obtained from grid (CCPG), according to Tool to Calculate Baseline, Project and/or Leakage Emissions from Electricity Consumption (Version 01), 20% can be used as default value for project or leakage electricity consumption sources.
Purpose of Data	Calculation of project emissions
Comments	-

4.2 Data and Parameters Monitored

With consideration of the fact of the Project, data and parameters monitored are summarized in below tables.

Data / Parameter	$EG_{projectplant,y}$ (1st crediting period) $EL_{PJ,exp,y}$ (2nd crediting period)
Data unit	MWh
Description	For 1st crediting period, $EG_{projectplant,y}$ is net quantity of electricity generated in the project plant during the year y For 2nd crediting period, $EL_{PJ,exp,y}$ is the project electricity exports to grid in year y
Source of data	On-site measurement

<table>
<tr><td>Description of measurement methods and procedures to be applied</td><td>For 1st crediting period, $EG_{projectplant,y}$ is measured by measure meter to measure export ($EG_{export,y}$) and import ($EG_{import,y}$) electricity from the grid, the difference between export electricity and import electricity is the net electricity generation supplied by the project plant/unit to the grid.

For 2nd crediting period, as per section 4.1 of renewed VCS PD, $EL_{BL,y} = EL_{PJ,exp,y}$, the monitored parameter $EL_{PJ,exp,y}$ is directly measured by measure meter and in line with the actual situation of the project and Electricity Purchase and Sale Agreement, which also does not influence the baseline emission calculation. Therefore, in this monitoring period, $EL_{PJ,exp,y}$ is monitored directly instead of the monitored parameters $EL_{PJ,aux,y}$ and $EL_{PJ,gross,y}$.

Data type: Measured
Archiving procedure: Paper and Electronic
Responsibility: The monitoring team was responsible for monitoring including monitoring, aggregating and processing original data, crosscheck and archiving of monitoring data, and the calibration and maintenance of the measuring equipment.

Calibration Frequency: Once in one year</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Continuously measured by meter and monthly recorded</td></tr>
<tr><td>Value monitored</td><td>Please refer to ER spreadsheet for monthly data.
<table>
<tr><th colspan="2">Period</th><th>Value</th></tr>
<tr><td>01-Jan-2018</td><td>31-Dec-2018</td><td>118,359.577</td></tr>
<tr><td>01-Jan-2019</td><td>27-Oct-2019</td><td>78,262.120</td></tr>
<tr><td>28-Oct-2019</td><td>31-Dec-2019</td><td>26,485.561</td></tr>
<tr><td>01-Jan-2020</td><td>31-Dec-2020</td><td>151,825.455</td></tr>
<tr><td>01-Jan-2021</td><td>31-Jul-2021</td><td>78,857.520</td></tr>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>Bi-directional electric meter
<table>
<tr><th>Type</th><th>Serial number</th><th>Accuracy class</th><th>Date of calibration</th><th>Validity</th></tr>
<tr><td>DSZ188</td><td>47304-2-</td><td>0.2S</td><td>06-Apr-2017
04-Apr-2018</td><td>05-Apr-2018
03-Apr-2019</td></tr>
</table></td></tr>
</table>

	(Measure meter M1)	11301669		01- Apr-2019 30-Mar-2020 25-Mar-2021	31-Mar-2020 29-Mar-2021 24-Mar-2022
	DSZ188 (Check meter M1')	47304-2-11301670	0.2S	06-Apr-2017 04-Apr-2018 01-Apr-2019 30-Mar-2020 25-Mar-2021	05-Apr-2018 03-Apr-2019 31-Mar-2020 29-Mar-2021 24-Mar-2022
QA/QC procedures to be applied	The consistency of metered net electricity generation should be crosschecked with receipts from electricity sales and purchases, and the quantity of fuels fired. During the first and second VCS monitoring period, the power generation efficiency is 18.70% and 22.52%, respectively. Power generation efficiency in this monitoring period is 19.11% within the range of previous years, the value is reasonable. The meters were installed and calibrated based on the national standard DL/T 448 and JJG596.				
Purpose of the data	Calculation of baseline emissions				
Calculation method	NA				
Comments	NA				

Data / Parameter	$EL_{PJ,imp,y}$[14]
Data unit	MWh
Description	The project electricity imports from the grid in year y
Source of data	On-site measurement
Description of measurement methods and procedures to be applied	The measure meter is to measure the quantity of electricity consumed by the project activity plant from the grid. Data type: Measured Archiving procedure: Electronic Responsibility: The monitoring team is responsible for monitoring including monitoring, aggregating and processing original data, crosscheck and archiving of monitoring data, and the calibration and maintenance of the measuring equipment. Calibration Frequency: Once in one year

[14] This parameter is only applied in the 2nd crediting period according to the renewable VCS PD.

<table>
<tr><td>Frequency of monitoring/recording</td><td>Continuously measured by meter and monthly recorded</td></tr>
<tr><td>Value monitored</td><td>Please refer to ER spreadsheet for monthly data. This parameter is only applied in the 2nd crediting period.
<table>
<tr><th colspan="2">Period</th><th>Value</th></tr>
<tr><td>01-Jan-2018</td><td>31-Dec-2018</td><td>NA</td></tr>
<tr><td>01-Jan-2019</td><td>27-Oct-2019</td><td>NA</td></tr>
<tr><td>28-Oct-2019</td><td>31-Dec-2019</td><td>5.239</td></tr>
<tr><td>01-Jan-2020</td><td>31-Dec-2020</td><td>75.600</td></tr>
<tr><td>01-Jan-2021</td><td>31-Jul-2021</td><td>57.120</td></tr>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>Bi-directional electric meter
<table>
<tr><th>Type</th><th>Serial number</th><th>Accuracy class</th><th>Date of calibration</th><th>Validity</th></tr>
<tr><td>DSZ188 (Measure meter M1)</td><td>47304-2-11301669</td><td>0.2S</td><td>06-Apr-2017
04-Apr-2018
01-Apr-2019
30-Mar-2020
25-Mar-2021</td><td>05-Apr-2018
03-Apr-2019
31-Mar-2020
29-Mar-2021
24-Mar-2022</td></tr>
<tr><td>DSZ188 (Check meter M1’)</td><td>47304-2-11301670</td><td>0.2S</td><td>06-Apr-2017
04-Apr-2018
01-Apr-2019
30-Mar-2020
25-Mar-2021</td><td>05-Apr-2018
03-Apr-2019
31-Mar-2020
29-Mar-2021
24-Mar-2022</td></tr>
</table></td></tr>
<tr><td>QA/QC procedures to be applied</td><td>The consistency of metered electricity generation will be cross-checked with receipts from electricity purchase.
The meters were installed and calibrated based on the national standard DL/T 448 and JJG596.</td></tr>
<tr><td>Purpose of the data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Calculation method</td><td>-</td></tr>
<tr><td>Comments</td><td>-</td></tr>
</table>

Data / Parameter	For biomass residues categories for which scenarios B1, B2 or B3 is deemed a plausible baseline alternative, project participants shall demonstrate that this is a realistic and credible alternative scenario[15]
Data unit	Tonnes
Description	-Quantity of available biomass residues of category n in the region -Quantity of biomass residues of category n that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region -Availability of a surplus of biomass residues category n (which cannot be sold or utilized) at the ultimate supplier to the project and a representative sample of other suppliers in the defined geographical region
Source of data	The local statistical data
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Annually
Value applied	

Year	Biomass residues type	Quantity of available biomass residues	Quantity of biomass residues utilized	Larger percentage than utilized
2018	Maize stalk	381,300	248,243	53.60%
	Waste wood	322,000	243,339	32.33%
2019	Maize stalk	384,100	297,084	29.29%
	Waste wood	307,800	195,863	57.15%
2020	Maize stalk	399,300	310,664	28.53%
	Waste wood	340,000	241,750	40.64%
2021	Maize stalk	384,000	248,614	54.46%
	Waste wood	338,700	204,498	65.62%

[15] This parameter description applied in renewable VCS PD during the 2nd crediting period is more detailed than the parameters defined in registered PDD during the 1st crediting period, and the monitored data source and purpose are also same. Hence, the value of parameters defined in registered PDD have been incorporated and shown in this table.

Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline and leakage emissions
Calculation method	-
Comments	-

Data / Parameter	$BF_{k,y}$ (1st crediting period) $BR_{B1,n,y}$ (2nd crediting period)
Data unit	*tonnes on dry-basis*
Description	For 1st crediting period, $BF_{k,y}$ is quantity of biomass residue type k combusted in the project plant during the year y. For 2nd crediting period, $BR_{B1,n,y}$ is quantity of biomass residues of category n used in the project activity in year y.
Source of data	On-site measurements
Description of measurement methods and procedures to be applied	Use electronic belt weight installed at the feeding inlet of the boiler to measure continuously the quantity of biomass residues combusted in the project plant. Data aggregated monthly was recorded in the monthly consumption statistics spreadsheet. Adjust for the moisture content in order to determine the quantity of dry biomass. And please refer to below parameter Moisture content of the biomass residues for relevant moisture content. Data type: Measured Archiving procedure: Paper and Electronic Responsibility: The monitoring team was responsible for monitoring including monitoring, aggregating and processing original data, crosscheck and archiving of monitoring data, and the calibration and maintenance of the measuring equipment. Calibration Frequency: once in one year
Frequency of monitoring/recording	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
Value monitored	The biomass residues are from the nearby area dumped or burnt in an uncontrolled manner(B1). The annual value is listed as following. Please refer to ER spreadsheet for monthly data.

<table>
<tr><td></td><td>
<table>
<tr><td colspan="2">Period</td><td>Maize stalk</td><td>Waste wood</td></tr>
<tr><td>01-Jan-2018</td><td>31-Dec-2018</td><td>49,838.22</td><td>96,725.52</td></tr>
<tr><td>01-Jan-2019</td><td>27-Oct-2019</td><td>49,760.63</td><td>47,952.28</td></tr>
<tr><td>28-Oct-2019</td><td>31-Dec-2019</td><td>23,094.06</td><td>17,145.48</td></tr>
<tr><td>01-Jan-2020</td><td>31-Dec-2020</td><td>90,838.60</td><td>94,749.85</td></tr>
<tr><td>01-Jan-2021</td><td>31-Jul-2021</td><td>46,707.68</td><td>72,612.06</td></tr>
<tr><td colspan="2">Total</td><td>260,239.19</td><td>329,185.19</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>Electronic belt weight
<table>
<tr><th>Type</th><th>Serial number</th><th>Accuracy class</th><th>Date of calibration</th><th>Validity</th></tr>
<tr><td>ICS-17B-1400</td><td>12060401</td><td>0.5</td><td>06-Dec-2017
05-Dec-2018
04-Dec-2019
03-Dec-2020</td><td>05-Dec-2018
04-Dec-2019
03-Dec-2020
02-Dec-2021</td></tr>
</table>
Moisture analyzer or Drying oven & balance

Please refer to below parameter Moisture content of the biomass residues.</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes. The energy balances sheet of the project during this monitoring period has been incorporated in the ER calculation spreadsheets;</td></tr>
<tr><td>Purpose of the data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Calculation method</td><td>-</td></tr>
<tr><td>Comments</td><td>-</td></tr>
</table>

Data / Parameter	Moisture content of the biomass residues
Data unit	% Water content
Description	Moisture content of each biomass residues type k
Source of data	On-site measurements
Description of measurement methods and	From 04-Jan-2018 onwards, use drying oven & balance installed in laboratory of the project site instead of moisture analyzer to determine once for the water content of the biomass of each freight transported.

procedures to be applied

Then, the relevant staff records the water content of the biomass of each freight transported in the monthly fuel statistics spreadsheet.

Adjust for the moisture content in order to determine the quantity of dry biomass.

Data type: Measured

Archiving procedure: Electronic

Responsibility: The monitoring team was responsible for monitoring including monitoring, aggregating and processing original data, crosscheck and archiving of monitoring data, and the calibration and maintenance of the measuring equipment.

Calibration Frequency: Once in one year

Frequency of monitoring/recording

Continuously, monthly mean values are calculated based on the water content of the biomass of each freight transported.

Value monitored

Please refer to ER spreadsheet for monthly data. The actual ER is calculated by the monthly data of moisture content.

Annual average of biomass residues moisture during this monitoring period:

Period		Maize stalk (%)	Waste wood (%)
01-Jan-2018	31-Dec-2018	32.31%	27.51%
01-Jan-2019	31-Dec-2019	34.21%	21.29%
01-Jan-2020	31-Dec-2020	31.68%	26.17%
01-Jan-2021	31-Jul-2021	22.77%	22.49%

Monitoring equipment

Moisture analyzer (Ma1):

Type	Serial number	Accuracy class	Date of calibration	Validity
Sh-10A	-	0.2%	13-Apr-2017	12-Apr-2018

From 04-Jan-2018 onwards, the moisture content of biomass residues is measured by drying oven & balance instead of moisture analyzer, which are installed in laboratory of the project site for the random sample when they are transported into the project site each time, and the mean values calculated annually. The relevant calibration information of drying oven & balance is listed as below table.

Drying oven

Type	Serial number	Accuracy class	Date of calibration	Validity

	<table><tr><td>101-2A</td><td>19120084</td><td>±1℃</td><td>08-Dec-2017 07-Dec-2018 06-Dec-2019 02-Dec-2020</td><td>07-Dec-2018 06-Dec-2019 05-Dec-2020 01-Dec-2021</td></tr></table> Balance <table><tr><th>Type</th><th>Serial number</th><th>Accuracy class</th><th>Date of calibration</th><th>Validity</th></tr><tr><td>TCS-30</td><td>Z121413</td><td>III</td><td>08-Dec-2017 07-Dec-2018 06-Dec-2019 02-Dec-2020</td><td>07-Dec-2018 06-Dec-2019 05-Dec-2020 01-Dec-2021</td></tr></table>
QA/QC procedures to be applied	The random sample of the biomass residues were monitored by moisture analyzer when the biomass residues are transported into the project site each time, and calculate the mean values calculated monthly used in ER calculation sheet. To ensure the authenticity of the value, the project owner invited the technician of local Quality Testing Bureau to calibrate the moisture analyzer used for monitoring annually.
Purpose of the data	Calculation of baseline and project emissions
Calculation method	-
Comments	-

Data / Parameter	$FF_{projectsite,diesel,,y}$ (1st crediting period) $FC_{projectsite,i,,y}$ (2nd crediting period)
Data unit	t
Description	Quantity of diesel combusted in the project activity during the year y (1st and 2nd crediting period)
Source of data	On-site measurement by the records of diesel purchase and remained
Description of measurement methods and procedures to be applied	The fuel consumption quantities were from available purchase invoices from the financial records which is conservative for project calculation.
Frequency of monitoring/recording	Continuously

Value monitored	<table><tr><th colspan="2">Period</th><th>Value</th></tr><tr><td>01-Jan-2018</td><td>31-Dec-2018</td><td>105.99</td></tr><tr><td>01-Jan-2019</td><td>27-Oct-2019</td><td>84.35</td></tr><tr><td>28-Oct-2019</td><td>31-Dec-2019</td><td>23.65</td></tr><tr><td>01-Jan-2020</td><td>31-Dec-2020</td><td>115</td></tr><tr><td>01-Jan-2021</td><td>31-Jul-2021</td><td>40</td></tr><tr><td colspan="2">Total</td><td>368.99</td></tr></table>
Monitoring equipment	-
QA/QC procedures to be applied	Cross-check the measurements with diesel purchase invoice.
Purpose of the data	Calculation of project emissions
Calculation method	-
Comments	For the diesel used in forklifts, the consumption was determined by the records of diesel purchase and remained, and the measurements were crosschecked by diesel purchase invoice.

Data / Parameter	$BF_{T,k,y}$ (1st crediting period) $FR_{f,m}$ (2nd crediting period)
Data unit	Tonnes
Description	For 1st crediting period, $BF_{T,k,y}$ is quantity of biomass residue type k that has been transported to the project site during the year y For 2nd crediting period, $FR_{f,m}$ is total mass of freight transported in freight transportation activity f in monitoring period m
Source of data	On-site measurement
Description of measurement methods and procedures to be applied	Use weight meter installed in the gate of the project site to determine once for the mass of each freight transported. Then, the relevant staff records the type and mass of the biomass of each freight transported in the monthly fuel statistics spreadsheet. Adjust for the moisture content in order to determine the quantity of dry biomass. Data type: Measured Archiving procedure: Electronic

<table>
<tr><td></td><td>Responsibility: The monitoring team was responsible for monitoring including monitoring, aggregating and processing original data, crosscheck and archiving of monitoring data, and the calibration and maintenance of the measuring equipment.

Calibration Frequency: once in one year</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Continuously, prepare annually an energy balance</td></tr>
<tr><td>Value monitored</td><td>Please refer to ER spreadsheet for monthly data.

Biomass residues during this monitoring period:
<table>
<tr><td colspan="2">Period</td><td>Value</td></tr>
<tr><td>01-Jan-2018</td><td>31-Dec-2018</td><td>193,631.72</td></tr>
<tr><td>01-Jan-2019</td><td>27-Oct-2019</td><td>153,238.38</td></tr>
<tr><td>28-Oct-2019</td><td>31-Dec-2019</td><td>57,308.99</td></tr>
<tr><td>01-Jan-2020</td><td>31-Dec-2020</td><td>274,841.81</td></tr>
<tr><td>01-Jan-2021</td><td>31-Jul-2021</td><td>131,396.52</td></tr>
<tr><td colspan="2">Total</td><td>810,417.42</td></tr>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>Weight meter:
<table>
<tr><th>Type</th><th>Serial number</th><th>Accuracy class</th><th>Date of calibration</th><th>Validity</th></tr>
<tr><td>XK3190-A9 (SCS-80)</td><td>0710430</td><td>III</td><td>01-Dec-2017
29-Nov-2018
28-Nov-2019
26-Nov-2020</td><td>30-Nov-2018
28-Nov-2019
27-Nov-2020
25-Nov-2021</td></tr>
</table></td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes. the energy balance sheet of the project during this monitoring period has been incorporated in the ER calculation spreadsheets;
It is conservative to use quantity of biomass residue based on wet basis for project emission calculation.</td></tr>
<tr><td>Purpose of the data</td><td>Calculation of project emissions</td></tr>
<tr><td>Calculation method</td><td>-</td></tr>
<tr><td>Comments</td><td>Applicable to Option B</td></tr>
</table>

<table>
<tr><td>Data / Parameter</td><td>TL_y[16]</td></tr>
<tr><td>Data unit</td><td>t</td></tr>
<tr><td>Description</td><td>Average load of the trucks used in transportation of biomass during the year y</td></tr>
<tr><td>Source of data</td><td>On-site measurement</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>Determined by averaging the weights of each truck carrying biomass to the project plant</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Continuously, calculated by averaging the weights of each truck carrying biomass to the project plant annually</td></tr>
<tr><td>Value monitored</td><td>This parameter belongs to 1st crediting period and the value are listed as followings.
<table>
<tr><td colspan="2">Period</td><td>Value</td></tr>
<tr><td>01-Jan-2018</td><td>31-Dec-2018</td><td>15.64</td></tr>
<tr><td>01-Jan-2019</td><td>27-Oct-2019</td><td>15.40</td></tr>
<tr><td>28-Oct-2019</td><td>31-Dec-2019</td><td>NA</td></tr>
<tr><td>01-Jan-2020</td><td>31-Dec-2020</td><td>NA</td></tr>
<tr><td>01-Jan-2021</td><td>31-Jul-2021</td><td>NA</td></tr>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>-</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>The average truck load was determined by averaging the weights of each truck carrying biomass to the project plant which were recorded continuously and calculated annually.</td></tr>
<tr><td>Purpose of the data</td><td>Calculation of project emissions</td></tr>
<tr><td>Calculation method</td><td>-</td></tr>
<tr><td>Comments</td><td>-</td></tr>
</table>

Data / Parameter	AVD_y (1st crediting period) $D_{f,m}$ (2nd crediting period)

[16] This parameter only belongs to 1st crediting period according to the registered PDD.

Data unit	Kilometer
Description	For 1st crediting period, AVD_y is average round-trip distance (from and to) between biomass fuel supply sites and the project site during the year y For 2nd crediting period, $D_{f,m}$ is return trip road distance between the origin and destination of freight transportation activity f in monitoring period m
Source of data	On-site measurement
Description of measurement methods and procedures to be applied	Recorded in log books for each truck of biomass residues transported to the project plant.
Frequency of monitoring/recording	Continuously
Value monitored	50*2
Monitoring equipment	-
QA/QC procedures to be applied	Check consistency of the distance records provided by the truckers by comparing recorded distances with other information from other sources (e.g. maps); During this monitoring period, all the biomass residues supply sites are within 50 kilometers away around the site of the Project. Therefore, the 100 kilometers (AVD_y / $D_{f,m}$) is conservative for project emission calculation.
Purpose of the data	Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	$NCV_{maizestalk}$ &$NCV_{wastewood}$ (1st crediting period) NCV_k (2nd crediting period)
Data unit	GJ/ton of dry matter
Description	For 1st crediting period, $NCV_{maizestalk}$ is the net calorific value of maize stalk, $NCV_{wastewood}$ is the net calorific value of waste wood. For 2nd crediting period, NCV_k is net calorific value of biomass residue type k

<table>
<tr><td>Source of data</td><td>Sample measurement</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>The random sample of the biomass residues were sent to local Quality Testing Bureau every six months for analysis during this monitoring period.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Measured every six months, taking at least three samples for each measurement</td></tr>
<tr><td>Value monitored</td><td>The net calorific value in the second half of 2021 is not available temporarily, and for conservative, which equals to the maximum of net calorific values of biomass residue from 01-Jan-2018 to 31-Dec-2020. Then, the annual net calorific value equals to the maximum of net calorific values of biomass residue measured every six months.

These values are listed in below table.
<table>
<tr><td colspan="2">Period</td><td>$NCV_{Maizestalk}$</td><td>$NCV_{Wastewood}$</td></tr>
<tr><td rowspan="2">01-Jan-2018</td><td rowspan="2">31-Dec-2018</td><td>15.11</td><td>13.93</td></tr>
<tr><td>12.5</td><td>7.68</td></tr>
<tr><td rowspan="2">28-Oct-2019</td><td rowspan="2">31-Dec-2019</td><td>14.9</td><td>13.93</td></tr>
<tr><td>8.31</td><td>14.34</td></tr>
<tr><td rowspan="2">01-Jan-2020</td><td rowspan="2">31-Dec-2020</td><td>8.82</td><td>13.39</td></tr>
<tr><td>13.6</td><td>10.38</td></tr>
<tr><td rowspan="2">01-Jan-2021</td><td rowspan="2">31-Jul-2021</td><td>13.73</td><td>16.25</td></tr>
<tr><td>15.11</td><td>14.34</td></tr>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>-</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements.
Ensured that the NCV is determined on the basis of dry biomass.</td></tr>
<tr><td>Purpose of the data</td><td>Calculation of project emissions</td></tr>
<tr><td>Calculation method</td><td>-</td></tr>
</table>

Comments	-

4.3 Monitoring Plan

1. Organizational structure, responsibilities and competencies

The project owner has set up a specific VCS department for monitoring decisions and operation of the monitoring plan.

There is a VCS director as a leader of the VCS department, a monitoring manager for overall implementation and management of the monitoring plan, and a monitoring team for practical operation of the monitoring.

The management structure of the monitoring team is shown in Figure 3.

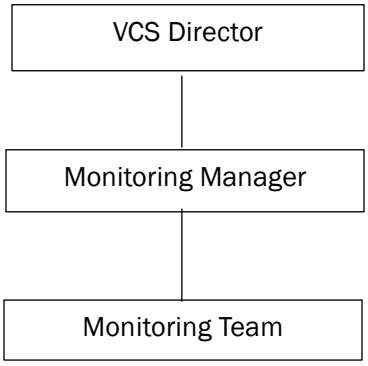


Figure 2 Monitoring structure of the Project

The VCS director is responsible for the general management of the VCS project, and takes charge of the communication and coordination with VCS related departments (DNA, stakeholders, VCUs buyer and VVB, etc.).

The monitoring manager is responsible for the overall implementation and management of the monitoring plan for this project, including data collection, ERs calculation, preparing monitoring reports and cooperating with VVB for verification.

The monitoring team is responsible for the practical operation of the monitoring work, including monitoring, aggregating and processing original data, crosscheck and archiving of monitoring data, and the calibration and maintenance of the measuring equipment.

2. Monitoring system and procedures

Monitoring of biomass residues data

The biomass residues data of this project includes quantity, moisture content and net calorific value of used biomass residues.

Quantity of utilized biomass residues were measured by electronic belt weight installed at the feeding inlet of the boiler, and these data shall be crosschecked with the quantity of electricity and heat generated or any fuel purchase receipts (if available). The type of the electronic belt weight is ICS-17B-1400 with an accuracy of 0.5.

From 04-Jan-2018 onwards, the moisture content of biomass residues is measured by drying oven & balance instead of moisture analyzer, which are installed in laboratory of the project site for the random sample when they are transported into the project site each time, and the mean values calculated annually. To ensure the authenticity of the value, the project owner will invite the technician of local Quality Testing Bureau to calibrate the moisture analyzer used for monitoring annually.

The net calorific value of biomass residues was measured by sending the random sample to local Quality Testing Bureau for analysis every six months, taking at least three samples for each measurement and the mean values calculated annually. The consistency of the measurements was checked by comparing the measurement results with measurements from previous years, relevant data sources (e .g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements.

Monitoring of transport data

The transport data of this project includes quantity of biomass residues transported to the project site, average truck load and average round trip distance.

Quantity of biomass residues transported to the project site were measured by weighing the trucks twice when it goes in and out of the project site with electronic weight meter installed in the gate of the project site, and these data shall be crosschecked with the quantity of electricity and heat generated and any fuel purchase receipts (if available). The type of the weight meter is XK3190-A9 (SCS-20/SCS-80) with an accuracy of level III.

In the period from 01-Jan-2018 to 27-Oct-2019 attributed to the 1st crediting period, the average truck load was determined by averaging the weights of each truck carrying biomass to the project plant which were measured continuously and aggregated annually.

The average round trip distance was obtained from the records by project participants on the origin of the biomass which were measured continuously, and the consistency of distance records provided by the truckers was checked by comparing recorded distances with other information from other sources (e. g. maps).

Monitoring of fossil fuel data

The flow meter F1 for monitoring the ignition consumption has been dismantled on 02-Feb-2013 by the project owner in order to improve efficiency and save the maintenance expense. And in this monitoring period, the diesel consumption for operation of forklifts at the project site is determined by the quantity of diesel purchase and remained, and the measurements were crosschecked by diesel purchase invoice.

Monitoring of electricity data

The electricity data of this project includes on-site electricity consumption and net electricity generation.

The two bi-directional electricity meters M1 (measure meter) and M1' (check meter) with an accuracy of 0.5s were used as gate-meters to monitor the exported and imported electricity since the project start operation. On 02-Jun-2015, the local grid company replaced the gate meters with two new bi-directional electricity meters with an accuracy of 0.2s which could be more fit for the remote monitoring, and according to the latest Power Purchase Agreement signed between the project owner and the grid company on 09-May-2016, the new gate meters have been installed at supply side of the project site due to the change of property rights of grid-connected line. The new meters have been calibrated regularly in line with the relevant regulations, and which have higher accuracy than the old ones, so there was no influence on the ER calculation due to the meter replacement. And in this monitoring period, the two new bi-directional electricity meters M1 (measure meter) and M1' (check meter) with an accuracy of 0.2s are used to monitor the export and import electricity, from December 2019 onwards, bidirectional electricity meter reading record date was changed from 24:00 hr of the 23rd day to 24:00 hr of last day of each month.

Before 10-March-2014, only one stalk collecting site was built to collect stalks, and the on-site electricity consumption at the stalk collection site was measured by an electricity mete (M2) installed on this collecting site. The monitoring team records the M2 electricity meter's readings and complete Meter Reading Records at 24:00 hr of the last day of each month. Since 10-March-2014, this stalk collection site has been closed and all biomass is transported directly to the project site. Therefore, M2 has been dismantled and the electricity consumed by the project activity is 0 from 10-March-2014 onward. And in this monitoring period, there is no change and the electricity consumed by the project activity is 0.

If in the future, other stalk collecting sites will be built, the electricity meters will be installed as per the related standards and rules in China to measure the on-site electricity consumption at the stalk collection sites.

Monitoring of availability of biomass residues

The quantity of available and utilized biomass residues in the defined geographical region was monitored to check the leakage effect. These data were obtained from official statistical information on a yearly basis.

The detailed structure of the monitoring system can be found in Figure 4 and Table 2

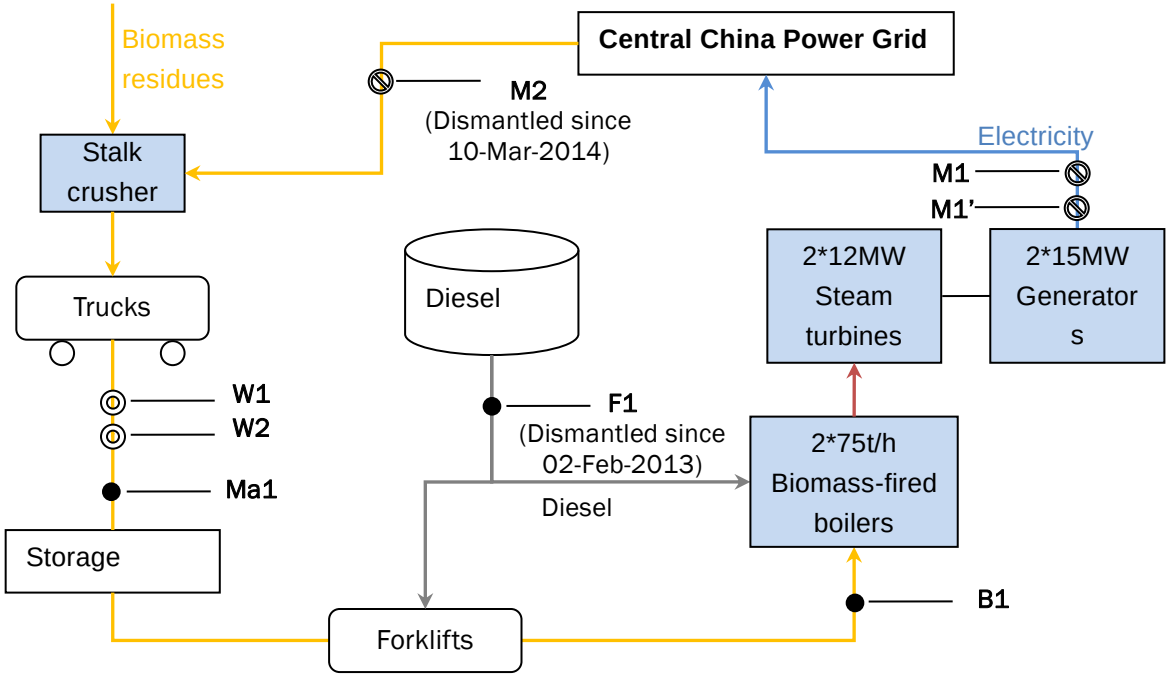


Figure 3: the monitoring diagram of the project

Table 2: Details of the monitoring equipment

Monitoring equipment	Description	Location
M1	Measure meter, measuring the net electricity generated by the project	The meter is installed on supply side of the project site
M1'	Check meter, measuring the net electricity generated by the project	The meter is installed on supply side of the project site
W1	Weight meter, measuring the quantity of the biomass residues that has been transported to the project site	Gate of the project site
B1	Electronic belt weight, measuring the quantity of biomass residues combusted in the project plant	Feeding inlet of the boiler
Ma1	Drying oven & balance, measuring the moisture content of the biomass residues	Laboratory of the project site

4. QA/QC

Training program

Before the operation of this project, monitoring personnel was trained for basic conception and management of the project activity, monitoring and archiving procedures of relevant data, and the requirement for data quality assurance etc.

Calibration of measuring equipment

In order to assure precision, the project owner invited the technician of local Quality Testing Bureau to calibrate all the monitoring equipment every year. The calibration of the equipment was implemented according to the relevant national standard. The calibration records were saved for verification, and the data inspectors of VCS monitoring team are in charge of daily maintenance of the equipment.

5. Emergency procedure

Electricity meters

If reading of measure meter is not precision allowed error range at any month, electricity connected to grid should be confirmed as follow:

(1) Firstly, reading data from check meter, calculating electricity connected to grid of the project according to historical line lose rate, except anyone think that check ammeter is not precision after check;

(2) If check meter has not accepted precision or operation is not criterion, the project owner and power grid company should design a reasonable conservative method to estimate reading together, and explain that it's reasonable and conservative at verification of VVB.

(3) If the project owner and power grid company can't compass consistent idea about the method to estimate reading, it should be arbitrated according to conventional process to confirm consistency of reading estimated.

Electronic belt weight

When the electronic belt weight is broken, the biomass consumption data could be calculated by energy balance based on purchased quantities and stock changes, the most conservative approach will be applied in ER calculation.

Weight meter

When malfunction of weight meter appears, the relevant monitoring data could be calculated by combusted quantities and stock changes, the most conservative approach will be applied in ER calculation.

Moisture analyzer

When malfunction of moisture analyzer appears, the historical data would be used by choosing the most conservative data.

Drying oven & balance

When malfunction of Drying oven & balance appears, the historical data would be used by choosing the most conservative data.

If the failure of whole power generation system occurs, no VCUs should be claimed until it has been recovered.

During this monitoring period, there is no emergency happened.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

For the period from 01-Jan-2018 to 27-Oct-2019 attributed to 1st crediting period,

According to the methodology ACM0006 (Version 10), the emission reductions of this project are calculated following formula (1) in the registered PDD and the baseline emissions are not defined directly. As per the baseline scenario of this project defined in registered PDD, the baseline emissions are calculated as follows:

1. Emission reductions due to displacement of electricity (***ER*** $_{electricity,y}$)

$$ER_{electricity,y} = EG_y \cdot EF_{electricity,y} = EG_{projectplant,y} \cdot EF_{grid,CM,y} \quad (1)$$

Where:

$EG_{project\ plant,y}$	=	Net quantity of electricity generated in the project plant during the year y (MWh)
$EF_{grid,CM,y}$	=	CO_2 emission factor for the electricity displaced due to the project activity during the year *y* (tCO_2e/MWh)

2. Baseline emissions due to displacement of heat (***ER*** $_{heat,y}$)

The project does not claim for the emission reductions due to displacement of heat, so ***ER*** $_{heat,y}$ = 0

3. Baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass residues (***BE*** $_{biomss,y}$)

$$BE_{biomass,y} = GWP_{CH_4} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k \cdot EF_{burning,CH_4,k,y} \quad (2)$$

Where:

GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (tCO_2e/ tCH_4)
$BF_{PJ,k,y}$	=	Incremental quantity of biomass residue type *k* used as a result of the project activity in the project plant during the year *y* (tons of dry matter)
NCV_k		Net calorific value of the biomass residue type *k* (GJ/ tons of dry matter)
$EF_{burning,CH4,k}$		CH_4 emission factor for uncontrolled burning of the biomass residue type *k* during the year *y* (tCH_4/GJ)

During this period, $EG_{project\ plant,y}$ = 196,621.697 MWh, and $EF_{electricity,y}$ = 0.9735 tCO_2e/MWh, GWP_{CH4} = 28 tCO_2e/ tCH_4, k=maize stalk and waste wood, $\sum BF_{PJ,k,y} = BR_{PJ,maizestalk,y} + BR_{PJ,wastewood,y}$ =(99,598.850 t+ 144,677.800 t) , and $NCV_k \cdot EF_{burning,CH_4,k,y}$= 0.001971 tCH_4/t,

So, $BE_y = ER_{electricity,y} + BE_{biomss,y}$ =196,621.697MWh × 0.9735 tCO_2e/MWh +(99,598.850 t+144,677.800 t) × 28 tCO_2e/ tCH_4×0.001971 tCH_4/t = **204,891 tCO_2e.**

For the period from 28-Oct-2019 to 31-Jul-2021 attributed to 2nd crediting period,

According to the ACM0006 (Version 15.0), the baseline emissions are calculated as follows:

$$BE_y = EL_{BL,y} \times EF_{grid,CM,y} + BE_{BR,B1,y} \quad (3)$$

$$=EL_{PJ,exp,y} \times EF_{grid,CM,y} + GWP_{CH4} \times \sum_n BR_{B1,n,y} \times NCV_{BR,n,y} \times EF_{BR,n,y}$$

Where:

BE_y	=	Baseline emissions in year *y* ($t\ CO_2e$)
$BE_{BR,B1,y}$	=	Baseline emissions due to aerobic decay of biomass residues in year *y* ($t\ CO_2$)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period ($t\ CO_2/t\ CH_4$)
$BR_{B1,n,y}$	=	Quantity of biomass residues of category *n* used in the CDM project activity in year *y* for which the baseline scenario is B1 (tonnes on dry-basis)
$NCV_{BR,n,y}$	=	Net calorific value of biomass residue of category *n* in year *y* (GJ/tonne on dry-basis)
$EF_{BR,n,y}$	=	CH_4 emission factor for uncontrolled burning of the biomass residues category *n* during the year *y* (tCH_4/GJ)
n	=	Biomass residue category
$EL_{BL,y}$	=	Baseline electricity generation in year *y* (MWh)
$EL_{PJ,exp,y}$	=	The project electricity exports to grid in year y (MWh)

$EF_{grid,CM,y}$ = The baseline grid emission factor (tCO_2e/MWh)

$EL_{BL,y}$ = 257,168.536 MWh, and $EF_{grid,CM,y}$= 0.4287 tCO_2e/MWh, GWP_{CH4} = 28 tCO_2e/ tCH_4, n=maize stalk and waste wood, $\sum BR_{B1,n,y}$ = $BR_{B1,maizestalk,y}$ +$BR_{B1,wastewood,y}$=(160,640.350t+184,507.390t), and $NCV_{BR,n,y} \cdot EF_{BR,n,y}$= 0.001971 tCH_4/t,

So, **BE_2** = 257,168.536 MWh × 0.4287 tCO_2e/MWh +(160,640.350t+184,507.390t) × 28 tCO_2e/ tCH_4×0.001971 tCH_4/t = **129,294 tCO_2e**

Therefore, in this monitoring period,

BE_y = 204,891 tCO_2e + 129,294 tCO_2e = 334,185 tCO_2e

In summary, during this monitoring period, the annual baseline emission is listed as below.

Monitoring period		$ER_{electricity,y}$ /$EL_{BL,y}$*$EF_{gird,CM,y}$	$BE_{biomss,y}$ / $BE_{BR,B1,y}$	BE_y
		tCO_2e	tCO_2e	tCO_2e
01-Jan-2018	31-Dec-2018	115,223	8,088	123,311
01-Jan-2019	27-Oct-2019	76,188	5,392	81,580
28-Oct-2019	31-Dec-2019	11,354	2,220	13,574
01-Jan-2020	31-Dec-2020	65,087	10,242	75,329
01-Jan-2021	31-Jul-2021	33,806	6,585	40,391
Total		**301,658**	**32,527**	**334,185**

5.2 Project Emissions

For the period from 01-Jan-2018 to 27-Oct-2019 attributed to 1st crediting period,

According to the registered PDD, the project emissions are calculated as follows:

$$PE_y = PET_y + PEEF_y + PE_{EC,y} + GWP_{CH4} \cdot PE_{biomass,CH4,y} \quad (4)$$

Where:

PE_y = Project emissions in year *y* ($t CO_2$)

PET_y = CO_2 emissions during the year y due to transport of the biomass residues to the project plant, ($t CO_2$)

$PEEF_y$ = CO_2 emissions during the year y due to fossil fuels co-fired by the generation facility or other fossil fuel consumption at the project site that is attributable to the project activity ($t CO_2$)

$PE_{EC,y}$ = CO_2 emissions during the year y due to electricity consumption at the project site that is attributable to the project activity ($t CO_2$)

GWP_{CH4}	=	Global Warming Potential for methane valid for the relevant commitment period
$PE_{biomass,CH4,y}$	=	CH4 emissions from the combustion of biomass residues during the year y (t CO_2e)

1. Determination of $PEFF_y$

$$PEEF_y = \sum_i (FF_{projectplant,i,y} + FF_{projectsite,i,y}) \cdot NCV_i \cdot EF_{CO_2,i,y} \quad (5)$$

Where:

$FF_{project\ plant,i,y}$	=	quantity of the fossil fuel *i* (diesel) combusted in the project plant during the year *y* (t)
$FF_{project\ site,i,y}$	=	quantity of the fossil fuel *i* (diesel) combusted at the project site for other purposes that are attributable to the project activity during the year *y* (t)
NCV_i	=	net calorific value of the fossil fuel *i* (diesel) (GJ/t)
$EF_{CO2,i,y}$	=	CO_2 emission factor for the fossil fuel *i* (diesel) during year *y* (tCO_2e/GJ)
i	=	Diesel

During this period, according to above equation, ***i*=diesel**, the annual **$PEFF_y$** is listed in below table.

Period		$FF_{projectplant,diesel,y}$	$FF_{projectsite,diesel,y}$	$NCV_{diesel,y}$	$EF_{CO2,diesel,y}$	$PEFF_y$
		t	t	GJ/t	tCO_2/GJ	tCO_2e
		A	B	C	D	E=(A+B) *C*D
01-Jan-2018	31-Dec-2018	0	105.99	42.652	0.0741	335
01-Jan-2019	27-Oct-2019	0	84.35	42.652	0.0741	267

2. Determination of *PET_y*

As per registered PDD, carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues to the project plant (*PET_y*)

$$PET_y = \frac{\sum_k BF_{T,k,y}}{TL_y} \cdot AVD_y \cdot EF_{km,CO_2,y} \quad (6)$$

Where:

$BF_{T,k,y}$	=	Quantity of biomass residue type *k* that has been transported to the project site during the year *y*
TL_y	=	Average truck load of the trucks used during the year *y*
AVD_y	=	Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the year *y* (km)
$EF_{km,CO2}$	=	Average CO_2 emission factor for the trucks measured during the year *y* (tCO_2e/km)

k = Refers to the types of biomass residues used in the project plant and that have been transported to the project plant in year y

All the biomass residues supply sites are within 50 kilometers away around the site of the project. Therefore, the 100 kilometers (AVD_y) is conservative for project emission calculation.

During the period from 01-Jan-2018 to 27-Oct-2019, according to above equation, the annual PET_y was listed in below table.

Period		$BF_{T,k,y}$	TL_y	AVD_y	$EF_{km,CO2,y}$	PET_y
		t	t	km	tCO_2/km	tCO_2e
		A	B	C	D	E=A/B*C*D
01-Jan-2018	31-Dec-2018	193,631.72	15.64	100	0.001097	1,359
01-Jan-2019	27-Oct-2019	153,238.38	15.40	100	0.001097	1,092

3. Determination of $GWP_{CH4} \cdot PE_{biomass,CH4,y}$

As per registered PDD, methane emissions from combustion of biomass residues are calculated as follows:

$$PE_{biomass,CH_4,y} = EF_{CH_4,BF} \cdot \sum_k BF_{k,y} \cdot NCV_k \quad (7)$$

Where:

$EF_{CH4,BF}$ = CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)

$BF_{k,y}$ = Quantity of biomass residue type *k* combusted in the project plant during the year *y* (t), k=maize stalks and waste wood

NCV_k = Net calorific value of the biomass residue type *k* (GJ/t). k=maize stalks and waste wood

During the period, according to above equation, k=maize stalks and waste wood, the annual $GWP_{CH4}*PE_{biomass,CH4,y}$ was listed in below table.

Period		$BF_{maizestalk,y}$	$BF_{wastewood,y}$	$NCV_{maizestalk}$	$NCV_{wastewood}$	$EF_{CH4,BF}$	GWP_{CH4}	$GWP_{CH4}*PE_{biomass,CH4,y}$
		t	t	GJ/t	GJ/t	tCH_4/GJ	/	tCH_4
		A	B	C	D	E	F	G=F*(A*C+B*D)*E
01-Jan-2018	31-Dec-2018	49,838.22	96,725.52	15.11	13.93	0.0000411	28	2,417

01-Jan-2019	27-Oct-2019	49,760.63	47,952.28	14.9	14.34	0.0000411	28	1,645

4. Determination of $PE_{EC,y}$

As per registered PDD, CO_2 emissions from electricity consumption are calculated as follows:

$$PE_{EC,y} = EC_{PJ,y} \cdot EF_{grid,y} \cdot (1 + TDL_y) \quad (8)$$

Where:

$EC_{PJ,y}$	=	Quantity of electricity consumed by the project activity during the year *y* (MWh)
$EF_{grid,y}$	=	CO_2 emission factor of CCPG during the year *y* (tCO_2e/MWh)
TDL_y	=	Average technical transmission and distribution losses in the grid in year *y* for voltage level at which electricity is obtained from the grid at the project site, %.

From 10-March-2014 onward, only stalk collection site has been closed and all biomass is transported directly to the project site. Therefore, M2 installed on stalk collection site has been dismantled and the electricity consumed by the project activity is 0 from 10-March-2014 onward, $EC_{PJ,y}$=0, according to above equation, during the period from 01-Jan-2018 to 27-Oct-2019, the $PE_{EC,y}$ =0.

For the period from 28-Oct-2019 to 31-Jul-2021 attributed to 2nd crediting period,

According to the methodology ACM0006 (version 15.0) and renewed VCS PD, the project emissions are calculated as follows:

$$PE_y = PE_{FF,y} + PE_{TR,y} + PE_{BR,y} + PE_{GR1,y} \quad (9)$$

Where:

PE_y	=	Project emissions in year *y* (t CO_2)
$PE_{FF,y}$	=	Emissions during the year *y* due to fossil fuel consumption at the project site (t CO_2)
$PE_{TR,y}$	=	Emissions during the year *y* due to incremental transport of biomass to the project plant (t CO_2)
$PE_{BR,y}$	=	Emissions from the combustion of biomass during the year *y* (t CO_2e)
$PE_{GR1,y}$	=	Emissions during the year y due to grid electricity imports to the project site (t CO_2)

1. Determination of PE_{FFy}

According to "TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", **Option B,** the CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type I, is chose, the formula in tool 03 is listed as following:

$$PE_{FFy} = \sum_i FC_{projectsite,i,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,y} \quad (10)$$

Where:

PE_{FFy}	=	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{projectsite,i,y}$	=	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr), i=diesel
$NCV_{i,y}$	=	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit), i=diesel
$EF_{CO_2,i,y}$	=	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ), i=diesel
i	=	Are the fuel types combusted in process j during the year y, i=diesel

During this period, according to above equation, ***i*=diesel**, the annual **PE_{FFy}** is listed in below table.

Period		$FC_{projectsite,diesel,y}$	$NCV_{diesel,y}$	$EF_{CO2,diesel,y}$	PE_{FFy}
		t	GJ/t	tCO_2/GJ	tCO_2e
		A	B	C	D=A*B*C
28-Oct-2019	31-Dec-2019	23.65	42.652	0.0748	75
01-Jan-2020	31-Dec-2020	115	42.652	0.0748	367
01-Jan-2021	31-Jul-2021	40	42.652	0.0748	128

2. Determination of $PE_{TR,y}$

According to the "TOOL12: Project and leakage emissions from transportation of freight", **Option B:** Using conservative default values is chose. $PE_{TR,m}$ in the tool corresponds to the parameter $PE_{TR,y}$ in this methodology ACM0006 (Version 15.0) is calculated as followings,

$$PE_{TR,y} = PE_{TR,m} = \sum D_{f,m} \times FR_{f,m} \times EF_{CO2,f} \times 10^{-6} \quad (11)$$

Where:

$PE_{TR,m}$	=	Project emissions from transportation of freight monitoring period m (t CO_2)

$D_{f,m}$ = Return trip distance between the origin and destination of freight transportation activity f in monitoring period m (km)

$FR_{f,m}$ = Total mass of freight transported in freight transportation activity f in monitoring period m (t)

$EF_{CO2,f}$ = Default CO_2 emission factor for freight transportation activity f (g CO_2/t km)

f = Freight transportation activities conducted in the project activity in monitoring period m

During the period from 28-Oct-2019 to 31-Jul-2021, according to above equation, the annual $PE_{TR,y}$ is listed in below table.

Period		$FR_{f,m}$	$D_{f,m}$	$EF_{CO2,f}$	$PE_{TR,y}$
		t	km	gCO_2/t km	tCO_2e
		A	B	C	D=A*B*C/1000000
28-Oct-2019	31-Dec-2019	57,308.99	100	245	1,405
01-Jan-2020	31-Dec-2020	274,841.81	100	245	6,734
01-Jan-2021	31-Jul-2021	131,396.52	100	245	3,220

3. Determination of $PE_{BR,y}$

The project proponents chose to include emissions due to uncontrolled burning or decay of biomass residues ($BE_{BR,y}$) in the calculation of baseline emissions, then emissions from the combustion of this category of biomass residues have also to be included in the project scenario. Corresponding emissions formula in ACM0006 version 15.0 is calculated as follows:

$$PE_{BR,y} = GWP_{CH4} \times EF_{CH4,BR} \times \sum_{n} BR_{B1,n,y} \times NCV_k \quad (12)$$

Where:

$PE_{BR,y}$ = Emissions from the combustion of biomass residues during the year *y* (tCO_2e)

GWP_{CH4} = Global Warming Potential of methane valid for the commitment period (tCO_2/tCH_4)

$EF_{CH4,BR}$ = CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)

$BR_{B1,n,y}$ = Quantity of biomass residues of category *n* used in the CDM project activity in year *y* (tonnes on dry-basis), n= maize stalks and waste wood

NCV_k = Net calorific value of biomass residue of category *k* in year *y* (GJ/tonne on dry-basis), k=maize stalks and waste wood

During the period, according to above equation, *i*=diesel, n= k=maize stalks and waste wood the annual $PE_{BR,y}$ is listed in below table.

Period		$BR_{B1,maizestalks,y}$	$BR_{B1,wastewood,y}$	$NCV_{maizestalk}$	$NCV_{wastewood}$	$EF_{CH4,BR}$	$PE_{BR,y}$
		t	t	GJ/t	GJ/t	tCH_4/GJ	tCO_2
		A	B	C	D	E	F=28*(A*C+B*D)*E
28-Oct-2019	31-Dec-2019	23,094.06	17,145.48	14.9	14.34	0.0000411	679
01-Jan-2020	31-Dec-2020	90,838.60	94,749.85	13.6	13.39	0.0000411	2,882
01-Jan-2021	31-Jul-2021	46,707.68	72,612.06	15.11	16.25	0.0000411	2,170

4. 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:

$$PE_{GR1,y} = EF_{EG,GR,y} \times EL_{PJ,imp,y} \quad (13)$$

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)

$EF_{EG,GR,y}$ /$EF_{grid,CM,y}$ = Grid emission factor in year *y* (t CO_2/MWh)

In the period, according to above equation, annual $PE_{GR1,y}$ is listed in below table.

Monitoring period		$EL_{PJ,imp,,y}$	$EF_{EG,GR,y}/EF_{gird,CM,y}$	$PE_{GR1,y}$
		MWh	tCO_2e/MWh	tCO_2e
28-Oct-2019	31-Dec-2019	5.239	0.4287	2
01-Jan-2020	31-Dec-2020	75.600	0.4287	32
01-Jan-2021	31-Jul-2021	57.120	0.4287	24

In summary, during this monitoring period from 01-Jan-2018 to 31-Jul-2021,

1. $PEFF_y + PE_{FFy}$= (335 tCO_2e + 267 tCO_2e)+(75 tCO_2e + 367 tCO_2e + 128 tCO_2e)=1,172 tCO_2e

2. $PET_y + PE_{TR,y}$= (1,359 tCO_2e +1,092 tCO_2e)+(1,405 tCO_2e + 6,734 tCO_2e + 3,220 tCO_2e = 13,810 tCO_2e

3. $GWP_{CH4} \cdot PE_{biomass,CH4,y}+PE_{BR,y}$= (2,417 tCO_2e + 1,645 tCO_2e) +(679 tCO_2e +2,882 tCO_2e +2,170 tCO_2e) = 9,793 tCO_2e

4. $PE_{EC,y} + PE_{GR1,y}$ =0+(2+32+24)=58 tCO_2e

Therefore, PE_y=13,810 tCO_2e + 1,172 tCO_2e + 9,793 tCO_2e +58 tCO_2e =24,833 tCO_2e

And the annual project emission is listed as below.

Monitoring period		$PET_{,y}$ /$PE_{TR,y}$	$PEEF_y$ /PE_{FFy}	$GWP_{CH4} \cdot PE_{biomass,CH4,y}$/$PE_{BR,y}$	$PE_{EC,y}$/ $PE_{GR1,y}$	PE_y
		tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
01-Jan-2018	31-Dec-2018	1,359	335	2,417	0	4,111
01-Jan-2019	27-Oct-2019	1,092	267	1,645	0	3,004
28-Oct-2019	31-Dec-2019	1,405	75	679	2	2,161
01-Jan-2020	31-Dec-2020	6,734	367	2,882	32	10,015
01-Jan-2021	31-Jul-2021	3,220	128	2,170	24	5,542
Total		**13,810**	**1,172**	**9,793**	**58**	**24,833**

5.3 Leakage

Estimated project leakage emissions:

Based on the analysis below, we can find out that the quantity of available biomass residues in the defined geographical boundary are far larger than 25% the quantity of biomass residues utilized in the project. Thus, the utilization of the biomass residues by the project plant is considered to have no influence on the current biomass usage, and therefore the leakage of proposed project is considered to be 0.

Therefore, Leakage emissions (LE_y) = 0.

Category	Type	Quantity of available (t/yr)	Quantity of utilized (t/yr)						Larger percentage than utilized
			Feedstuff	Compost	Return to field	Processing	For this project	Total	
2018	Maize stalk	381,300	3,839	73,246	97,115	0	74,043	248,243	53.60%
	Waste wood	322,000	0	0	0	110,200	133,139	243,339	32.33%
	Total	703,300	3,839	73,246	97,115	110,200	207,182	**491,582**	**43.07%**
2019	Maize stalk	384,100	3,910	76,784	106,998	0	109,392	297,084	29.29%
	Waste wood	307,800	0	0	0	112,700	83,163	195,863	57.15%
	Total	691,900	3,910	76,784	106,998	112,700	192,555	**492,947**	**40.36%**
2020	Maize stalk	399,300	3,842	73,197	97,109	0	136,516	310,664	28.53%
	Waste wood	340,000	0	0	0	113,400	128,350	241,750	40.64%
	Total	739,300	3,842	73,197	97,109	113,400	264,867	**552,415**	**33.83%**
2021	Maize stalk	384,000	3,840	76,782	107,497	0	60,495	248,614	54.46%
	Waste wood	338,700	0	0	0	110,800	93,698	204,498	65.62%
	Total	722,700	3,840	76,782	107,497	110,800	154,193	**453,112**	**59.50%**

Data source: Special Report of Biomass Fuel in Huixian City (2018, 2019, 2020 and 2021).

5.4 Net GHG Emission Reductions and Removals

According to the Section 5.1, 5.2 and 5.3 above,

BE_y = 334,185 tCO_2e;

PE_y = 24,883 tCO_2e;

LE_y = 0 tCO_2e;

Therefore, $ER_y = BE_y - PE_y - LE_y$ = 334,185 tCO_2e -24,883 tCO_2e -0 tCO_2e =309,352 tCO_2e

This monitoring period includes the period from 01-Jan-2018 to 27-Oct-2019 attributed to the 1st crediting period and the other period from 28-Oct-2019 to 31-Jul-2021 attributed to the 2nd crediting period, with totally 1,308 days. Based on the annual estimated emission reductions from the registered VCS PD in 1st crediting period and renewed VCS PD in the 2nd crediting period, the amount of emission reductions for this monitoring period would be 123,858tCO_2e/365days*665days+55,874tCO_2e/365days*643days=324,094tCO_2e.

The actual emission reductions in this monitoring period (1,308 days) are 309,352 tCO_2e, which is only 4.55% less than the estimation in the registered PDD and renewed VCS PD, the fluctuation of which is at normal level.

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
01-Jan-2018~31-Dec-2018	123,311	4,111	0	119,200
01-Jan-2019~31-Dec-2019	95,154	5,165	0	89,989
01-Jan-2020~31-Dec-2020	75,329	10,015	0	65,314
01-Jan-2021~31-Jul-2021	40,391	5,542	0	34,849
Total	**334,185**	**24,883**	**0**	**309,352**