



JILIN LIAOYUAN 50MW LEVEL BIOMASS COGENERATION PROJECT



Document Prepared By LGAI Technological Center, S.A. (Applus+ Certification)

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Summary:

LGAI Technological Center, S.A. (hereafter referred to as “Applus+ Certification”) has been commissioned by Beijing Ruifang Information Technology Co., Ltd to perform the verification of greenhouse gas emission reductions of the project activity “Jilin Liaoyuan 50MW Level Biomass Cogeneration Project” (VCS Ref. No. 1126, hereafter referred to as “the project activity”) reported in the monitoring report /1/ during monitoring period 25/09/2013 to 29/11/2017.

The project activity has been validated by TÜV SÜD Industrie Service GmbH based on the CDM PDD /3/ version 08 dated 15/02/2010 and reported in the validation report /4/ No. 1041281, version 04, completed on 01/03/2010. The project activity was registered as a CDM project activity on 09/03/2010 which is available at <https://cdm.unfccc.int/Projects/DB/TUEV-SUED1241699458.61/view>. Also, a PRC has been made and approved by UNFCCC, then CDM PDD /3/ version 09 dated 24/05/2010 would also be the basis for this verification. A gap validation was performed by re-Consult through the first VCS verification which is available at https://www.vcsprojectdatabase.org/#/project_details/1126.

The main purpose of this project activity is to generate clean form of electricity through renewable biomass resource. The installed capacity of the project activity is 30 MW, consisting of 1 set of steam turbine and generator with unit capacity of 30 MW. The total quantity of biomass residues used by the project activity will be 297,341 tons. The average annual power delivered to the grid by the project is expected to be 190.2 GWh. Meanwhile, 0.75 million GJ heat is expected to deliver to Longshan Industrial Development Zone annually. The GHG emission reductions are from two components. Firstly, the project activity substituted electricity generation of Northeast China Grid (NEPG) dominated by fossil fuel power plants. Secondly, the project activity used biomass residues, which will reduce CH₄ emissions because the biomass is dumped or left to decay or burned in an uncontrolled manner in the absence of the project. No emission reduction will be claimed due to the heat replacement. It's estimated that the project activity could achieve GHG emission reductions of 190,139 tCO₂e annually. The project activity is located at Longshan Industrial Development Zone, Liaoyuan City, Jilin Province, People's Republic of China. The project has been developed by National Bio Energy Co., Ltd.

During the 10 years of first crediting period, the project will replace anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 190,139 tCO₂e per year, thereon displacing 190.2 GWh amount of

electricity from the generation-mix of power plants connected to the Chinese power grid annually, which is mainly dominated by thermal/fossil fuel-based power plant.

The purpose and scope of this verification is to ensure that reported emission reductions are complete and accurate in accordance with applicable VCS standards and relevant UNFCCC requirements in order to be certified. A desk review and a site visit have been conducted to verify the data submitted in the monitoring report /1/. Applus+ Certification confirms the following has been reviewed:

- Monitoring plan included in the registered PDD /3/ version 09 dated 24/05/2010;
- Validation report No. 1041281 /4/, version 04, completed on 01/03/2010;
- Approved methodology, ACM0006 /7/, version 06.2, dated 10/08/2007;
- VCS standards and guidance version 4.0, as well as relevant UNFCCC requirements;
- All information and references relevant to the project activity's resulting in emission reductions.

During this verification, no finding was identified related to the monitoring, implementation or operations of the project activity in relation to relevant VCS standards, guidance and UNFCCC requirements and relevant host party criteria and the applied baseline and monitoring methodology etc.

Applus+ Certification confirms that the project is implemented in accordance with the registered PDD /3/. The monitoring plan complies with the applied methodology ACM0006 /7/ version 06.2 and the monitoring has been carried out in accordance with the monitoring plan in the registered PDD /3/. The monitoring system is in place and the emission reductions are calculated without material misstatements. The level of assurance of the verification is reasonable. Our opinion relates to the projects GHG emissions and the resulting GHG emission reductions reported and related to the valid and registered project baseline and monitoring and its associated documents. Based on the information reviewed and evaluated Applus+ Certification confirms that the implementation of the project has resulted in 806,163 tCO₂e emission reductions during period 25/09/2013 to 29/11/2017.

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1 INTRODUCTION

1.1 Objective

LGAI Technological Center, S.A. has been commissioned by Beijing Ruifang Information Technology Co., Ltd to perform the verification of greenhouse gas emission reductions of the project activity “Jilin Liaoyuan 50MW Level Biomass Cogeneration Project” (VCS Ref. No. 1126) reported in the Monitoring Report /1/ during monitoring period 25/09/2013 to 29/11/2017.

LGAI Technological Center, S.A. as the verification body of the project activity has been accredited as a DOE by UNFCCC and also meets the competence requirements as set out in ISO 14065:2007.

The objective of verification is to have an independent review and ex post determination by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registration of VCS project. Certification is the written assurance by the DOE that, during a specific time period, a proposed VCS project activity achieved the reductions in anthropogenic emissions by sources of GHGs as verified.

The objective of this verification/certification is to verify and certify emission reductions, reported for the “Jilin Liaoyuan 50MW Level Biomass Cogeneration Project” in China for the period 25/09/2013 to 29/11/2017.

1.2 Scope and Criteria

The verification scope is defined as an independent and objective review of the registered PDD, the Project's baseline study and Monitoring Report (MR) and other relevant documents. The information in these documents is reviewed against VCS Version 4.0 requirements, UNFCCC rules and associated interpretations.

The verification is not meant to provide any consulting towards the client. However, stated requests for forward actions and/or corrective actions may provide input for improvement of the Project monitoring towards reductions in the GHG emissions.

1.3 Level of Assurance

The verification report is based on the CDM-PDD, the VCS Monitoring Report (MR), supporting evidences made available to the verifier and information collected through performing interviews and during the on-site assessment.

The verification conclusion is assured a reasonable level of assurance.

1.4 Summary Description of the Project

Project title	Jilin Liaoyuan 50MW Level Biomass Cogeneration Project
VCS and CDM reference number	VCS Ref. No: 1126 CDM Ref. No: 2563
Project Participants	National Bio Energy Co., Ltd. (Project Owner, host country, P. R. China)
Location of the project	Longshan Industrial Development Zone, Liaoyuan City, Jilin Province, People's Republic of China Geographic coordinates: East longitude: 125° 15'23" North latitude: 42° 55'24"
Project start date	Construction start date: 28/06/2006 Operation start date: 30/11/2007
Version of registered CDM PDD	Version 09, dated 24/05/2010 (CDM PDD and basis for verification)
Monitoring period	25/09/2013 to 29/11/2017
First monitoring report	Version 1.0, dated 17/01/2020
Final monitoring report	Version 2.0, dated 14/02/2020
Applied Methodology/Version	ACM0006, version 06.2, dated 10/08/2007
Scope/Technical Area	1/1.1

The main purpose of this project activity is to generate clean form of electricity through renewable biomass resource. The installed capacity of the project activity is 30 MW, consisting of 1 set of steam turbine and generator with unit capacity of 30 MW. The total quantity of biomass residues used by the project activity will be 297,341 tons. The average annual power delivered to the grid by the project is expected to be 190.2 GWh. Meanwhile, 0.75 million GJ heat is expected to deliver to Longshan Industrial Development Zone annually. The GHG emission reductions are from two components. Firstly, the project activity substituted electricity generation of Northeast China Grid (NEPG) dominated by fossil fuel power plants. Secondly, the project activity used biomass residues, which will reduce CH₄ emissions because the biomass is dumped or left to decay or burned in an uncontrolled manner in the absence of the project. No emission reduction will be claimed due to the heat replacement. It's estimated that the project activity could achieve GHG emission reductions of 190,139 tCO₂e annually. The project activity is located at Longshan Industrial Development Zone, Liaoyuan City, Jilin Province, People's Republic of China. The project has been developed by National Bio Energy Co., Ltd.

During the 10 years of first crediting period, the project will replace anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 190,139 tCO₂e per year, thereon displacing 190.2 GWh amount of electricity from the generation-mix of power plants connected to the Chinese power grid annually, which is mainly dominated by thermal/fossil fuel-based power plant.

The project activity was registered as a VCS project which is available at https://www.vcsprojectdatabase.org/#/project_details/1126.

2 VERIFICATION PROCESS

2.1 Method and Criteria

Verification was conducted using Applus+ Certification's procedures in line with the requirements specified in the VCS Standard version 4.0, CDM M&P, the latest version of the CDM Validation and Verification Standard, and relevant UNFCCC requirements and applying standard auditing techniques.

Applus+ Certification completed a strategic review and risk assessment of the projects activities and processes in order to gain a full understanding of:

- Activities associated with all the sources contributing to the project emissions and emission reductions, including leakage if relevant;
- Protocols used to estimate or measure GHG emissions from these sources;
- Collection and handling of data;
- Controls on the collection and handling of data;
- Means of verifying reported data; and
- Compilation of the monitoring report.

Applus+ Certification verified the implementation of the monitoring plan and the data presented in the Monitoring Report /1/ for the period in question. This involved a site visit and a desk review of the Monitoring Report. This Verification Report describes the findings of this assessment.

The information of the assessment team is included in below:

Assessment team

According to the sectoral scopes / technical area and experiences in the sectoral or national business environment, Applus+ Certification has composed a project assessment team in accordance with the appointment rules in Applus+ Certification. The composition of assessment team has to 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 as below:

- Leader Auditor (LA)
- Auditor (A)/ Auditor Trainee (AiT)

- Technical Reviewer (TR)
- Technical Experts (TE)

Name	Qualification	Coverage of scope	Coverage of Technical Area	Host country experience
<i>Denny Xue</i>	<i>LA/TE</i>	<i>Y (1.1)</i>	<i>Y</i>	<i>Y</i>
<i>Simon Shen</i>	<i>TR</i>	<i>Y (1.1)</i>	<i>Y</i>	<i>Y</i>

Denny Xue (Master Degree in Environmental Engineering, Bachelor Degree in Thermal Engineering) is a lead auditor appointed by Applus+ Certification for the GHG project assessment. He is based on Shanghai. He has 1.5 years of work experiences in CDM project development. Before he joined Applus+ Certification, he has been worked for Shanghai Chuanji Investment and Management which is a CDM consultancy company as a project manager for CDM project development.

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/Assessment team and ISO 9001/14001 Lead Auditor for 3.5 years.

2.2 Document Review

The VCS monitoring report /1/ version 1.0 dated 17/01/2020, version 2.0 dated 14/02/2020 and the emission reduction calculations spreadsheet /2/, were assessed as part of the verification. In addition, the registered PDD /3/ version 09 dated 24/05/2010 in particular the baseline estimations and the monitoring plan, and the CDM validation report /04/ version 04 dated 01/03/2010, as well as relevant documents, were reviewed. A detailed documents reviewed are listed in Annex 1 of the report.

2.3 Interviews

The key personnel interviewed are summarized in the table below:

Interviewed personnel	Role	Organization	Subject
Mr. Jia Chao	Manager	National Bio Energy Co., Ltd.	Operation of the project activity; Implementation of the monitor plan of the project activity; Data collection and data achievement;
Ms. Sun Shijia	Operator	National Bio Energy Co., Ltd.	Calibration of meters and equipment maintenance. Data collection and ER calculation.

2.4 Site Inspections

The assessment team performed the on-site verification (Longshan Industrial Development Zone, Liaoyuan City, Jilin Province, People's Republic of China) on 21-22/01/2020. The interviewed personnel and objective are listed in above table.

2.5 Resolution of Findings

As an outcome of the verification process, the team can raise different types of findings.

Where a non-conformance arises the assessment team shall raise a Corrective Action Request (CAR). A CAR is issued, where:

- Non-compliance with the monitoring plan or methodology 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 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.

The assessment team shall raise a Clarification Request (CL) if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

All CARs and CLs raised during verification shall be resolved prior to submitting a request for issuance.

There is no CARs and CLs raised for this monitoring period for the project.

2.5.1 Forward Action Requests

None FAR was raised during the verification process. Also there are no remaining from former verification and validation.

2.6 Eligibility for Validation Activities

Not applicable as LGAI Technological Center, S.A. holds the accreditation for the validation and verification for projects under scope 1.

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

Through reviewing the registered PDD /3/ and validation report /4/ at CDM website <https://cdm.unfccc.int/Projects/DB/TUEV-SUED1241699458.61/view>. It is confirmed that the project has been registered as a CDM project with reference No. 2563. By checking VCS website http://www.vcsprojectdatabase.org/#/project_details/1126, it was validated that the project has been also registered as a VCS project with reference No. 1126. The project does not participate in the other emissions trading program by checking public information on Internet and interviewing with project owner.

During the period from 30/11/2007 to 29/11/2017 as the crediting period, the project would claim for only for CERs or VCUs confirmed by checking statement issued by project owner. Also, there are CERs issuance during the period from 09/03/2010 to 24/09/2013.

Therefore, Applus+ Certification consider the project is eligible to participate under the VCS Program as there is no double counting for the emission reduction during any period.

3.2 Methodology Deviations

Not applicable as no methodology deviation.

3.3 Project Description Deviations

There are following project description deviations during this monitoring period:

- (1) In the registered PDD, the project owner planned to use SCS-30t-QC to monitor the biomass weight for both combustion and transportation ($BF_{T,k,y}$ and $BF_{k,y}$). However, after the operation of the project, the project owner chose another type of weight meter (such as SCS-50t-QC) to monitor the biomass weight for transportation ($BF_{T,k,y}$) and use belt scale (such as HY2105 and 6001B) to monitor the biomass weight for combustion ($BF_{k,y}$). This will not influence the data accuracy because all weight meter or belt scale are calibrated according to national standards. The assessment team confirms that the change of type of weight meter and the change of monitoring instrument will not influence the monitoring accuracy of parameters.
- (2) In the registered PDD, Moisture content of the biomass residues was monitored by moisture analyzer (HMT2). However, during the actual operation status, Moisture content of the biomass residues is monitored through electronic oven and electronic balance which also a common approach for monitoring Moisture content of the biomass residues. Also, both electronic oven and electronic balance are calibrated according to national standard. The assessment team confirms that the change of monitoring instrument will not influence the monitoring accuracy of parameter.

- (3) In the registered PDD, Net Calorific Value of biomass (NCV_k) was monitored by reputed laboratories. However, during the actual operation status, a calorimeter own by the project owner is used to monitor Net Calorific Value of biomass (NCV_k) which is the same approach used for monitoring in other reputed laboratories. Moreover, the calorimeter is calibrated according to national standard. Therefore, the assessment team confirms the change of monitoring will not influence the monitoring accuracy of parameter.

3.4 Grouped Project

Not applicable as not a grouped project.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

By means of on-site visit, the assessment team confirms that all physical features of the project activity proposed in the registered PDD /3/ are in place and the PP has operated the project as per registered PDD /3/. The installed capacity of the project activity is 30 MW, consisting of 1 set of steam turbine and generator with unit capacity of 30 MW. The electricity generated is transmitted to the Jilin Power Grid via newly built substation, which was then exported to the NEPG. The average annual power delivered to the grid by the project is expected to be 190.2 GWh. The construction of the project started on 28/06/2006 and the commissioning time was 30/11/2007 verified by site visit interview and checking registered PD. There are no changes on the key equipment and technology since the validation of the project. No special event which would affect the monitoring of the project has been observed during the monitoring period. The implementation of project is in line with the description of registered PDD.

The project has been registered under CDM. The emission reductions resulted from the project during this monitoring period would apply for VCUs. The project only applies VCUs (no other form of environmental credit) or CDM and no rejection from VCS and CDM occurs. The project would contribute to sustainable development in Job creation, Reduction in GHG emissions, Reduction of fossil fuel use and Increase of power supply aspects confirmed during site visit.

The technical parameters have been verified with the nameplates /9 / as below:

Boiler		
Parameters	Unit	Value
Model	/	HG-130/9.2-S.JG1
Boiler maximum continuous rating	t/h	130
Superheated Steam pressure	Mpa	9.2
Superheated Steam temperature	°C	540
Boiler feed-water temperature	°C	210
Boiler Efficiency	%	≥92
Boiler Exhaust Temperature	°C	130
Boiler Dirt-discharge Rate	%	2
Expected lifetime	Years	30
Manufacturer	/	BWE boiler made by Harbin Boiler Group Co., Ltd.
Steam turbine		

Parameters	Unit	Value
Model	/	C30-8.83/0.981
Rated Output	MW	30
Rated Rotation Speed	r/min	3,000
Rated Flow of main steam	t/h	110
Rated Pressure of main steam	MPa	8.83
Rated Temperature of main steam	°C	535
Efficiency	%	81
Expected lifetime	Years	30
Manufacturer	/	Qingdao Jieneng Steam Turbine Group Co., Ltd
Generator		
Parameters	Unit	Value
Model	/	QF-30-2
Rated Output	MW	30
Rated Voltage	kV	6.3
Rated Electric Current	A	3,437
Rated Rotation Speed	r/min	3,000
Efficiency	%	≥97.6
Expected lifetime	Years	30

By comparing the actual ER claimed in this monitoring period with the estimate in the registered PDD, the actual emission reductions (806,163 tCO₂e) are 1.3% higher than what is stated in the registered PD (i.e. 795,458 tCO₂e) which could be considered in the reasonable range and will not lead to the overestimation of VERs.

The assessment team confirmed that there is no proposed or actual change to the project design during this monitoring period.

All required equipments and procedures are available and implemented in an appropriate manner.

All necessary monitoring instruments are installed. All required instruments including standby and operating procedures for the same have been implemented in an appropriate manner.

The project is completely operational and the same has been confirmed on-site. Neither mistakes nor malfunction on main meters have been observed during this monitoring period.

4.2 Safeguards

4.2.1 No Net Harm

The project activity promotes environmental and socio-economic well-being as it results in zero GHG emissions due to installation and operation of clean, renewable energy technology for electricity generation.

By checking Environmental Impact Assessment summary for the project activity, the assessment team confirm all environmental impacts has been analysed and no net harm was detected.

Also, no potential environment or social economic matter was found during the site visit. The project is renewable energy project and thus no net harm observed in air or water quality on-site.

4.2.2 Local Stakeholder Consultation

The project owner carried out the stakeholders meeting on November 2006. Questionnaire was implemented by filling the stakeholder comments investigation form. The comments, from the government, environmental protection bureau, local farmers, teachers and other relevant stakeholders, were collected. 50 copies questionnaires were distributed and 46 of them were collected. The recovery rate is 92%. Investigator introduced the project information to the interviewee firstly including the environmental impacts during the construction and operation, environmental protection measures that will be taken. Then, the stakeholders' comments were investigated by questionnaires.

The stakeholder meeting and the survey showed that the project activity receives strong support from the local community. They all believe the project activity will promote local economic development and agree with the project development and construction.

Communications with Local stakeholders was being carried out at periodic intervals. There are no negative comments received for the project.

All such conclusion has been verified through site visit and check registered PDD.

4.3 AFOLU-Specific Safeguards

Not applicable as non-AFOLU project.

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

The monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD /3/. All parameters were monitored and determined as per the monitoring plan which is listed in below table:

Data / Parameter:	EG _{project plant,y}
Data unit:	MWh
Description:	Net electricity generated in the project plant during the year y
Purpose of the data:	Calculation of baseline emissions
Parameter value:	792,588.720
Source of data used:	Net electricity generated in the project plant during the year y (EG _{project plant,y}) are all sourced from Meter Reading Records (MRRs) /10/ issued by the project owner, Electricity Transaction Notes (ETNs) /11/ issued by power grid company covering monitoring period.
Information flow:	2 bidirectional electricity meters (one as main meter and another as backup) installed at project site were measured continuously, recorded monthly and archived electronically. At 24:00 hr of the last day of each month, the staff from project owner will record the main electricity meter's readings and form Meter Reading Records (MRRs). The staff from power grid company will record the meter readings of main meter then transcribes the data into Electricity Transaction Notes (ETNs) then after the confirmation of the project owner for the ETNs, the project owner will issue the invoice. The data for MRRs and ETNs have been sent to the CDM consulting company for reporting of GHG emission reduction. The conservative one would be used for ER calculation.
Monitoring method, frequency and equipments:	The parameter was measured continuously and recorded monthly by 2 bi-direction electricity meters installed at project site during the monitoring period verified by site visit.

	See below for the information of 2 bi-direction electricity meters verified by site visit and checking calibration certificates /12/: <table><tr><th>Meter</th><th>Type</th><th>Serial Number</th><th>Accuracy</th></tr><tr><td>Main Meter</td><td>ZMD402CT44</td><td>93982941</td><td>0.2s</td></tr><tr><td>Backup Meter</td><td>ZMD402CT44</td><td>93982942</td><td>0.2s</td></tr></table> The type, serial number and accuracy have been confirmed by site visit.	Meter	Type	Serial Number	Accuracy	Main Meter	ZMD402CT44	93982941	0.2s	Backup Meter	ZMD402CT44	93982942	0.2s													
Meter	Type	Serial Number	Accuracy																							
Main Meter	ZMD402CT44	93982941	0.2s																							
Backup Meter	ZMD402CT44	93982942	0.2s																							
Calibration:	The calibration information is shown as below /12/: <table><tr><th>Meter</th><th>Calibration date</th><th>Valid until</th></tr><tr><td rowspan="5">Main Meter</td><td>13/03/2013</td><td>12/03/2014</td></tr><tr><td>07/03/2014</td><td>06/03/2015</td></tr><tr><td>02/03/2015</td><td>01/03/2016</td></tr><tr><td>26/02/2016</td><td>25/02/2017</td></tr><tr><td>20/02/2017</td><td>19/02/2018</td></tr><tr><td rowspan="5">Backup Meter</td><td>13/03/2013</td><td>12/03/2014</td></tr><tr><td>07/03/2014</td><td>06/03/2015</td></tr><tr><td>02/03/2015</td><td>01/03/2016</td></tr><tr><td>26/02/2016</td><td>25/02/2017</td></tr><tr><td>20/02/2017</td><td>19/02/2018</td></tr></table> The calibration was conducted by accredited third parties which is Jilin Electric Science Research Institute Co., Ltd was accredited by Quality and Technology Supervision Bureau of Jilin province /13/.	Meter	Calibration date	Valid until	Main Meter	13/03/2013	12/03/2014	07/03/2014	06/03/2015	02/03/2015	01/03/2016	26/02/2016	25/02/2017	20/02/2017	19/02/2018	Backup Meter	13/03/2013	12/03/2014	07/03/2014	06/03/2015	02/03/2015	01/03/2016	26/02/2016	25/02/2017	20/02/2017	19/02/2018
Meter	Calibration date	Valid until																								
Main Meter	13/03/2013	12/03/2014																								
	07/03/2014	06/03/2015																								
	02/03/2015	01/03/2016																								
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	20/02/2017	19/02/2018																								
Backup Meter	13/03/2013	12/03/2014																								
	07/03/2014	06/03/2015																								
	02/03/2015	01/03/2016																								
	26/02/2016	25/02/2017																								
	20/02/2017	19/02/2018																								
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.																									
Means of verification:	Data of the parameter was verified by checking MRRs and ETNs. All data is in line with MRRs and ETNs; Information flow was verified by checking MRRs and ETNs, and all information are consistent; Monitoring method was verified by site visit, checking calibration certificates, all monitoring method meets the description in the PDD; Calibration was verified by checking calibration certificate and Accreditation certificate, all calibration of monitoring equipment meets the requirement indicated in the PDD.																									

Data / Parameter:	EC _{PJ,y}
Data unit:	MWh

Description:	On-site electricity consumption attributable to the project activity during the year y																
Purpose of the data:	Calculation of project emissions																
Parameter value:	350.280																
Source of data used:	On-site electricity consumption attributable to the project activity during the year y ($EC_{PJ,y}$) are all sourced from Meter Reading Records (MRRs) /10/ issued by the project owner, Electricity Transaction Notes (ETNs) /11/ issued by power grid company covering monitoring period.																
Information flow:	2 bidirectional electricity meters (one as main meter and another as backup) installed at project site were measured continuously, recorded monthly and archived electronically. At 24:00 hr of the last day of each month, the staff from project owner will record the main electricity meter's readings and form Meter Reading Records (MRRs). The staff from power grid company will record the meter readings of main meter then transcribes the data into Electricity Transaction Notes (ETNs) then after the confirmation of the project owner for the ETNs, the power grid company will issue the invoice. The data for MRRs and ETNs have been sent to the CDM consulting company for reporting of GHG emission reduction. The conservative one would be used for ER calculation.																
Monitoring method, frequency and equipments:	The parameter was measured continuously and recorded monthly by 2 bi-direction electricity meters installed at project site during the monitoring period verified by site visit. See below for the information of 2 bi-direction electricity meters verified by site visit and checking calibration certificates /12/: <table><tr><th>Meter</th><th>Type</th><th>Serial Number</th><th>Accuracy</th></tr><tr><td>Main Meter</td><td>ZMD402CT44</td><td>93982941</td><td>0.2s</td></tr><tr><td>Backup Meter</td><td>ZMD402CT44</td><td>93982942</td><td>0.2s</td></tr></table> The type, serial number and accuracy have been confirmed by site visit.			Meter	Type	Serial Number	Accuracy	Main Meter	ZMD402CT44	93982941	0.2s	Backup Meter	ZMD402CT44	93982942	0.2s		
Meter	Type	Serial Number	Accuracy														
Main Meter	ZMD402CT44	93982941	0.2s														
Backup Meter	ZMD402CT44	93982942	0.2s														
Calibration:	The calibration information is shown as below /12/: <table><tr><th>Meter</th><th>Calibration date</th><th>Valid until</th></tr><tr><td rowspan="5">Main Meter</td><td>13/03/2013</td><td>12/03/2014</td></tr><tr><td>07/03/2014</td><td>06/03/2015</td></tr><tr><td>02/03/2015</td><td>01/03/2016</td></tr><tr><td>26/02/2016</td><td>25/02/2017</td></tr><tr><td>20/02/2017</td><td>19/02/2018</td></tr></table>			Meter	Calibration date	Valid until	Main Meter	13/03/2013	12/03/2014	07/03/2014	06/03/2015	02/03/2015	01/03/2016	26/02/2016	25/02/2017	20/02/2017	19/02/2018
Meter	Calibration date	Valid until															
Main Meter	13/03/2013	12/03/2014															
	07/03/2014	06/03/2015															
	02/03/2015	01/03/2016															
	26/02/2016	25/02/2017															
	20/02/2017	19/02/2018															

	Backup Meter	13/03/2013	12/03/2014
		07/03/2014	06/03/2015
		02/03/2015	01/03/2016
		26/02/2016	25/02/2017
		20/02/2017	19/02/2018
	The calibration was conducted by accredited third parties which is Jilin Electric Science Research Institute Co., Ltd was accredited by Quality and Technology Supervision Bureau of Jilin province /13/.		
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.		
Means of verification:	Data of the parameter was verified by checking MRRs and ETNs. All data is in line with MRRs and ETNs; Information flow was verified by checking MRRs and ETNs, and all information are consistent; Monitoring method was verified by site visit, checking calibration certificates, all monitoring method meets the description in the PDD; Calibration was verified by checking calibration certificate and Accreditation certificate, all calibration of monitoring equipment meets the requirement indicated in the PDD.		

Data / Parameter:	EG _{PJ,y}
Data unit:	MWh
Description:	Electricity consumption at the biomass residue storage sites
Purpose of the data:	Calculation of project emissions
Parameter value:	0
Source of data used:	During the site visit, it is able to confirm that 3 biomass residue storage sites have been closed since 19/04/2010, no monitoring equipment was re-installed since then. Therefore, there are no Electricity consumption at the biomass residue storage sites (EG_{PJ,y}) during this monitoring period.
Information flow:	During the site visit, it is able to confirm that 3 biomass residue storage sites have been closed since 19/04/2010, no monitoring equipment was re-installed since then. Therefore, there are no Electricity consumption at the biomass residue storage sites (EG_{PJ,y}) during this monitoring period.

Monitoring method, frequency and equipments:	During the site visit, it is able to confirm that 3 biomass residue storage sites have been closed since 19/04/2010, no monitoring equipment was re-installed since then. Therefore, there are no Electricity consumption at the biomass residue storage sites ($EG_{PJ,y}$) during this monitoring period.
Calibration:	Not applicable
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	During the site visit, it is able to confirm that 3 biomass residue storage sites have been closed since 19/04/2010, no monitoring equipment was re-installed since then. Therefore, there are no Electricity consumption at the biomass residue storage sites ($EG_{PJ,y}$) during this monitoring period.

Data / Parameter:	$BF_{k,y}$
Data unit:	tons of dry matter
Description:	Quantity of biomass residue type k combusted in the project plant during the year y (k = maize stalks)
Purpose of the data:	Calculation of baseline emissions
Parameter value:	790,188.71
Source of data used:	Quantity of biomass residue maize stalks combusted in the project plant during the year y ($BF_{k,y}$) are all sourced from Monthly Report for fuel /15/ and Moisture of biomass residues report /16/ covering monitoring period.
Information flow:	3 belt scales were used to monitor Quantity (tonnes on wet-basis) continuously, aggregated monthly, and prepare annually. For each batch of biomass, the quantity (wet-basis) would be measured and recorded in Monthly Report for fuel /15/. Also, for each batch of biomass, the moisture content of the biomass residues would be monitored continuously by using electric oven and electric balance and recorded in the Moisture of biomass residues report /16/. Then Quantity (tonnes on dry-basis) of biomass residues were calculated based on Quantity (tonnes on wet-basis) of biomass residues and the moisture content of the biomass residues accordingly and recorded in the Monthly Report for fuel /9/. The data for Monthly Report for fuel have been sent to the CDM consulting company for reporting of GHG emission reduction.

Monitoring method, frequency and equipments:	The parameter was measured continuously and recorded monthly by 3 belt scales, electric oven and electric balance during the monitoring period verified by site visit.			
	See below for the information of 3 belt scales, electric oven and electric balance verified by site visit and checking calibration certificates /12/:			
	Equipment	Type	Serial Number	Accuracy
	Belt scale	HY2105	81218	III
	Belt scale	HY2105	090325	III
	Belt scale	6001B	6B23262163X0888	III
	Electric oven	DHG-9145A	0900466	0.02
Electric balance	TE4101-L	24390302	III	
The type, serial number and accuracy have been confirmed by site visit.				
Calibration:	The calibration information is shown as below /12/:			
	Equipment	Calibration date	Valid until	
	Belt scales (total: 3)	13/06/2013	12/12/2013	
		09/12/2013	08/06/2014	
		03/06/2014	02/12/2014	
		25/11/2014	24/05/2015	
		19/05/2015	18/11/2015	
		13/11/2015	12/05/2016	
		08/05/2016	07/11/2016	
		04/11/2016	03/05/2017	
		28/04/2017	27/10/2017	
		23/10/2017	22/04/2018	
	Electric oven	30/08/2013	29/08/2014	
		27/08/2014	25/08/2015	
		21/08/2015	20/08/2016	
		17/08/2016	16/08/2017	
		14/08/2017	13/08/2018	
	Electric balance	27/08/2013	26/08/2014	
		27/08/2014	25/08/2015	
		21/08/2015	20/08/2016	
		17/08/2016	16/08/2017	
		14/08/2017	13/08/2018	
	The calibration was conducted by accredited third parties which is Liaoyuan Institute of Metrology Verification and Test.			
	QA/QC procedure:	Annual energy balance has been calculated annually as following:		

	Year	Efficiency (%)
	2013	22%
	2014	21%
	2015	20%
	2016	22%
	2017	21%
Based on above table, it is able to confirm the Efficiency of the project varied in the normal range in this monitoring period. Data record will be archived for a period of 2 years after the crediting period to which the records pertain.		
Means of verification:	Data of the parameter was verified by checking Monthly Report for fuel. All data is in line with Monthly Report for fuel; Information flow was verified by checking Monthly Report for fuel, and all information are consistent; Monitoring method was verified by site visit, checking calibration certificates, all monitoring method meets the description in the PDD; Calibration was verified by checking calibration certificate and Accreditation certificate, all calibration of monitoring equipment meets the requirement indicated in the PDD.	

Data / Parameter:	$BF_{T,k,y}$
Data unit:	tons of dry matter
Description:	Quantity of biomass residue type k that has been transported to the project site during the year y (k = maize stalks)
Purpose of the data:	Calculation of baseline emissions
Parameter value:	795,503.05
Source of data used:	Quantity of biomass residue maize stalks that has been transported to the project site during the year y ($BF_{T,k,y}$) are all sourced from Monthly Report for fuel /15/ and Moisture of biomass residues report /16/ covering monitoring period.
Information flow:	1 weight meter was used to monitor Quantity (tonnes on wet-basis) continuously, aggregated monthly, and prepare annually. For each batch of biomass, the quantity (wet-basis) would be measured and recorded in

	Monthly Report for fuel /15/. Also, for each batch of biomass, the moisture content of the biomass residues would be monitored continuously by using electric oven and electric balance and recorded in the Moisture of biomass residues report /16/. Then Quantity (tonnes on dry-basis) of biomass residues were calculated based on Quantity (tonnes on wet-basis) of biomass residues and the moisture content of the biomass residues accordingly and recorded in the Monthly Report for fuel /9/. The data for Monthly Report for fuel have been sent to the CDM consulting company for reporting of GHG emission reduction.																																								
Monitoring method, frequency and equipments:	The parameter was measured continuously and recorded monthly by 1 weight meter, electric oven and electric balance during the monitoring period verified by site visit. See below for the information of 1 weight meter, electric oven and electric balance verified by site visit and checking calibration certificates /12/: <table><tr><th>Equipment</th><th>Type</th><th>Serial Number</th><th>Accuracy</th></tr><tr><td>Weight meter</td><td>SCS-50t-QC</td><td>212</td><td>III</td></tr><tr><td>Electric oven</td><td>DHG-9145A</td><td>0900466</td><td>0.02</td></tr><tr><td>Electric balance</td><td>TE4101-L</td><td>24390302</td><td>III</td></tr></table> The type, serial number and accuracy have been confirmed by site visit.	Equipment	Type	Serial Number	Accuracy	Weight meter	SCS-50t-QC	212	III	Electric oven	DHG-9145A	0900466	0.02	Electric balance	TE4101-L	24390302	III																								
Equipment	Type	Serial Number	Accuracy																																						
Weight meter	SCS-50t-QC	212	III																																						
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Electric balance	TE4101-L	24390302	III																																						
Calibration:	The calibration information is shown as below /12/: <table><tr><th>Equipment</th><th>Calibration date</th><th>Valid until</th></tr><tr><td rowspan="10">Weight meter</td><td>12/06/2013</td><td>11/12/2013</td></tr><tr><td>09/12/2013</td><td>08/06/2014</td></tr><tr><td>03/06/2014</td><td>02/12/2014</td></tr><tr><td>25/11/2014</td><td>24/05/2015</td></tr><tr><td>19/05/2015</td><td>18/11/2015</td></tr><tr><td>13/11/2015</td><td>12/05/2016</td></tr><tr><td>08/05/2016</td><td>07/11/2016</td></tr><tr><td>04/11/2016</td><td>03/05/2017</td></tr><tr><td>28/04/2017</td><td>27/10/2017</td></tr><tr><td>23/10/2017</td><td>22/04/2018</td></tr><tr><td rowspan="5">Electric oven</td><td>30/08/2013</td><td>29/08/2014</td></tr><tr><td>27/08/2014</td><td>25/08/2015</td></tr><tr><td>21/08/2015</td><td>20/08/2016</td></tr><tr><td>17/08/2016</td><td>16/08/2017</td></tr><tr><td>14/08/2017</td><td>13/08/2018</td></tr><tr><td rowspan="2">Electric balance</td><td>27/08/2013</td><td>26/08/2014</td></tr><tr><td>27/08/2014</td><td>25/08/2015</td></tr></table>	Equipment	Calibration date	Valid until	Weight meter	12/06/2013	11/12/2013	09/12/2013	08/06/2014	03/06/2014	02/12/2014	25/11/2014	24/05/2015	19/05/2015	18/11/2015	13/11/2015	12/05/2016	08/05/2016	07/11/2016	04/11/2016	03/05/2017	28/04/2017	27/10/2017	23/10/2017	22/04/2018	Electric oven	30/08/2013	29/08/2014	27/08/2014	25/08/2015	21/08/2015	20/08/2016	17/08/2016	16/08/2017	14/08/2017	13/08/2018	Electric balance	27/08/2013	26/08/2014	27/08/2014	25/08/2015
Equipment	Calibration date	Valid until																																							
Weight meter	12/06/2013	11/12/2013																																							
	09/12/2013	08/06/2014																																							
	03/06/2014	02/12/2014																																							
	25/11/2014	24/05/2015																																							
	19/05/2015	18/11/2015																																							
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	17/08/2016	16/08/2017																																							
	14/08/2017	13/08/2018																																							
Electric balance	27/08/2013	26/08/2014																																							
	27/08/2014	25/08/2015																																							

		21/08/2015	20/08/2016
		17/08/2016	16/08/2017
		14/08/2017	13/08/2018
		The calibration was conducted by accredited third parties which is Liaoyuan Institute of Metrology Verification and Test.	
QA/QC procedure:	Annual energy balance has been calculated annually as following:		
	Year	Efficiency (%)	
	2013	22%	
	2014	21%	
	2015	20%	
	2016	22%	
	2017	21%	
	Based on above table, it is able to confirm the Efficiency of the project varied in the normal range in this monitoring period.		
Data record will be archived for a period of 2 years after the crediting period to which the records pertain.			
Means of verification:	Data of the parameter was verified by checking Monthly Report for fuel. All data is in line with Monthly Report for fuel;		
	Information flow was verified by checking Monthly Report for fuel, and all information are consistent;		
	Monitoring method was verified by site visit, checking calibration certificates, all monitoring method meets the description in the PDD;		
	Calibration was verified by checking calibration certificate and Accreditation certificate, all calibration of monitoring equipment meets the requirement indicated in the PDD.		

Data / Parameter:	Moisture content of the biomass residues
Data unit:	% Water content
Description:	Moisture content of each biomass residues type k
Purpose of the data:	Calculation of project emissions
Parameter value:	28.65
Source of data used:	Moisture content of the biomass residues are sourced from Moisture of biomass residues report /16/.

Information flow:	For each batch of biomass, the moisture content of the biomass residues would be monitored continuously by using constant temperature electric oven and electric balance and recorded in the Moisture of biomass residues report /16/. The data for Moisture of biomass residues report /16/ have been sent to the CDM consulting company for reporting of GHG emission reduction.																									
Monitoring method, frequency and equipments:	The parameter was measured continuously and recorded monthly by electric oven and electric balance during the monitoring period verified by site visit. See below for the information of electric oven and electric balance verified by site visit and checking calibration certificates /12/: <table><tr><th>Equipment</th><th>Type</th><th>Serial Number</th><th>Accuracy</th></tr><tr><td>Electric oven</td><td>DHG-9145A</td><td>0900466</td><td>0.02</td></tr><tr><td>Electric balance</td><td>TE4101-L</td><td>24390302</td><td>III</td></tr></table> The type, serial number and accuracy have been confirmed by site visit.	Equipment	Type	Serial Number	Accuracy	Electric oven	DHG-9145A	0900466	0.02	Electric balance	TE4101-L	24390302	III													
Equipment	Type	Serial Number	Accuracy																							
Electric oven	DHG-9145A	0900466	0.02																							
Electric balance	TE4101-L	24390302	III																							
Calibration:	The calibration information is shown as below /12/: <table><tr><th>Equipment</th><th>Calibration date</th><th>Valid until</th></tr><tr><td rowspan="5">Electric oven</td><td>30/08/2013</td><td>29/08/2014</td></tr><tr><td>27/08/2014</td><td>25/08/2015</td></tr><tr><td>21/08/2015</td><td>20/08/2016</td></tr><tr><td>17/08/2016</td><td>16/08/2017</td></tr><tr><td>14/08/2017</td><td>13/08/2018</td></tr><tr><td rowspan="5">Electric balance</td><td>27/08/2013</td><td>26/08/2014</td></tr><tr><td>27/08/2014</td><td>25/08/2015</td></tr><tr><td>21/08/2015</td><td>20/08/2016</td></tr><tr><td>17/08/2016</td><td>16/08/2017</td></tr><tr><td>14/08/2017</td><td>13/08/2018</td></tr></table> The calibration was conducted by accredited third parties which is Liaoyuan Institute of Metrology Verification and Test.	Equipment	Calibration date	Valid until	Electric oven	30/08/2013	29/08/2014	27/08/2014	25/08/2015	21/08/2015	20/08/2016	17/08/2016	16/08/2017	14/08/2017	13/08/2018	Electric balance	27/08/2013	26/08/2014	27/08/2014	25/08/2015	21/08/2015	20/08/2016	17/08/2016	16/08/2017	14/08/2017	13/08/2018
Equipment	Calibration date	Valid until																								
Electric oven	30/08/2013	29/08/2014																								
	27/08/2014	25/08/2015																								
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	21/08/2015	20/08/2016																								
	17/08/2016	16/08/2017																								
	14/08/2017	13/08/2018																								
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.																									
Means of verification:	Data of the parameter was verified by checking Moisture of biomass residues report. All data is in line with Moisture of biomass residues report; Information flow was verified by checking Moisture of biomass residues report, and all information are consistent;																									

	Monitoring method was verified by site visit, checking calibration certificates, all monitoring method meets the description in the PDD; Calibration was verified by checking calibration certificate and Accreditation certificate, all calibration of monitoring equipment meets the requirement indicated in the PDD.
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Data / Parameter:	NCV _k																
Data unit:	GJ/ton of dry matter																
Description:	Net Calorific Value of biomass type k																
Purpose of the data:	Calculation of project emissions																
Parameter value:	16.861																
Source of data used:	Net Calorific Value of biomass type k (NCV _k) are sourced from NCV Test Report /21/.																
Information flow:	3 samples of biomass residues would be collected as 1 batch and then sent to laboratory of project owner to test the NCV of biomass residues by using calorimeter according to national standard within at least 6 months based on national standard during this monitoring period and the laboratory would issue NCV Test Report. All the test would be based on dry basis. The data for NCV Test Report /21/ has been sent to the CDM consulting company for reporting of GHG emission reduction.																
Monitoring method, frequency and equipments:	The parameter was measured within at least 6 months by 1 calorimeter during the monitoring period verified by site visit. See below for the information of 1 calorimeter verified by site visit and checking calibration certificates /12/: <table><tr><th>Equipment</th><th>Type</th><th>Serial Number</th><th>Accuracy</th></tr><tr><td>Calorimeter</td><td>SDACM4000</td><td>1000009</td><td>0.1%</td></tr></table> The type, serial number and accuracy have been confirmed by site visit.			Equipment	Type	Serial Number	Accuracy	Calorimeter	SDACM4000	1000009	0.1%						
Equipment	Type	Serial Number	Accuracy														
Calorimeter	SDACM4000	1000009	0.1%														
Calibration:	The calibration information is shown as below /12/: <table><tr><th>Equipment</th><th>Calibration date</th><th>Valid until</th></tr><tr><td rowspan="5">Calorimeter</td><td>03/03/2013</td><td>02/03/2014</td></tr><tr><td>26/02/2014</td><td>25/02/2015</td></tr><tr><td>13/02/2015</td><td>12/02/2016</td></tr><tr><td>02/02/2016</td><td>01/02/2017</td></tr><tr><td>23/01/2017</td><td>22/01/2018</td></tr></table>			Equipment	Calibration date	Valid until	Calorimeter	03/03/2013	02/03/2014	26/02/2014	25/02/2015	13/02/2015	12/02/2016	02/02/2016	01/02/2017	23/01/2017	22/01/2018
Equipment	Calibration date	Valid until															
Calorimeter	03/03/2013	02/03/2014															
	26/02/2014	25/02/2015															
	13/02/2015	12/02/2016															
	02/02/2016	01/02/2017															
	23/01/2017	22/01/2018															

	The calibration was conducted by accredited third parties which is Liaoyuan Institute of Metrology Verification and Test.
QA/QC procedure:	By comparing the NCV of biomass residues sourced from NCV Test Report /21/ and the default value in the IPCC, the assessment team confirm the NCV of biomass residues is in reasonable range. Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	Data of the parameter was verified by checking NCV Test Report. All data is in line with NCV Test Report; Information flow was verified by checking NCV Test Report, and all information are consistent; Monitoring method was verified by site visit, checking NCV Test Report, all monitoring method meets the description in the PDD.

Data / Parameter:	AVD _y
Data unit:	km
Description:	Average return trip distance (from and to) between biomass fuel supply sites and the project site
Purpose of the data:	Calculation of project emissions
Parameter value:	50*2 = 100
Source of data used:	As according to the law and regulation, the radius collection of every biomass project should be no more than 50 km. Therefore, it is most conservative to apply 100 km as the value.
Information flow:	Not applicable
Monitoring method, frequency and equipments:	Not applicable
Calibration:	Not applicable
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	Not applicable

Data / Parameter:	T _{ly}																						
Data unit:	tons																						
Description:	Average load of the trucks used for transportation of biomass																						
Purpose of the data:	Calculation of project emissions																						
Parameter value:	14.14 as weighted average																						
Source of data used:	Average load of the trucks used for transportation of biomass are sourced from Monthly Report for fuel /15/.																						
Information flow:	1 weight meter was used to monitor Quantity (tonnes on wet-basis) of biomass residues transported to the project site which is the total load of truck continuously, aggregated monthly, and prepare annually. For each batch of biomass, the quantity (wet-basis) which is the load of truck would be measured and recorded in Monthly Report for fuel /15/. When considering the number of batch also indicated in the Monthly Report for fuel /15/, the average load of the trucks used for transportation of biomass would be determined. The data for Monthly Report for fuel have been sent to the CDM consulting company for reporting of GHG emission reduction.																						
Monitoring method, frequency and equipments:	The parameter was measured continuously and recorded monthly by 1 weight meter during the monitoring period verified by site visit. See below for the information of 1 weight meter verified by site visit and checking calibration certificates /12/: <table><tr><th>Equipment</th><th>Type</th><th>Serial Number</th><th>Accuracy</th></tr><tr><td>Weight meter</td><td>SCS-50t-QC</td><td>212</td><td>III</td></tr></table> The type, serial number and accuracy have been confirmed by site visit.			Equipment	Type	Serial Number	Accuracy	Weight meter	SCS-50t-QC	212	III												
Equipment	Type	Serial Number	Accuracy																				
Weight meter	SCS-50t-QC	212	III																				
Calibration:	The calibration information is shown as below /12/: <table><tr><th>Equipment</th><th>Calibration date</th><th>Valid until</th></tr><tr><td rowspan="8">Weight meter</td><td>12/06/2013</td><td>11/12/2013</td></tr><tr><td>09/12/2013</td><td>08/06/2014</td></tr><tr><td>03/06/2014</td><td>02/12/2014</td></tr><tr><td>25/11/2014</td><td>24/05/2015</td></tr><tr><td>19/05/2015</td><td>18/11/2015</td></tr><tr><td>13/11/2015</td><td>12/05/2016</td></tr><tr><td>08/05/2016</td><td>07/11/2016</td></tr><tr><td>04/11/2016</td><td>03/05/2017</td></tr></table>			Equipment	Calibration date	Valid until	Weight meter	12/06/2013	11/12/2013	09/12/2013	08/06/2014	03/06/2014	02/12/2014	25/11/2014	24/05/2015	19/05/2015	18/11/2015	13/11/2015	12/05/2016	08/05/2016	07/11/2016	04/11/2016	03/05/2017
Equipment	Calibration date	Valid until																					
Weight meter	12/06/2013	11/12/2013																					
	09/12/2013	08/06/2014																					
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	04/11/2016	03/05/2017																					

		28/04/2017	27/10/2017
		23/10/2017	22/04/2018
	The calibration was conducted by accredited third parties which is Liaoyuan Institute of Metrology Verification and Test.		
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.		
Means of verification:	Data of the parameter was verified by checking Monthly Report for fuel. All data is in line with Monthly Report for fuel; Information flow was verified by checking Monthly Report for fuel, and all information are consistent; Monitoring method was verified by site visit, checking calibration certificates, all monitoring method meets the description in the PDD; Calibration was verified by checking calibration certificate and Accreditation certificate, all calibration of monitoring equipment meets the requirement indicated in the PDD.		

Data / Parameter:	FF _{project site,i,y}
Data unit:	Mass or volume unit /year
Description:	Quantity of fossil fuel type i combusted at the project plant for other purposes that are attributable to the project activity during the year y
Purpose of the data:	Calculation of project emissions
Parameter value:	712.53
Source of data used:	Quantity of fossil fuel type i combusted at the project plant for other purposes that are attributable to the project activity during the year y are sourced from Diesel purchase record /18/.
Information flow:	When diesel was purchased each time, an invoice would be issued by the supplier and the project owner will record the number of diesels purchased in the Diesel purchase record /18/. Also, a volume meter would be used to monitor the volume of stock on a monthly basis then record the number in the Diesel purchase record /18/. With amount of purchased diesel and diesel in the stock, it is able to calculate the diesel consumed. The data for Diesel purchase record have been sent to the CDM consulting company for reporting of GHG emission reduction.

Monitoring method, frequency and equipments:	The parameter was measured continuously and recorded monthly by 1 flow meter during the monitoring period verified by site visit. See below for the information of 1 flow meter verified by site visit and checking calibration certificates /12/: <table><tr><th>Equipment</th><th>Type</th><th>Serial Number</th><th>Accuracy</th></tr><tr><td>Flow meter</td><td>LC11-A</td><td>46</td><td>0.5</td></tr></table> The type, serial number and accuracy have been confirmed by site visit.	Equipment	Type	Serial Number	Accuracy	Flow meter	LC11-A	46	0.5						
Equipment	Type	Serial Number	Accuracy												
Flow meter	LC11-A	46	0.5												
Calibration:	The calibration information is shown as below /12/: <table><tr><th>Equipment</th><th>Calibration date</th><th>Valid until</th></tr><tr><td rowspan="5">Flow meter</td><td>12/08/2013</td><td>11/08/2014</td></tr><tr><td>07/08/2014</td><td>06/08/2015</td></tr><tr><td>03/08/2015</td><td>02/08/2016</td></tr><tr><td>29/07/2016</td><td>28/07/2017</td></tr><tr><td>24/07/2017</td><td>23/07/2018</td></tr></table> The calibration was conducted by accredited third parties which is Liaoyuan Institute of Metrology Verification and Test.	Equipment	Calibration date	Valid until	Flow meter	12/08/2013	11/08/2014	07/08/2014	06/08/2015	03/08/2015	02/08/2016	29/07/2016	28/07/2017	24/07/2017	23/07/2018
Equipment	Calibration date	Valid until													
Flow meter	12/08/2013	11/08/2014													
	07/08/2014	06/08/2015													
	03/08/2015	02/08/2016													
	29/07/2016	28/07/2017													
	24/07/2017	23/07/2018													
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.														
Means of verification:	Data of the parameter was verified by checking Diesel purchase record. All data is in line with Monthly Report for fuel; Information flow was verified by checking Diesel purchase record, and all information are consistent; Monitoring method was verified by site visit, checking calibration certificates, all monitoring method meets the description in the PDD; Calibration was verified by checking calibration certificate and Accreditation certificate, all calibration of monitoring equipment meets the requirement indicated in the PDD.														

Data / Parameter:	FF _{project plant,i,y}
Data unit:	Mass or volume unit /year
Description:	Quantity of fossil fuel type i combusted in the project plant during the year y
Purpose of the data:	Calculation of project emissions
Parameter value:	0

Source of data used:	During the site visit, it is confirmed that there is no fossil fuel combusted in the project plant (boiler), thus the value for this monitoring parameter is 0.
Information flow:	During the site visit, it is confirmed that there is no fossil fuel combusted in the project plant (boiler), thus the value for this monitoring parameter is 0.
Monitoring method, frequency and equipments:	During the site visit, it is confirmed that there are no fossil fuel combusted in the project plant (boiler), thus the value for this monitoring parameter is 0.
Calibration:	Not applicable
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	During the site visit, it is confirmed that there are no fossil fuel combusted in the project plant (boiler), thus the value for this monitoring parameter is 0.

Data / Parameter:	EF _{CO2,FF,y}
Data unit:	tCO ₂ /GJ
Description:	CO ₂ emission factor for fossil fuel type i
Purpose of the data:	Calculation of project emissions
Parameter value:	0.0748
Source of data used:	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories /17/
Information flow:	Not applicable
Monitoring method, frequency and equipments:	Not applicable
Calibration:	Not applicable
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	Not applicable

Data / Parameter:	NCV _{i,y}
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Data unit:	GJ/mass of volume unit
Description:	Net calorific value of the fossil fuel type i in year y
Purpose of the data:	Calculation of project emissions
Parameter value:	42.652
Source of data used:	China Energy Statistical Yearbook 2018 /22/
Information flow:	Not applicable
Monitoring method, frequency and equipments:	Not applicable
Calibration:	Not applicable
QA/QC procedure:	By checking IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories /17/ and value from China Energy Statistical Yearbook 2018 /22/, the assessment confirmed there are no major difference. Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	Not applicable

Data / Parameter:	EF _{CH₄,BF}
Data unit:	tCH ₄ /GJ
Description:	CH ₄ emission factor for the combustion of biomass residues in the project plant
Purpose of the data:	Calculation of project emissions
Parameter value:	0.000041
Source of data used:	Default value provided in table 4 of ACM0006 /7/
Information flow:	Not applicable
Monitoring method, frequency and equipments:	Not applicable
Calibration:	Not applicable

QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	Not applicable

Data / Parameter:	EF _{burning,CH4,k,y}
Data unit:	tCH ₄ /GJ
Description:	CH ₄ emission factor for uncontrolled burning of the biomass residue type k during the year y
Purpose of the data:	Calculation of baseline emissions
Parameter value:	0.001971
Source of data used:	Default value provided in table 5 of ACM0006 /7/
Information flow:	Not applicable
Monitoring method, frequency and equipments:	Not applicable
Calibration:	Not applicable
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	Not applicable

Data / Parameter:	TDL _y
Data unit:	%
Description:	Average technical transmission and distribution losses for providing electricity to the Northeast China Power Grid in year y
Purpose of the data:	Calculation of baseline emissions
Parameter value:	20
Source of data used:	Default value in “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” /19/
Information flow:	Not applicable

Monitoring method, frequency and equipments:	Not applicable
Calibration:	Not applicable
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	Not applicable

Data / Parameter:	EF _{km,com2,y}
Data unit:	tCO ₂ /km
Description:	Average CO ₂ Emission Factor for transportation of biomass with trucks
Purpose of the data:	Calculation of baseline emissions
Parameter value:	0.001011
Source of data used:	Default value from 2006 IPCC /17/
Information flow:	Not applicable
Monitoring method, frequency and equipments:	Not applicable
Calibration:	Not applicable
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	Not applicable

Data / Parameter:	-						
Data unit:	tons						
Description:	Quantity of biomass residues of type k that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region						
Purpose of the data:	Calculation of leakage						
Parameter value:	Year	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017	

		(wet basis)	(wet basis)	(wet basis)	(wet basis)	(wet basis)
	Biomass Residues	Maize stalks	Maize stalks	Maize stalks	Maize stalks	Maize stalks
	Biomass utilized out of the project (10 ⁴ ton)	46.90	45.12	46.79	43.85	44.62
	Biomass utilized by the project in whole year y (10 ⁴ ton)	23.09	27.45	27.63	26.94	25.17
	Total biomass utilized, including the project (10 ⁴ ton)	69.99	72.57	74.42	70.79	69.79
Source of data used:	Biomass Survey Report /20/					
Information flow:	Agricultural Bureau of Liaoyuan City would issue a Biomass Survey Report annually in which Quantity of biomass residues are utilized and Total Quantity of biomass residues available in the area of 50 km would be issued.					
Monitoring method, frequency and equipments:	Agricultural Bureau of Liaoyuan City would issue a Biomass Survey Report annually in which Quantity of biomass residues are utilized and Total Quantity of biomass residues available in the area of 50 km would be issued.					
Calibration:	Not applicable					
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.					
Means of verification:	Data of the parameter was verified by checking Biomass Survey Report. All data is in line with Monthly Report for fuel; Information flow was verified by checking Biomass Survey Report, and all information are consistent.					

Data / Parameter:	-
Data unit:	tons
Description:	Quantity of biomass residues of type k in the region
Purpose of the data:	Calculation of leakage

Parameter value:	Year	Year 2013 (wet basis)	Year 2014 (wet basis)	Year 2015 (wet basis)	Year 2016 (wet basis)	Year 2017 (wet basis)
	Biomass Residues	Maize stalks	Maize stalks	Maize stalks	Maize stalks	Maize stalks
	Available Biomass in the region (10 ⁴ ton)	168.90	170.10	172.47	174.23	175.91
Source of data used:	Biomass Survey Report /20/					
Information flow:	Agricultural Bureau of Liaoyuan City would issue a Biomass Survey Report annually in which Quantity of biomass residues are utilized and Total Quantity of biomass residues available in the area of 50 km would be issued.					
Monitoring method, frequency and equipments:	Agricultural Bureau of Liaoyuan City would issue a Biomass Survey Report annually in which Quantity of biomass residues are utilized and Total Quantity of biomass residues available in the area of 50 km would be issued.					
Calibration:	Not applicable					
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.					
Means of verification:	Data of the parameter was verified by checking Biomass Survey Report. All data is in line with Monthly Report for fuel; Information flow was verified by checking Biomass Survey Report, and all information are consistent.					

Data / Parameter:	EF _{CO₂,LE}
Data unit:	tCO ₂ /GJ
Description:	CO ₂ emission factor of the most carbon intensive fuel used in the country
Purpose of the data:	Calculation of leakage
Parameter value:	0.092708

Source of data used:	As coal is still the most carbon intensive fuel used in the China, the CO ₂ emission factor was determined through 2006 IPCC Guidelines on National GHG Inventories /17/ as below: $25.8 \text{ tC/TJ} * 44/12 \text{ tCO}_2/\text{tC} * 0.001 \text{ TJ/GJ} * 0.98 = 0.092708 \text{ tCO}_2/\text{GJ}$
Information flow:	Not applicable
Monitoring method, frequency and equipments:	Not applicable
Calibration:	Not applicable
QA/QC procedure:	Data record will be archived for a period of 2 years after the crediting period to which the records pertain.
Means of verification:	Not applicable

Parameters available at validation stage:

Below data has been verified against the data sources and the PDD.

Parameter title	Description	Data	Source
GWP _{CH4}	Global Warming Potential for CH ₄	25	IPCC default value /17/.

As the GWP_{CH_4} after 2013 has been updated to 25, therefore in this monitoring period, 25 has been used other than 21 in the registered PDD.

For the rest of parameter fixed in the registered PDD are all used to calculate the $EF_{CM,y}$ which is fixed as 0.996 tCO_{2e}/MWh in this monitoring period.

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

The monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD /3/ version 09 dated 24/05/2010.

As a result of verification of the ER calculation process, the assessment team confirmed that all the parameters required for the determination of the emission reductions have been included in the MR Report and ER Calculation Spreadsheet /2/ and are consistent with the applied methodology ACM0006 version 06.2 and the monitoring plan contained in the registered PDD. The parameters are complete in this monitoring period.

After verifying the reported figures with the raw data sources, it's confirmed that the values of the parameters from the raw data sources are consistent with those quoted in the ER Calculation Spreadsheet and the MR Report. The verification process for the same has been clearly described above in section 4.4 of the report.

4.6 Non-Permanence Risk Analysis

Not applicable as a renewable project.

5 VERIFICATION CONCLUSION

Applus+ Certification has been commissioned by Beijing Ruifang Information Technology Co., Ltd to perform the verification of greenhouse gas emission reductions of the project activity “Jilin Liaoyuan 50MW Level Biomass Cogeneration Project” (VCS Ref. No. 1126).

The management of National Bio Energy Co., Ltd. is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions on the basis set out within the project’s Monitoring Plan in the registered PD /3/, version 09 dated 24/05/2010.

Our verification approach was based on the requirements as defined under the applicable VCS standards and relevant UNFCCC requirements. Our approach is risk-based, drawing on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these. The verification can confirm that:

- the project is implemented and operated as per the registered PDD;
- the monitoring plan in registered PDD is as per the applied methodology;
- the monitoring complies with the monitoring plan in the registered PDD;
- the monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable VCS and CDM requirements;
- the installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately;
- the monitoring system is in place and generates GHG emission reductions data;
- the GHG emission reductions are calculated without material misstatements.

In our opinion, the GHG emission reductions for “Jilin Liaoyuan 50MW Level Biomass Cogeneration Project” during the monitoring period 25/09/2013 to 29/11/2017 as reported in Monitoring Report, prepared on the basis of the project’s Monitoring Plan are fairly stated. Based on the information we have seen and evaluated, we confirm the following statement:

Reporting period: From 25/09/2013 to 29/11/2017 (divided into 5 vintage periods). Verified GHG emission reductions or removals in the above reporting period:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2013	48,831	1,264	0	47,567

2014	196,575	5,180	0	191,395
2015	198,024	5,528	0	192,496
2016	198,961	5,221	0	193,740
2017	185,940	4,975	0	180,965
Total	828,331	22,168	0.0	806,163

APPENDIX 1: REFERENCE LIST

1. Monitoring report, version 1.0, dated 17/01/2020; Version 2.0, dated 14/02/2020
2. ER calculation spreadsheet
3. Revised PDD, version 09, dated 24/05/2010;
Registered PDD, version 08, dated 15/02/2010
4. Validation report, No. 1041281, version 04, completed by TÜV SÜD Industrie Service GmbH
5. VCS standard version 4.0, dated on 19/09/2019
6. Statement issued by project owner
7. Approved methodology ACM0006, version 06.2, dated 10/08/2007
8. CDM Monitoring procedure
9. Nameplate of the equipment
10. Meter Reading Record (MRRs) for Meter
11. Electricity Transaction Notes covering the monitoring period
12. Calibration certificates of meters covering the whole monitoring period issued by Jilin Electric Science Research Institute Co., Ltd;

Calibration certificates of weight meters, belt scale, electric oven, electric balance and calorimeter covering the whole monitoring period issued by Liaoyuan Institute of Metrology Verification and Test
13. Accreditation certificates for Jilin Electric Science Research Institute Co., Ltd issued by Quality and Technology Supervision Bureau of Jilin province

- 14 EF calculation in the registered PDD
- 15 Monthly Report for fuel
- 16 Moisture of biomass residues report
- 17 2006 IPCC Guidelines on National GHG Inventories
- 18 Diesel purchase record
- 19 Tool to calculate baseline, project and/or leakage emissions from electricity consumption, version 1.0
- 20 Biomass Survey Report
- 21 NCV Test Report
- 22 China Energy Statistical Yearbook 2018