



**Verified Carbon
Standard**

JILIN DA'AN DAGANGZI WIND POWER PROJECT PHASE II

Document Prepared by CGN Carbon Asset Management (Beijing) Co.,
Ltd.

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Jilin Da'an Dagangzi Wind Power Project Phase II (hereinafter referred as the project) is to utilize the wind resources for generating renewable electricity to supply into the Jilin grid, an integral part of the Northeast China Power Grid (herein after referred to as NECPG). The project involves the installation of 33 turbines, each of which have a capacity of 1,500kW and total installed capacity of 49.5MW. The project is to utilize the wind resource to generate electricity which would otherwise have been produced by fossil fuel-fired power plants. The Project helps reduce GHG emissions generated from the high-growth, coal-dominated power generation.

The starting date of the construction was 10-March-2008. The first wind turbine was put into operation since 16-December-2008 and all the turbines were put into operation since 15-February-2009. The expected operation period of the Project is 20 years as stated in the registered VCS PD Version 5.0 dated 18-February-2010 and approved VCS PD for crediting period renewal Version 07 dated 21-October-2020.

According to the approved VCS PD for crediting period renewal Version 07 dated 21-October-2020, the first renewable crediting period of the project has been updated from 01-January-2009 ~ 08-March-2010 to 01-January-2009 ~ 31-December-2018 and the second crediting period is from 01-January-2019 to 31-December-2028. The estimated emissions reductions of the project are 94,250 tCO₂e annually during the second crediting period.

The project has been registered as VCS project with Ref. VCS548 and as CDM project with Ref. 2586. For the monitoring period from 01-January-2009 to 08-March-2010, the emission reductions of the project were issued under the VCS, the volume issued was 128,377 tCO₂e; for the monitoring period from 09-March-2010 to 24-December-2016, the emission reductions of the project applied for the CDM, the volume issued was 561,051 tCO₂e; for the monitoring period from 25-December-2016 to 31-December-2018, the emission reductions of the project were issued under the VCS, the volume issued was 177,467 tCO₂e; for the monitoring period from 01-January-2019 to 31-December-2020, the emission reductions of the project were issued under the VCS, the volume issued was 186,772 tCO₂e.

The monitoring period of the MR is from 01-January-2021 to 31-December-2021. The total emission reductions achieved in this monitoring period are 88,818 tCO₂e, which are applying for VCS.

1.2 Sectoral Scope and Project Type

Sectoral Scope 1: Energy Industry (renewable/non-renewable sources)

Project type: Grid connected wind power project

The project is not a grouped project.

1.3 Project Proponent

Organization name	Jilin CGN Wind Power Co., Ltd.
Contact person	Shi Lei
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1.4 Other Entities Involved in the Project

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Role in the Project	Consultancy
Contact person	Liu Yang
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1.5 Project Start Date

The project started on 16-December-2008 (the start date of electricity generation).

1.6 Project Crediting Period

The project is registered under VCS 2007.1 and completed validation before 19-March-2020. Thus, it remains eligible to apply the crediting period requirements under VCS Version 3, which shall be a maximum of ten years and may be renewed at most twice, so the first renewable crediting period of the project (from 01-January-2009 to 08-March-2010) was updated to from 01-January-2009 to 31-December-2018.

The validation report for renewal of crediting period issued after the end of the previous project crediting period but within two years after the end of the previous project crediting period. Thus,

the second crediting period is from 01-January-2019 to 31-December-2028. The total number of years for the crediting period is 10 years.

As the project is also registered as a CDM project with a seven year twice renewable project crediting period, it is not eligible for VCU issuance beyond the end of those 21 years (08-March-2031).

1.7 Project Location

The project is located near the village of Shuanggang, Dagangzi County, Da'an City of Jilin Province in People's Republic of China (P. R. China). The exact location of the project is defined using geographic coordinates obtained with a Global Positioning System (GPS) receiver: E 123°35'26"~123°38'58" Longitude, N 44°18'23" ~ 45°18'46" Latitude for the whole area of the wind farm.





Figure 1. Location of the project

1.8 Title and Reference of Methodology

Following approved baseline & monitoring methodology is applied:

Methodology:

ACM0002 “Grid-connected electricity generation from renewable sources” (Version 20.0)

Reference:

<https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG>

The applied tools:

“Tool for assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” (Version 3.0.1).

Reference:

<https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-11-v3.0.1.pdf>

“Tool to calculate the emission factor for an electricity system” (Version 07.0)

Reference:

<https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v7.0.pdf>

1.9 Participation under other GHG Programs

The project has been registered as a Clean Development Mechanism (CDM) project in UNFCCC on 09-March-2010 (UNFCCC Ref. 2586), with the first 7 years crediting period from 09-March-2010 to 08-March-2017. The renewal of the crediting period for the project was approved by CDM EB on 29-March-2019, with the second 7 years crediting period from 09-March-2017 to 08-March-2024. Total GHG emission reductions of 561,051 tCO₂ generated from 09-March-2010 to 24-December-2016 (both 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/TUEV-SUED1242408811.21/view?cp=1>

1.10 Other Forms of Credit

Emission Trading Programs and Other Binding Limits

The project has been registered as a VCS project with Ref. VCS548 and 492,616 tCO₂e have been issued as VCUs during three monitoring periods between 01-January-2009 and 31-December-2020.

Type of GHG emission reductions	Monitoring period	Volume (tCO ₂ e)	Status
VCU	From 01-January-2009 to 08-March-2010	128,377	Issued
VCU	From 25-December-2016 to 31-December-2018	177,467	Issued
VCU	From 01-January-2019 to 31-December-2020	186,772	Issued
Total	-	492,616	-

All credits generated during this monitoring period (01-January-2021 to 31-December-2021) will be only claimed under VCS program as VCUs for the project to avoid double counting, which will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions.

Other Forms of Environmental Credit

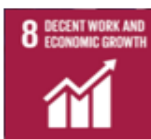
The project hasn't sought or received another form of environmental credits.

1.11 Sustainable Development Contributions

The project activity is a renewable wind power project located near the village of Shuanggang, Dagangzi County, Da'an City of Jilin Province in People's Republic of China.



The project utilizes wind power energy resources to generate and supply 97,186.738 MWh renewable electricity to NECPG during the monitoring period, which contributes to SDG 7.



The project provides 12 job opportunities for local people (9 men and 3 women) during both the construction and operational period, which has a positive effect on the local economy and contributes to SDG 8.



The renewable electricity generated by the project replaces electricity generation by fossil-fuel power plants of the power grid, which reduces 88,818 tCO_{2e} GHG emission during this monitoring period and contributes to SDG 13.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	Renewable energy supplied to the power grid	Implemented activities to increase	97,186.738 MWh of electricity from renewable sources has been supplied to the power grid during the monitoring period.	97,186.738 MWh of electricity from renewable sources has been supplied to the power grid during the monitoring period.
2)	8.5	Numbers of job opportunities provided by implementation of the project	Implemented activities to increase	The project provides 12 job opportunities for local people (9 men and 3 women) as long-term employees.	The project provides 12 job opportunities for local people (9 men and 3 women) as long-term employees.
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	The project involves the installation of 33 wind turbines, each of which have a capacity of 1,500kW and total installed capacity of 49.5MW. The project has achieved a total GHG emission reduction of 88,818 tCO ₂ e during the monitoring period.	The project involves the installation of 33 wind turbines, each of which have a capacity of 1,500kW and total installed capacity of 49.5MW. The project has achieved a total GHG emission reduction of 88,818 tCO ₂ e during the monitoring period.

2 SAFEGUARDS

2.1 No Net Harm

According to clauses 13 and 19 of the Environmental Evaluation Law of the P.R.China, the project entity must analyze the environmental impacts of project activities in P.R.China before utilizing natural resources and beginning project construction. The project developer therefore commissioned a third party, the Northeast Coal Industry and Environment Institute, to conduct the required Environmental Impact Assessment (EIA) in 2007, and the EIA report was approved by the Jilin Provincial Environmental Protection Bureau in September 2007 (approval number: Jihuanjian (biao) zi [2007] No.239).

There are no transboundary impacts related to the project, and there is no resettlement or relocation of population, buildings or public services required. Therefore, social and environmental influences are considered partial, short-term and reversible.

Where impacts of the project were identified, mitigation measures were suggested and defined. The EIA highlights the following with regards to the project, as shown in the following discussion.

Impact on air

the air pollution from dust and other airborne emissions were expected to exist mainly during the period of construction. Protective measures adopted include stopping work on windy days and reducing the speed of vehicles. As the period of construction is short, the impacts on air are deemed to be insignificant after conducting these mitigation measures. During operation, there will be no bad gas emissions generated by the project.

Impact from noise

The operation of the wind turbines will generate continuous low-level noise. It is said in the EIA that 600m away from the turbine is a reasonable distance for residents to not experience any significant adverse noise impacts. The nearest resident area, however, is 2.3km away from the project location. Therefore, the noise of the turbines will not affect the local residents.

Electromagnetic impact

The operation of the wind farm will generate electromagnetic energy, however, it has little effect on residents. According to the survey of the local residents near the project, no impact to local residents and electronic equipment were detected. Furthermore, the site of the project is far from the residential area. Therefore, there is no significant electromagnetic impact expected to be generated.

Impacts from solid waste

Most of the waste earth produced in the construction shall be refilled back to the foundations of the turbines. The staff waste during the construction period will be collected and transported to Baicheng municipal landfill.

Impacts on vegetation

The land area permanently taken by the project will be 68,847m², most of which is grassland. There is little biomass resource and rare plant species in the area. As the lands will be replanted after completion of the project construction, the impacts on grassland are considered insignificant.

Biological impact

There are very few animals at the site and no protected animal has been detected where the project is constructed. Therefore, there is no significant impact by the project to the local ecosystem.

With mitigation controls planned as part of the project construction and EIA process, and the contribution made by the project to sustainable development for the local and national area, the project is expected to have an overall positive impact on the local and global environment. All negative environmental impacts are subject to mitigation measures as described above.

2.2 Local Stakeholder Consultation

Local stakeholders Consultation during the project preparation stage:

The stakeholder consultation for the project activity took place in February 2008. During the consultation, local stakeholders were invited to submit comments on the project activity by filling a questionnaire sent out by the project developer. The project developer put the notice at the project management office as well as the government building around the project site and also randomly sent the questionnaire out around the project site.

The questionnaires included a technical description of the project as well as a brief explanation of how the project activity mitigates climate change through the Clean Development Mechanism of the Kyoto Protocol and brings sustainable development benefits. The questions asked were as follows:

- What impacts do you think the CDM project activity will have on the local environment?
- What impacts do you think the CDM project activity will have on employment and social welfare in the local area?
- Are there any negative impacts on your livelihood during the construction of the CDM project?
- What would be the overall positive effects of the construction and operation of the CDM project?
- What would be the overall negative effects of the construction and operation of the CDM project?
- What is your attitude towards the construction of the CDM project?
- Do you support the construction of the CDM project?

30 questionnaires were sent to the stakeholders by the project developer. The survey received 100% participation (30 questionnaire returned out of 30). The survey shows the stakeholders believe that the proposed CDM project activity will have positive impacts on the local ecological, environmental, employment and social life. All stakeholders expressed their support to the proposed project. No negative comments have been received on the project.

Local stakeholder Consultation during the project implementation stage:

The project owner has set out the mechanism for on-going communication with local stakeholders and the communications with local stakeholders are being carried out at periodic intervals.

Firstly, stakeholders were informed of the status and progress of the project through the bulletin board on the village committee, and their comments can be recorded in the village committee's complaint book. This information is fed back to the project proponent by the contact person for a timely response.

Secondly, stakeholders can communicate and give feedback directly to the project proponent at any time through the published phone number of contact person.

Finally, the contract person of project owner also meets local villagers to collect their comments and suggestions yearly.

During this monitoring period, the project carried out the communication with local stakeholders in line with the mechanism. Village committee's complaint book were quarterly checked by the contact person, and the contact person visited the villages in September 2021 to communicate with stakeholders. Meanwhile, the local authority has also conducted spot checks on the implementation of the project yearly. There are no negative comments received for the project during this monitoring period. In line with VCS requirements all the processed have been implemented to receive comments from local stakeholders as well as communicate with them.

2.3 AFOLU-Specific Safeguards

The project is not AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The Project is to utilize wind resources for electricity generation through the installation and operation of 33 wind turbines with unit capacity of 1500 kW and total up an installation capacity of 49.5MW. The power generated is delivered to the Northeast China Power Grid by 220kV step-up substation. The starting date of the construction was 10-March-2008. The first wind turbine was put into operation since 16-December-2008 and all the turbines were put into operation

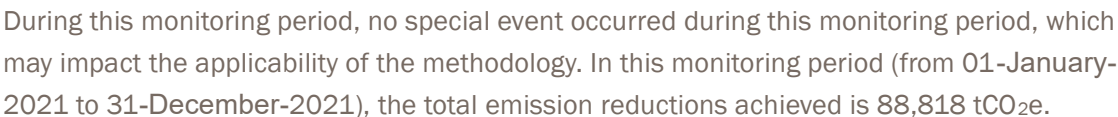
since 15-February-2009. During the monitoring period, all turbines have come into operation and supplied electricity to the grid.

According to the turbine layout, each turbine is equipped with one transformer which increase the Voltage of electricity generated of 0.69kV to 35kV. The wind power to be generated is delivered to the 35kV-to-220kV transformer via 35kV transmission lines. The power in the 220kV step-up substation is transmitted to the Baicheng 220kV Da'an substation. Then the electricity generated is first transmitted to the Jilin Power Grid and then to the Northeast China Power Grid.

The generator is produced by Dongfang Steam Turbine Works Company. All other items of equipment used in the Project are produced domestically and the project developer is experienced in handling and operating this kind of equipment. The key technical parameters of wind turbines are listed in the following table.

Item	Unit	Index
Type	-	FD77B
Number of blades	-	3
Rated power	kW	1,500
Diameter of wheels	m	77
Cut-in speed	m/s	4
Cut-out speed	m/s	25
Rated wind speed	m/s	16
Height of wheel	m	61.5
Load factor	-	23.78%
Lifetime	Years	20

The technology diagram of the Project is as follows:



3.2.1 Methodology Deviations

There are no methodology deviations applied during this monitoring period.

In the registered VCS PD and the verification report for the first VCS monitoring period, the crediting period is described as from 01-January-2009 to 08-March-2010. A crediting period deviation was requested in the updated VCS PD for the 2nd renewal crediting period which has already been approved by Verra. The project is registered under VCS 2007.1 and completed validation before 19-March-2020. Thus, it remains eligible to apply the crediting period requirements under VCS Version 3, which shall be a maximum of ten years and may be renewed at most twice. The deviation of crediting period has no impacts on the applicability, additionality or baseline of the project.

Furthermore, as the project is also registered as a CDM project with a seven year twice renewable project crediting period, it is not eligible for VCU issuance beyond the end of those 21 years (08-March-2031).

Hence, the first renewable crediting period of the project has been updated from 01-January-2009 ~ 08-March-2010 to 01-January-2009 ~ 31-December-2018. The validation report for renewal of crediting period issued after the end of the previous project crediting period but within two years after the end of the previous project crediting period. Thus, the second crediting period is from 01-January-2019 to 31-December-2028 corresponding to this monitoring period.

There are no project description deviations applied during this monitoring period.

3.3 Grouped Projects

The project is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO _{2e} / MWh
Description	The baseline grid emission factor
Source of data	VCS PD for the second crediting period
Value applied	0.9139
Justification of choice of data or description of measurement methods and procedures applied	As per the requirements in “Tool to calculate the emission factor for an electricity system version 07.0”.
Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the second crediting period

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/year
Description	The net electricity supplied to the grid by the project in year y
Source of data	Measured by electricity meters: M_{main} , M_{10kV} , m_i
Description of measurement methods	The net electricity supplied to the grid by the project is cumulative measurement and monthly recorded by the project owner.

and procedures to be applied	The net electricity delivered from the project to the grid is calculated with the formula showed in section 4.3. The accuracy of the electricity meters involved will be described below in the monitored parameter $M_{main,export,y}$, $M_{main,import,y}$, $M_{10kV,import,y}$ and $m_{i,export,y}$.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value monitored	97,186.738
Monitoring equipment	Please refer to the monitoring equipment information in the table “Information of monitoring equipment” below.
QA/QC procedures to be applied	The metering instruments will be calibrated annually in accordance with the “Technical administrative code of electric energy metering (DL/T448-2016)”. Sale receipts/records to the grid are used to ensure the consistency.
Purpose of the data	Calculation of baseline emissions
Calculation method	The net electricity supplied by the project to the grid is calculated through $M_{main,export,y}$, $M_{main,import,y}$, $M_{10kV,import,y}$ and $m_{i,export,y}$ according to the question in section 4.3.
Comments	-

Data / Parameter	$M_{main,export,y}$
Data unit	MWh/year
Description	Quantity of the electricity supplied to the grid and measured by the meter M_{main} (or M_{backup}) during the monitoring period y .
Source of data	Measured by electricity meters: M_{main} or M_{backup}
Description of measurement methods and procedures to be applied	The electricity supplied to the grid is measured by the meter M_{main} (or M_{backup}) and cumulative measurement and monthly recorded by the project owner. The accuracy of electricity meters M_{main} and M_{backup} is 0.2S.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value monitored	464,115.520
Monitoring equipment	Please refer to the monitoring equipment information in the table of “Information of monitoring equipment” below.
QA/QC procedures to be applied	The metering instruments will be calibrated annually in accordance with the “Technical administrative code of electric energy metering (DL/T448-2016)”.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$M_{main,import,y}$
Data unit	MWh/year
Description	Quantity of the electricity imported from the grid and measured by the meter M_{main} (or M_{backup}) during the monitoring period y
Source of data	Measured by electricity meters: M_{main} or M_{backup}
Description of measurement methods and procedures to be applied	The electricity imported from the grid is measured by the meter M_{main} (or M_{backup}) and cumulative measurement and monthly recorded by the project owner. The accuracy of electricity meters M_{main} and M_{backup} is 0.2S.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value monitored	1,592.800
Monitoring equipment	Please refer to the monitoring equipment information in the table "Information of monitoring equipment" below.
QA/QC procedures to be applied	The metering instruments will be calibrated annually in accordance with the "Technical administrative code of electric energy metering (DL/T448-2016)". Sale receipts have been used to cross-check the meters' readings.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$m_{i,export,y}$
Data unit	MWh/year
Description	Quantity of the electricity supplied to the grid and measured by the meters m_i during the monitoring period y i is the number of the meters which installed at its on-site 35kV low voltage side of the 35kV-to-220kV transformer. $i=1\sim14$
Source of data	Measured by electricity meters: m_i
Description of measurement methods and procedures to be applied	The electricity supplied to the grid is measured by the meter m_i and cumulative measurement and monthly recorded by the project owner. The accuracy of electricity meters m_i is no lower than 0.5S.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value monitored	Detailed monthly data are presented in Section 5.1. of the monitoring report.
Monitoring equipment	Please refer to the monitoring equipment information in the table of "Information of monitoring equipment" below.

QA/QC procedures to be applied	The metering instruments will be calibrated annually in accordance with the “Technical administrative code of electric energy metering (DL/T448-2016)”.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$M_{10kV,import,y}$
Data unit	MWh/year
Description	Quantity of the electricity imported from the grid and measured by the meters M_{10kV} during the monitoring period y
Source of data	Measured by electricity meter: M_{10kV}
Description of measurement methods and procedures to be applied	The electricity imported from the grid is measured by the meter M_{10kV} and cumulative measurement and monthly recorded by the project owner. The accuracy of electricity meter M_{10kV} is 1.0.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value monitored	0.000
Monitoring equipment	Please refer to the monitoring equipment information in the table of “Information of monitoring equipment” below.
QA/QC procedures to be applied	The metering instruments will be calibrated annually in accordance with the “Technical administrative code of electric energy metering (DL/T448-2016)”. Sale receipts have been used to cross-check the meters’ readings.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	-

Information of monitoring equipment

Meters	Type	Accuracy	Serial number	Calibration date	Validity date
M_{main}	ZMD402CT44	0.2S	96628173	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
M_{backup}	ZMD402CT44	0.2S	94348626	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m_1	DTSD341	0.5S	1210139747 000006	10-February-2020	09-February-2021

				09-February-2021	08-February-2022
m ₂	DTSD341	0.5S	200708650 50026	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₃	DTSD341	0.5S	200708650 50027	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₄	DTSD341	0.2S	200707120 10071	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₅	DTSD341	0.5S	200708650 50025	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₆	DTSD341	0.5S	200708650 50021	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₇	DTSD341	0.5S	200808460 40146	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₈	DTSD341	0.5S	200808460 40145	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₉	DTSD341	0.5S	200808460 40142	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₁₀	DTSD341	0.5S	200808460 40141	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₁₁	DTSD341	0.5S	200808460 40151	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₁₂	DTSD341	0.5S	200808460 40143	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₁₃	DTSD341	0.5S	111008957 6000011	10-February-2020	09-February-2021
				09-February-2021	08-February-2022
m ₁₄	DTSD341	0.5S	200808460 40150	10-February-2020	09-February-2021

				09-February-2021	08-February-2022
M _{10kV}	DTSD318	1.0	60014972	10-February-2020	09-February-2021
				09-February-2021	08-February-2022

4.3 Monitoring Plan

The monitoring system is specified as below:

Monitoring Organization

Roles and responsibilities have been defined for the relevant staff involved in VCS monitoring, and the prospect of nominating a responsible person has been considered. The responsible person has the overall responsibility for the monitoring system on this project.

A responsible person manages the process of training new staff, ensuring trained staffs perform the monitoring duties and that where trained monitoring staffs are absent, and the integrity of the monitoring system is maintained by other trained staff.

Records of trained VCS staff have been retained by the Project Developer. A formal set of monitoring procedures such as training, data quality assurance and control, and relevant back-up procedures have been identified prior to the start of the project. A description of these procedures is provided in the following tables. It is important to note that these procedures may be based on existing on-site practices.

VCS Monitoring System Procedures

Procedure name	Description
VCS Staff training	This procedure outlines the steps to ensure that staffs receive adequate training to collect and archive complete and accurate data necessary for VCS monitoring.
VCS data and record keeping arrangements	This procedure provides details of the sites data and record keeping arrangements. The arrangements ensure that complete and accurate records are retained by the appropriate senior Manager within the quality control system.
Data collection	This procedure outlines the steps to collect the data from the meter(s).
VCS data quality control and quality assurance	Data and records are checked prior to being stored and archived. Data from the project are checked to identify possible errors or emissions. The data checks include cross checks of the electricity figures on the receipts. All records will be checked for completeness.
Electricity meter check	This procedure outlines the steps to provide regular and preventative check to the electricity meter (s)
Equipment failure	This procedure details the process of data collection in the case that a problem with any meter occurs.
Equipment calibration	This procedure details the process of organizing and managing the calibration process. The procedure includes details of how a suitable company or organization is commissioned to undertake the calibration to the relevant standards.

The above procedures are available during the verification and documented as part of the monitoring support material. The procedures may be contained in a single document (e.g. a monitoring manual) for VCS monitoring rather than separate procedures. Some of these procedures may exist in the form of existing on-site practices.

Operational procedures and responsibilities for monitoring and quality assurance of emissions reductions from the project activity

Task	On-site technician	Operations manager	Project developer's head office	Head of Maintenance/External company
Collect Data	E	R	N/A	N/A
Enter data into Spread sheet	N/A	E	R	N/A
Make monitoring reports	N/A	E	R	N/A
Archive data & reports	N/A	E	R	N/A
Calibration/ Maintenance	I	I	I	E

Legend: E=responsible for executing data collection, R=responsible for overseeing and assuring quality, I=to be informed

Monitoring equipment and installation

Given that the emission factor is calculated ex-ante, and referring to the Monitoring Methodology ACM0002, the only data to be monitored is the net electricity supplied to the grid by the Project.

The net electricity supplied by the Project to the grid is monitored through the main meter installed in the power plant 220kV high voltage side of the 35kV-to-220kV transformer, and the backup meter which is an assistant meter, is in the power plant 220kV high voltage side of the 35kV-to-220kV transformer also. When the main meter has any troubles, the project developer should employ the data monitored by the backup meter. The main meter and the backup meter are both bidirectional meters which can also monitor the electricity imported from the grid.

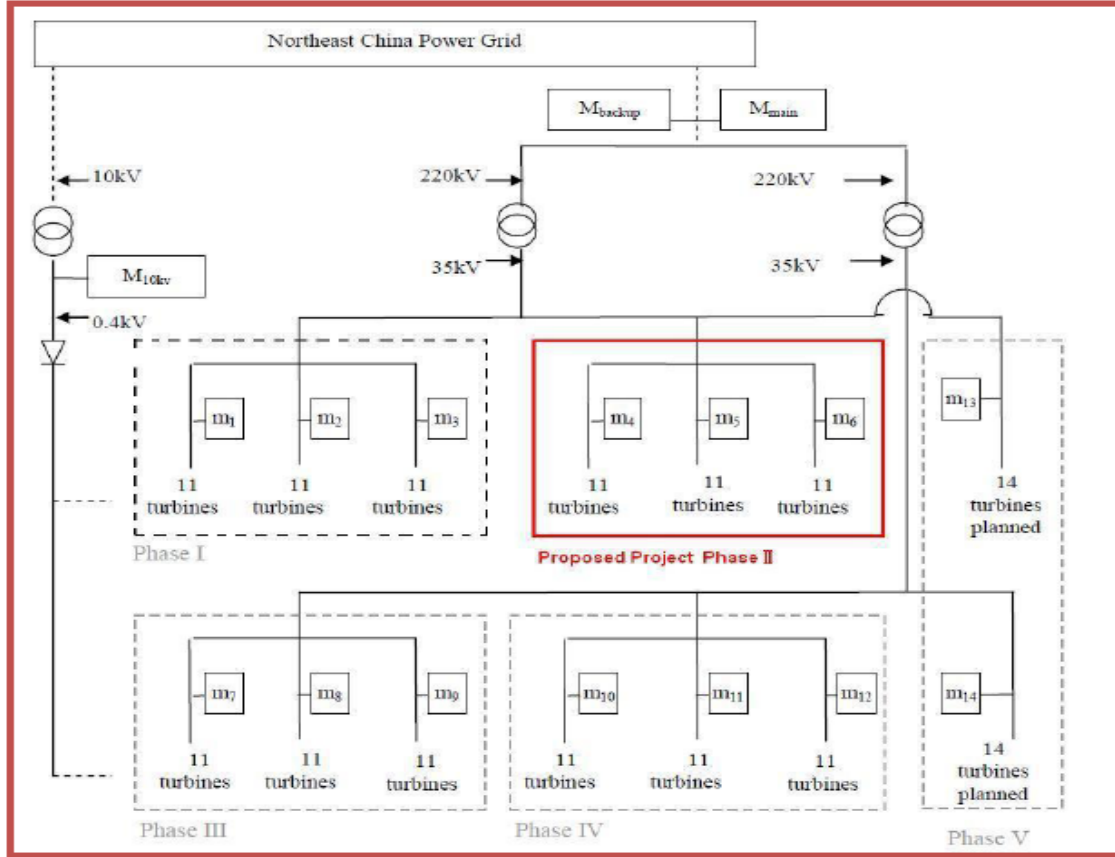
In addition, a spare 10kV line is used for supplying electricity in emergency case that the Project fails to generate power. The electricity from the spare 10kV line connecting with the grid monitored by the meter M10kV. Currently four other wind power project shares the same substation 220kV transmission line, the spare 10kV line, and all the involved meters. The separate meters have already been installed in the project site presented as the following meter diagram so that the electricity generation can be monitored respectively to calculate the share of this wind power project of the net electricity delivered to the grid at 220kV transformer. The project is the Phase II of five phases. The net electricity delivered to the Northeast China Power Grid by the Project has been monitored through the meters. There are totally 17 meters involved: M_{main}, M_{backup}, M_{10kV}, m₁, m₂, m₃, m₄, m₅, m₆, m₇, m₈, m₉, m₁₀, m₁₁, m₁₂, m₁₃ and m₁₄. The metering diagram and the meters list are presented as follows, giving an overview of these meters.

Meters' list is as below:

Meter	Owner	Monitor	Site
M_{main}	Power company	The total electricity of the all five projects exported to the grid ($M_{main,export,y}$) and imported from the grid ($M_{main,import,y}$).	At 220kV high voltage side of the 35kV-to-220kV transformer
M_{backup}	Power company	All the electricity exported to the grid ($M_{main,export,y}$) and imported from the grid ($M_{main,import,y}$). Only when the main meter has a breakdown, the readings of back up meter will be adopted.	At 220kV high voltage side of the 35kV-to-220kV transformer
M_{10kV}	Project owner	The electricity imported of all five projects from grid through the 10kV spare line.	At enter of the spare 10kV line connect the grid
m_1	Project owner	Phase I project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_2	Project owner	Phase I project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_3	Project owner	Phase I project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_4	Project owner	The Project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_5	Project owner	The Project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_6	Project owner	The Project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_7	Project owner	Phase III project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_8	Project owner	Phase III project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_9	Project owner	Phase III project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_{10}	Project owner	Phase IV project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_{11}	Project owner	Phase IV project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_{12}	Project owner	Phase IV project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
m_{13}	Project owner	Phase V project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer

m_{14}	Project owner	Phase V project	At power plant 35kV low voltage side of the 35kV-to-220kV transformer
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A diagram shows how parameters are monitored is presented as follows:



The net electricity supplied to the grid by the Project ($EG_{facility,y}$) will be calculated as follows:

$$EG_{facility,y} = M_{main,export,y} \times \frac{\sum_{i=4}^6 m_{i,export,y}}{\sum_{i=1}^{14} m_{i,export,y}} - M_{main,import,y} - M_{10kv,import,y}$$

Where:

$EG_{facility,y}$	=	The net electricity supplied to the grid by the project in year y;
$m_{i,export,y}$	=	Quantity of the electricity supplied to the grid and measured by the meters m_i during the monitoring period y;
$M_{main,export,y}$	=	Quantity of the electricity supplied to the grid and measured by the meter M_{main} (or M_{backup}) during the monitoring period y;
$M_{main,import,y}$	=	Quantity of the electricity imported from the grid and measured by the meter M_{main} (or M_{backup}) during the monitoring period y;
$M_{10kv,import,y}$	=	Quantity of the electricity imported from the grid and measured by the meter M_{10kv} during the monitoring period y;
i	=	The number of the meters m_i which installed at its onsite 35kV low voltage side of the 35kV-to-220kV transformer. $i = 1 \sim 14$.

It is conservative to calculate the net electricity supplied to the grid by the Project by deduction of the total electricity of the all five projects imported from the grid ($M_{main,import,y}$) and the total electricity of the all five projects imported from grid through the 10kV spare line ($M_{10kV,import,y}$).

The net electricity delivered to the grid by the Project shall be recorded by the project owner and the data should be cross-checked against relevant electricity sale receipts from the grid.

The Project owner should ensure that the meter readings be readily available for VVB's verification.

Data recording procedure, management and archiving

The monitoring steps are as follows:

- (1) The measured data of all the 17 meters (M_{main} , M_{backup} , M_{10kV} and m_i ($i=1\sim14$)) has been monitored continuously and recorded monthly. The Project Developer and the Grid Company check these data at the same time. The net electricity supplied to the grid by the Project is calculated based on these data.
- (2) The Project Developer and the Grid Company have confirmed the electricity sales receipts of each wind project, respectively.
- (3) The copies of sales receipts have been obtained to cross check the data of supplied electricity.
- (4) The project developer has archived the data electronically until two years after the end of the crediting period or the last issuance of VCUs, whichever occurs later.

The cut-off time for the meter recording and sales receipts of exported and imported Electricity by meter M_{main} is at 24:00 on 24th every month.

A spare 10kV line was used for supplying electricity in emergency case that the project fails to generate power in the registered Monitoring Plan. The electricity from the spare 10kV line was monitored by the meter M_{10kV} . But according to the actual situation, the spare 10 kV line was only used for the construction purpose of the projects; when the Dagangzi Wind Power Project Phase I (the first project of the Dagangzi Wind Power Project Phase I-V) starting operation in December 2007, the spare 10 kV line was cut off but the spare 10kV line is still at the project site. Once the project meets the emergency case, the spare 10kV line will be connected again, therefore, the project owner still recorded the electricity import by the spare 10kV line monthly and calibrated the meter according to the monitor plan.

All relevant documentation such as technical drawings and reports has been stored and available for reference. All the data shall be kept until two years after the end of crediting period.

Quality Assurance and Quality Control

The quality of data has been maintained through the development of an overarching monitoring system. Relevant operating procedures have been provided to relevant monitoring staff, and the monitoring staff has been supervised.

The meters have been calibrated annually in accordance with the “Technical administrative code of electric energy metering (DL/T448 -2016)”.

All data collected on-site has been checked internally before being compiled in an electronic format, to ensure that it is complete and of appropriate quality. Electricity export by the project to the Power Grid has been cross-checked against the export electricity sales receipts and the electricity import from the Power Grid by the M_{main} to the project has been cross-checked against the import electricity sales receipts. The electricity imported from the grid via 10kV line to the Project, which was measured by the meter M_{10kv} , has been confirmed by the Power Grid as well.

Emergency procedures

When the meters have a breakdown, the electricity generation difference will be treated as follows:

- (1) When one of the main meter or backup meter has a breakdown, the readings of the other meter will be adopted;
- (2) If both the main meter and back-up meter have breakdowns, Jilin CGN Wind Power Co., Ltd and the Northeast China Power Grid shall jointly prepare a reasonable and conservative estimate of the correct reading and deducting the line losses, then provide sufficient evidence that this estimation is reasonable and conservative when VVB undertakes verification.
- (3) If any of 17 meters has breakdown, the project owner and Northeast China Power Grid shall jointly prepare a reasonable and conservative estimate of the correct reading and provide sufficient evidence that this estimation is reasonable and conservative.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

In accordance with the ACM0002, baseline emissions are calculated according to the following formula:

$$BE_y = EG_{facility,y} \times EF_{grid,CM,y}$$

$$EG_{facility,y} = M_{main,export,y} \times \frac{\sum_{i=4}^6 m_{i,export,y}}{\sum_{i=1}^{14} m_{i,export,y}} - M_{main,import,y} - M_{10kv,import,y}$$

Where

$EG_{facility,y}$ - Net electricity supplied to the grid during the monitoring period (MWh)

$EF_{grid,CM,y}$ - Emission factor of the grid (tCO₂/MWh) (0.9139 tCO₂/MWh as calculated ex-ante in the approved VCS PD for crediting period renewal and fixed during the second crediting period according to the methodology of ACM0002 version 20.0)

$M_{main,export,y}$ = Quantity of the electricity supplied to the grid and measured by the meter M_{main} during the monitoring period (MWh)

$M_{main,import,y}$ = Quantity of the electricity imported from the grid and measured by the meter M_{main} during the monitoring period (MWh)

$m_{i,export,y}$ = Quantity of the electricity supplied to the grid and measured by the meters m_i during the monitoring period (MWh)

i = the number of the meters installed at power plant 35kV low voltage side of the 35kV-to-220kV transformer. $i=1\sim14$.

$M_{10kV,import,y}$ = Quantity of the electricity imported from the grid and measured by the meter M_{10kV} during the monitoring period (MWh)

The electricity supplied to the grid by meter m_i and M_{main} is listed as below:

Period	Electricity supplied by phase I project monitored by m_1 , m_2 and m_3 ($m_{1,export,y}$ + $m_{2,export,y}$ + $m_{3,export,y}$)	Electricity supplied by phase II project monitored by m_4 , m_5 and m_6 ($m_{4,export,y}$ + $m_{5,export,y}$ + $m_{6,export,y}$)	Electricity supplied by phase III project monitored by m_7 , m_8 and m_9 ($m_{7,export,y}$ + $m_{8,export,y}$ + $m_{9,export,y}$)	Electricity supplied by phase IV project monitored by m_{10} , m_{11} and m_{12} ($m_{10,export,y}$ + $m_{11,export,y}$ + $m_{12,export,y}$)	Electricity supplied by phase V project monitored by m_{13} and m_{14} ($m_{13,export,y}$ + $m_{14,export,y}$)	Total electricity supplied to the grid monitored by the meters installed on the 35kV lines ($m_{1,export,y}$ +...+ $m_{14,export,y}$)	Electricity supplied to the grid monitored by the main meter ($M_{main,export,y}$)
	MWh	MWh	MWh	MWh	MWh	MWh	MWh
	A1	A2	A3	A4	A5	A	B
From 01-January-2021 to 24-January-2021	4808.58	5009.34	5220.39	4879.77	4564.56	24482.64	24119.744
From 25-January-2021 to 24-February-2021	8559.18	8958.60	9312.66	8846.88	7680.12	43357.44	42590.240
From 25-February-2021 to 24-March-2021	9433.83	10396.05	10653.72	10540.74	8949.08	49973.42	49629.888
From 25-March-2021 to 24-April-2021	11469.78	12251.61	11518.71	11235.00	9927.96	56403.06	55129.888
From 25-April-2021 to 24-May-2021	10762.08	11481.12	10605.42	10480.05	9793.56	53122.23	52230.112
From 25-May-2021 to 24-June-2021	6954.57	7242.06	6831.09	6593.79	5991.72	33613.23	33399.872
From 25-June-2021 to 24-July-2021	4954.11	5264.28	4708.62	5169.15	4607.68	24703.84	24230.272
From 25-July-2021 to 24-August-2021	4786.53	5087.46	4813.83	5369.91	4364.36	24422.09	24069.760
From 25-August-2021 to 24-September-2021	5131.14	5290.74	5347.86	5521.32	4380.60	25671.66	25340.128
From 25-September-2021 to 24-October-2021	8156.82	8721.09	8417.64	9060.45	7363.72	41719.72	41280.096
From 25-October-2021 to 24-November-2021	8579.76	9494.10	8693.58	9304.26	6730.36	42802.06	41800.000
From 25-November-2021 to 24-December-2021	6080.55	9801.54	10934.91	10110.87	7627.20	44555.07	43659.968
From 25-December-2021 to 31-December-2021	1354.71	1395.66	1406.79	1431.78	1142.40	6731.34	6635.552
Total	91031.64	100393.65	98465.22	98543.97	83123.32	471557.80	464115.520

Note: The electricity supplied to the grid by meter m_i and M_{main} during the period from 25-December-2021 to 31-December-2021 were calculated by the meter readings on 25-December-2021 and 31-December-2021, which were sourced from the daily records carried out by the project owner. The relevant certificate issued by the power grid company was used to take the crosscheck.

The electricity imported from the grid and measured by the meter M_{10kV} is as below:

A spare 10kV line was used for supplying electricity in emergency case that the project fails to generate power in the registered Monitoring Plan. The electricity from the spare 10kV line was monitored by the meter M_{10kV} . But according to the actual situation, the spare 10 kV line was only used for the construction purpose of the projects; when the Dagangzi Wind Power Project Phase I (the first project of the Dagangzi Wind Power Project Phase I-V) starting operation in December 2007, the spare 10 kV line was cut off but the spare 10kV line is still at the project site. Once the project meet the emergency case, the spare 10kV line will be connected again, therefore, the project owner still recorded the electricity import by the spare 10kV line monthly and calibrated the meter according to the MP. In this monitoring period, the electricity imported from the grid and measured by the meter M_{10kV} is 0MWh.

$$M_{10kV,import,y} = 0MWh \quad (C)$$

The electricity imported from the grid and measured by meter M_{main} used for ERs calculation is listed as follows:

Period	Electricity imported from the grid monitored by the main meter ($M_{main,import,y}$)		
	Monitoring value	Value on receipts	Conservative value
	MWh	MWh	MWh
	D	E	F=MAX(D,E)
From 01-January-2021 to 24-January-2021	92.224	92.224	92.224
From 25-January-2021 to 24-February-2021	100.320	100.320	100.320
From 25-February-2021 to 24-March-2021	98.208	98.208	98.208
From 25-March-2021 to 24-April-2021	89.056	89.056	89.056
From 25-April-2021 to 24-May-2021	61.248	61.248	61.248
From 25-May-2021 to 24-June-2021	106.304	106.304	106.304
From 25-June-2021 to 24-July-2021	230.912	230.912	230.912
From 25-July-2021 to 24-August-2021	156.992	156.992	156.992
From 25-August-2021 to 24-September-2021	171.424	171.424	171.424
From 25-September-2021 to 24-October-2021	122.496	122.496	122.496
From 25-October-2021 to 24-November-2021	149.248	149.248	149.248
From 25-November-2021 to 24-December-2021	166.496	166.496	166.496
From 25-December-2021 to 31-December-2021	47.872	47.872	47.872
Total	1592.800	1592.800	1592.800

Note: The electricity imported from the grid by meter M_{main} during the period from 25-December-2021 to 31-December-2021 were calculated by the meter readings on 25-December-2021 and 31-December-2021, which were sourced from the daily records carried out by the project owner. The relevant certificate issued by the power grid company was used to take the crosscheck.

The electricity supplied to the grid by the Project used for ERs calculation is listed as follows:

Period	Electricity supplied to the grid by the Project used for ERs calculation
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	Calculated value	Value on receipts	Conservative value
	MWh	MWh	MWh
	$G=B \times A2/A$	H	$I=\text{MIN}(G:H)$
From 01-January-2021 to 24-January-2021	4935.089	4940.000	4935.089
From 25-January-2021 to 24-February-2021	8800.080	8800.000	8800.000
From 25-February-2021 to 24-March-2021	10324.584	10320.000	10320.000
From 25-March-2021 to 24-April-2021	11975.058	11980.000	11975.058
From 25-April-2021 to 24-May-2021	11288.310	11290.000	11288.310
From 25-May-2021 to 24-June-2021	7196.091	7200.000	7196.091
From 25-June-2021 to 24-July-2021	5163.365	5160.000	5160.000
From 25-July-2021 to 24-August-2021	5014.065	5010.000	5010.000
From 25-August-2021 to 24-September-2021	5222.414	5220.000	5220.000
From 25-September-2021 to 24-October-2021	8629.191	8630.000	8629.191
From 25-October-2021 to 24-November-2021	9271.829	9270.000	9270.000
From 25-November-2021 to 24-December-2021	9604.629	9600.000	9600.000
From 25-December-2021 to 31-December-2021	1375.800	1380.000	1375.800
Total	98800.503	98800.000	98779.538

Note: The electricity supplied to the grid by the Project during the period from 25-December-2021 to 31-December-2021 were calculated by the equation of $G=B \times A2/A$. The relevant certificate issued by the power grid company was used to take the crosscheck.

The net electricity supplied to the grid by the Project used for ERs calculation is listed as follows:

Period	Net electricity supplied to the grid by the project ($EG_{\text{facility},y}$)			
	Electricity supplied to the grid by the Project used for ERs calculation	Electricity imported from the grid monitored by the main meter ($M_{\text{main},\text{import},y}$)	Electricity imported from the grid via the 10kV line by the meter M10kV ($M_{10kV,\text{import},y}$)	Net electricity supplied to the grid by the project ($EG_{\text{facility},y}$)
	MWh	MWh	MWh	MWh
	I	F	C	$J=I-F-C$
From 01-January-2021 to 24-January-2021	4935.089	92.224	0.000	4842.865
From 25-January-2021 to 24-February-2021	8800.000	100.320	0.000	8699.680
From 25-February-2021 to 24-March-2021	10320.000	98.208	0.000	10221.792
From 25-March-2021 to 24-April-2021	11975.058	89.056	0.000	11886.002
From 25-April-2021 to 24-May-2021	11288.310	61.248	0.000	11227.062
From 25-May-2021 to 24-June-2021	7196.091	106.304	0.000	7089.787
From 25-June-2021 to 24-July-2021	5160.000	230.912	0.000	4929.088
From 25-July-2021 to 24-August-2021	5010.000	156.992	0.000	4853.008
From 25-August-2021 to 24-September-2021	5220.000	171.424	0.000	5048.576
From 25-September-2021 to 24-October-2021	8629.191	122.496	0.000	8506.695
From 25-October-2021 to 24-November-2021	9270.000	149.248	0.000	9120.752
From 25-November-2021 to 24-December-2021	9600.000	166.496	0.000	9433.504

From 25-December-2021 to 31-December-2021	1375.800	47.872	0.000	1327.928
Total	98779.538	1592.800	0.000	97186.738

As shown above, the net electricity supplied to the grid during this monitoring period (from 01-January-2021 to 31-December-2021) is 97,186.738 MWh.

The baseline emission is:

$$BE_{facility,y} = EG_y \times EF_{grid,CM,y} = 97,186.738 \text{ MWh} \times 0.9139 \text{ tCO}_2\text{e/MWh} = 88,818 \text{ tCO}_2\text{e}$$

5.2 Project Emissions

According to ACM0002 (Version 20.0), no project emissions were to be counted by the Project.

Hence, $PE_y = 0 \text{ tCO}_2\text{e}$.

5.3 Leakage

According to the baseline methodology ACM0002 (version 20.0), the leakage of the Project is not considered.

5.4 Net GHG Emission Reductions and Removals

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)
Year 2021	88,818	0	-	88,818
Total	88,818	0	-	88,818

Comparison of actual emission reduction and the estimation in the registered PDD.

This monitoring period started from 01-January-2021 to 31-December-2021, with totally 365 days. Based on the annual estimated emission reductions from the approved VCS PD, the amount of emission reductions for this monitoring period would be $94,250 \text{ tCO}_2\text{e} / 365 \text{ d} \times 365 \text{ d} = 94,250 \text{ tCO}_2\text{e}$. The actual emission reductions in this monitoring period (365 days) are 88,818 tCO₂e, which are 5.76% lower than the estimation in the approved VCS PD. It was mainly resulted by the erratically fluctuation of wind resources in the project area, and limited absorption capacity of local grid.

APPENDIX 1: <SUPPORTING EVIDENCE>

Evidence for SDG Target 7 and SDG Target 13: From project operation date onwards, the net electricity supplied to the grid and corresponding emission reduction in every monitoring period have been listed in below table. Please refer to following links for details.

<https://cdm.unfccc.int/Projects/DB/TUEV-SUED1242408811.21/view?cp=1>

<https://registry.verra.org/app/projectDetail/VCS/548>

Period		EG _y	ER _y	GHG program
From	To	MWh	tCO ₂ e	
01-January-2009	08-March-2010	112,012.619	128,377	VCS
09-March-2010	24-February-2011	91,041.06	104,342	CDM
25-February-2011	24-April-2012	91,538.241	104,911	CDM
25-April-2012	24-September-2012	33,363.526	38,237	CDM
25-September-2012	31-December-2012	18,752	21,491*	CDM
01-January-2013	24-December-2016	273,589.995	313,561	CDM
25-December-2016	31-December-2018	154,845.602	177,467	VCS
01-January-2019	31-December-2020	204,369.966	186,772	VCS
01-January-2021	31-December-2021	97,186.738	88,818	VCS

*The emission reductions generated for the period from 25-September-2012 to 31-December-2012 were developed under CDM program, which were still under the process of issuance request.

Since the current project contributions with all impacts are not included in previously approved VCS monitoring reports or Sustainable Development Contribution Reports, all impacts during the previous monitoring period from 01-January-2009 to 31-December-2020 have not been calculated in the cumulative impact. Thus, the cumulative impacts in project lifetime are the same as the one in this monitoring period.

Evidence for SDG Target 8: The staff payroll of the project has been submitted as a separate document to VVB due to confidentiality requirement of the project proponent.