SHANDONG WENDENG ZHANGJIACHAN WIND FARM PROJECT

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

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Shandong Wendeng Zhangjiachan Wind Farm Project (hereinafter referred to as the project) is located in Wendeng City, Shandong Province, P. R. China. The project is developed by Wendeng Zhangjiachan Wind Power Co., Ltd.. The objective of the project is to generate renewable electricity using wind power resources and to sell the generated output to the North China Power Grid (NCPG).

The project site has an abundant wind resource. A decision has been made to install a total of 58 wind turbines, each with a rated power output of 850 kW. The total power capacity of the wind farm is 49.3 MW. The expected net supplied power to the grid is 90,997 MWh per year. The estimated annual average and total emission reductions of the project is 75,245 tCO_2e and 752,450 tCO_2e during the second crediting period from 26/02/2021 to 25/02/2031. The project is a grid-connected renewable energy project. The project started construction on 26/02/2010. The first batch of generating units started commercial operation on 26/02/2011 and all of the generating units had put into commercial operation on 11/08/2011.

The scenario existing prior to the start of the implementation of the project activity is NCPG providing the same electricity service as the Project.

The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

1.2 Sectoral Scope and Project Type

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

Project type: Energy industries (renewable/non-renewable sources)

The project is not a grouped project.

1.3 Project Eligibility

The scope of the VCS Program includes six Kyoto Protocol greenhouse gases. As stated in Section 1.1, the Project achieves emission reductions by reducing CO_2 emissions by displacing part of the electricity that would otherwise have been supplied by NCPG, hence falls into the scope of the VCS Program.

CDM methodology ACM0002 Version 20.0 “Grid-connected electricity generation from renewable sources” is adopted, which is the methodology approved under a VCS approved GHG program and is eligible for VCS by Verra.

The project is to utilize solar energy for electricity generation. Prior to the implementation of the project, the equivalent electricity supplied by the project was sourced from NCPG. Apparently, the project does not generate GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction.

Therefore, as a registered VCS project, the Project is still eligible under the scope of VCS program for the second crediting period.

1.4 Project Design

The project is not a grouped project and is eligible under the scope of the VCS Program.

Eligibility Criteria

Not applicable as not a grouped project.

1.5 Project Proponent

Organization name	Wendeng Zhangjiachan Wind Power Co., Ltd.
Contact person	Shi Lei
Title	CDM office director
Address	Area 12 of Advanced Business Park, No. 188 west of South 4th Ring Road, No.2 Building, Beijing, The People’ s Republic of China
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1.6 Other Entities Involved in the Project

Organization name	CGN Carbon Asset Management (Beijing) Co., LTD
Role in the Project	Consultancy
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1.7 Ownership

The project proponent is Wendeng Zhangjiachan Wind Power Co., Ltd., who has the full ownership of the project. The approval of Environmental Impact Assessment (EIA), Feasibility Study Report (FSR), and Letter of Approval for the Project as a CDM Project issued by China's DNA and the business license of the project owner are evidences for legislative right. Besides, the equipment purchasing contract and the purchasing power agreement are the evidences for the ownership of the plant, equipment and power generating.

1.8 Project Start Date

The project started on 26/02/2011 (commissioning start date).

1.9 Project Crediting Period

In the registered PD, the crediting period is described as from 26/02/2011 to 29/02/2012. A deviation is requested for the crediting period. The project is registered under VCS Standard Version 3.4 and completed validation before 19/03/2020. Thus, it remains eligible to apply the crediting period requirements under VCS Standard Version 3.4 which shall be a maximum of ten years and may be renewed at most twice, so the first renewable crediting period of the project should be updated from 26/02/2011 to 29/02/2012 to 26/02/2011 to 25/02/2021. This change was made in the MR (version 02 dated 18/05/2021) for the verified monitoring period 01/03/2012-31/12/2015 and it has been approved by Verra on 08/06/2021.

Therefore, the project crediting period is ten years, twice renewable for a total of 30 years. However, as the project is also registered as a CDM project with a seven year twice renewable project crediting period and furthermore, the project has the lifetime of 20 years, it is not eligible for VCU issuance beyond 25/02/2031. Therefore, the second crediting period is from 26/02/2021 to 25/02/2031.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	✓
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
26/02/2021~25/02/2022	75,245
26/02/2022~25/02/2023	75,245

26/02/2023~25/02/2024	75,245
26/02/2024~25/02/2025	75,245
26/02/2025~25/02/2026	75,245
26/02/2026~25/02/2027	75,245
26/02/2027~25/02/2028	75,245
26/02/2028~25/02/2029	75,245
26/02/2029~25/02/2030	75,245
26/02/2030~25/02/2031	75,245
Total estimated ERs	752,450
Total number of crediting years	10
Average annual ERs	75,245

1.11 Description of the Project Activity

The project is to utilize wind resources for electricity generation in Wendeng City, Shandong Province, P. R. China. The project is a grid-connected renewable energy project. Prior to the start of implementation of the project activity, there is no power generation unit at the site of the project, and the electricity was supplied by the NCPG. The baseline scenario of the project is providing the same electricity service as the project by NCPG which is dominated by the fossil-fuel fired power plants.

The project involves the installation of 58 wind turbines with capacities of 850kW each, which amount to a total installed capacity of 49.3MW. The estimated annual power output is 90,997MWh and the plant load factor (PLF) is 21%. The annual operation hour is 1,846h.

The lifetime of the project is 20 years.

The 110kV substation on the project site is to be utilized, which connects the project to the Xijiao 110kV Substation. Then the power produced in the wind farm can be transmitted to the Shandong Power Grid which is part of NCPG. Grid-connected electricity generated by the proposed project is monitored through metering equipment (meter monitoring both electricity input and electricity output).

Technology to be employed by the project activity

Table 1 Key Technical specifications of wind turbines (G58-850kW)

Key Technology Parameter	Value
Rotor diameter(m)	58

Swept area(m^2)	2,642
Cut-in wind speed (m/s)	3
Rated wind speed (m/s)	16
Cut-out wind speed (m/s)	23
Hub height of the wind turbines (m)	65
Capacity (kW)	850
Load Factor (%)	21
Lifetime(years)	20
Rated voltage (V)	690

1.12 Project Location

The project is located at Wendeng City, Shandong Province, P. R. China. The geographical coordinates of the project is from 122.051944 E to 122.155278 E, and from 37.093611 N to 37.181667 N. The central geographical coordinate of the project is 122.103611 E, 37.137639 N. Figures 1 and 2 show the geographical location of the project.

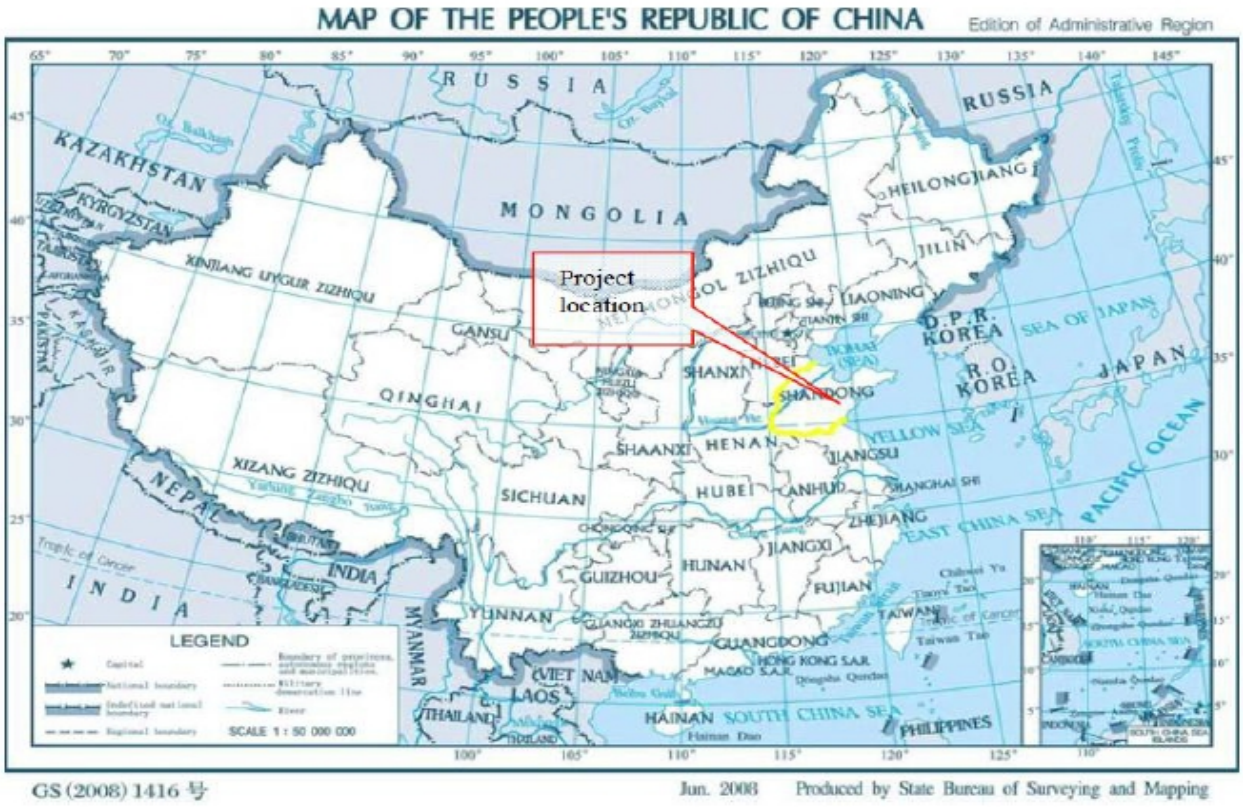


Figure 1. The location of the project in the map of P. R. China

Figure 2. The project on the map of Shandong Province and Wendeng County

1.13 Conditions Prior to Project Initiation

Prior to project initiation, equivalent electricity delivered to the grid by the project activity would have otherwise been generated by the operation of the existing grid-connected power plants or by the addition of new generation sources from NCPG.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project complies with all Chinese relevant laws and regulations, mainly including Environmental Protection Law of the People's Republic of China, Law of the People's Republic of China on the Prevention and Control of Solid Waste Pollution, etc. It also obtained the approval letters from governmental authorities: Development and Reform Commission (DRC), as well as Environment Protection Bureau (EPB) of Shandong Province. The two approvals well demonstrate that local government permits the construction of the project. Consequently, the project is compliance with laws, status and other regulatory frameworks.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has been registered as a CDM project on 17/01/2012 with Ref No.5655, for which a renewable crediting period of 3*7 years will be used under the CDM GHG Program. The first crediting period is from 01/03/2012 to 28/02/2019 and the second crediting period is from 01/03/2019 to 28/02/2026. The project has been registered as VCS project with Ref. VCS1188. VCUs of 63,369 tCO_2e have been issued for the monitoring period from 26/02/2011 - 29/02/2012, 335,659 tCO_2e have been issued for the monitoring period from 01/03/2012 - 31/12/2015, and 403,631 tCO_2e have been issued for the monitoring period from

01/01/2016 - 25/02/2021. In addition, the project has not been registered under other GHG program. There is no emission reductions issued, request for issuance or waiting issuance request under CDM mechanism.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by other GHG Programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project has not been registered as a CCER (Chinese Certified Emission Reductions) project in China. Also, the project proponent Wendeng Zhangjiachan Wind Power Co., Ltd. is not included in the compliance entity list by China national Emission Trading Scheme (ETS). Thus, the emission reductions generated by project activity is not eligible to be used under the national emission trading programme as per the requirement of the China ETS.

The project is not involved in an emission trading program or any other mechanism that includes GHG allowance trading. The GHG emission reductions and removals generated by the project will not be enforced to be used for compliance in China. The project proponent has signed statement on not being used for the compliance and no double counting claiming of the credits.

1.16.2 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit.

1.17 Sustainable Development Contributions

The project makes contribution to the local sustainable development as follows:

1. GHG emission reduction

The project activity will achieve obvious greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions, as grid-connected fossil fuel-fired power dominates in the North China Power Grid, the annual average emission reductions of the project during this crediting period is estimated to be 75,245tCO_2e, which contributes to the China's commitment to peak carbon dioxide emissions before 2030. Thus, the project achieved SDG13 "Take urgent action to combat climate change and its impacts".

2. Pollutants emission reduction through replacing fossil fuel combustion

The project is to replace fossil fuel consumption by fired power plants in the NCPG which can increase the share of renewable energy and improve China's energy security and efficiency.

Thus, the project achieved SDG7 “Ensure access to affordable, reliable, sustainable and modern energy for all”.

3. Employment opportunities

The conducting of the project will offer job opportunities for local people during both the construction and operational period. Thus, the project achieved SDG8 “Promote sustained inclusive and sustainable economic growth, full and productive employment and decent work for all”.

1.18 Additional Information Relevant to the Project

Leakage Management

According to the consolidated methodology ACM0002 (Version 20.0), the leakage of the project is not considered. No leakage management as the project is not an AFOLU project.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Further Information

No further information is required.

2 SAFEGUARDS

2.1 No Net Harm

The potential negative environmental impacts of both power plants have been analysed by a third-party company; please refer to Section 2.3 for details. With necessary mitigation measures taken, there are no negative environmental impacts due to the Project.

The Project brings many socio-economic benefits to local people, as mentioned in Section 1.17. The Project does not result in any negative socio-economic impacts.

In conclusion, the construction and operation of the Project does not result in any significant environmental impacts or any negative socio-economic impact.

2.2 Local Stakeholder Consultation

Wendeng Zhangjiachan Wind Power Co., Ltd. put up a notice of Stakeholder Consultation Meeting Notification of Shandong Wendeng Zhangjiachan Wind Power Project to invite

comments on the construction of the project on 19/11/2009. Stakeholder Consultation Meeting of the project was held at Wendeng Detai Hotel on 21/11/2009 to guarantee the successful implementation of project with the interest of stakeholder being taken into account. The project owner also distributed public participation questionnaires at the project location Zhangjiachan Town to collect advice and opinions on the project from local stakeholders. 48 out of 50 copies of questionnaires were collected. Among the interviewees, there were 27 farmers, 14 workers, and 7 government officials; 36 of them had junor high school education or below while 12 had high school level education.

The questions in the questionnaire were mainly as follows:

a) How do you think of the local environmental quality in general?

b) Is there any electromagnetic radiation disturbance when you watch TV?

c) Do you think the construction of the project will have any negative effect on you and your family?

d) Will the project promote the local economy?

e) How do you think the project will affect the acoustic environment (noise) quality?

f) What is your most concerned environmental issue during the construction and operation of the project?

g) Do you favour the construction of the project?

h) Do you have any advice about the selection of environmental protection measures?

i) Do you have any other suggestions to the project?

The summary of survey is listed as the following:

88% of the interviewee think good of the general local environmental quality, 12% of them think it average;

90% of them think there is no electromagnetic radiation disturbance when they watch TV, 8% are not sure about it and 2% of them think there is;

96% of them think the construction of the project will have no negative effect on them and their family while 4% of them think it will;

96% of them think the project will promote the local economy while 4% are not sure;

77% of them think the project will not affect the acoustic environment (noise) quality, 4% think it will and 19% are not sure;

29% of them consider electromagnetic disturbance their most concerned environmental issue during the construction and operation of the project, 64% are most concerned about noise effect and 7% are most concerned about wastewater discharge;

94% of them support the construction of the project and 6% are not sure.

Conclusions from the survey:

The vast majority of public opinions received were supportive. Some of local residents were concerned with temporary land occupation and construction waste and some of them showed concern about wastewater during construction period. As discussed in the EIA report, these issues are well illuminated and specific instructions were given to mitigate the potential impacts of these issues. In addition, the project site is designed to be far enough away from the residential area. Wastewater during the construction and operation phase will be removed periodically. The environmental impacts can be avoided, controlled or mitigated via thorough implementation of the mitigation measures. Therefore, the project can be carried out as planned.

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 meet local villagers to collect their commetns and suggestions yearly.

2.3 Environmental Impact

The environmental impact assessment for this project was carried out by Shandong Academy of Environmental Science in April, 2008 and approved by Shandong Environmental Protection Bureau on 24/06/2008. A summary of the report is illustrated as below:

Ambient air

The impact on ambient air quality of the project is mainly from dust during construction stage. The excavation work is the primary emission source, however, it is a ground source and the particle size is quite large so that dust will deposit quickly on the ground. Immediately replant the areas where construction has completed, and by sprinkling water frequently and timely clearing can reduce the dust pollution. When the project is in operational period, there will be no air pollutions. In conclusion, the project will not pose any threat on the quality of ambient air.

Impact from noise

There is some noise during the operation of wind turbines. The equipments and techniques with lower noise will be chosen to apply. Improvement on construction process and strengthening of equipment maintenance is emphasized. Noise Limits in Construction site (GB12523-90) and Emission standard for industrial enterprise noise at boundary (GB12348-2008) Level II noise standard would be fulfilled during the construction and operational period. Besides, some noise control measures on the noise source control and sensitive object protection would be taken to mitigate the noise at the maximum limit. Consequently, the noise of operation has little impact to the surrounding environment. Hence, the noise will not impact the work and daily life of local residents.

Electromagnetic impact

The operation of the wind farm will generate electromagnetic pollution, whereas the pollution is slight. Some measures on the prevention and control of electromagnetic influence, for example, strengthen the training on the electromagnetic knowledge for the workers and organise and manage the work time, will be taken to reduce the electromagnetic impact during the operation phase. In addition, the wind turbines are very far from local residents and village. Therefore, the electronic magnetic pollution to the surrounding environment is insignificant.

Impact from Solid waste

Solid wastes generated from the project activity are excavated earth material and municipal solid waste. Part of the excavated earth material will be backfilled, and the rest will be used for land levelling and road construction near the project site. The municipal solid waste will be collected and treated together with the waste from local residents. As the report indicates, solid waste is handled properly.

Impact from Wastewater

Wastewater is mainly domestic wastewater. Wastewater quantity is fairly small and treatment methods will be applied for on-site primary treatment, and then the wastewater will be treated together with the local wastewater. Small-scale septic tanks should be built on the site, through which the discharging wastewater can reach the Water quality standard for urban miscellaneous water consumption (GB/T18920-2002). Therefore, the impact of wastewater is limited and mitigated.

No migrating birds have been found in the project field. Therefore, the project is not located on the passage of migrating birds, and the project construction will not influence the migration of birds.

Conclusion

The environmental impacts of the Shandong Wendeng Zhangjiachan Wind Farm Project are not considered as significant.

2.4 Public Comments

Some comments were received during the CDM registration PDD public announcement, but they have been clarified and resolved in the registered CDM PDD.

2.5 AFOLU-Specific Safeguards

NA.

3 APPLICATION OF METHODOLOGY

3.1 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:

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 03.0.1).

Reference:

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

Tools: "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

3.2 Applicability of Methodology

The approved methodology ACM0002 (version 20.0) is applicable to the project activity and the project meets the applicability of the applied methodology as follows:

Clauses	Requirements of the ACM0002	Scenario of the project	Conclusion
1	This methodology is applicable to grid-connected renewable energy power generation project activities that: a) Install a Greenfield power plant; b) Involve a capacity addition to (an) existing plant(s); c) Involve a retrofit of (an) existing	The project is a greenfield NCPG-connected renewable power generation project.	Applicable

Clauses	Requirements of the ACM0002	Scenario of the project	Conclusion
	operating plants/units; d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s)/unit(s).).		
2	The methodology is applicable under the following conditions: (a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	The project is a newly built wind power project and the project activity involves the installation of the wind power plant.	Applicable
3	In case of hydro power plants, one of the following conditions must apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (7), is greater than 4 W/m^2;	Not applicable, the project is not a hydro power plant, so this applicability condition does not need to be considered.	NA

Clauses	Requirements of the ACM0002	Scenario of the project	Conclusion
	or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m^2; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m^2, all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m^2; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.		
4	In the case of integrated hydro power projects, project proponent shall: Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or Provide an analysis of the water balance covering the water fed to power units, with all possible	Not applicable, the project is not a hydro power plant, so this applicability condition does not need to be considered.	NA

Clauses	Requirements of the ACM0002	Scenario of the project	Conclusion
	combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.		
5	The methodology is not applicable to: a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; b) Biomass fired power plants/units.	The project does not involve switching from fossil-fuels to renewable energy sources at the site of the project activity and the project is not a biomass-fired power project.	NA
6	In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	Not applicable, the project is a newly built wind power project.	NA

In addition, the project meets the applicability conditions of the applied tools applied in the PD as follows:

Tool	Criteria	Applicability	Conclusion
Tool to calculate the emission factor for an electricity	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that	The project is the installation of a wind power plant supplying	Applicable

Tool	Criteria	Applicability	Conclusion
system	substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	electricity to the grid.	
Tool to calculate the emission factor for an electricity system	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project electricity system is located in a non-Annex I country.	NA
Tool for assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period"	This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism. The tool consists of two steps: The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period.	The validity of the baseline of the project is assessed by the following two steps: Evaluate whether the current baseline is still valid for the next crediting period; Update the baseline in case that the current baseline is not valid anymore for the next crediting period.	Applicable

3.3 Project Boundary

According to ACM0002 (version 20.0), the spatial extent of the project boundary includes the project power plant and all the power plants connected physically and geographically to electricity system that the project power plant is connected to. According to the "Tool to calculate the emission factor for an electricity system (version 07.0)", the electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that are covered by either single or layered dispatch area.

Electricity generated by the Project was delivered to North China Power Grid (NCPG). According to 2019 Baseline Emission Factors for Regional Power Grids in China issued by China's DNA[1], The NCPG is composed of Beijing, Tianjin, Hebei, Shandong, Shanxi and Inner Mongolia power grids, therefore, NCPG was defined as the electricity system the project is connected to, and the spatial extent of the project boundary includes the project power plant and all the power plants connected physically and geographically to NCPG.

The greenhouse gases and emission sources included in or excluded from the above-identified project boundary are shown as below:

Source		Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel-fired power plants that is displaced due to the project activity.	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
		Other	No	Minor emission source
Project	The wind power plant	CO_2	No	No CO_2 emissions are emitted from the project
		CH_4	No	Project activity does not emit CH_4
		N_2O	No	Project activity does not emit N_2O
		Other	No	Project activity does not emit other gas

The flow diagram of the project boundary is illustrated as follow:

[1] http://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/index_1.shtml

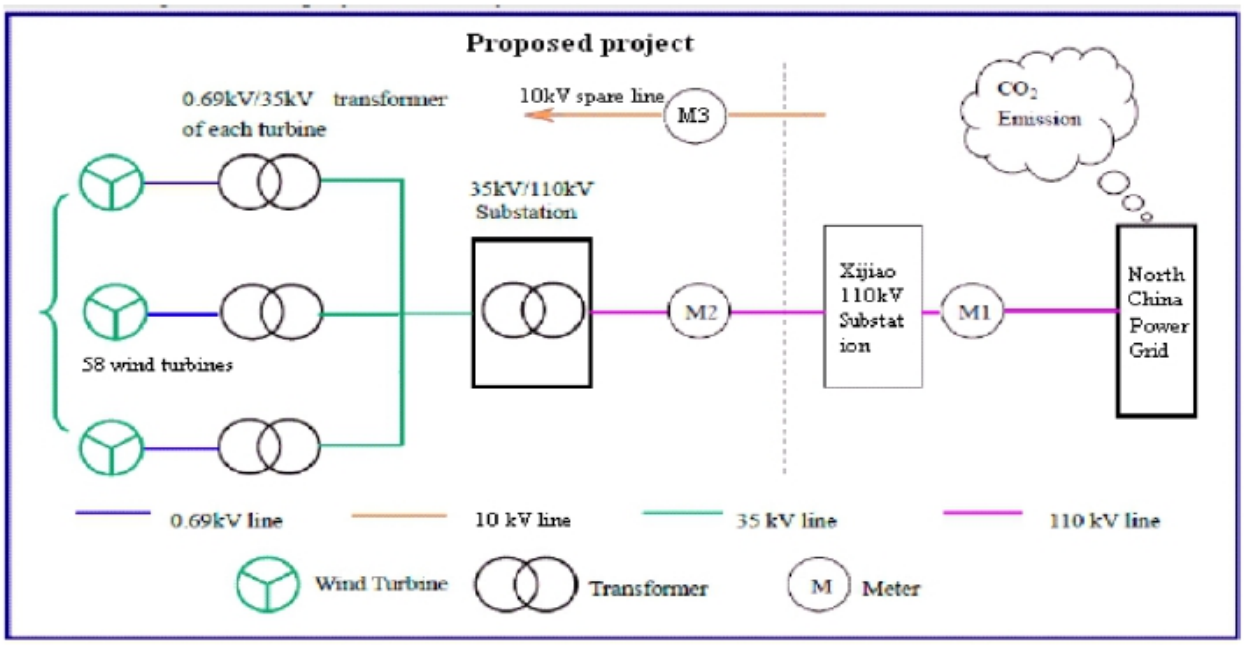


Figure 3 Flow diagram of the project boundary

3.4 Baseline Scenario

In accordance with "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (version 03.0.1), the validity of the current baseline is assessed using the following sub-steps:

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

There are no new national and/or sectoral policies that could affect the baseline scenario during the renewal of the crediting period. For total electricity generation produced by fossil fuel power plants, the average share of the five most recent years is more than 50% of total electricity generation in NCPG[2], the proportions are 94%, 93%, 91%, 90% and 88% from the year 2014 to 2018, respectively. Hence in the absence of the project activity, electricity would still have been generated in the existing grid-connected power plants or by the addition of new generation sources from NCPG. The current baseline still complies with all relevant mandatory national and sectoral policies which have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period. Go to step 1.2.

Step 1.2: Assess the impact of circumstances

[2] China Electric Power Yearbook 2019

The baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment. The investment environment or market characteristics especially the feed-in tariff, the policy in terms of market access permit, these circumstances continue during the second crediting period and therefore, do not have an impact on the current baseline emissions. Hence the current baseline does not need to be updated. Go to step 1.3.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

The project is a greenfield project with a lifetime of 20 operation years, with no baseline equipment(s) or an investment for the crediting period for which renewal is requested, this step is not applicable. Go to step 1.4.

Step 1.4: Assessment of the validity of the data and parameters

Data and parameters that need to be updated are as follows:

$EF_{grid,CM,y}$: the baseline emission factor that determined once for the first crediting period at the time of validation, hence it has been updated using the latest version of "Tool to calculate the emission factor for an electricity system". Please refer to section 4 for details.

$EF_{grid,OM,y}$: the baseline emission factor that determined once for the first crediting period at the time of validation, hence it has been updated using the latest version of "Tool to calculate the emission factor for an electricity system". Please refer to section 4 for details.

$EF_{grid,BM,y}$: the baseline emission factor that determined once for the first crediting period at the time of validation, hence it has been updated using the latest version of "Tool to calculate the emission factor for an electricity system". Please refer to section 4 for details.

Data and parameters that are still valid thus need not to be updated are as follows:

For wind power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.

Application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline is valid for the second crediting period but data and parameters need to be updated. Therefore step 2 is used.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The baseline emissions for the second crediting period has been updated, without reassessing the baseline scenario, based on the latest approved version of the methodology ACM0002 (Version 20.0). This update was applied in the context of the sectoral policies and circumstances that is applicable at the time of requesting for renewal of the crediting period.

More details for the updated baseline emissions for the second crediting period can be seen in section 4.

Step 2.2: Update the data and parameters

The updated baseline emission factor for the project ($EF_{grid,CM,y}$) is 0.8269 tCO_2e/MWh.

Parameter	Data
$EF_{grid,OM,y}$ (tCO_2/MWh)	0.9419
$EF_{grid,BM,y}$ (tCO_2/MWh)	0.4819
$EF_{grid,CM,y}$ (tCO_2/MWh)	0.8269

3.5 Additionality

The project has demonstrated its additionality in the first crediting period and no changes affect the additionality of the project since its registration. There are no new national and/or sectoral policies that could affect the baseline scenario during the renewal of the crediting period. Of course no regulatory surplus required comparing with the first validation at time of renewal of crediting period.

3.6 Methodology Deviations

There is no deviation applied to this second crediting period.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

According to the ACM0002 (Version 20.0), baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} \quad (1)$$

Where:

BE_y = Baseline emission in year y (tCO_2/yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"

The project activity is a Greenfield wind power plant, then:

$EG_{PJ,y} = EG_{facility,y}$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

4.1.1 To calculate the emission factor for an electricity system

$EF_{grid,CM,y}$ is calculated as per the latest version of "Tool to calculate the emission factor for an electricity system" (version 07.0). The baseline emission factor $EF_{grid,CM,y}$ is calculated ex ante and fixed for the second crediting period. Detailed as follows:

Step 1. Identify the relevant electricity system

According to the" Tool to calculate the emission factor for an electricity system (Version 07.0)", project participants may delineate the project electricity system using any of the following options:

Option 1. A delineation of the project electricity system and connected electricity systems published by the DNA or the group of the DNAs of the host country(ies), In case a delineation is provided by a group of DNAs, the same delineation should be used by all the project participants applying the tool in these countries;

Option 2. A delineation of the project electricity system defined by the dispatch area of the dispatch centre responsible for scheduling and dispatching electricity generated by the project activity.

Where the dispatch area is controlled by more than one dispatch centre, i.e. layered dispatch area, the higher-level area shall be used as a delineation of the project electricity system (e.g. where regional dispatch centres are required to comply with dispatch orders of the national dispatch centre then area controlled by the national dispatch centre shall be used);

Option 3. A delineation of the project electricity system defined by more than one independent dispatch areas, e.g. multi-national power pools.

Since Chinese DNA has published a delineation of the project electricity system and connected electricity systems, Option 1 is applied for the project. According to the delineations, the North China Power Grid (NCPG) is identified as the relevant electric power system of the project,

which includes Beijing, Tianjin, Hebei, Shandong, Shanxi and Inner Mongolia Provincial Power Grids. The project is located in Wendeng City, Shandong Province, P. R. China. and covered by the North China Power Grid (NCPG). According to the "2019 Baseline Emission Factors for Regional Power Grids in China", There is no net electricity imports to NCPG. Therefore, North China Power Grid (NCPG) is chosen as the relevant electric power system.

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional)

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

Based on China's real situation, only grid power plants are included in the calculation.

Step 3. Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

In China, specific data from the grid or each power plant is treated as business confidential and thus not public available. Therefore, method (b) and method (c) is not suitable for the project.

According to ACM0002, the Simple OM method (a) can only be applied when low-cost/must run resources[3] constitute less than 50% of total grid generation in average of the five most recent years or based on long-term normal for hydroelectric production.

The share of low-cost/must-run generation in NCPG is 6%, 7%, 9%, 10% and 12% of total generation of NCPG from the year 2014 to 2018, respectively (China Electric Power Yearbooks 2015-2019), all lower than 50%, which satisfied the applicability of the method (a), therefore, the simple OM method is chosen for the calculation of the OM emission factor $EF_{grid,OM,y}$.

[3] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

As per the latest version of "Tool to calculate the emission factor for an electricity system", one of the following methods should be chosen to calculate the simple OM emission factor:

- **Ex ante option:** If the ex-ante option is chosen, the emission factor is determined once at the validation stage. Thus, no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation;

- **Ex post option:** If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of the year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

Here ex-ante vintage is chosen, and the $EF_{grid,OM}$ is fixed during the second crediting period.

Step 4. Calculate the operating margin emission factor according to the selected method

Based on the analysis of the step 3, the simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/ units. The simple OM may be calculated by one of the following two options:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

For the project activity, the required data for the exercise of Option A is not available and those of Option B can be obtained from official sources, and off-grid power plants are not included in the calculation, therefore, Option B is chosen to calculate the operating margin emission factor:

Option B can only be used if:

(a) The necessary data for option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation.

As the data required by option A is not available in China, and the nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known in china, and off-grid power plants are not included in the calculation. Therefore, Option B is used for calculating project OM as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (2)$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2 /MWh)

$FC_{i,y}$ = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2 /GJ)

EGy = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year y

y = The relevant year as per the data vintage chosen in Step 3

If available, $NCV_{i,y}$ and $EF_{CO2\ ,i,y}$ from the fuel supplier of the power plants in invoices may be used; or, regional or national average default values may be used. In this PDD, $NCV_{i,y}$ of different fuels are obtained from China Energy Statistical Yearbook 2018. With regard to the fuel types where $NCV_{i,y}$ fluctuate in a certain range, the floor values of the fluctuation range are used for conservatism. $EF_{CO2\ ,i,y}$ of fossil fuel comes from IPCC default values.

The Simple OM Emission Factor ($EF_{grid,OMsimple,y}$) of the project is calculated on the basis of the fuel consumption data for electricity generation of the NECG, not including those of low-operating cost and must-run power plants, such as wind power, hydropower and nuclear etc. These data are obtained from the China Electric Power Yearbook (2016~2018, published annually) and China Energy Statistical Yearbook (2016~2018). Based on these data, the Simple OM Emission Factor ($EF_{grid,OMsimple,y}$) of the NCPG is calculated as 0.9419 tCO_2e/MWh.

Step 5. Calculate the build margin emission factor

In terms of vintages of data, project participants can choose between one of the following two options:

Option 1 For the first crediting period, calculate the build margin emission factor, ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the

build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the second crediting period should be used. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2 For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The PDD chooses **Option 1,** which requires the project participant to calculate the Build Margin Emission Factor $EF_{grid,BM,y}$, ex-ante based on the most recent information available on units already built for sample group m at the time of PDD submission.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20 per cent of AEG_{total} (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20}$ per cent) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20 \text{ per cent}}$, in MWh);

(c) From $SET_{5\text{-}units}$ and $SET_{\geq 20 \text{ per cent}}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20 per cent of the annual electricity generation of the project electricity system (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprising at least 20 per cent of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20 per cent of the annual electricity generation of the project electricity system (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM\text{-}>10yrs}$).

However, in China, it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20 per cent of the system generation (in MWh) and that were built most recently, since no data of plant specific generation and fossil fuel consumption is currently available in China. As none of the above options can be selected, the follows are adopted to calculate the BM[4] as approved by CDM EB:

First, to calculate the newly added installed capacity and the contribution component of other various power generation technologies, then calculate of the weight of newly added installed capacity of each power generation technology, and finally, to calculate BM emission factor using the commercially optimal efficiency level of each power generation technology.

According to the "Tool to calculate the emission factor for an electricity system", the build margin emissions factor ($EF_{grid,BM,y}$) is calculated as the generation-weighted average emission factor (tCO_2e/MWh) of all power units m during the most recent year y for which power generation data is available. The calculation equation is as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (3)$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year *y* (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

[4] http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM

Since the generating capacity of coal-fired, oil-fired and gas-fired technologies can't be separated from the existing statistical data, the following measures are taken for the calculation:

First, based on the available data of the latest year, determine the ratio of CO_2 emissions from coal, oil, and gas consumption for power generation to the total CO_2 emission; Second, to calculate the emission factor of the thermal power based on the weight of CO_2 emission from coal, oil, and gas, and the emissions factors using commercial technologies with optimal efficiency. And finally, to multiply the thermal emission factor with the portion of the thermal power comprising 20 per cent of the newly added capacity.

Sub-step 5.1. Calculate the weights of CO_2 emission of solid, liquid and gaseous fossil fuels in total emissions for power generation

$$\lambda_{Coal} = \frac{\sum_{i\in COAL,j} F_{i,j,y}\times NCV_{i,y}\times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y}\times NCV_{i,y}\times EF_{co_2,i,j,y}} \quad (4)$$

$$\lambda_{Oil} = \frac{\sum_{i\in OIL,j} F_{i,j,y}\times NCV_{i,y}\times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y}\times NCV_{i,y}\times EF_{co_2,i,j,y}} \quad (5)$$

$$\lambda_{Gas} = \frac{\sum_{i\in GAS,j} F_{i,j,y}\times NCV_{i,y}\times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y}\times NCV_{i,y}\times EF_{co_2,i,j,y}} \quad (6)$$

Where:

$FC_{i,j,y}$ = Amount of fossil fuel type i consumed in province *j* in year *y* (mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/t or GJ/m^3)

$EF_{CO2,i,j,y}$ = CO_2 emission factor of fossil fuel type i in year *y* (tCO_2e/GJ)

Sub-step 5.2. Calculation of Emission Factor of Relevant Thermal Power

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{oil,y} \times EF_{oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (7)$$

Where:

$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ refers to the emission factors representing best technologies commercially available for coal, oil and gas fired power plants, respectively.

Sub-step 5.3. Calculate of BM of the grid

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (8)$$

Where:

$CAP_{Total,y}$ = The total newly added electricity generation capacity (MW) in year y;

$CAP_{Thermal,y}$ = The newly added electricity generation capacity of thermal power (MW) in year y

Key parameters used to calculate BM emission factor include the low calorific value of each fossil fuel, the oxidation rate, the potential emission factors, and the efficiency of various power generation technologies. The data of low calorific value of each fossil fuel and their oxidation rate comes from China Energy Statistical Yearbook 2018. The potential emission factors are sourced from "2006 IPCC Guidelines for National Greenhouse Gas Inventories" Table 1.3 and Table 1.4 of Page 1.21-1.24 in Chapter one, Volume 2 Energy.

According to the latest and available data at the time of this PD submission, $EF_{grid,BM,y}$ is calculated to be 0.4819 tCO_2e/MWh.

Step6. Calculate the combined margin emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option B) can only be used if:

(a) The project activity is located in: (i) a Least Developed Country (LDC); or in (ii) a country with less than 10 registered CDM projects at the starting date of validation; or (iii) a Small Island Developing States (SIDS); and

(b) The data requirements for the application of step 5 above cannot be met.

The PD choose option A.

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = \omega_{OM} \times EF_{grid,OM,y} + \omega_{BM} \times EF_{grid,BM,y} \quad (9)$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor for the project electricity system in year *y* (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor for the project electricity system in year *y* (tCO_2/MWh)

ω_{OM} = Weighting of operating margin emissions factor (%)

ω_{BM} = Weighting of build margin emissions factor (%)

The combined margin emissions factor $EF_{grid,CM,y}$ should be calculated as the weighted average of the Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$), where ω_{OM}= 0.75 and ω_{BM} = 0.25 for wind project (owing to their intermittent and

non-dispatchable nature) for the second crediting period and for subsequent crediting periods. The ($EF_{grid,OM,y}$) and ($EF_{grid,BM,y}$) are calculated as described in Step 4 and 5.

$EF_{grid,CM,y}$ = 0.9419 tCO_2e/MWh *0.75+0.4819 tCO_2e/MWh *0.25 = 0.8269 (tCO_2e/MWh)

4.2 Project Emissions

According to ACM0002 (version 20.0), the project is a wind farm, belongs to renewable energy activity, hence PE_y =0 tCO_2e/MWh.

4.3 Leakage

According to ACM0002 (version 20.0), no leakage is considered for this project.

4.4 Net GHG Emission Reductions and Removals

The annual emission reductions ER_y for the project activity are calculated as the baseline emissions minus the project emissions. Being the project of a greenhouse gas GHG zero-emission activity, the final GHG emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (10)$$

Where:

ER_y Emission reductions in year y (tCO_2)

BE_y Baseline Emissions in year y (tCO_2)

PE_y Project emissions in year y (tCO_2)

And the baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO_2/MWh) times the electricity supplied by the project activity to the grid ($EG_{facility}$ in MWh). The calculation formula is as follows:

$$BE_y = EG_{facility,y} \times EG_{grid,CM,y} \quad (11)$$

The summary of ex ante estimates of emission reductions is shown as follows:

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
26/02/2021~25/02/2022	75,245	0	0	75,245
26/02/2022~25/02/2023	75,245	0	0	75,245
26/02/2023~25/02/2024	75,245	0	0	75,245

26/02/2024~25/02/2025	75,245	0	0	75,245
26/02/2025~25/02/2026	75,245	0	0	75,245
26/02/2026~25/02/2027	75,245	0	0	75,245
26/02/2027~25/02/2028	75,245	0	0	75,245
26/02/2028~25/02/2029	75,245	0	0	75,245
26/02/2029~25/02/2030	75,245	0	0	75,245
26/02/2030~25/02/2031	75,245	0	0	75,245
Total	752,450	0	0	752,450

5 MONITORING

5.1 Data and Parameters Available at Validation

The baseline gird emission factor is obtained directly from the official source 2019 Baseline Emission Factors for Regional Power Grids in China by China's DNA. Thus, the relevant basis parameters for calculation of are not described in detail here. With consideration of the fact of the Project, data and parameters that are available at validation are summarized in below tables.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2e/MWh
Description	Combined margin CO_2 emission factor in year y
Source of data	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Value applied	0.8269
Justification of choice of data or description of measurement methods and procedures applied	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2e/MWh
Description	Simple operating margin CO_2 emission factor in year y
Source of data	"2019 Baseline Emission Factors for Regional Power Grids in China" published by China DNA
Value applied	0.9419
Justification of choice of data or description of measurement methods and procedures applied	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2e/MWh
Description	Build margin CO_2 emission factor in year y
Source of data	"2019 Baseline Emission Factors for Regional Power Grids in China" published by China DNA
Value applied	0.4819
Justification of choice of data or description of measurement methods and procedures applied	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	ω_{OM}
Data unit	-
Description	Weighting of operating margin emissions factor
Source of data	"Tool to calculate the emission factor for an electricity system"

	(version 07.0)
Value applied	0.75
Justification of choice of data or description of measurement methods and procedures applied	Follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of Data	Calculation of $EF_{grid,CM,y}$
Comments	N/A

Data / Parameter	ω_{BM}
Data unit	-
Description	Weighting of operating margin emissions factor
Source of data	"Tool to calculate the emission factor for an electricity system" (version 07.0)
Value applied	0.25
Justification of choice of data or description of measurement methods and procedures applied	Follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of Data	Calculation of $EF_{grid,CM,y}$
Comments	N/A

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit in year y.
Source of data	Calculation by $EG_{output,y}$, $EG_{import,y}$ and $EG_{im\text{-}spare,y}$
Description of measurement methods and procedures to be applied	The net electricity supplied to the Grid by the project will be calculated through electricity supplied by the project to the grid ($EG_{output,y}$) minus electricity purchased from the Grid ($EG_{import,y}$) and electricity purchased from the 10 kV spare line ($EG_{im\text{-}spare,y}$).

Frequency of monitoring/recording	Continuously measurement and monthly recording
Value applied	90,997 MWh
Monitoring equipment	Please refer to the monitoring equipment information of $EG_{output,y}$, $EG_{import,y}$ and $EG_{im-spare,y}$.
QA/QC procedures to be applied	Electricity supplied to and purchased from the grid is cross-checked according to sales receipts issued by grid company. Data will be archived for 2 years following the end of the last crediting period.
Purpose of data	Calculation of baseline emissions
Calculation method	$EG_{facility,y} = EG_{output,y} - EG_{import,y} - EG_{im-spare,y}$
Comments	-

Data / Parameter	$EG_{output,y}$
Data unit	MWh
Description	Quantity of electricity supplied by the project plant/unit to the grid in year y.
Source of data	Electricity meter reading (M1 as main meter, M2 as backup meter)
Description of measurement methods and procedures to be applied	$EG_{output,y}$ is monitored by the main meter M1 and backup meter M2 at the at the connection points between the project and the Grid (M1 installed at Xijiao 110kV substation; M2 installed at on-site 110kV substation).
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	

Meters	Type	Accuracy Class	Serial number
M1	DTZ341	0.2s	3730001000000171096347
M2	DTSD341	0.2s	1007036777000001

QA/QC procedures to be	The project operator is responsible for recording. The accuracy of meter is not lower than 0.5s. The accuracy of electricity meter is

applied	satisfied to the requests of monitoring plan. The meters at the substation are calibrated once a year according to the national standards. Electricity supplied to the grid is cross-checked according to sales receipts issued by grid company. Data will be archived for 2 years following the end of the last crediting period.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	-

Data / Parameter	$EG_{import,y}$
Data unit	MWh
Description	Quantity of electricity delivered to the project plant/unit from the grid in year y.
Source of data	Electricity meter reading (M1 as main meter, M2 as backup meter)
Description of measurement methods and procedures to be applied	$EG_{import,y}$ is monitored by the main meter M1 and backup meter M2 at the at the connection points between the project and the Grid (M1 installed at Xijiao 110kV substation; M2 installed at on-site 110kV substation).
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	
QA/QC procedures to be applied	The project operator is responsible for recording. The accuracy of meter is not lower than 0.5s. The accuracy of electricity meter is satisfied to the requests of monitoring plan. The meters at the substation are calibrated once a year according to the national standards. Electricity purchased from the grid is cross-checked according to sales receipts issued by grid company. Data will be archived for 2 years following the end of the crediting period.

Meters	Type	Accuracy Class	Serial number
M1	DTZ341	0.2s	3730001000000171096347
M2	DTSD341	0.2s	1007036777000001

Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	-

Data / Parameter	$EG_{im\text{-}spare,y}$
Data unit	MWh
Description	Quantity of electricity delivered to the project plant/unit from the 10 kV spare line in the year y.
Source of data	Electricity meter reading (M3)
Description of measurement methods and procedures to be applied	The local power distributor measures the $EG_{im\text{-}spare,y}$ by metering instrument (M3) owned, operated and installed at the project site. Only the local power distributor is accessible to the meter. Sales receipts are issued accordingly in an approach which is agreed by both the local power distributor and the project owner.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	<table><tr><th>Meters</th><th>Type</th><th>Accuracy Class</th><th>Serial number</th></tr><tr><td>M3</td><td>DTSY341</td><td>2.0</td><td>WY4D98135</td></tr></table>
QA/QC procedures to be applied	The accuracy of M3 is not lower than 2.0. The accuracy of electricity meter is satisfied to the requests of monitoring plan. The meter is calibrated once a year according to the national standards. Reading recording, operation and maintenance of this meter is implemented by the local power distributor (the owner of the metering instrument). The meter readings will cross-checked with sales receipts issued by grid company. Data will be archived for 2 years following the end of the last crediting period.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	-

5.3 Monitoring Plan

The project adopts the approved consolidated baseline and monitoring methodology ACM0002 "Grid-connected electricity generation from renewable sources" (version 20.0) to determine the emission reductions from the net electricity generation from the wind farm. This plan describes in more detail the process.

1. Monitoring Object

The monitoring is to justify the realistic amount of emission reduction from the VCS project. The monitoring plan will provide credible, accurate, transparent and conservative monitoring data and ensure the real, measurable, long-term GHG emission reduction from this project.

2. Management Structure

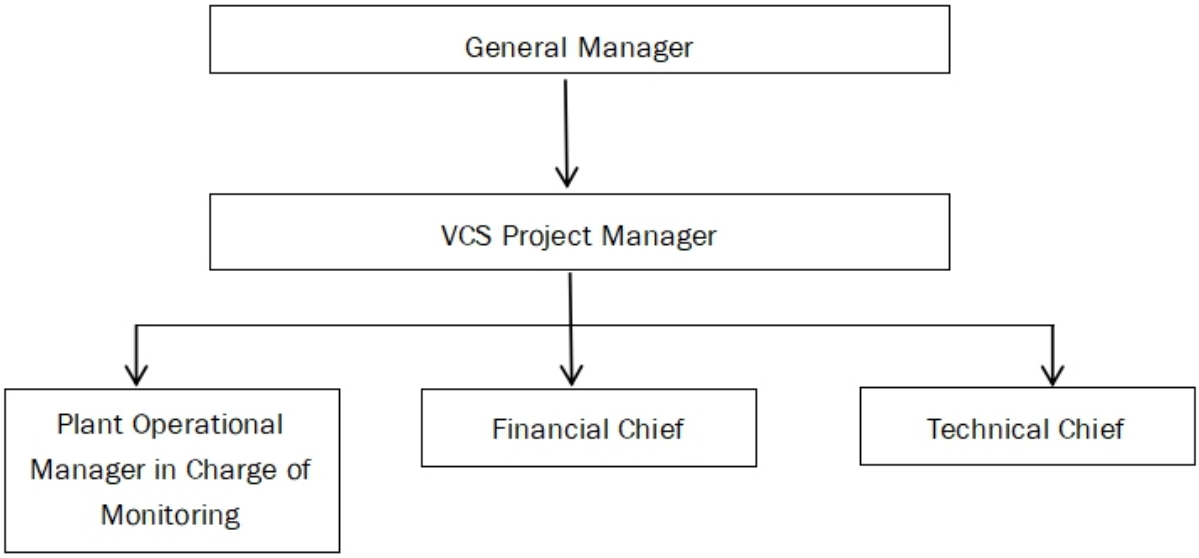
The project owner will use this document as guideline in monitoring of the project emission reduction performance and will adhere to the guidelines set out in this monitoring plan to ensure that the monitoring is credible, transparent and conservative.

The responsibilities of the project staff are as follows:

General Manager: To be responsible for supervising the whole monitoring procedure.

VCS Project Manager: To be responsible for data management and compiling monitoring report.
Operational and monitoring manager: To be responsible for collecting data and do internal audit.
Financial chief: To be responsible for collection of sales receipts.

Technical chief: To be responsible for preparing operational reports of the project activity, recording the daily operation of the wind farm, including operating periods, equipment defects, etc.



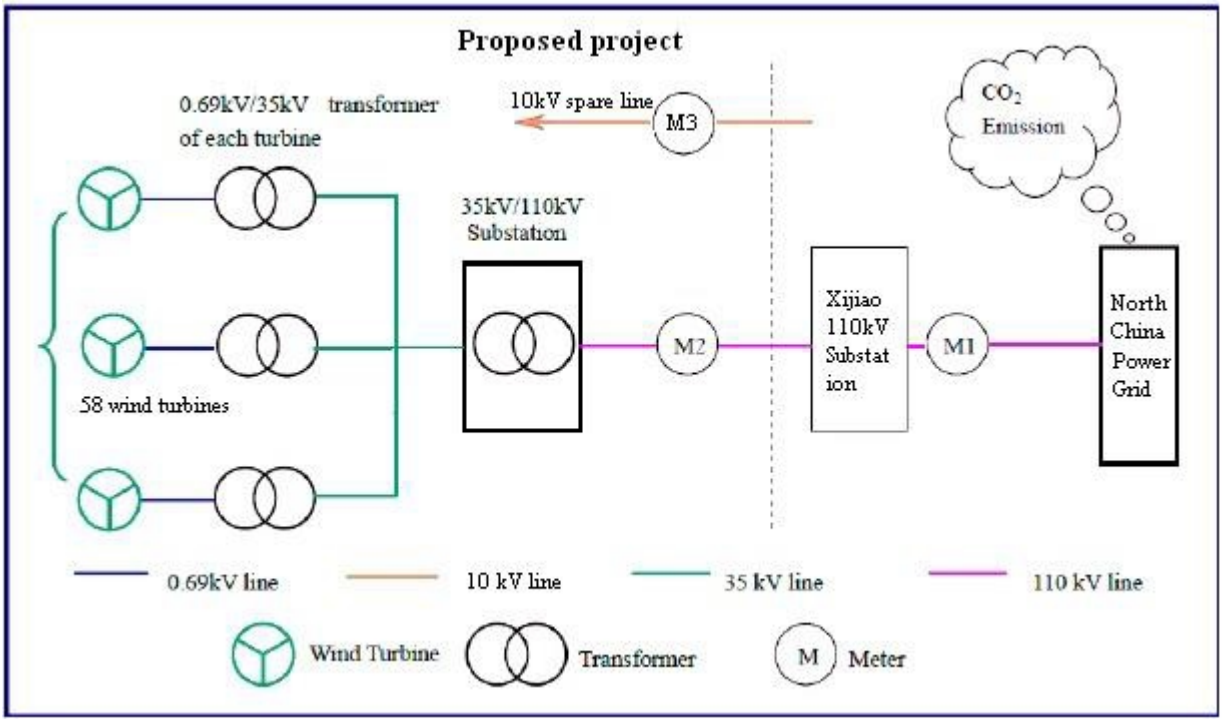
3. Monitoring Program and Equipments

The bi-directional electricity meter (M1) is installed on the Xijiao 110kV substation to measure directly and continuously the electricity supplied to the grid by the project activity and the electricity purchased from the grid to the project site. The supplied and purchased electricity will be double checked with the sales receipts.

The sales receipts of the electricity supplied to the grid by this project and the electricity purchased from the grid is issued based on the power purchase agreement (PPA) signed between the project entity and the power grid company and the readings from the main meter (M1). The back-up meter (M2) is installed in the onsite 110kV substation in the wind farm. The reading of meter (M2) is carried out by the project owner as the backup meter when M1 out of order, taken the line loss into consideration. The sales receipts of the electricity supplied to the grid by this project and the electricity purchased from the grid is issued based on the power purchase agreement (PPA) signed between the project entity and the power grid company and the readings from the main meter (M1). The accuracy of M1 and M2 is no lower than 0.5s, and the calibration frequency of M1 and M2 is once a year in line with the national standards.

A 10kV spare line is used for supplied electricity to the project when the main power line fails to supply power. A meter (hereafter referred as meter M3) is installed to measure the electricity imported via this line. This meter is owned, maintained and monitored by the local power distributor. The accuracy of the meter is not lower than 2.0, and the calibration frequency of the meter M3 is once a year in line with the national standards.

A diagram shows how parameters are monitored is presented as follows:



Before the project is in operation, both the project owner and the grid company check the equipments to ensure their work properly. The accuracy of M1 and M2 is no lower than 0.5s while that of M3 is no lower than 2.0.

4. Data Collection

The verification will use the main meter's data as long as the inaccuracy of the meter is within the permissible tolerance. The main procedures are as follows:

I According to the requirements of power purchase/sales agreement, the project owner and the grid company should collect the three meters' data periodically, and check them at the same time.

II The project owner supplies the electricity to the grid company, and provides sales receipt to the Grid Company. A copy of the sales receipt is stored by the project owner, together with a record of the payment by the grid company.

III When the electricity generated by this project cannot meet the electricity requirement of the power plant, the grid company supplies the electricity to the project owner. The Grid Company provides an electricity sales receipt to the project owner and the sales receipt are stored by the project owner.

IV The project owner records the power supplied to and purchased from the grid, and hence calculate the net electricity supplied to the grid;

V The project owner keeps the records of the meter readings for verification by the VVB.

If the fault of the main meter exceeds the allowable tolerance or its malfunction occurs, the grid- connected electricity generated by the project will be resolved by following measures:

I Adopting the backup meter's data (after taking the line losses into consideration), unless a test by either party reveals it is inaccuracy;

II If the inaccuracy of the backup meter is not within the acceptable limits or it cannot work properly, the project owner and the grid company shall jointly prepare a new agreement of correct reading;

III If the project owner and the grid company fail to reach an agreement concerning the correct reading, this matter will be submitted for arbitration according to agreed procedures.

5. Calibration of Meters & Metering

The metering equipment is properly calibrated and checked according to the national standards. The project owner prepares backup procedures to deal with any errors occurred to the meters. The calibration records carried out by the grid company should be provided to the project owner, and these records will be maintained by the project owner and the third party designated.

Meters should be tested by a qualified metric organization co-authorized by the project owner and the grid company within 10 days after:

I The detection of the reading difference between the main meter and the backup meter that exceeds the allowable tolerance.

II The equipments malfunction caused by improper operation

All the calibration test records should be maintained safely for the verification.

6. Data Management System

To keep safely the record of the data collected during monitoring, this project sets up a complete data management system. The project perfects the whole monitoring procedure by developing the VCS manual, tracking information from the primary source to the end-data calculations in paper document format. It is the responsibility of the project owner to provide additional necessary data and information for validation and verification requirements of respective VVB. Physical documentation such as paper-based maps, diagrams and environmental assessment is collated in a central place, together with this monitoring plan. All paper-based information is stored by the project owner and kept at least one copy.

At the end of each month, the monitoring data are filed in a spreadsheet, and the paper-based printout is also archived as well. Furthermore, the project owner collects the sales receipts for the electricity supplied to the grid as a cross-check, and compiled the monitoring report including the monitoring data and relevant evidence at the end of each crediting year.

All the data will be kept for two years following the end of the last crediting period.

7. Monitoring Report

After the VCS project manager collects and sorts the monitored data, the monitoring report is prepared by a VCS Consultancy Company. The VCS Consultancy Company has to make sure that the format and content of the monitoring report are consistent with the monitoring methodology in the registered PDD.

8. Quality Assurance and Quality Control

The workers are trained to be competent and the metering equipments are calibrated and sealed as per the industry practices at regular intervals, with the purpose to provide credible, accurate, transparent and conservative monitoring data and ensure the real, measurable, long-term GHG emission reduction from this project.

Monthly metering data of the supplied and purchased electricity by the project are approved and signed off by the Manager before it is accepted and stored. This audit checks compliance with monitoring procedures in this monitoring plan. This internal audit identifies potential improvements to procedures to improve monitoring and reporting in future years. The monitoring officers attend a training session organized by the VCS consultant. The purpose of

training is to assure those staffs are competent to conduct the monitoring plan, thus to make the monitored data accurate.

9. Training

The project owner entrusts the professional engineers and experts to train all the relative staffs before operation of generators. The training contains VCS knowledge, operational regulations, quality control (QC) standard flow, data monitoring requirements and data management regulations etc.