



SHANDONG YISHUI TANGWANGSHAN WIND FARM PROJECT



Document Prepared by Climate Bridge (Shanghai) Ltd.

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Shandong Yishui Tangwangshan Wind Farm Project (hereinafter referred to as the proposed project) is to utilize wind resources for electricity generation through the construction of a wind farm with a total capacity of 20.4 MW in Yishui County, Shandong Province, P. R. China. The electricity generated from the project will be sold to North China Power Grid (NCPG). The proposed project will achieve obvious greenhouse gas (GHG) emission reductions through the displacement of electricity delivered by NCPG which is a fossil-fuel dominated grid. It involves the installation and operation of 24 sets of wind turbines, with capacity of 850 kW each, providing a total capacity of 20.4 MW. The estimated annual net electricity generation of the proposed project is 38,068.7 MWh.

The project is expected to reduce emissions of greenhouse gases by an estimated 31,996 tCO₂e per year, in total 319,960 tCO₂e during the second crediting period from 12/05/2020 to 11/05/2030.

The project started construction on 02/11/2009. The first batch of generating units started commercial operation on 12/05/2010.

Prior to the start of implementation of the project activity, there is no power generation unit at the site of the proposed project, and the electricity is supplied by the NCPG which is dominated by fossil fuel-fired power plants. According to ACM0002 applied, the proposed project is an electricity generating activity.

The baseline scenario of the proposed project is the electricity supply of equal amount as the proposed project from the NCPG.

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 project is not a grouped project.

1.4 Project Design

NA.

1.5 Project Proponent

Organization name	Yishui Tangwangshan Wind Power Co., Ltd.
Contact person	Xiansong Xu
Title	Manager
Address	No.188, West of South 4th ring Road, No.2 Building, Area of Advanced Business Park, Beijing, P. R. China
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1.6 Other Entities Involved in the Project

Organization name	Climate Bridge (Shanghai) Ltd.
Role in the project	VCU buyer
Contact person	Zhiwen Gao
Title	General Manager
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1.7 Ownership

The project proponent is Yishui Tangwangshan 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 National Development and Reform Commission, 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 12/05/2010 (commissioning start date).

1.9 Project Crediting Period

Project description deviation:

There is a deviation for the crediting period. The project is registered under VCS Version 3 and completed validation before 19/03/2020. 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 should be updated from 12/05/2010-29/02/2012 to 12/05/2010-11/05/2020.

The project crediting period is ten years, twice renewable for a total of 30 years. However, as the project was 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 date of those 21 years, which is 11/05/2031. The project first crediting period is from 12/05/2010 to 11/05/2020. This is the second crediting period from 12/05/2020 to 11/05/2030.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	2
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
12/05/2020~11/05/2021	31,996
12/05/2021~11/05/2022	31,996
12/05/2022~11/05/2023	31,996
12/05/2023~11/05/2024	31,996
12/05/2024~11/05/2025	31,996
12/05/2025~11/05/2026	31,996
12/05/2026~11/05/2027	31,996
12/05/2027~11/05/2028	31,996
12/05/2028~11/05/2029	31,996
12/05/2029~11/05/2030	31,996
Total estimated ERs	319,960

Total number of crediting years	10
Average annual ERs	31,996

1.11 Description of the Project Activity

The proposed project is to utilize wind resources for electricity generation in Yishui County, Linyi City, Shandong Province, P. R. China. The proposed 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 proposed project, and the electricity was supplied by the NCPG. The baseline scenario of the proposed project is providing the same electricity service as the proposed project by NCPG which is dominated by the fossil-fuel fired power plants. The proposed project involves the installation of 24 wind turbines with capacities of 850 kW each, which amount to a total installed capacity of 20.4 MW. The estimated power output is 38,068.7 MWh and the plant load factor (PLF) is 21%. The annual operation hour of the proposed project is 1,866h. The estimated annual emission reductions of the Project are 31,996 tCO_{2e} during the second crediting period.

For the Project,

- (a) The scenario existing prior to the start of the implementation of the project activity is NCPG providing the same electricity service as the Project;
- (b) The project scenario is the implementation of the project, the installation and operation of turbines with a total capacity of 20.4 MW which will supply an average annual generation of 38,068.7 MWh to NCPG and replace the same amount of electricity generated by fossil fuel fired power plants connected to NCPG;
- (c) The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

Technologies applied on the small-scale project activity

The 24 sets of 850kW turbines were selected. The technical design of the wind turbines is advanced and deemed to reflect current good practice, and Key Technology Parameters are listed in Table1.

Table 1 Key Technical specifications of wind turbines

Key Technology Parameter	Value
Rotor diameter(m)	58
Number of blades	3
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
Rated voltage (V)	690
Lifetime (Year)	20

The lifetime of the project is 20 years. The 35 kV/110kV substation on the project site will be utilized, which connects the proposed project to the Muling 220kV Substation. Then the power produced in the wind farm can be transmitted to the Shandong Power Grid which is part of NCPG. Electricity generated by the proposed project will be monitored through metering equipment (meter monitoring both electricity input and electricity output) at the low voltage of 35 kV/110kV substation on the project site.

Technology transfer

The proposed project will use foreign wind turbines. Hence, it involves technology transferred to the host party.

1.12 Project Location

The proposed project is located at Yishui County, Linyi City, Shandong Province, P. R. China. The geographical coordinates of the proposed project is from 118.216667 E to 119.05 E, from 35.6 N to 36.216667 N. The central geographical coordinate of the proposed project is 118.633334 E, 35.808334 N. Figures A1 and A2 show the geographical location of the proposed project.

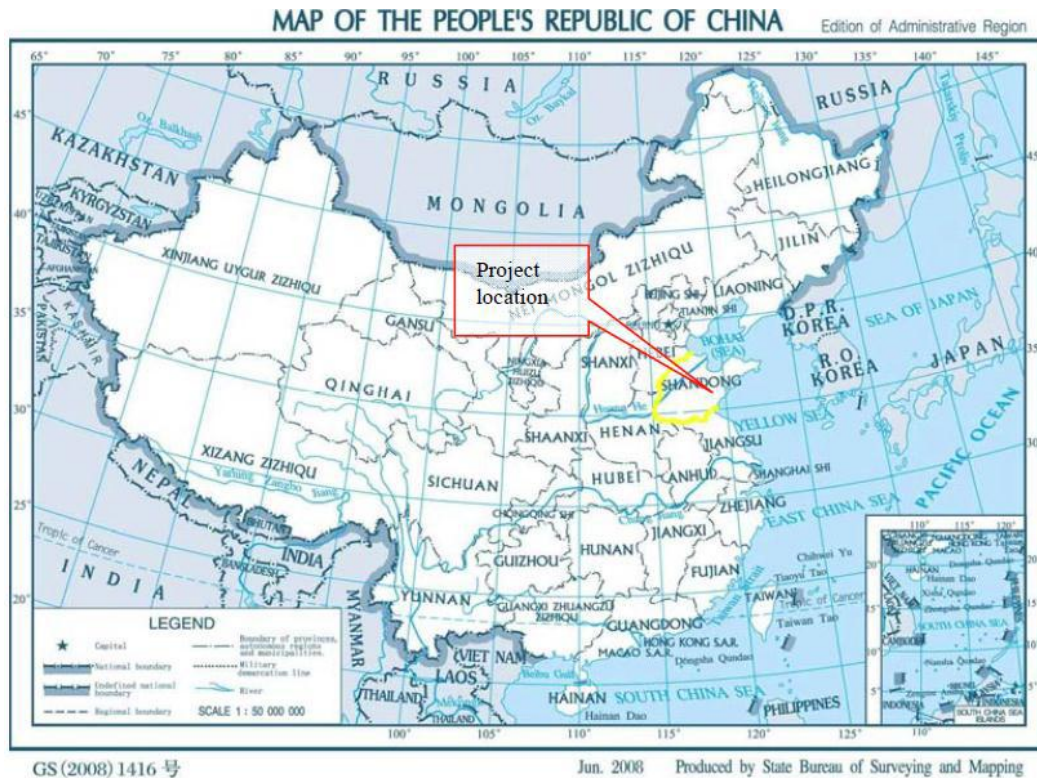


Figure 1 The location of the proposed project in the map of P. R. China



Figure 2 The proposed project on the map of Shandong Province and Yishui County

1.13 Conditions Prior to Project Initiation

The project activity is the installation of a new grid-connected wind power project and the generated power shall be exported to the NCPG. Electricity delivered to the grid by the project

activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources within NCPG.

The project is a renewable resource based on wind power project without GHG emissions during operation period. Therefore, it was confirmed that the project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project complies with all Chinese relevant laws and regulations. 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 Clean Development Mechanism (CDM) project in UNFCCC on 26/01/2012 (UNFCCC Ref. 5658), with the 7 years crediting period started from 01/03/2012. The crediting period was renewed on 01/05/2019 and the second crediting period is from 01/03/2019 to 28/02/2026. Please refer to the following link for details.

<https://cdm.unfccc.int/Projects/DB/SGS-UKL1326112903.91/view>.

1.15.2 Projects Rejected by Other GHG Programs

NA.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project has been registered as a CDM project on 26/01/2012 with Ref No.5658, for which a renewable crediting period of 3*7 years will be used under the CDM GHG Program.

Until now, no emission reductions were issued under CDM scheme. The project was registered as a VCS project under VCS standard (Version 3), emission reduction from 12/05/2010 to 29/02/2012, 01/03/2012 to 31/12/2015, and 01/01/2016 to 11/05/2020 has been issued under VCS scheme.

The project has not been counted or used under GS project or under any other voluntary carbon crediting scheme. And the project does not involved in ETS or other binding limits.

Since 12/05/2020, the emission reductions that apply for issuance under VCS will not be issued under CDM project or under any other voluntary carbon crediting scheme.

1.16.2 Other Forms of Environmental Credit

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

1.17 Additional Information Relevant to the Project

Leakage Management

NA.

Commercially Sensitive Information

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

Sustainable Development

The Project will contribute to sustainable development in the following ways:

1. GHG emission reduction

The proposed project activity will achieve obvious GHG emission reductions by avoiding CO₂ emissions, as grid-connected fossil fuel-fired power dominates in the NCPG.

2. Pollutants emission reduction through replacing fossil fuel combustion

The proposed project is to replace grid-connected fossil fuel-fired power plants in the NCPG, and thus reduce fossil fuel consumption and avoid pollutants emission, such as sulfur dioxide and dust, brought about by fossil fuel combustion. Therefore, the proposed project has obvious environmental benefit.

3. Employment opportunities

The implementation of the proposed project will offer job opportunities for local people during both the construction and operational period.

4. Economic development

The region can achieve economic growth and booming of local tourism through the construction and operation of the project. Furthermore, the project will contribute to local government with more tax revenues and poverty eradication.

Further Information

No further information is required.

2 SAFEGUARDS

2.1 No Net Harm

There are no negative environmental and/or socio-economic impacts due to the project.

2.2 Local Stakeholder Consultation

Yishui Tangwangshan Wind Power Co. Ltd. put up a notice of Stakeholder Consultation Meeting Notification of Shandong Yishui Tangwangshan Wind Power Project to invite comments on the construction of the proposed project on 18/09/2009. Stakeholder Consultation Meeting of the project was held at Yishui County Government hostel on 28/09/2009 to guarantee the successful implementation of proposed project with the interest of stakeholder being taken into account. The project owner also distributed public participation questionnaires at the project location Quanli Town to collect advice and opinions on the proposed project from local stakeholders.

50 out of 50 copies of questionnaires were collected. Among the interviewees, there were 25 farmers, 6 workers, 4 government officials, 5 teachers and 10 with other occupation; 19 of them had junior high school education or below, 21 had high school level education, 9 had college level education and 1 with other education level. 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 proposed project?

Summary of comments received

The summary of survey is listed as the following:

- 76% of the interviewee think good of the general local environmental quality while 24% of them think it average.
- 90% of them think there is no electromagnetic radiation disturbance when they watch TV while 8% are not sure about it and 2% of them think there is;
- 90% of them think the construction of the project will have no negative effect on them and their family while 6% are not sure about it and 4% think it will.
- 88% of them think the project will promote the local economy while 12% are not sure;
- 72% of them think the project will not affect the acoustic environment (noise) quality while 8% think it will and 20% are not sure ;
- 42% of them consider electromagnetic disturbance their most concerned environmental issue during the construction and operation of the project; 40% are most concerned about noise effect and 18% are most concerned about wastewater discharge ;
- 90% of them support the construction of the project and 10% are not sure.

Conclusion from the survey

The vast majority of public opinions received were supportive. Local residents were most concerned about electromagnetic disturbance, noise impact and wastewater discharge. The EIA report of the proposed project has taken these issues into consideration and provided specific measures to control the environmental impact of the project. The proposed project selected antimagnetic and anti-radiation WTG design and material. The project owner will take measures to implement strict control and management on travelling time and route to avoid noise sensitive area and period. The WTG will be distributed far from residential area nearby, which satisfies the requirements of Standard of Urban Area Environmental Noise. The discharged wastewater will be treated periodically and transported out of the project location. The environmental impacts can be avoided, controlled or mitigated via thorough implementation of the mitigation measures. Therefore, the proposed project can be carried out as planned.

2.3 Environmental Impact

The environmental impact assessment for this project was carried out by Shandong Academy of Environmental Science in September 2008 and approved by Shandong Environmental Protection Bureau on 13/10/2008. A summary of the report is illustrated as below:

1. Ambient air

The impact on ambient air quality of the proposed 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 proposed project will not pose any threat on the quality of ambient air.

2. Impact from noise

There is some noise during the operation of wind turbines. The equipment 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.

3. 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.

4. Impact from Solid waste

Solid wastes generated from the proposed 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.

5. 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.

2.4 Public Comments

The project design documents for this project was made available on <http://cdm.unfccc.int/Projects/Validation/DB/JS8JLS0950BM3XES45J5DMGFTCG2CH/view.html> and was open for comments from 08/04/2011 until 07/05/2011. Comments were invited through the UNFCCC CDM homepage.

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 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).).	The project is a greenfield NWPG-connected renewable power generation project.	Applicable
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	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
	(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/m²; 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/m²; 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/m², 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/m²; (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/m² 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	Not applicable, the project is not a hydro power plant, so this applicability condition does not need to	NA

Clauses	Requirements of the ACM0002	Scenario of the project	Conclusion
	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 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.	be considered.	
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 system	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that 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).	The project is the installation of a wind power plant supplying electricity to the grid.	Applicable
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 2017 Baseline Emission Factors for Regional Power Grids in China issued by China’s DNA¹, 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	Yes	Main emission source
	CH ₄	No	Minor emission source
	N ₂ O	No	Minor emission source
	Other	No	Minor emission source
Project	CO ₂	No	No CO ₂ emissions are emitted from the project
	CH ₄	No	Project activity does not emit CH ₄
	N ₂ O	No	Project activity does not emit N ₂ O
	Other	No	Project activity does not emit other gas

Figure 3 presents a flow diagram within the project boundary including all the equipment in the systems.

¹ http://www.mee.gov.cn/ywgz/ycqhbh/wsqtz/index_1.shtml

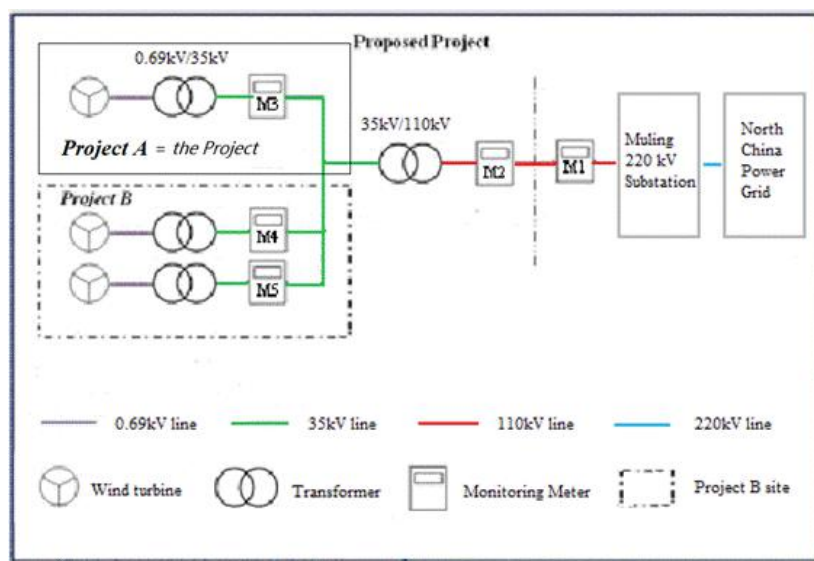


Figure 3 The flow diagram within the project boundary

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 NCPG². 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

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

² China Electric Power Yearbook 2017

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.

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 0.8405 tCO₂e/MWh.

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 CO₂ 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 at Yishui County, Linyi City, Shandong Province, P. R. China. and covered by the North China Power Grid (NCPG). According to the "2017 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 resources³ 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.

According to the data from China Electric Power Yearbook 2013-2017, from year 2012 to year 2016, for the NCPG the project activity connected to, the low-cost/must-run electric power resources generation accounts for the total grid total are 26.26%, 23.47%, 23.54%, 24.13% and 24.29%, respectively, 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 $EF_{grid,OM,y}$.

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

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.

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 CO₂ emissions per unit net electricity generation (tCO₂/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 CO₂ 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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y} \dots\dots\dots (2)$$

Where:

- $EF_{grid,OMsimple,y}$ = Simple operating margin CO₂ emission factor in year y (tCO₂ /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)
- $EF_{CO_2,i,y}$ = CO₂ emission factor of fossil fuel type i in year y (tCO₂ /GJ)
- EG_y = 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 2016. 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 NCG, 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 (2014~2016, published annually) and China Energy Statistical Yearbook (2014~2016). Based on these data, the Simple OM Emission Factor ($EF_{grid,OMsimple,y}$) of the NCPG is calculated as 0.9680 tCO₂e/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. 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.

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) ($SET_{\geq 20\text{ per cent}}$) 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 than 10 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 ($SET_{sample\text{-}CDM\text{-}>10\text{yrs}}$).

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 following deviations are adopted to calculate the BM⁴:

⁴<http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM>

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 (tCO₂e/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:

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

Where:

$EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂ /MWh)

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

$EF_{EL,m,y}$ = CO₂ emission factor of power unit m in year y (tCO₂ /MWh)

m = Power units included in the build margin

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

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 CO₂ emissions from coal, oil, and gas consumption for power generation to the total CO₂ emission; Second, to calculate the emission factor of the thermal power based on the weight of CO₂ 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 CO₂ emission of solid, liquid and gaseous fossil fuels in total emissions for power generation

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \dots\dots\dots (4)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \dots\dots\dots (5)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \dots\dots\dots (6)$$

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/m³)
- $EF_{CO_2,i,j,y}$ = CO₂ emission factor of fossil fuel type i in year y (tCO₂e/GJ)

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

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

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

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

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 2016. 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 0.4578 tCO₂e/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:

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

Where:

$EF_{grid,BM,y}$ = Build margin CO₂ emission factor for the project electricity system in year y
(tCO₂/MWh)

$EF_{grid,OM,y}$ = Operating margin CO₂ emission factor for the project electricity system in year y (tCO₂/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.

$$EF_{grid,CM,y} = 0.9680 \text{ tCO}_2\text{e/MWh} * 0.75 + 0.4578 \text{ tCO}_2\text{e/MWh} * 0.25 = 0.8405 \text{ (tCO}_2\text{e/MWh)}$$

4.2 Project Emissions

According to ACM0002 (version 20.0), the project is a GHG zero-emission electricity generating activity; therefore, no project emissions from the project activity were identified $PE_y = 0$.

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:

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

Where:

ER_y Emission reductions in year y (tCO₂)

BE_y Baseline Emissions in year y (tCO₂)

PE_y Project emissions in year y (tCO₂)

And the baseline emissions (BE_y in tCO₂) are the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO₂/MWh) times the electricity supplied by the project activity to the grid ($EG_{facility}$ in MWh). The calculation formula is as follows:

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

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

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
12/05/2020~11/05/2021	31,996	0	0	31,996
12/05/2021~11/05/2022	31,996	0	0	31,996
12/05/2022~11/05/2023	31,996	0	0	31,996
12/05/2023~11/05/2024	31,996	0	0	31,996
12/05/2024~11/05/2025	31,996	0	0	31,996
12/05/2025~11/05/2026	31,996	0	0	31,996
12/05/2026~11/05/2027	31,996	0	0	31,996
12/05/2027~11/05/2028	31,996	0	0	31,996
12/05/2028~11/05/2029	31,996	0	0	31,996
12/05/2029~11/05/2030	31,996	0	0	31,996
Total	319,960	0	0	319,960

5 MONITORING

5.1 Data and Parameters Available at Validation

The baseline grid emission factor is obtained directly from the official source Notification on Determining Baseline Emission Factor of China's Grid by China's DNA. Thus, the relevant basis parameters for calculation of 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 ₂ e/MWh
Description	The baseline grid emission factor
Source of data	Tool to calculate the emission factor for an electricity system version 07.0
Value applied	0.8405
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.

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ e/MWh
Description	Operating Margin Emission Factor for North China Power Grid
Source of data	"2017 Baseline Emission Factors for Regional Power Grids in China" published by China DNA
Value applied	0.9680
Justification of choice of data or description of measurement methods	As per the requirements in "Tool to calculate the emission factor for an electricity system version 07.0"

and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the second crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ e/MWh
Description	Build Margin Emission Factor for North China Power Grid
Source of data	“2017 Baseline Emission Factors for Regional Power Grids in China” published by China DNA
Value applied	0.4578
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.

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	As per the requirements in “Tool to calculate the emission factor for an electricity system version 07.0”
Purpose of Data	Calculation of $EF_{grid,CM,y}$
Comments	Calculated ex ante and fixed for the second crediting period.

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	As per the requirements in "Tool to calculate the emission factor for an electricity system version 07.0"
Purpose of Data	Calculation of $EF_{grid,CM,y}$
Comments	Calculated ex ante and fixed for the second crediting period.

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 to the grid in year y.
Source of data	Calculated according to the equation (12) in section 5.3
Description of measurement methods and procedures to be applied	The Quantity of net electricity generation supplied by the project plant/unit in year y will be calculated through $EG_{export,y}$, $EG_{import,y}$, $EG_{A,y}$ and $EG_{B,y}$ according to the equation (12) in section 5.3 – $EG_{facility,y} = EG_{A,y} / (EG_{A,y} + EG_{B,y}) * EG_{export,y} - EG_{import,y}$. $EG_{export,y}$ and $EG_{import,y}$ will be monitored by the main meter M1. The reading from the main meter M1 is first choice. When the main meter is out of order, the reading from the backup meter M2 will be used. The project operator is responsible for recording such data. Cross check the meter reading with sales receipts. Designated person records the readings of the main meter each month.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	38,068.7
Monitoring equipment	Electricity meters reading M1, M2, M3, M4, M5. Electricity meter M3 installed at the low voltage side of

	35kV/110kV substation on the project site measures the quantity of electricity supplied to the grid by the proposed project, hereafter referred to Project A, in year y. Electricity meters M4 and M5 installed at the Project B site measure the electricity supplied to the grid by Shandong Taipingshan Wind Farm Project, hereafter referred to Project B, in year y. The accuracy of electricity meters is not lower than 0.5s.
QA/QC procedures to be applied	The meter M3 at the project site and meters M1, M2, M4 as well as M5 will be calibrated once a year according to the national rules. Meter readings from meters M1 or M2 will be used for cross checking against sales receipts. Conservative values will be adopted for ERs calculation.
Purpose of data	Baseline Emission calculation
Calculation method	Not applicable
Comments	Not applicable

Data / Parameter	EG _{export,y}
Data unit	MWh
Description	Total electricity supplied to the grid by the proposed Project (Project A) and Project B during year y.
Source of data	Bidirectional electricity meter reading of Main meter M1.
Description of measurement methods and procedures to be applied	The readings of the electricity meter will be hourly measured and monthly recorded by the designated person. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup. The accuracy of electricity meter is not lower than 0.5s. The calibration frequency is one time/year according to the national calibration standard.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The main meter M1 and backup meter M2 will be calibrated once a year according to the national standards. Electricity supplied to the grid will be double checked according to sales receipts.

Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	The reading from the main meter is first choice. When the main meter is out of order, the reading from the backup meter will be used.

Data / Parameter	EG _{import,y}
Data unit	MWh/yr
Description	Electricity imported from the grid by the Project (Project A) and Project B during year y.
Source of data	Bidirectional electricity meter reading of M1. The reading from the main meter M1 is first choice. When the main meter is out of order, the reading from the backup meter M2 will be used.
Description of measurement methods and procedures to be applied	The data will be continuously measured and monthly recorded by the designated person. Data will be archived for 2 years following the end of the crediting period.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	0
Monitoring equipment	Electricity meter reading M1 and M2. The accuracy of electricity meter is not lower than 0.5s. .
QA/QC procedures to be applied	Meter readings from the meter M1 and M2 will be directly applied for cross checking of electricity purchased from the grid by the proposed project. Electricity purchased from the grid will be double checked against electricity sales receipts. Conservative values will be adopted for ERs calculation.
Purpose of data	Baseline Emission calculation
Calculation method	Not applicable
Comments	The reading from the main meter is first choice. When the main meter is out of order, the reading from the backup meter will be used.

Data / Parameter	EG _{A,y}
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Data unit	MWh/yr
Description	Quantity of electricity supplied to the grid by Project A (the project) in year y.
Source of data	The readings of the meter M3 installed at the low voltage side of 35kV/110kV substation on the project site.
Description of measurement methods and procedures to be applied	The readings of the electricity meters are continuously measured and monthly recorded. Data will be archived for 2 years following the end of the last crediting period by means of electronic and paper backup. The calibration frequency is once a year.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	Electricity meter M3 installed at the low voltage side of 35kV/110kV substation on the project site. The accuracy of electricity meter is not lower than 0.5s..
QA/QC procedures to be applied	The metering equipment at the substation are calibrated once a year according to the national standards
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	Not applicable

Data / Parameter	$EG_{B,y}$
Data unit	MWh/yr
Description	Quantity of electricity supplied to the grid by Project B in year y.
Source of data	Readings of electricity meters M4 and M5 installed at the site of project B.
Description of measurement methods and procedures to be applied	The readings of the electricity meters are continuously measured and monthly recorded. Data will be archived for 2 years following the end of the last crediting period by means of electronic and paper backup. The calibration frequency is once a year.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	Electricity meter M4 and M5 installed at the Project B site. The

	accuracy of electricity meter is not lower than 0.5s..
QA/QC procedures to be applied	The metering equipment at the substation is calibrated once a year according to the national standards.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	Not applicable

5.3 Monitoring Plan

The 24 sets of wind turbines of the proposed project are connected with a 35kV transmission line and installed with a meter M3 at the low voltage side of 35kV/110kV substation on the project site. The meter M3 is used to monitor the electricity supplied to the grid by the proposed project, hereafter referred to Project A.

The project is sharing the meter M1 installed at Muling 220kV substation measures the electricity exported to and imported from the grid by Project A and another project (Shandong Taipingshan Wind Farm Project, hereafter referred to Project B). The backup meter M2 was installed at the higher voltage side of 35kV/110kV substation. The reading from the main meter M1 is first choice. When the main meter is out of order, the reading from the backup meter M2 will be used.

Electricity supplied to the grid by Project B is measured by meter M4 and M5 installed at the Project B site.

The accuracy of meter M1, M2, M3, M4 and M5 is no lower than 0.5s, and the calibration accuracy is once a year in line with the national rules. Also, sales receipts for the proposed project activity will be used for double checking following the requirement in the applied methodology.

For calculating the net electricity generation supplied by the project plant/unit to the grid in year y, the following equation will be applied.

$$EG_{\text{facility},y} = EG_{A,y} / (EG_{A,y} + EG_{B,y}) * EG_{\text{export},y} - EG_{\text{import},y} \quad (12)$$

Where:

$EG_{\text{facility},y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.

$EG_{\text{export},y}$ = Total electricity supplied to the grid by the proposed Project (Project A) and Project B during year y.

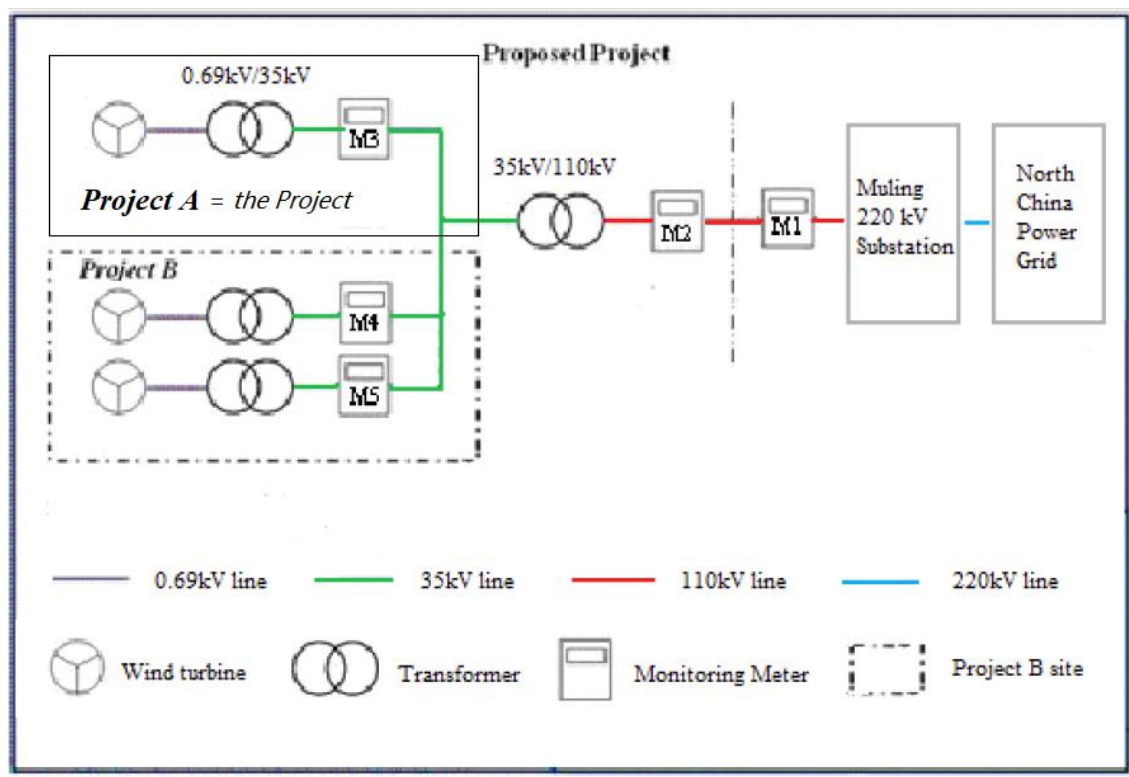
$EG_{import,y}$ = Electricity imported from the grid by the Project (Project A) and Project B during year y.

$EG_{A,y}$ = Quantity of electricity supplied to the grid by the Project (Project A) in year y.

$EG_{B,y}$ = Quantity of electricity supplied to the grid by Project B in year y.

Meter readings from meter M1 or M2 which measures the electricity imported by both Project A and project B. The total electricity purchased from the grid by the Project (Project A) and Project B is deemed as the total electricity purchased from the grid by the project when calculating emission reductions, which is conservative.

The simplified wiring diagram is shown as below:



1. Monitoring organizational structure, roles and responsibilities

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.

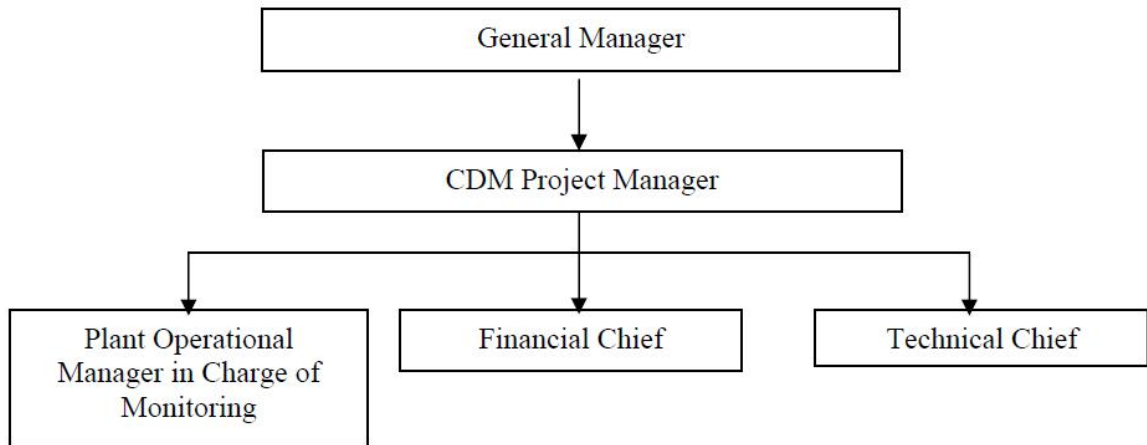
CDM Project Manager: To be responsible for data management and compiling monitoring report.

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.

The organization of the monitoring implementers is illustrated in the table below:



2. Data Management System

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

At the end of each month, the monitoring data will be filed in a spreadsheet, and the paper-based printout will be 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.

3. Quality Assurance and Quality Control

The workers are trained to be competent and the metering equipment is 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 proposed project will be approved and signed off by the Manager before it is accepted and stored. This audit will check compliance with monitoring procedures in this monitoring plan. This internal audit will also identify potential improvements to procedures to improve monitoring and reporting in future years. The monitoring officers will also attend a training session organized by the CDM consultant. The purpose of training is to assure those staffs are competent to conduct the monitoring plan, thus to make the monitored data accurate.