# SHANDONG TAIPINGSHAN WIND FARM PROJECT

Document Prepared by Climate Bridge (Shanghai) Ltd.

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| Project Title | Shandong Taipingshan Wind Farm Project |
| Version | 07.1 |
| Date of Issue | 05-11-2021 |
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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Project

Shandong Taipingshan 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 49.3MW and an 110kV substation in Weifang City, 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 North China Power Grid which is a fossil-fuel dominated grid.

The proposed project is located in Weifang City, Shandong Province, P. R. China. It involves the installation of 58 wind turbines with capacity of 850 kW each, which amount to a total installed capacity of 49.3MW. The proposed project is constructed and operated by Anqiu Taipingshan Wind Power Co., Ltd.. The estimated annual net electricity generation supplied to the grid is 91,030.5 MWh and the annual full-load operation time amount to 1,846 h per year.

The project is expected to reduce emissions of greenhouse gases by an estimated 76,511 $tCO_2e$ per year, in total 765,110 $tCO_2e$ during the second crediting period from 27/04/2020 to 26/04/2030.

The project started construction on 11/08/2009. The first batch of generating units started commercial operation on 27/04/2010.

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** | Anqiu Taipingshan 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 |
| **Telephone** | 021-23019950 |
| **Email** | 1169735462@qq.com |

## 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 |
| **Address** | Block B, Level 24, Jiangong Mansion, 33 Fushan Road, Pudong New Area, Shanghai, China 200120 |
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## 1.7 Ownership

The project proponent is Anqiu Taipingshan 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 27/04/2010 (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 27/04/2010-23/04/2012 to 27/04/2010-26/04/2020.

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 26/04/2031. The project first crediting period is from 27/04/2010-26/04/2020. This is the second crediting period from 27/04/2020 to 26/04/2030.

## 1.10 Project Scale and Estimated GHG Emission Reductions or Removals

| Project Scale | |
|---|---|
| Project | ☑ |
| Large project | |

| Year | Estimated GHG emission reductions or removals ($tCO_2e$) |
|---|---|
| 27/04/2020~26/04/2021 | 76,511 |
| 27/04/2021~26/04/2022 | 76,511 |
| 27/04/2022~26/04/2023 | 76,511 |
| 27/04/2023~26/04/2024 | 76,511 |
| 27/04/2024~26/04/2025 | 76,511 |
| 27/04/2025~26/04/2026 | 76,511 |
| 27/04/2026~26/04/2027 | 76,511 |
| 27/04/2027~26/04/2028 | 76,511 |
| 27/04/2028~26/04/2029 | 76,511 |

| | |
|---|---|
| 27/04/2029~26/04/2030 | 76,511 |
| Total estimated ERs | 765,110 |
| Total number of crediting years | 10 |
| Average annual ERs | 76,511 |

## 1.11 Description of the Project Activity

The proposed project is to utilize wind resources for electricity generation in Weifang 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 58 wind turbines with capacities of 850 kW each, which amount to a total installed capacity of 49.3MW. The estimated power output is 91,030.5MWh. The annual full-load operation time amount to 1,846 h per year and the load factor is 0.211.

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 49.3MW which will supply an average annual generation of 91,030.5 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 58 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 |
|---|---|
| Model | G58-850 kW |

| | | |
|---|---|---|
| Quantity | | 58 |
| Hub height of the wind turbines (m) | | 65 |
| Wind Turbine | Rotor diameter (m) | 58 |
| | Number of blades | 3 |
| | Rated wind speed (m/s) | 16 |
| | Cut-in wind speed (m/s) | 3 |
| | Cut-off wind speed (m/s) | 21 |
| Generator | Rated power (kW) | 850 |
| | Rated voltage (V) | 690 |
| | Lifetime (Years) | 20 |

The wind power generated will be switched through a 110 kV substation at the project site, and then connected to the 220 kV Muling substation, then transmitted to the North China Power Grid finally. The grid-connected electricity generated by the proposed project will be monitored through metering equipment (meter monitoring both electricity input and electricity output) installed on the 35kV transmission lines at the project site.

The to-grid and from-grid electricity will be cross-checked with the electricity receipts.

**Technology transfer**

The proposed project does not involve any technology transfer.

## 1.12 Project Location

The proposed project is in Weifang City, Shandong Province, P. R. China. The project has geographical coordinates with east longitude from 118°42'46"E to 118°50'27"E and north latitude from 36°10'20"N to 36°13'30"N. The figure 1 and figure 2 show the geographical location of the proposed project.

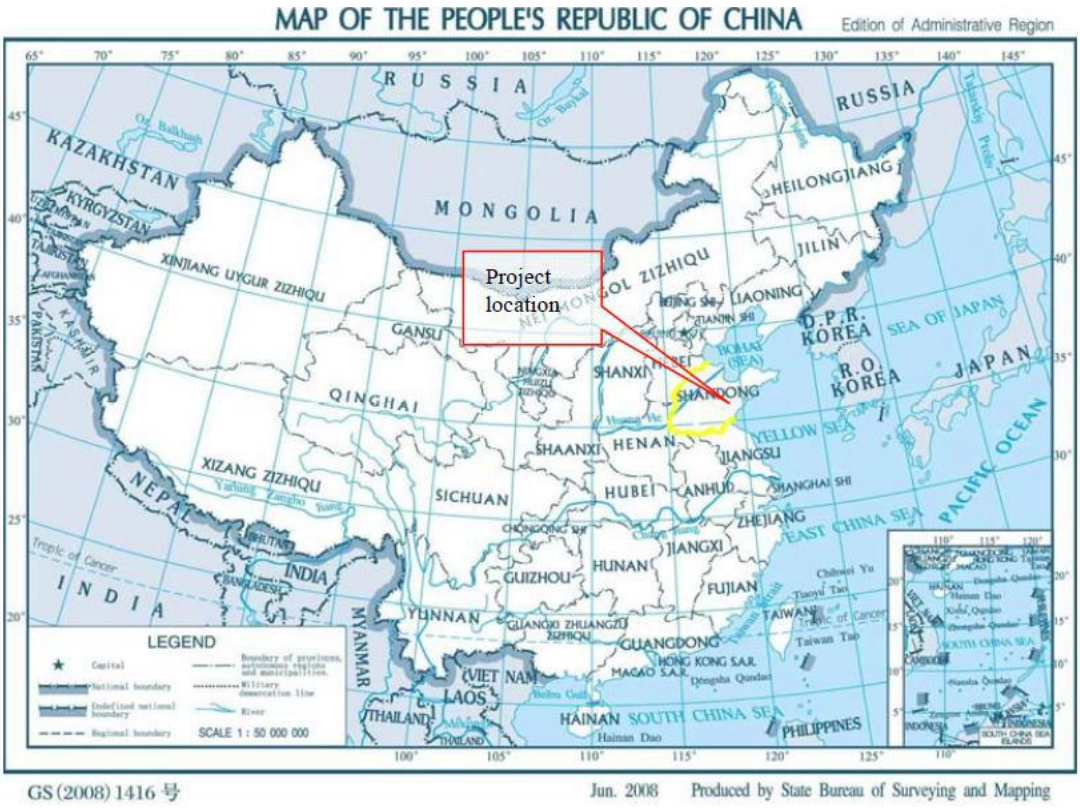



Figure 1 The location of the proposed project in the map of P. R. China


Figure 2 The proposed project on the map of Shandong Province and Weifang 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 24/04/2012 (UNFCCC Ref. 5659), with the 7 years crediting period started from 24/04/2012. The crediting period was renewed on 27/04/2019 and the second crediting period is from 24/04/2019 to 23/04/2026. Please refer to the following link for details.

https://cdm.unfccc.int/Projects/DB/SGS-UKL1326127836.78/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 24/04/2012 with Ref No.5659, 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. 3.4), emission reduction from 27/04/2010 to 23/04/2012, 24/04/2012 to 31/12/2015, and 01/01/2016 to 26/04/2020 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 27/04/2020, 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 is contributing to sustainable development of the local community. Specifically, the project

- Reduce the greenhouse gas GHG emissions versus the high-growth, coal-dominated business-as-usual scenario in the NCPG by reducing the electricity generation from the fossil-fuel fired power plants, particularly the emission of $SO_x$, $NO_x$ and dust.
- Creates job opportunities for local people during both the construction and operational period.
- Promote local economy by contributing to local government with more tax revenues through selling power generation.

### 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

Comments on the construction of the proposed project is invited through means of putting up a notice and holding stakeholder meeting to guarantee the successful implementation of proposed project with the interest of stakeholder being taken into account.

The project developer conducted a survey among the potential stakeholders, collecting public opinion regarding the proposed project activity. 50 copies of questionnaires were all received. Among the interviewees, there were 22 farmers, 13 workers, 2 are officers, 4 are teachers and 9 others with other occupation; 28 of them have educational level of middle school, 14 of high school, 4 of technical secondary school and 4 of collage. The questions regarding the proposed project were mainly as follows:

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

b) Do you currently experience electromagnetic interference when watching TV at home?

c) Are there any negative impacts of the proposed project on the everyday life of local residents?

d) Is the proposed project going to help improve the living and/or working environment?

e) How the proposed project impacts the acoustic environment (noise) quality?

f) Which is the environmental topic that concerns you the most during the construction and operation of the proposed project?

g) Do you support the proposed project?

**Summary of comments received**

The summary of survey is listed as the following:

- 35 (70%) of them think the local environmental quality is very well, 15(30%) of them think it is general;

- All (100%) of them currently do not experience electromagnetic interference when watching TV at home;

- 47 (94%) of them think there will not be any negative impacts on their everyday life, and the remainder is unsure;

- All (100%) of them think the proposed project will help improve their living and/or working environment;

- All (100%) of them are unsure whether the proposed project will make noise;

- Regarding the construction and operation of the propose project, 22 (44%) of them are most concerned with electromagnetic interference, 28 (56%) of them are most concerned with the noise level, and none of them are most concerned with wastewater from the project;

- All (100%) of them support the implementation of the proposed project.

**Conclusion from the survey**

During the survey local residents support the propose project as they showed in the questionnaires. Some people express their concerns about the negative impacts of the project, but they don't think it is serious. About the environment impacts of the project, the requirements in the EIA report will be strictly conducted by the project owner and be supervised by the municipal environmental protection bureau. 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 December 2007 and approved by Shandong Environmental Protection Bureau on 11/01/2008. The approval number is Luhuanshen [2008] 3. 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, 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 Industry Company and Factory Noise Standards (GB12348-2008) Level II noise standard would be fulfilled during the construction and operational period. 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 electromagnetic pollution generated from operation of the wind blades has limited effect within about 20m around, whereas no wireless communication facilities exist within, so the electronic magnetic pollution to the surrounding environment is insignificant.

**4. Impact from Solid waste**

There is mainly some waste of stone, bricks or domestic waste in the construction stage and basically no solid waste in the operational period. Solid waste will be collected and handled properly. Hence, it will not result any environmental impact.

**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 *https://cdm.unfccc.int/Projects/Validation/DB/78EDZ03I69BA83HKU2AV9SHLG90WTM/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:<br>a) Install a Greenfield power plant;<br>b) Involve a capacity addition to (an) existing plant(s);<br>c) Involve a retrofit of (an) existing operating plants/units;<br>d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or<br>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:<br>(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;<br>(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 | The project is a newly built wind power project and the project activity involves the installation of the wind power plant. | Applicable |

| Clauses | Requirements of the ACM0002 | Scenario of the project | Conclusion |
|---|---|---|---|
| | plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity. | | |
| 3 | In case of hydro power plants, one of the following conditions must apply:<br><br>(a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or<br><br>(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 $W/m^2$; or<br><br>(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<br><br>(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:<br><br>(i) The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 $W/m^2$;<br><br>(ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; | 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 |
|---|---|---|---|
| | (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/$m^2$ shall be:<br><br>a. Lower than or equal to 15 MW; and<br><br>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:<br><br>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<br><br>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. | Not applicable, the project is not a hydro power plant, so this applicability condition does not need to be considered. | NA |
| 5 | The methodology is not applicable to:<br><br>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;<br><br>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 |

| Clauses | Requirements of the ACM0002 | Scenario of the project | Conclusion |
|---|---|---|---|
| 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.<br><br>The tool consists of two steps:<br><br>The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting | The validity of the baseline of the project is assessed by the following two steps:<br><br>Evaluate whether the current baseline is still valid for the next crediting period;<br><br>Update the baseline in case | Applicable |

| Tool | Criteria | Applicability | Conclusion |
|---|---|---|---|
| | 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. | that the current baseline is not valid anymore for the next crediting period. | |

## 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 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 $CH_4$ |

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

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| | | $N_2O$ | No | Project activity does not emit $N_2O$ |
| | | 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.

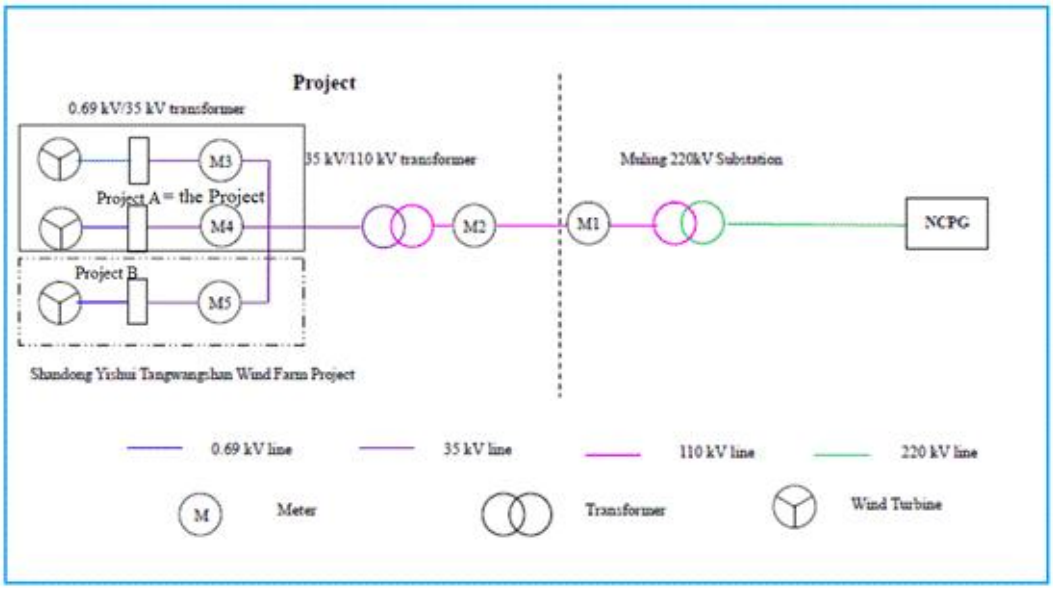



Figure 3 The flow diagram within the project boundary

## 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 NCPG[2]. Hence in the absence of the project activity, electricity would

[2] China Electric Power Yearbook 2017

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 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 $tCO_2e/MWh$.

## 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 $CO_2$ 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 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 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.

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;

[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.

- **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:

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

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 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 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 (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 $tCO_2e$/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. 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) ($SET_{\geq 20}$ 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 following deviations are adopted to calculate the BM[4]:

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:

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

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

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

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

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

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

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

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

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

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

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

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

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 $tCO_2e/MWh$.

**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:

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

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* ($tCO_2/MWh$)

$\omega_{OM}$ = Weighting of operating margin emissions factor (%)

$\omega_{BM}$ = 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 $\omega_{OM}$= 0.75 and $\omega_{BM}$ = 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 $tCO_2e/MWh$ *0.75+0.4578$tCO_2e/MWh$ *0.25 = 0.8405 ($tCO_2e/MWh$)

## 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:

$$ER_y = BE_y - PE_y \quad \text{..... (10)}$$

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:

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

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 ($tCO_2e$) |
|---|---|---|---|---|
| 27/04/2020~26/04/2021 | 76,511 | 0 | 0 | 76,511 |
| 27/04/2021~26/04/2022 | 76,511 | 0 | 0 | 76,511 |
| 27/04/2022~26/04/2023 | 76,511 | 0 | 0 | 76,511 |

| | | | | |
|---|---|---|---|---|
| 27/04/2023~26/04/2024 | 76,511 | 0 | 0 | 76,511 |
| 27/04/2024~26/04/2025 | 76,511 | 0 | 0 | 76,511 |
| 27/04/2025~26/04/2026 | 76,511 | 0 | 0 | 76,511 |
| 27/04/2026~26/04/2027 | 76,511 | 0 | 0 | 76,511 |
| 27/04/2027~26/04/2028 | 76,511 | 0 | 0 | 76,511 |
| 27/04/2028~26/04/2029 | 76,511 | 0 | 0 | 76,511 |
| 27/04/2029~26/04/2030 | 76,511 | 0 | 0 | 76,511 |
| Total | 765,110 | 0 | 0 | 765,110 |

# 5 MONITORING

## 5.1 Data and Parameters Available at Validation

The baseline gird 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** | $tCO_2e/MWh$ |
| **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 | $tCO_2e/MWh$ |
| 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 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 | $EF_{grid,BM,y}$ |
| Data unit | $tCO_2e/MWh$ |
| 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 | $\omega_{OM}$ |
| 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 | $\omega_{BM}$ |
| 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 | 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 -- |

| | |
|---|---|
| applied | $EG_{facility,y} = EG_{A,y}/(EG_{A,y} + EG_{B,y})* EG_{export,y} - EG_{import,y}$<br>$EG_{export,y}$ 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 | 91030.5 |
| Monitoring equipment | Electricity meters reading M1, M2, M3, M4, M5. Electricity meter M3 and M4 installed on the 35kV transmission lines at 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 M5 installed at the Project B site measure the electricity supplied to the grid by Shandong Tangwangshan 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 M1, M2, M3, M4 and M5 will be calibrated once a year according to the national rules. The electricity generation by the proposed project will be monitored and recorded. The project operator is responsible for recording such data. |
| 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 and Project B during year y. |
| Source of data | Bidirectional electricity meter reading of 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. |
| Description of | The readings of the electricity meter will be hourly measured and |

| | |
|---|---|
| measurement methods and procedures to be applied | 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.<br>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 M1 is first choice. When the main meter is out of order, the reading from the backup meter M2 will be used. |

| | |
|---|---|
| Data / Parameter | $EG_{import, y}$ |
| Data unit | MWh/yr |
| Description | Electricity imported from the grid by the Project and Project B during year y. |
| Source of data | Bidirectional electricity meter reading. 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 | Main electricity meter reading M1 and backup electricity meter reading 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 | $EG_{A,y}$ |
| 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 meters M3 and M4 installed on the 35kV transmission lines at 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 and M4 installed on the 35kV transmission lines at 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 standard. |
| 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 meter 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 M5 was 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 equipments 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 |

## 5.3 Monitoring Plan

The 58 sets of wind turbines of the project are connected with two 35kV transmission lines. Two electricity meters (M3 and M4) are installed on the 35kV transmission lines at the project site. The M3 and M4 are used to measure the electricity supplied to the grid by the project, which are equal to the summation of the readings of M3 and M4.

The project is sharing the meter M1 installed Muling 220kV substation measures the electricity exported to and imported from the grid by the proposed project and another project (Shandong Yishui Tangwangshan 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 M5 installed at the Project B site.

The accuracy of the meters 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 of Relative Technical Administrative Code of Electric Energy Metering. 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.

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

Where:

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

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

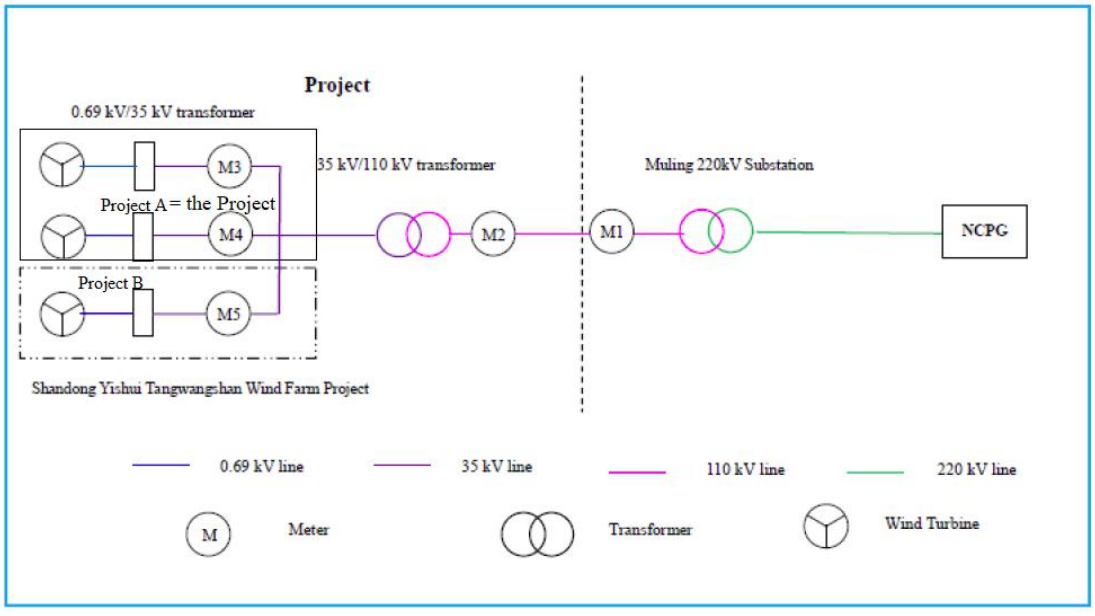
$EG_{import,y}$ = Electricity imported from the grid by the Project (Project A) and Project B during in year y.

$EG_{A,y}$ = 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.

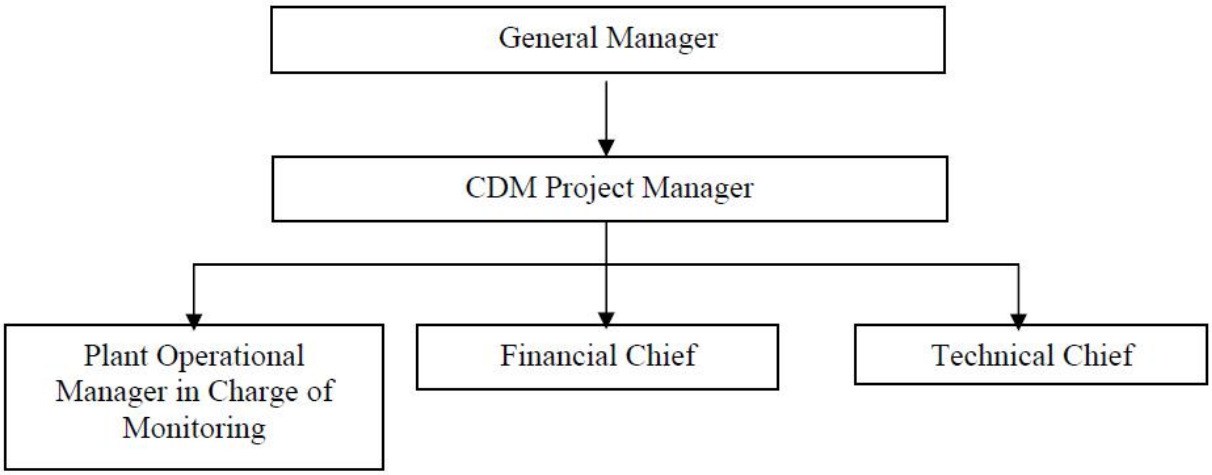
Operational and monitoring manager: To be responsible for collecting data and do internal audit.

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.