



**Verified Carbon
Standard**

JILIN DA'AN DAGANGZI WIND POWER PROJECT PHASE II

Document Prepared by Climate Bridge (Shanghai) Ltd.

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The Jilin Da'an Dagangzi Wind Power Project Phase II (hereafter referred to as the "Project") developed by Jilin CGN Wind Power Co., Ltd (hereafter referred to as the "Project Developer") is a grid connected renewable energy project in Da'an city, Jilin Province, in the People's Republic of China. It involves the installation of 33 wind turbines, each of which has a rated output of 1,500 kW, providing a total installed capacity of 49.5 MW, with a predicted power supplied to the grid of 103,130 MWh per annum.

The estimated average annual emission reductions of the project is 94,250 tCO₂e during the second crediting period from 01/01/2019 to 31/12/2028, and the total emission reductions during this second crediting period are 942,500 tCO₂e.

The project started construction on 10/03/2008 and it has been put into operation since 16/12/2008.

The scenario existing prior to the start of the implementation of the project activity is Northeast China Power Grid (NECPG) providing the same electricity service as the Project.

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

1.2 Sectoral Scope and Project Type

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

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

The project is not a grouped project.

1.3 Project Eligibility

The project is not a grouped project.

1.4 Project Design

NA.

1.5 Project Proponent

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

Organization name	Climate Bridge (Shanghai) Ltd.
Role in the project	Consultancy
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Title	General Manager
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1.7 Ownership

The project proponent is Jilin CGN 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 16/12/2008 (the start date of electricity generation).

1.9 Project Crediting Period

Project description deviations:

There is a deviation for the crediting period. The project is registered under VCS Version 2007.1 and completed validation before 19/03/2020. thus, it remains eligible to apply the crediting period requirements under VCS 2007.1 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 01/01/2009¹-08/03/2010 to 01/01/2009-31/12/2018.

Therefore, the project crediting period is ten years, twice renewable for a total of 30 years. However, as the project is also registered as a CDM project with a seven year twice renewable project crediting period, it is not eligible for VCU issuance beyond the end of those 21 years (08/03/2031). The project first crediting period is from 01/01/2009 to 31/12/2018. This is the second crediting period from 01/01/2019 to 31/12/2028.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	✓
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
01/01/2019~31/12/2019	94,250
01/01/2020~31/12/2020	94,250
01/01/2021~31/12/2021	94,250
01/01/2022~31/12/2022	94,250
01/01/2023~31/12/2023	94,250
01/01/2024~31/12/2024	94,250
01/01/2025~31/12/2025	94,250
01/01/2026~31/12/2026	94,250
01/01/2027~31/12/2027	94,250
01/01/2028~31/12/2028	94,250

¹ The project start date is 16/12/2008, while the project owner chose 01/01/2009 as the start date of the first crediting period based on the approved 1st VCS monitoring report.

Total estimated ERs	942,500
Total number of crediting years	10
Average annual ERs	94,250

1.11 Description of the Project Activity

The purpose of the Project is to use well established wind power generation technology for electricity generation and transmission to generate low emissions electricity for the Grid thereby displacing CO₂ emissions from electricity generation from the Grid. The baseline scenario is the same as the scenario existing prior to the start of the implementation of the project activity: electricity delivered to the Grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. The Grid includes the Jilin, Liaoning and Heilongjiang Provincial Power Grids.

The project involves the installation of 33 wind turbines each of which has a rated capacity of 1,500 kW, providing a total capacity of 49.5MW. The expected annual electricity supply to the grid is 103,130MWh and the forecast load factor is 23.78%². The height of the rotor hub of all turbines is 61.5m. As the wind resource in the area is plentiful, and the average wind speed is relatively high at 5.91m/s at a height of 30m and 6.61m/s at a height of 50m, the wind resource can be used as much as possible.

According to the turbine layout, each turbine is equipped with one transformer. The construction also includes the wind farm 220kV step-up substation. The wind power generated is delivered to the step-up substation by 35kV transmission lines. The power in the 220kV step-up substation is transmitted to the Baicheng 220kV Da'an substation. The electricity generated is first transmitted to the Jilin Power Grid and then to the North East China Power Grid.

Details on the monitoring equipment and its location are given in section 5.3 of the PD.

The wind turbine is produced by Dongfang Steam Turbine Works Company. All other items of equipment used in the Project are produced domestically and the project developer is experienced in handling and operating this kind of equipment. The key technical parameters of wind turbines are listed in Table 1.

Table 1 Main Technical Parameters of wind turbines

Item	Unit	Index
Type	-	FD77B
Number of blades	-	3

² 103130MWh /49.5MW/(24hours*365 days)=23.78%

Rated Power	kW	1,500
Diameter of wheels	m	77
Cut-in speed	m/s	4
Cut-out speed	m/s	25
Rated wind speed	m/s	16
Height of wheel	m	61.5
Load factor	-	23.78%
Lifetime	years	20

1.12 Project Location

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

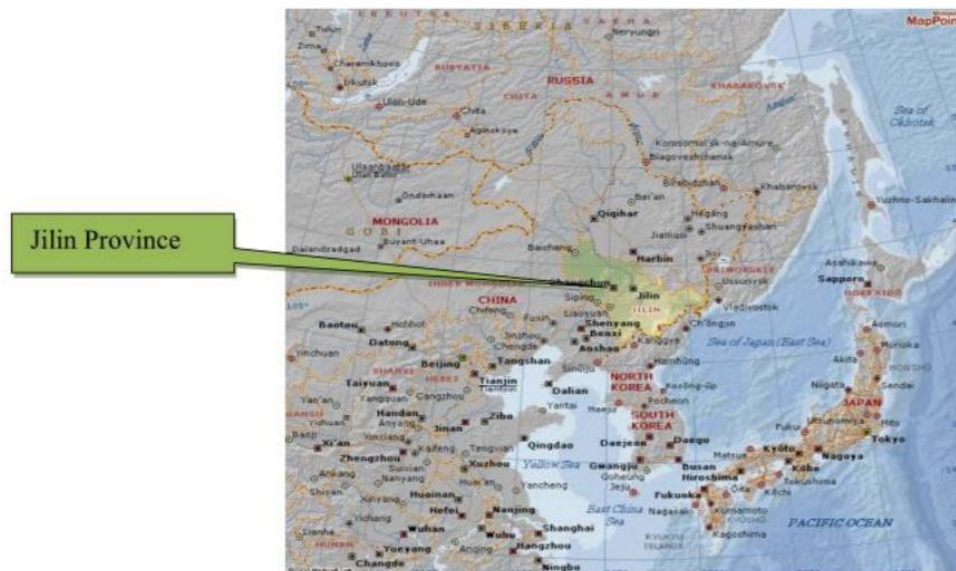




Figure 1 Location of the project

1.13 Conditions Prior to Project Initiation

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

The project scenario is the implementation of the Project, the installation and operation of turbines with a total capacity of 49.5MW which supply an average annual generation of 103,130 MWh to NECPG and replace the same amount of electricity generated by fossil fuel fired power plants connected to NECPG;

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

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project is wind power generation project and meets the relevant provisions of the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution. The generation of power supplied to NECPG will meet the requirement of national laws and regulations, also financially viable.

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 09/03/2010 (UNFCCC Ref. 2586), with the 7 years crediting period started from 09/03/2010. Total GHG emission reductions of 561,051 tCO₂ generated from 09/03/2010 to 24/12/2016 (both days included) by the project has been issued as CER under CDM program. Please refer to the following link for details.

<https://cdm.unfccc.int/Projects/DB/DNV-CUK1265965250.28/view?cp=1>

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 does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

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

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 the sustainable development in the following ways:

- Achieves GHG emission reductions by avoiding CO₂ emission from the business-as-usual scenario electricity generation of those fossil fuel-fired power plants connected to the Grid, which is dominated by fossil fuel fired electricity.
- Increases employment opportunities in the area where the project is located (approximately 16 people will be permanently employed for the project operation, and the construction of the project secures jobs in the construction sector) and thereby contributes to poverty alleviation.

- Enhances the local investment environment and therefore improves the local economy.
- Diversifies the sources of electricity generation, important for meeting growing energy demands and the transition away from coal-supplied electricity generation.
- Makes greater use of renewable wind resources.

Further Information

NA.

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

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

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

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

- Do you support the construction of the CDM Project?

The survey received 100% participation (30 questionnaires returned out of 30). The survey shows the stakeholders believe that the proposed CDM project activity will have positive impacts on the local ecological, environmental, employment and social life. All stakeholders expressed their support to the project.

2.3 Environmental Impact

Based on China Environmental Protection Law, the Environmental Impact Assessment (EIA) must be completed before the development and construction of the Project. Thus, the project owner authorized a third party to carry out the EIA report. And an expert-group was invited to attend a verification meeting hold by the Environmental Protection Bureau to verify the EIA report of the Project, and finally the Environmental Protection Bureau approved the EIA report in September 2007, indicating that the Project meets all the national environmental protection regulations.

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

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

Impact on air

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

Impact from noise

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

Electromagnetic impact

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

Impacts from solid waste

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

Impacts on vegetation

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

Biological impact

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

2.4 Public Comments

No negative comments have been received on the project during the public comment period has been taken.

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 3.0.1).

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 NECPG-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	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: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (7), is greater than 4 W/m²; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), 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 (3), 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;	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/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 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.	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: 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

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.	Applicable
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	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	Applicable

Tool	Criteria	Applicability	Conclusion
	case that the current baseline is not valid anymore for the next crediting period.	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 is delivered to Northeast China Power Grid (NECPG). According to 2017 Baseline Emission Factors for Regional Power Grids in China issued by China’s DNA³, the NECPG is composed of Liaoning, Jilin and Heilongjiang power grids, therefore, NECPG is 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 NECPG.

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 ₂ O	No	Minor emission source
Project	The wind power plant	CO ₂	No	According to ACM0002, the project emission of renewable energy project activity should not be considered.
		CH ₄	No	
		N ₂ O	No	

Figure 2 presents a flow diagram within the project boundary including all the equipment and systems.

³ <http://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/201812/P020181220579925103092.pdf>

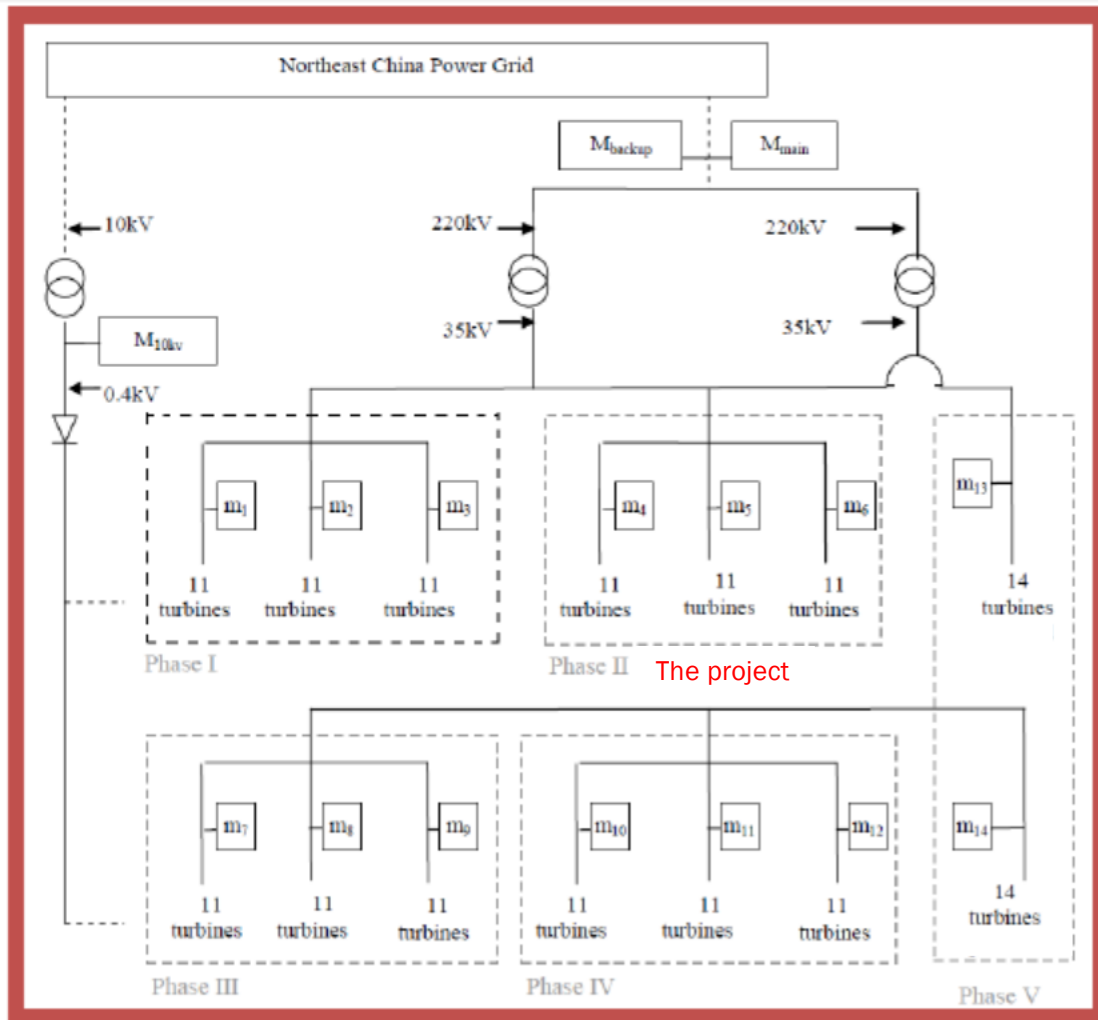


Figure 2 Flow diagram of the project boundary

3.4 Baseline Scenario

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

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

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

There are no new national and/or sectoral policies that could affect the baseline scenario during the renewal of the crediting period. For total electricity generation produced by fossil fuel power plants, the average share of the five most recent years is more than 50% of total electricity generation in NECPG. 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 NECPG. 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

Assess whether data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are still valid or whether they should be updated. Updates should be undertaken in the following cases:

- Where IPCC default values are used, the values should be updated if any new default values have been adopted and published by the IPCC, for example, in guidelines for national GHG inventories, IPCC assessment report or special reports by the IPCC;
- Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity.

If any of the data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, the current baseline needs to be updated for the subsequent crediting period.

In accordance with the methodology, the grid emission factor and all the values in its calculation are updated in section 4.1.

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

As per the analysis in step 1 above, the current baseline does not need to be updated.

Step 2.2: Update the data and parameters

The updated baseline emission factor for the project ($EF_{grid,CM,y}$) is calculated in line with the “Tool to calculate the emission factor for an electricity system (version 07.0)”, the data is calculated as 0.9139 tCO₂e/MWh, refer to section 4.1 for details.

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.

3.6 Methodology Deviations

There is no methodology 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 (tCO₂/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 CO₂ 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 Northeast China Power Grid (NECPG) is identified as the relevant electric power system of the project, which includes Liaoning, Jilin and Heilongjiang Provincial Power Grids. The project is located near the village of Shuanggang, Dagangzi County, Da'an City, Jilin Province, P. R. China and covered by the Northeast China Power Grid (NECPG). According to the “2017 Baseline Emission Factors for Regional Power Grids in China”, There is no net electricity imported from other grids to NECPG, thus, there is no connected electricity system to the project. Therefore, Northeast China Power Grid (NECPG) 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 resources⁴ 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.

For the most recent 5 years (2012-2016), the share of low-cost/must-run generation in Northeast China Power Grid is 11.04% in 2012, 16.46% in 2013, 14.90% in 2014, 15.38% in 2015 and 19.29% in 2016⁵. The Simple OM method, therefore, is selected to calculate the Operating Margin emission factor of the project. 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

⁴ 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.

⁵ China Electric Power Yearbook 2013~2017

DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation;

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

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

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

Based on the analysis of the step 3, the simple OM emission factor is calculated as the generation-weighted average 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 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)
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 NECPG, 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 NECPG is calculated as 1.1082 tCO_{2e}/MWh.

Step 5. Calculate the build margin emission factor

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

Option 1 For the first crediting period, calculate the build margin emission factor, ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the second crediting period should be used. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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

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

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

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, 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 ($AEG_{SET-\geq 20 \text{ per cent}}$, in MWh);

(c) From $SET_{5-units}$ 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 ($SET_{sample-CDM}$) the annual electricity generation ($AEG_{SET-sample-CDM}$, 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. $AEG_{SET-sample-CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample-CDM}$ to calculate the build margin. Ignore steps (e) and (f).

(e) Include in the sample group $SET_{\text{sample-CDM}}$ 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 ($SET_{\text{sample-CDM} \rightarrow 10\text{yrs}}$).

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 BM⁶:

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 ($EF_{\text{grid,BM},y}$) is calculated as the generation-weighted average emission factor ($\text{tCO}_2\text{e/MWh}$) of all power units m during the most recent year y for which power generation data is available. The calculation equation is as follows:

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

Where:

$EF_{\text{grid,BM},y}$ = Build margin CO_2 emission factor in year y ($\text{tCO}_2 / \text{MWh}$)

$EG_{m,y}$ = 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 ($\text{tCO}_2 / \text{MWh}$)

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

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

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_{CO2,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 0.3310 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 PDD 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 $\omega_{OM} = 0.75$ 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.

$$EF_{grid,CM,y} = 1.1082 \text{ tCO}_2\text{e/MWh} * 0.75 + 0.3310 \text{ tCO}_2\text{e/MWh} * 0.25 = 0.9139 \text{ (tCO}_2\text{e/MWh)}$$

4.2 Project Emissions

According to ACM0002 (version 20.0), for most renewable energy power generation project activities, $PE_y = 0$

4.3 Leakage

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

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)

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)
01/01/2019~31/12/2019	94,250	0	0	94,250
01/01/2020~31/12/2020	94,250	0	0	94,250
01/01/2021~31/12/2021	94,250	0	0	94,250
01/01/2022~31/12/2022	94,250	0	0	94,250
01/01/2023~31/12/2023	94,250	0	0	94,250

01/01/2024~31/12/2024	94,250	0	0	94,250
01/01/2025~31/12/2025	94,250	0	0	94,250
01/01/2026~31/12/2026	94,250	0	0	94,250
01/01/2027~31/12/2027	94,250	0	0	94,250
01/01/2028~31/12/2028	94,250	0	0	94,250
Total	942,500	0	0	942,500

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 basic parameters for calculation of the baseline grid emission factor 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	0.9139
Justification of choice of data or description of measurement methods and procedures applied	As per the requirements in "Tool to calculate the emission factor for an electricity system version 07.0"
Purpose of Data	Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the second crediting period.

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility, y}$
Data unit	MWh/year
Description	The net electricity supplied to the grid by the project in year y
Source of data	Measured by electricity meters: M_{main} , M_{10kV} , m_i
Description of measurement methods and procedures to be applied	The net electricity supplied to the grid by the project is cumulative measurement and monthly recorded by the project owner. The net electricity delivered from the project to the grid is calculated with the formula showed in section 5.3 The accuracy of the electricity meters involved will be described below in the monitored parameter $M_{main, export, y}$, $M_{main, import, y}$, $M_{10kV, import, y}$ and $m_{i, export, y}$.
Frequency of monitoring/recording	-
Value applied	-
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The metering instruments will be calibrated annually in accordance with the “Technical administrative code of electric energy metering (DL/T448-2016)”. Sale receipts/ records to the grid are used to ensure the consistency.
Purpose of data	Calculation of baseline emissions
Calculation method	The net electricity supplied by the project to the grid is calculated through $M_{main, export, y}$, $M_{main, import, y}$, $M_{10KV, import, y}$ and $m_{i, export, y}$ according to the equation (11) in section 5.3
Comments	-

Data / Parameter	$M_{main, export, y}$
Data unit	MWh/year
Description	Quantity of the electricity supplied to the grid and measured by the meter M_{main} (or M_{backup}) during the monitoring period y
Source of data	Measured by electricity meters: M_{main} or M_{backup}
Description of measurement methods	The electricity supplied to the grid is measured by the meter M_{main} (or M_{backup}) and cumulative measurement and monthly recorded

and procedures to be applied	by the project owner. The accuracy of electricity meter M_{main} and M_{backup} is 0.2S.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The metering instruments will be calibrated annually in accordance with the “Technical administrative code of electric energy metering (DL/T448-2016)”.
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

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

Comments	-
Data / Parameter	$m_{i,export,y}$
Data unit	MWh/year
Description	Quantity of the electricity supplied to the grid and measured by the meters m_i during the monitoring period y i is the number of the meters which installed at its on-site 35kV low voltage side of the 35kV-to-220kV transformer. $i = 1 \sim 14$
Source of data	Measured by electricity meters: m_i
Description of measurement methods and procedures to be applied	The electricity supplied to the grid is measured by the meter m_i and cumulative measurement and monthly recorded by the project owner. The accuracy of electricity meter m_i is 0.5S.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The metering instruments will be calibrated annually in accordance with the “Technical administrative code of electric energy metering (DL/T448-2016)”.
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$M_{10kv,import,y}$
Data unit	MWh/year
Description	Quantity of the electricity imported from the grid and measured by the meter M_{10kv} during the monitoring period y
Source of data	Measured by electricity meters: M_{10kv}
Description of measurement methods	The electricity imported from the grid is measured by the meter M_{10kv} and cumulative measurement and monthly recorded by the project owner. The accuracy of electricity meter M_{10kv} is 1.0.

and procedures to be applied	
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The metering instruments will be calibrated annually in accordance with the “Technical administrative code of electric energy metering (DL/T448-2016)”. Sale receipts have been used to cross-check the meters’ readings.
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

5.3 Monitoring Plan

The monitoring system is specified as below:

1. Monitoring Organisation

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

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

Records of trained CDM staff have been retained by the Project Developer. A formal set of monitoring procedures such as training, data quality assurance and control, and relevant back-up procedures have been identified prior to the start of the project. A description of these procedures is provided in Table 2 and Table 3. It is important to note that these procedures may be based on existing on site practices.

Table 2. CDM Monitoring System Procedures

Procedure name	Description
VCS Staff training	This procedure outlines the steps to ensure that staffs receive adequate training to collect

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

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

Table 3. Operational procedures and responsibilities for monitoring and quality assurance of emissions reductions from the project activity

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

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

2. Monitoring equipment and installation

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

As the project shares the same substation 220KV transmission line with other 4 projects, the net electricity supplied by the Project to the grid is calculated based on the equation 11 in section 5.3.

The total electricity generated by the five projects and imported from the grid is monitored through the main meter installed on site of the 220kV high voltage side of the 35kV-to-220kV transformer, and the backup meter which is an assistant meter, is installed on site of the 220kV high voltage side of the 35kV-to-220kV transformer also. When the main meter has any troubles, the project developer should employ the data monitored by the backup meter. The main meter and the backup meter are both bidirectional meters which can also monitor the electricity imported from the grid.

In addition, a spare 10kV line is used for supplying electricity in emergency case that the Project fails to generate power. The electricity from the spare 10kV line connecting with the grid monitored by the meter M_{10kV}. Currently four other wind power project shares the same substation 220kV transmission line, the spare 10kV line, and all the involved meters. The separate meters have already been installed in the project site presented as the following meter diagram so that the electricity generation can be monitored respectively to calculate the share of this wind power project of the net electricity delivered to the grid at 220kV transformer.

The project is the Phase II of five phases. The net electricity delivered to the Northeast China Power Grid by the Project has been monitored through the meters. There are totally 17 meters

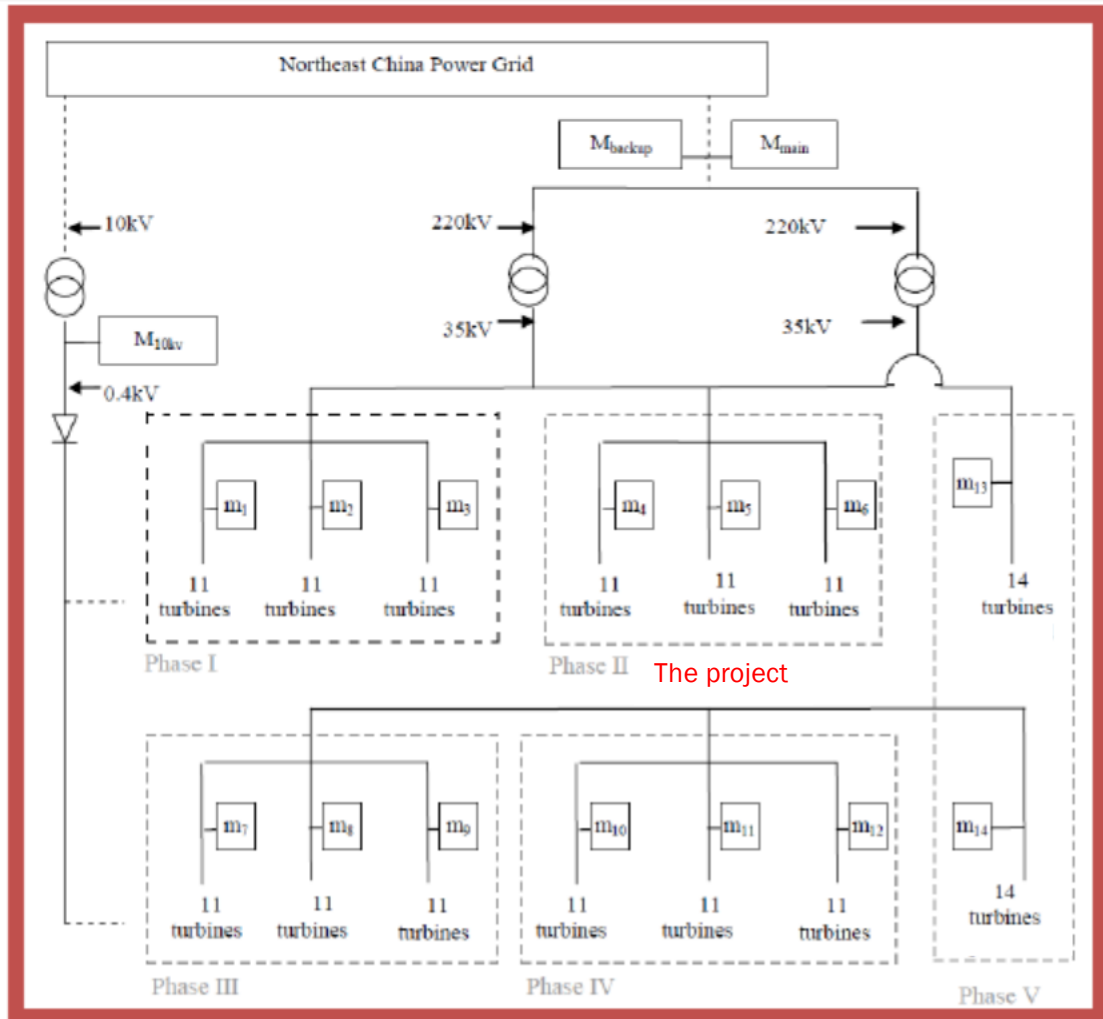
involved: M_{main} , M_{backup} , M_{10kv} , $m1$, $m2$, $m3$, $m4$, $m5$, $m6$, $m7$, $m8$, $m9$, $m10$, $m11$, $m12$, $m13$ and $m14$. The metering diagram and the meters list are presented as follows, giving an overview of these meters.

Meters list is as below:

Meter	Owner	Monitor	Site
M_{main}	Power company	The total electricity of the all five projects exported to the grid ($M_{main,export,y}$) and imported from the grid ($M_{main,import,y}$)	At 220kV high voltage side of the 35kV-to-220kV transformer
M_{backup}	Power company	The total electricity of the all five projects exported to the grid ($M_{main,export,y}$) and imported from the grid ($M_{main,import,y}$), only when the main meter has a breakdown, the readings of back up meter will be adopted.	At 220kV high voltage side of the 35kV-to-220kV transformer
M_{10kv}	Project Owner	The total electricity of the all five projects imported from grid through the 10kV spare line	At enter of the spare 10kV line where the grid is connected
$m1$, $m2$, $m3$	Project Owner	The total electricity supplied to the grid by the phase I project	At Phase I project's onsite 35kV low voltage side of the 35kV-to 220kV transformer
$m4$, $m5$, $m6$	Project Owner	The total electricity supplied to the grid by the Project	At the project's onsite 35kV low voltage side of the 35kV-to 220kV transformer
$m7$, $m8$, $m9$	Project Owner	The total electricity supplied to the grid by the phase III project	At the phase III project's onsite 35kV low voltage side of the 35kV-to 220kV transformer
$m10$, $m11$, $m12$	Project Owner	The total electricity supplied to the grid by the phase IV project	At the phase IV project's onsite 35kV low voltage side of the 35kV-to 220kV transformer

m_{13} , m_{14}	Project Owner	The total electricity supplied to the grid by the phase V project	At the phase V project's onsite 35kV low voltage side of the 35kV-to 220kV transformer
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A diagram shows how parameters are monitored is presented as follows:



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

$$EG_{facility,y} = M_{main,export,y} \times \frac{\sum_{i=1}^6 m_{i,export,y}}{\sum_{i=1}^{14} m_{i,export,y}} - M_{main,import,y} - M_{10kv,import,y} \quad (11)$$

Where:

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

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

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

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

3. Data recording procedure, management and archiving

The monitoring steps are as follows:

- (1) Net electricity supplied to the grid will be monitored continuously and recorded monthly.
- (2) The Project Developer and the Grid Company will confirm the electricity sales receipts or records of each wind farms respectively.
- (3) The copies of sales receipts will be obtained to cross check the data of supplied electricity.
- (4) The project developer will archive the data electronically until two years after the end of the crediting period or the last issuance of VCUs, whichever occurs later.

All relevant documentation such as technical drawings and reports (the Environmental Impact Assessment and the Feasibility study etc.) should be stored and available for reference. All the data shall be kept until two years after the end of crediting period, or the last issuance of VCUs, whichever occurs later.

4. Quality Assurance and Quality Control

The quality of data will be maintained through the development of an overarching monitoring system. Relevant operating procedures will be provided to relevant monitoring staff, and the

monitoring staff will be supervised. The on-site trained staff will be responsible for quality control of data collection and data archiving.

In the event of erroneous meter(s) readings (where there are either data gaps, or data outliers present), data can be cross-checked against sale receipts, power generation statements, or other meters (back-up meter, etc). Details of the back-up strategy will be consolidated into the monitoring manual for VCS monitoring.

5. Emergency procedures

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

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