CGN INNER MONGOLIA ZHURIHE PHASE I WIND FARM PROJECT

Document Prepared by Climate Bridge (Shanghai) Ltd.

Tel: +86 21 6246 2036; Fax: +86 21 2301 9950

Project Title	CGN Inner Mongolia Zhurihe Phase I Wind Farm Project
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Prepared By	Fan Zhang
Contact	Block B, Level 24, Jiangong Mansion, 33 Fushan Road, Pudong New Area, Shanghai, P.R. of China Telephone: 2162462036; Email: zhang.fan@climatebridge.com http://www.climatebridge.com

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1 PROJECT DETAILS

1.1 Summary Description of the Project

CGN Inner Mongolia Zhurihe Phase I Wind Farm Project (hereinafter referred to as the project) is located in the Inner Mongolia Autonomous Region. The project is developed by CGN Wind Power Co., Ltd.. The objective of the project is to generate renewable electricity using wind power resources and to sell the generated output to the North China Power Grid (NCPG).

The project site has an abundant wind resource. A decision has been made to install a total of 25 wind turbines, each with a rated power output of 2,000 kW. The total power capacity of the wind farm is 50 MW. The expected net supplied power to the grid is 123,962 MWh per year. The estimated annual net electricity output and average annual emission reductions of the project is 104,190 tCO_2e during the second crediting period from 04/03/2019 to 03/03/2029. The project is a grid-connected renewable energy project.

The project started construction on 01/05/2008. The first wind turbine of the Project has been put into operation on 04/03/2009. And all the wind turbines have been put into operation on 13/04/2009.

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

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

1.2 Sectoral Scope and Project Type

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

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

The project is not a grouped project.

1.3 Project Eligibility

The project is not a grouped project.

1.4 Project Design

NA

1.5 Project Proponent

Organization name	CGN Wind Power Co., Ltd.
Contact person	Huiying Ji
Title	Manager
Address	No. 2 Building, Area 12 of Advanced Business Park, No. 188 West of South 4th Ring Road, Beijing 100070 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
Telephone	+86-2162462036
Email	gao.zhiwen@climatebridge.com

1.7 Ownership

The project proponent is 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 04/03/2009 (commissioning start date)

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 04/03/2009-22/12/2009 to 04/03/2009-03/03/2019.

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 (03/03/2030). The project first crediting period is from 04/03/2009 to 03/03/2019. This is the second crediting period from 04/03/2019 to 03/03/2029.

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)
04/03/2019~03/03/2020	104,190
04/03/2020~03/03/2021	104,190
04/03/2021~03/03/2022	104,190
04/03/2022~03/03/2023	104,190
04/03/2023~03/03/2024	104,190
04/03/2024~03/03/2025	104,190
04/03/2025~03/03/2026	104,190
04/03/2026~03/03/2027	104,190
04/03/2027~03/03/2028	104,190
04/03/2028~03/03/2029	104,190
Total estimated ERs	104,190

Total number of crediting years	10
Average annual ERs	1,041,900

1.11 Description of the Project Activity

CGN Inner Mongolia Zhurihe Phase I Wind Farm Project (hereinafter referred to as the project) is located in the Inner Mongolia Autonomous Region. The project is developed by CGN Wind Power Co., Ltd.. The objective of the project is to generate renewable electricity using wind power resources and to sell the generated output to the North China Power Grid (NCPG).

The project site has an abundant wind resource. A decision has been made to install a total of 25 wind turbines, each with a rated power output of 2,000 kW. The total power capacity of the wind farm is 50 MW. The expected net supplied power to the grid is 123,962 MWh per year. The estimated annual net electricity output and average annual emission reductions of the project is 104,190 tCO_2e during the second crediting period from 04/03/2019 to 03/03/2029. The project is a grid-connected renewable energy project.

For the Project

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

The project scenario is the implementation of the Project, the installation and operation of turbines with a total capacity of 50 MW which supply an average annual generation of 123,962 MWh to NCPG and replace the same amount of electricity generated by fossil fuel fired power plants connected to NCPG;

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

Technology to be employed by the project activity

The 25 sets of 2,000kW turbines manufactured by Beijing Beizhong Stream Turbine Generator Co., Ltd were selected. The technology used for the project is transferred from a developed country. The technical design of the wind turbines is advanced and is deemed to reflect current good practice, and Key Technology Parameters are listed in Table1.

Table 1 Key Technical specifications of wind turbines

Key Technology Parameter	Value
Rotor diameter(m)	80
Swept area(m^2)	5,027

Cut-in wind speed (m/s)	3
Rated wind speed (m/s)	13.5
Cut-out wind speed (m/s)	25
Hub height of the wind turbines (m)	80
Capacity (kW)	2,000
Rated voltage (V)	690
Load Factor (%)	28.30
Lifetime(years)	20

The net supplied power to the grid is expected to be 123,962 MWh. The electricity generated from the project is transmitted to the substation of NCPG via a 220kV transmission line. A 220kV transformer and transmission line from the wind farm to the substation of the grid company was installed. The project scenario is the installation of 25 wind turbines with an aggregate capacity of 50MW. The wind turbines are estimated by the Inner Mongolia Power Exploration & Design Institute, an independent professional technical design instate contracted by the project developer to carry out the feasibility study for the project, to generate on average 123,962 MWh of electricity annually once fully operational, with an average load factor of 28.30%, in accordance with EB guidance on plant load factors (EB48 Annex 11). The power generation is monitored by the electronic control and monitoring system in sub-station of the wind farm.

Prior to the implementation of the project activity, the electricity was generated by grid-connected power plants. Without the implementation of the project, this scenario would have continued and is considered the baseline scenario.

1.12 Project Location

The project is located at Zhurihe Town, Xilinguole City, Inner Mongolia Autonomous Region, People's Republic of China. CGN Inner Mongolia Zhurihe Phase I Wind Farm lies in the middle north part of Inner Mongolia Autonomy Region of People's Republic of China. It is located at the latitude 42°27'40'' North and longitude 112°46'30''. The average altitude of the project site is 1,180 m above sea level. Figure 1 and 2 shows respectively the location of Xilinguole City in China map and the project site in the map of Inner Mongolia Autonomy Region.

Figure 1. The map of P. R. China showing the location of Xinlinguole City

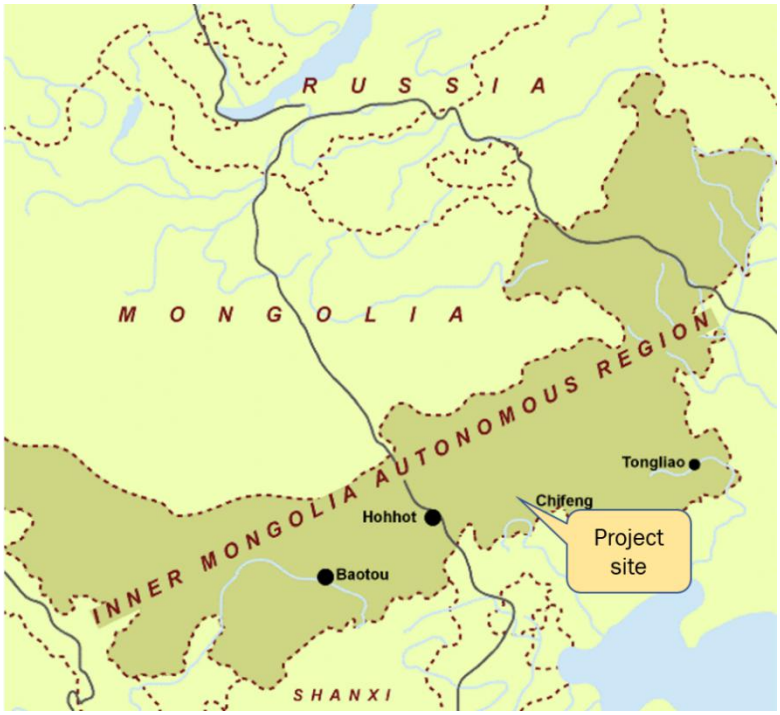

Figure 2. The map of Inner Mongolia Autonomy Region showing the project site

1.13 Conditions Prior to Project Initiation

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

The project scenario is the implementation of the Project, the installation and operation of turbines with a total capacity of 50 MW which supply an average annual generation of 125,573 MWh to NCPG and replace the same amount of electricity generated by fossil fuel fired power plants connected to NCPG;

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 NCPG 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 23/12/2009 (UNFCCC Ref. 1577), with the 7 years crediting period started from 23/12/2009.

Total GHG emission reductions of 144,678 tCO2 generated from 23/12/2009 to 28/02/2011 (both days included) by the project has been issued as CER under CDM program.

Total GHG emission reductions of 114,565 tCO2 generated from 01/03/2011 to 31/05/2012 (both days included) by the project has been issued as CER under CDM program.

Total GHG emission reductions of 74,792 tCO_2 generated from 01/06/2012 to 31/12/2012 (both days included) by the project has been issued as CER under CDM program.

Total GHG emission reductions of 506,420 tCO_2 generated from 01/01/2013 to 20/12/2016 (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-CUK1200642678.34/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 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 therefore helps reduce GHG emissions versus the high-growth, coal-dominated business-as-usual scenario. Furthermore, the project improves air quality and local livelihoods and promote sustainable renewable energy industry development. The project promotes local sustainable development through the following aspects:

- generate renewable electricity;
- reduce greenhouse gas emissions in China compared to a business-as-usual scenario;
- create local employment opportunity during the assembly and installation of wind turbines, and for operation of the wind farm;
- reduce other pollutants resulting from the power generation industry, compared to a business-as- usual approach, such as SO_2 and soot.

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

In Dec 2007, the staff from CGN Wind Power Co., Ltd. carried out a survey of the local villagers and residents in the area. 1-page questionnaire was designed to fill in and has the following sections.

The summary of survey is listed as the following:

Item	Content	Vote	Proportion
Gender	Male	6	20%
	Female	24	80%
Education	Elementary school	2	7%
	Junior high school	15	50%
	Senior high school	10	33%
	University or above	3	10%
Occupation	Officer	3	10%
	Worker	7	23%
	Farmer	16	54%
	Merchant	1	3%
	Others	3	10%

Their opinions:

1. Will the Project raise effects on your environment of living, studying and working?	Yes	No	Not Sure
	0	97%	3%
2. Will construction, operation or decommissioning of the Project affect natural resources or ecosystems, such as water, habitats, etc?	Yes	No	Not Sure
	0	97%	3%
3. Will the Project cause noise, vibration or release of electromagnetic radiation that could adversely affect your health?	Yes	No	Not Sure
	0	93%	7%
4. Do you think the proposed project will have promotion in local economic development?	Yes	No	Not Sure
	100%	0	0
5. Do you agree with the development of the Project?	Yes	No	Not Sure
	100%	0	0

Conclusions from the survey:

The survey shows that the project has strong local support among the local people. They all believe the project promotes the local economic development and agree the project construction.

2.3 Environmental Impact

An Environmental Impact Assessment (EIA) for the CGN Inner Mongolia Zhurihe Phase I Wind Farm has been completed by Inner Mongolia Power Exploration & Design Institute assigned by the Project owner, and has been approved by the Environmental Protection Bureau of Inner Mongolia Autonomous Region. The EIA is summarized as follows.

The main impacts identified in the EIA are summarized below.

1 The analysis of the environment impact in the construction period

- Construction machinery and construction activity generate noise. Since the local residential area is far away from the wind farm site, the impact of construction noise to the local region is light.
- The waste water from the construction site is mainly the waste water generated by the construction workers. This small quantity of sewage is treated by deposition in a septic tank, avoiding the impact on the environment. The waste water during the construction period, therefore, doesn't have impact on the local environment.
- The project temporarily uses and disturbs the grass for construction use. The occupied land was restored according to its characteristics after construction and ensured its reutilization. Overall, land use impact on the local residents arising from the Project is considered to be insignificant.

2. The analysis of the environment impact in operation period

- The noise from the wind turbines is reduced mainly by the selection of low noise equipment. Furthermore, the resident regions are far away from the wind farm, so the noise does not influence the residential districts nearest to the site.
- Solid waste and liquid waste are produced by operation staff during operation period. The emitted waste quantity is very small and might have no interference with the environment after treatment.

2. Conclusion

The Wind Farm does not put the much pressure on the local environment when generating renewable power. However, it brings great environmental benefit as well as the social benefit.

2.4 Public Comments

The project has been open for public comment from 25/04/2008 to 24/05/2008 on CDM website during CDM validation, no comments were received

2.5 AFOLU-Specific Safeguards

NA.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Following approved baseline & monitoring methodology is applied:

Methodology:

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

Reference: https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

The applied tools:

Tools: "Tool for assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (Version 03.0.1).

Reference:

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

Tools: "Tool to calculate the emission factor for an electricity system" (Version 07.0)

Reference: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

3.2 Applicability of Methodology

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

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

Clauses	Requirements of the ACM0002	Scenario of the project	Conclusion
	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).).		
2	The methodology is applicable under the following conditions: (a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	The project is a newly built wind power project and the project activity involves the installation of the wind power plant.	Applicable
3	In case of hydro power plants, one of the following conditions must apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using	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
	equation (7), is greater than 4 W/m^2; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m^2; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m^2, all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m^2; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.		
4	In the case of integrated hydro power projects, project proponent shall: Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or Provide an analysis of the water balance covering the water fed to	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
	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.		
5	The methodology is not applicable to: a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; b) Biomass fired power plants/units.	The project does not involve switching from fossil-fuels to renewable energy sources at the site of the project activity and the project is not a biomass-fired power project.	NA
6	In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	Not applicable, the project is a newly built wind power project.	NA

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

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

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

3.3 Project Boundary

According to ACM0002 (version 20.0), the spatial extent of the project boundary includes the project power plant and all the power plants connected physically and geographically to electricity system that the project power plant is connected to. According to the "Tool to calculate the emission factor for an electricity system (version 07.0)", the electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant

location or the consumers where electricity is being saved) and that are covered by either single or layered dispatch area.

Electricity generated by the Project was delivered to North China Power Grid (NCPG). According to 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
		N_2O	No	Project activity does not emit N_2O
		Other	No	Project activity does not emit other gas

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

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

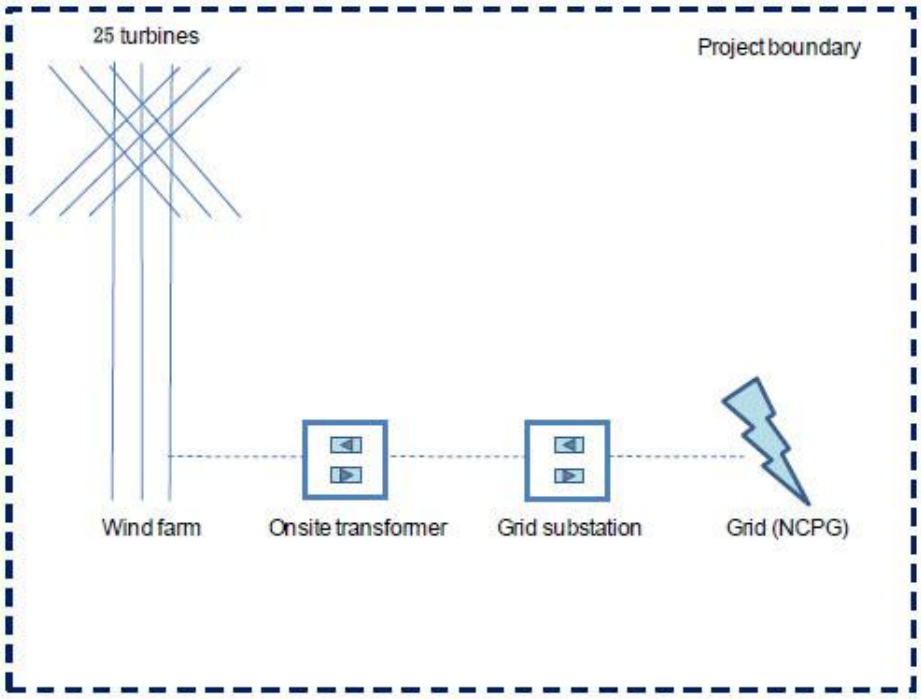

Figure 2 Flow diagram of the project boundary

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 NCPG[2]. Hence in the absence of the project activity, electricity would still have been generated in the existing grid-connected power plants or by the addition of new generation sources from NCPG. The current baseline still complies with all relevant mandatory national and sectoral policies which have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period. Go to step 1.2.

[2] China Electric Power Yearbook 2017

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 24 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:

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

Where:

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

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

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

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

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

Where:

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

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

4.1.1 To calculate the emission factor for an electricity system

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

Step 1. Identify the relevant electricity system

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

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

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

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

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

Since Chinese DNA has published a delineation of the project electricity system and connected electricity systems, Option 1 is applied for the project. According to the delineations, the North China Power Grid (NCPG) is identified as the relevant electric power system of the project, which includes Beijing, Tianjin, Hebei, Shandong, Shanxi and Inner Mongolia Provincial Power Grids. The project is located in Zhengxiangbai Qi, Xilinguole League, middle grassland of Inner Mongolia Autonomous Region, 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;
- **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

[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.

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. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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

third crediting period, the build margin emission factor calculated for the second crediting period should be used.

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

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

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

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

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

Otherwise:

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

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

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

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

However, in China, it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20 per cent of the system generation (in MWh) and that were built most recently, since no data of plant specific generation and fossil fuel consumption is currently available in China. As none of the above options can be selected, the 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)

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

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

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

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

$EF_{grid,CM,y}$ = 0.9680 tCO_2e/MWh *0.75+0.4578tCO_2e/MWh *0.25 = 0.8405 (tCO_2e/MWh)

4.2 Project Emissions

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

4.3 Leakage

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

4.4 Net GHG Emission Reductions and Removals

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

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

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:

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

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

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
04/03/2019~03/03/2020	104,190	0	0	104,190
04/03/2020~03/03/2021	104,190	0	0	104,190
04/03/2021~03/03/2022	104,190	0	0	104,190

04/03/2022~03/03/2023	104,190	0	0	104,190
04/03/2023~03/03/2024	104,190	0	0	104,190
04/03/2024~03/03/2025	104,190	0	0	104,190
04/03/2025~03/03/2026	104,190	0	0	104,190
04/03/2026~03/03/2027	104,190	0	0	104,190
04/03/2027~03/03/2028	104,190	0	0	104,190
04/03/2028~03/03/2029	104,190	0	0	104,190
Total	1,041,900	0	0	1,041,900

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	ω_{OM}
Data unit	-
Description	Weighting of operating margin emissions factor

Source of data	"Tool to calculate the emission factor for an electricity system" (version 07.0)
Value applied	0.75
Justification of choice of data or description of measurement methods and procedures applied	As per the requirements in "Tool to calculate the emission factor for an electricity system version 07.0"
Purpose of Data	Calculation of $EF_{grid,CM,y}$
Comments	Calculated ex ante and fixed for the second crediting period.

Data / Parameter	ω_{BM}
Data unit	-
Description	Weighting of operating margin emissions factor
Source of data	"Tool to calculate the emission factor for an electricity system" (version 07.0)
Value applied	0.25
Justification of choice of data or description of measurement methods and procedures applied	As per the requirements in "Tool to calculate the emission factor for an electricity system version 07.0"
Purpose of Data	Calculation of $EF_{grid,CM,y}$
Comments	Calculated ex ante and fixed for the second crediting period.

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit 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. The parameter will be calculated through $EG_{export,y}$, $EG_{import,y}$, $EG_{project-i,y}$,$EG_{A-i,y}$,$EG_{B-i,y}$ and $EG_{C-i,y}$ according to

applied	the equation (12) in section 5.3 and designated person record the readings of the main meter each month.
Frequency of monitoring/recording	Continuous measurement and monthly recording
Value applied	123,962 MWh
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	Power supplied to the grid will be checked by internal verification procedure and electricity sales receipts. Data will be archived for 2 years following the end of the last crediting period.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	-

Data / Parameter	$EG_{export,y}$
Data unit	MWh
Description	Total electricity supplied to the grid by the Project, Project A (CGN Inner Mongolia Zhurihe Phase II Wind Farm Project), Project B (CGN Inner Mongolia Zhurihe Phase III Wind Farm Project), and Project C (CGN Inner Mongolia Zhurihe Phase IV Wind Farm Project) during year y.
Source of data	Bidirectional electricity meter reading of Main meter or Backup meter installed at the substation.
Description of measurement methods and procedures to be applied	The readings of the electricity meter will be hourly measured and monthly recorded. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup. The accuracy of electricity meter is 0.2S. The calibration frequency is one time/year according to the national calibration standard (DL/T448-2016). Designated person records the readings of the main meter each month.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-

Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The electricity supplied by the project activity to the grid will be monitored and recorded at the central control room. The project operator is responsible for recording such data. Double check by receipt of sales.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	The reading from the main meter is first choice. When the main meter is out of order, the reading from the backup meter will be used.

Data / Parameter	$EG_{import,y}$
Data unit	MWh
Description	Total electricity purchased from the grid by the Project, Project A (CGN Inner Mongolia Zhurihe Phase II Wind Farm Project), Project B (CGN Inner Mongolia Zhurihe Phase III Wind Farm Project), and Project C (CGN Inner Mongolia Zhurihe Phase IV Wind Farm Project) during year y.
Source of data	Bidirectional electricity meter reading of Main meter or Back meter installed at the substation.
Description of measurement methods and procedures to be applied	The readings of the electricity meter are hourly measured and monthly recorded. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup. The accuracy of electricity meter is 0.2S. The calibration frequency is one time/year according to the national calibration standard (DL/T448-2016). Designated person records the readings of the main meter each month.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The electricity supplied by the project activity to the grid will be monitored and recorded at the central control room. The project operator is responsible for recording such data. Double check by

	receipt of sales.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	The total electricity purchased from the grid by the Project, Project A, Project B and Project C is deemed as the electricity purchased from the grid by the Project when calculating emission reductions, which is conservative

Data / Parameter	$EG_{project\text{-}i,\,y}$
Data unit	MWh/yr
Description	Quantity of electricity supplied to the grid by Group project-i (i=1,2,3,4) of the Project in year y.
Source of data	Readings of electricity meters (M1, M2, M3 and M4 described in section 5.3) installed at the transmission line of 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. The accuracy of electricity meter is no less than 0.5S. The calibration frequency is one time/year according to the national calibration standard (DL/T448-2016). Designated person records the readings of the meters each month.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The metering equipments at the substation will be calibrated once a year according to the management standard DL/T448-2016.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	-

Data / Parameter	$EG_{A\text{-}i,\,y}$
Data unit	MWh/yr
Description	Quantity of electricity supplied to the grid by Group project-i (i=1,2,3,4) of the Project A in year y..
Source of data	Readings of electricity meters (M5, M6, M7 and M8 described in section 5.3) installed at the site of project A.
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. The accuracy of electricity meter is no less than 0.5S. The calibration frequency is one time/year according to the national calibration standard (DL/T448-2016). Designated person records the readings of the meters each month.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The metering equipments at the substation are calibrated once a year according to the management standard DL/T448-2016.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	-

Data / Parameter	$EG_{B\text{-}i,\,y}$
Data unit	MWh/yr
Description	Quantity of electricity supplied to the grid by Group project-i (i=1,2,3,4) of the Project B in year y.
Source of data	Readings of electricity meters (M9, M10, M11 and M12 described in section 5.3) installed at the site of project B.
Description of measurement methods and procedures to be	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

applied	paper backup. The calibration frequency is once a year. The accuracy of electricity meter is no less than 0.5S. The calibration frequency is one time/year according to the national calibration standard (DL/T448-2016). Designated person records the readings of the meters each month.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The metering equipments at the substation are calibrated once a year according to the management standard DL/T448-2016.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	-

Data / Parameter	$EG_{C\text{-}i,\,y}$
Data unit	MWh/yr
Description	Quantity of electricity supplied to the grid by Group project-i (i=1,2,3,4) of the Project C in year y..
Source of data	Readings of electricity meters (M13, M14, and M15 described in section 5.3) installed at the site of project C.
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. The accuracy of electricity meter is no less than 0.5S. The calibration frequency is one time/year according to the national calibration standard (DL/T448-2016). Designated person records the readings of the meters each month.
Frequency of monitoring/recording	Continuously measured and monthly recorded
Value applied	-

Monitoring equipment	Electricity meter
QA/QC procedures to be applied	The metering equipments at the substation will be calibrated once a year according to the management standard DL/T448-2016.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	-

5.3 Monitoring Plan

1. Introduction

CGN Inner Mongolia Zhurihe Phase I Wind Farm Project adopts the Revision to the approved consolidated monitoring methodology ACM0002 "Grid-connected electricity generation from renewable sources (version 20.0) to determine the emission reductions from the net electricity generation from the wind farm. This plan describes in more detail the process.

2. Organizational structure and responsibilities

Overall responsibility for monitoring and carrying out the monitoring following this monitoring plan lies with the CGN Wind Power Co., Ltd. had advised the project developer on how to perform the monitoring work. The staffs who were responsible for electricity meter readings and recording, and who were responsible for auditing the metered data had been trained according to the VCS requirements.

The operating and management structure of monitoring is illustrated as follows:

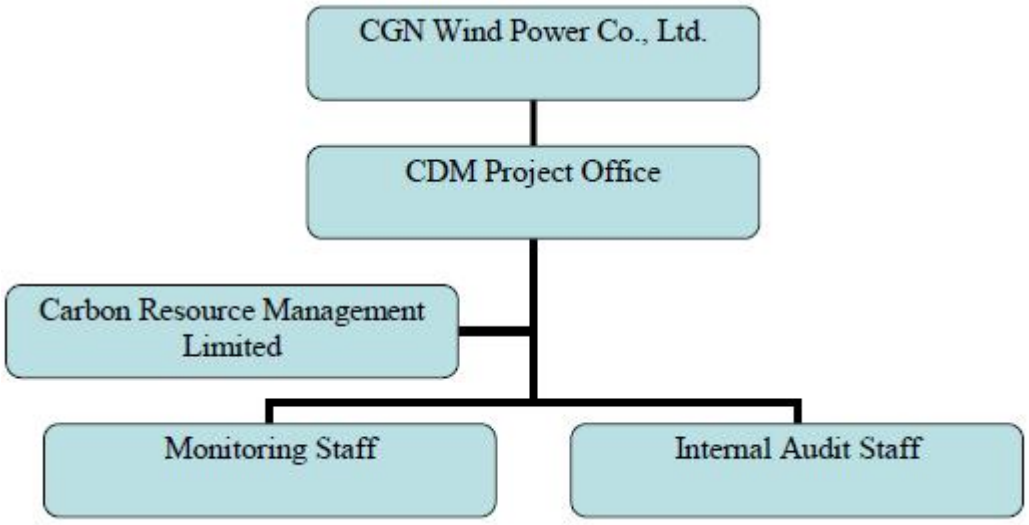

Figure 4 Operations and Monitoring Procedure of the Project

3. Monitoring Program and Equipments

Total electricity supplied to the grid by the Project, Project A, Project B, and Project C ($EG_{export,y}$) and total electricity purchased from the grid by the Project, Project A, Project B, and Project C ($EG_{import,y}$) are continuously measured by the main meter installed at the substation. The main and the back-up meter's precision is 0.2S, and is bidirectional, recording both electricity delivered to the grid and electricity purchased from the grid; The quantity of net electricity generation supplied to the grid by the project ($EG_{facility,y}$) is calculated through $EG_{export,y}$, $EG_{import,y}$, $EG_{project-i,y}$,$EG_{A-i,y}$,$EG_{B-i,y}$ and $EG_{C-i,y}$ according to the equation (12) in section 5.3.

Currently, the project activity shares the same transformer, substation and transmission line with other three wind farms, named CGN Inner Mongolia Zhurihe Phase II Wind Farm Project (UNFCCC ref. No. 3453, hereafter referred to as Project A, commissioned on 06/01/2010), CGN Inner Mongolia Zhurihe Phase III Wind Farm Project (project title in its PDD is CGN Inner Mongolia Suniteyouqi Phase 3 Windfarm Project, UNFCCC Ref. 5746, hereafter referred to as Project B, commissioned on 01/05/2011) and CGN Inner Mongolia Zhurihe Phase IV Wind Farm Project, hereafter referred to as Project C. Besides, if the project has to share the same transformer, substation or transmission line with some other wind farms, appropriate additional meters will be installed. Therefore, separate meters M1~M15 are installed at the project site so that the electricity generation can be monitored for each wind farm separately for calculating the share of this wind farm of the total net electricity exported to the grid. M1~M4 are installed in Line1#~4# respectively to monitor the generation from the project activity; M5~M8 are installed in Line5#~8# respectively to monitor the generation from Project A; M9~M12 are installed in Line9#~12# respectively to monitor the generation from Project B; M13~M15 are installed in Line13#~15# respectively to monitor the generation from Project C.

Therefore, the electricity generation can be monitored respectively to calculate the share of this wind farm of the total net exported electricity to the grid ($EG_{export,y}$).

The quantity of net electricity generation supplied by the project activity ($EG_{facility,y}$) is calculated as follows:

$$EG_{facility,y} = \frac{\sum_{i=1,2,3,4} EG_{project-i,y}}{\sum_{i=1,2,3,4} EG_{project-i,y} + \sum_{i=1,2,3,4} EG_{A-i,y} + \sum_{i=1,2,3,4} EG_{B-i,y} + \sum_{i=1,2,3,} EG_{C-i,y}} \times EG_{export,y} - EG_{import,y} \quad (12)$$

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 Project, Project A (CGN Inner Mongolia Zhurihe Phase II Wind Farm Project), Project B (CGN Inner Mongolia Zhurihe Phase

III Wind Farm Project), and Project C (CGN Inner Mongolia Zhurihe Phase IV Wind Farm Project) during year y.

$EG_{import,y}$ = Total electricity purchased from the grid by the Project, Project A (CGN Inner Mongolia Zhurihe Phase II Wind Farm Project), Project B (CGN Inner Mongolia Zhurihe Phase III Wind Farm Project), and Project C (CGN Inner Mongolia Zhurihe Phase IV Wind Farm Project) during year y.

$EG_{project-i,y}$ = Quantity of electricity supplied to the grid by Group project-i (i=1,2,3,4) of the Project in year y.

$EG_{A-i,y}$ = Quantity of electricity supplied to the grid by Group project-i (i=1,2,3,4) of the Project A in year y.

$EG_{B-i,y}$ = Quantity of electricity supplied to the grid by Group project-i (i=1,2,3,4) of the Project B in year y.

$EG_{C-i,y}$ = Quantity of electricity supplied to the grid by Group project-i (i=1,2,3,4) of the Project C in year y.

The location of the main meter, backup meter, separate meters in relation to the grid, project, other project transmission lines are displayed as following diagram:

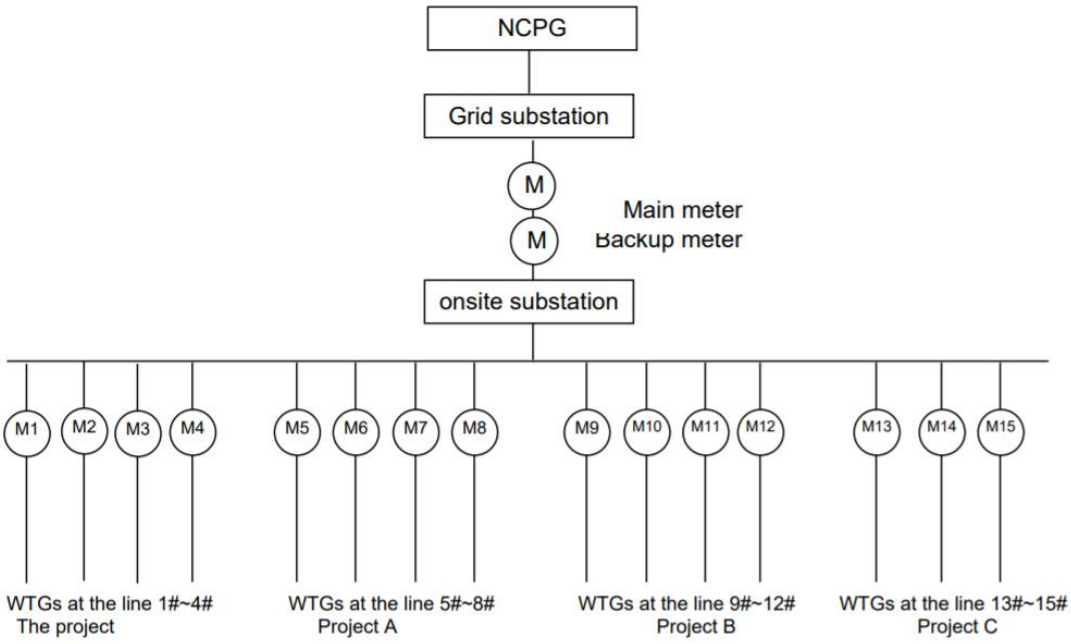

Figure 5 The location of meters

3. Training

The VCS project management office assigns and trains the dedicated people carrying out the monitoring work. Mr. Zhao Jingjing completes the monitoring personnel training before the registration, further training work is completed with the preliminary verification.

4. Installation of meters

Total electricity supplied to the grid by the Project, Project A, Project B, and Project C ($EG_{export,y}$) and total electricity purchased from the grid by the Project, Project A, Project B, and Project C ($EG_{import,y}$) are continuously measured by the main meter installed at the substation. The main and the back-up meter's precision is 0.2S, and is bidirectional, recording both electricity delivered to the grid and electricity purchased from the grid; The quantity of net electricity generation supplied to the grid by the project is calculated to the grid by the project is calculated through $EG_{export,y}$, $EG_{import,y}$, $EG_{project-i,y}$, $EG_{A-i,y}$,$EG_{B-i,y}$ and $EG_{C-i,y}$ according to the equation (12) in section 5.3.

Every month the wind farm obtains the net on-grid electricity supplied from the substation. The net generation monitored by these meters suffice for the purpose of billing and emission reductions, as long as the error in the meters is within the agreed limits. The primary meter used for billing (at the substation) also is the primary meter used for emission reduction calculations.

In addition, at the project site, electricity from the turbines and the transmission lines connected to the turbines is monitored, and these data is the references to the net power supply to the grid.

5.Calibration of Meters & Metering

The metering equipments are calibrated and checked for accuracy in accordance with industry standards. The metering equipments have sufficient accuracy so that any error resulting from such equipment shall not exceed 0.5% of full-scale rating. The net generation output registered by the meters alone suffice for the purpose of billing and emission reduction verification as long as the error in the meters is within the agreed limits.

Both meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.

Calibration is carried out by the qualified entity with the records being supplied to CGN Wind Power Co., Ltd. and these records are maintained by CGN Wind Power Co., Ltd. and the entity appointed by DOE.

All the meters installed are tested by qualified entity after: the detection of a difference larger than the allowable error in the readings of both meters; the repair of all or part of meter caused by the failure of one or more parts to operate in accordance with the specifications.

If any errors are detected the party owning the meter shall repair, recalibrate or replace the meter giving the other party sufficient notice to allow a representative to attend during any corrective activity.

6. Emergency procedures

The meters were calibrated and checked annually for accuracy. Calibration was carried out by the qualified entity. Meters had been jointly inspected and sealed on behalf of the parties concerned.

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the net generation output shall be determined by:

(a) Firstly, by reading backup meter, unless a test by either party reveals it is inaccurate;

(b) If the backup system is not within acceptable limits of accuracy or operation is performed improperly the project operator and NCPG shall jointly prepare a reasonable and conservative estimate of the correct reading, and provide sufficient evidence that this estimation is reasonable and conservative.

7. Quality Assurance and Quality Control

The calibration of meters is conducted by an authorized organization with a frequency of no less than once every year to ensure accuracy in accordance with the relevant national and industrial regulation which is 'Technical Administrative Code of Electric Energy Metering'(DL/T448-2016). Data and records are checked prior to being recorded and archived.

Training on VCS monitoring has been provided to the relevant staff to guarantee the implementation of the monitoring plan. Meanwhile, monthly net generation data is approved and signed off by VCS manager before it is accepted and stored. This audit checks compliance with operational procedures in this monitoring plan.

This internal audit also identifies potential improvements to procedures to improve monitoring and reporting in future years. If such improvements are these will be reported to the DOE and only operated after approval from the DOE.

8. Data collection and data management system

Physical document such as paper-based maps, diagrams and environmental assessments are collated in a central place, together with this monitoring plan. In order to facilitate auditors' reference of relevant literature relating to the CGN Inner Mongolia Zhurihe Phase I Wind Farm project, the project material and monitoring results are indexed. All paper-based information is stored by the technology department of CGN Wind Power Co., Ltd. and all the material have a copy for backup.

And all data including calibration records is kept until 2 years after the end of the total crediting period of the CDM project.

9. Reporting and verification

The steps required to meet the requirements for emissions reduction monitoring include:

- Designated person reads main meter and reports the result to power company and project owner monthly.
- The project records readings from the backup meter monthly.
- The project carries out an internal audit on and reports the readings to the DOE.

The project owner will facilitate the verification through providing the DOE all required necessary information.