Project design document form
(Version 11.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	CGN Guangdong Duanfen Wind Power Project
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the PDD	04
Completion date of the PDD	08/06/2020
Project participants	CGN Wind Power Co., Ltd. Statkraft Markets GmbH
Host Party	People's Republic of China
Applied methodologies and standardized baselines	ACM0002 (version 20.0): Grid-connected electricity generation from renewable sources
Sectoral scopes	Scope 1: energy industries (renewable sources)
Estimated amount of annual average GHG emission reductions	57,160 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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CGN Guangdong Duanfen Wind Power Project (hereinafter referred to as the Project) is located within Taishan County, Jiangmen City, Guangdong Province, P.R.China. It is invested, constructed and operated by CGN Wind Power Co., Ltd.

The total installed capacity of the Project is 47.6 MW equipped with 56 sets of wind turbines with a unit installed capacity of 850 kW. The height of the hub is 55 m. The estimated electricity delivered to China Southern Power Grid by the Project is 82,910 MWh per year and the plant load factor is 0.199. Electricity generated by the Project will be delivered to China Southern Power Grid via the 110 kV Duanfen Step-up Substation.

China Southern Power Grid is dominated by thermal power plants. In the absence of the Project, equivalent amount of annual power output of the Project will be generated and supplied by China Southern Power Grid which the Project is connected to. This is the same with the baseline scenario of the Project. It is expected that the Project as a renewable energy source will generate emission reductions of about 57,160 tCO_2e per year by avoiding CO_2 emissions from the same amount of electricity generation from China Southern Power Grid, which is mainly composed of traditional thermal power plants.

For the proposed project activity, the starting date of construction was 13/07/2010; the commission date was 26/12/2011. The proposed project activity was registered on 06/09/2011 (Ref. 5136) and the first crediting period is from 31/12/2012 to 30/12/2019. This is the second crediting period, which is from 31/12/2019 to 30/12/2026. Following the methodology, the emission reductions of the second crediting period are estimated to be 57,160 tCO_2e per year, and 400,120 tCO_2e over the chosen crediting period.

The Project will not only supply renewable electricity to the grid, but also contribute to sustainable development of the local community, the host country and the world by means of:

- reducing greenhouse gas emissions compared to a business-as-usual scenario;
- diversifying power sources and mitigating the demand and supply contradiction;
- helping to stimulate the growth of the wind power industry and encourage and promote the technology progress and commercial popularization of grid-connected renewable power generation projects in China;
- reducing the emission of other pollutants resulting from the power generation industry in China, compared to a business-as-usual scenario;
- creating 10 employment opportunities for local community during the operation period of the Project and creating several employment opportunities for local community during the construction period of the Project.

A.2. Location of project activity

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The Project is located within Taishan County, Jiangmen City, Guangdong Province, P.R.China. The geographical coordinates of the covered area of the Project are east longitude of 112°34′54″~112°43′18″ and north latitude of 21°53′24″~21°59′42″. Figure 1 shows the location of Guangdong Province, Figure 2 shows the location of Jiangmen City. Figure 3 shows the location of the Project.

Figure 1. Location of Guangdong Province

Figure 2. Location of Jiangmen City

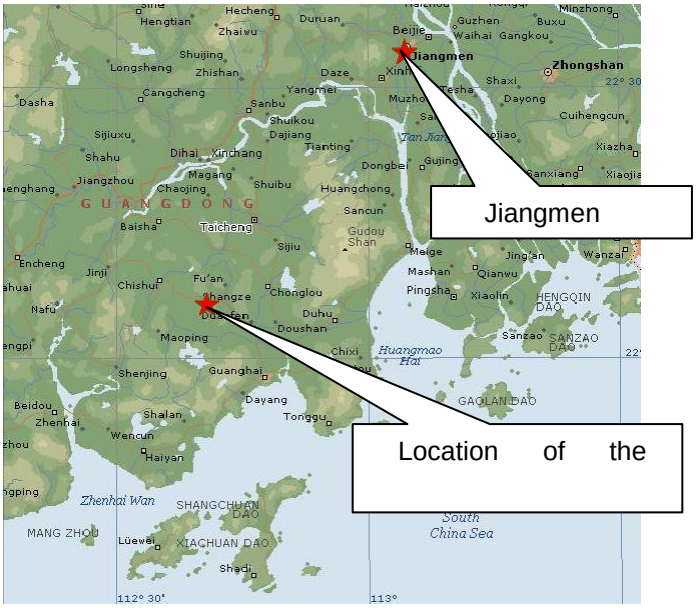

Figure 3. Location of the Project

A.3. Technologies/measures

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In the absence of the Project, equivalent amount of annual power output of the Project will be generated and supplied by China Southern Power Grid which the Project is connected to. This is the same with the baseline scenario of the Project. It is expected that the Project as a renewable energy source will generate emission reductions by avoiding CO_2 emissions from the same amount of electricity generation from China Southern Power Grid, which is mainly composed of traditional thermal power plants.

According to the meteorological data of the anemometer tower setup within the Project Site, there is abundant wind resource at the Project Site. The annual average wind speed is 7.36 m/s at 55 m height with stable prevailing wind direction. Thus it is suitable to build grid-connected wind power generation projects at the Project Site.

The total installed capacity of the Project is 47.6 MW equipped with 56 sets of wind turbines with a unit installed capacity of 850 kW. The estimated electricity delivered to China Southern Power Grid by the Project is 82,910 MWh per year and the plant load factor is 0.199. Electricity generated by the Project will be delivered to China Southern Power Grid via the 110 kV Duanfen Step-up Substation.

Table 1. Main technical parameters of key equipments in the Project

	Equipment	Quantity	Type	Technical parameters	Data sources
Main mechanical and electrical equipments	Turbine	56 sets	V52-850	Rated power: 850 kW Quantity of blades: 3 Rotor diameter: 52 m Rated wind speed: 16 m/s	*Vestas Product Brochure*
	35 kV packaged substation	56 sets	ZGSB11-Z·F-900/35	Capacity: 900 kVA Rated voltage: 35 kV	*Purchase Agreement of Packaged Substation*
Step-up substation	Main transformer	1 set	SZ11-50000/110	Capacity: 50 MVA Rated voltage: 110 kV	*Main Transformer Purchase Agreement*

The Project employs turbines manufactured by Vestas Wind Technology (China) Co., Ltd., which involves no technology transfer from abroad.

Electricity delivered to China Southern Power Grid by the Project will be monitored with two bi-directional meters (one of which is for backup) installed on No.II 110 kV Transmission Line at the Step- up Substation at the Project Site. The measurement precision of the meters employed by the Project will be at least 0.5s.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (host Party)	CGN Wind Power Co., Ltd. (the Project Owner)	No
Germany	Statkraft Markets GmbH	No

A.5. Public funding of project activity

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There is no public funding from Annex I Parties for the Project.

A.6. History of project activity

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The project was registered as CDM project on 06/09/2011 the reference no. is 5136. The PDD is renewal of crediting period. Therefore, it can be confirmed that:

(a) The proposed CDM project activity is neither registered as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA);
(b) The proposed CDM project activity is not a project activity that has been deregistered.

And confirm that:

(a) The proposed CDM project activity was not a CPA that has been excluded from a registered CDM PoA;
(b) The proposed project is not a registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the proposed CDM project activity.

A.7. Debundling

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N/A

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

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Approved consolidated baseline and monitoring methodology ACM0002 (version 20.0): *Grid-connected electricity generation from renewable sources*.
Reference:
https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

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

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

B.2. Applicability of methodologies and standardized baselines

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Wind power generation technology is a renewable power generation technology which displaces fossil fuel fired power generation technology to supply electricity to the grid. Therefore, the Project applies the methodology ACM0002 approved by CDM EB to determine the project baseline and calculate emission reductions achieved by wind power generation.

The Project meets all applicable requirements of the methodology ACM0002 as follows:

Applicability	Conclusion
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 proposed project is the installation of a Greenfield power plant;
The methodology is applicable under the following conditions:	a) The proposed project is

(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 installation of a wind power plant. b) Not applicable. The proposed project is a Greenfield plant and does not represent a capacity addition, retrofits, rehabilitations or replacement.
In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (7), is greater than 4 W/m^2; 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.	Not applicable. The proposed project is the installation of a wind power plant.
In the case of integrated hydro power projects, project proponent shall: (a) 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 (b) 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,	Not applicable. The proposed project is the installation of a wind power plant.

tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	
The methodology is not applicable to the following: (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.	a) Not applicable. The proposed project does not involve switching from fossil fuels to renewable energy at the site of the proposed project. b) Not applicable. The proposed project is a wind power plant.
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 proposed project is the installation of a wind power plant and not a retrofits, rehabilitations or replacement or capacity additions.
Applicability conditions of "Tool to calculate the emission factor for an electricity system", - Version 07.0	
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).	This condition is applicable. OM, BM and CM are estimated using the tool under section B.6.3 for calculating baseline emissions.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 2: be met. Namely, the total capacity of off-grid Procedures related to off-grid power generation" should power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	Since the proposed project is grid connected, this condition is applicable and the emission factor has been calculated accordingly.
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 proposed project is located in China, a non-Annex I country. Therefore, this criterion is not applicable for the project activity.
Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	The proposed project is a grid connected wind power project/ unit and does not involve emission from biofuels. Therefore, this criterion is not applicable.

Therefore, the project is in accordance with the applicability of methodology ACM0002 (Version 20.0)

B.3. Project boundary, sources and greenhouse gases (GHGs)

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The spatial extent of the Project Boundary includes the Project Power Plant and all the power plants connected physically and geographically to China Southern Power Grid that the Project is connected to.

The Project Power Plant includes the main control room, the Step-up Substation, 56 sets of wind turbines with a unit installed capacity of 850 kW and relevant auxiliaries.

Electricity generated by the Project will be delivered to China Southern Power Grid. According to 2017 Baseline Emission Factors for Regional Power Grids in China[1] issued by China's DNA which provides the delineation of grid boundaries, China Southern Power Grid is the grid boundary of the Project. China Southern Power Grid is composed of Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid and Guizhou Power Grid. And there exists net electricity import from Central China Grid to China Southern Power Grid. Central China Grid is composed of Henan Power Grid, Hubei Power Grid, Hunan Power Grid, Jiangxi Power Grid, Sichuan Power Grid and Chongqing Power Grid.

Table 2. Emission sources included in or excluded from the Project Boundary

Source		GHG	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation of China Southern Power Grid	CO_2	Yes	Main emission sources.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project activity	CO_2 emissions of the Project	CO_2	No	Minor emission source. Excluded because the Project is a wind power project and only project emissions of solar thermal power plants, geothermal power plants and hydro power plants need to be accounted as per the methodology ACM0002.
		CH_4	No	
		N_2O	No	

[1] http://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/201812/P020181220579925103092.pdf

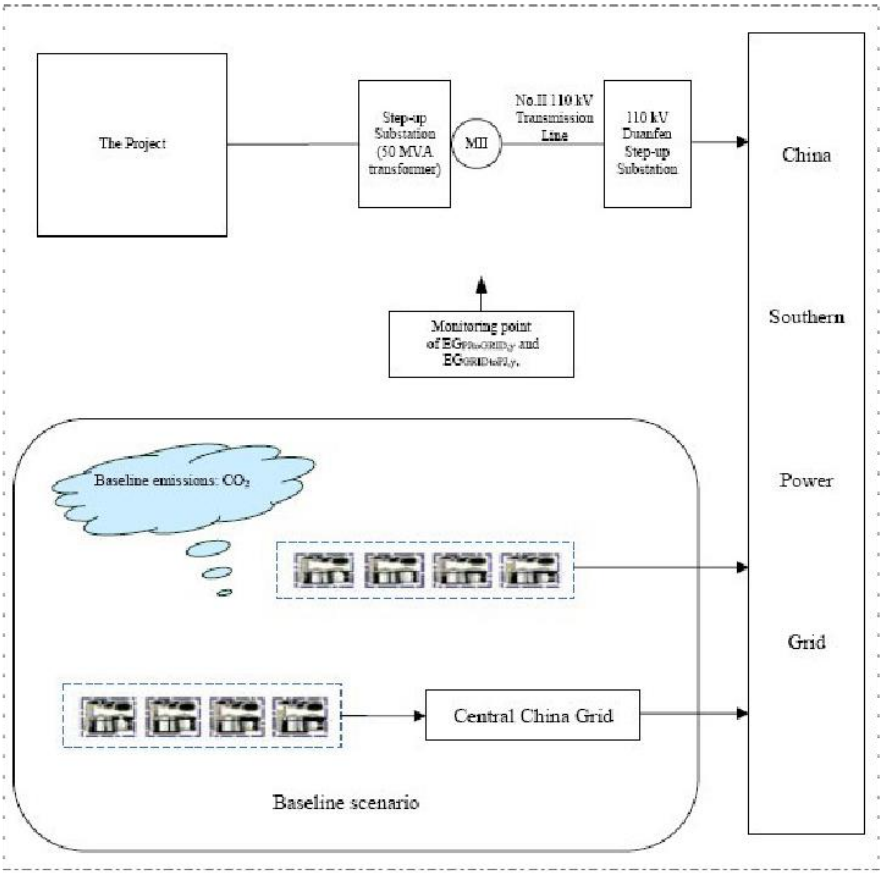

Figure 4. The Project Boundary and relevant emission sources

B.4. Establishment and description of baseline scenario

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The project is the installation of a new Greenfield power plant, and is not a capacity addition, retrofit, rehabilitation or replacement of existing grid-connected renewable power plant/unit. Therefore, the baseline scenario is prescribed in the methodology:

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, as reflected in the combined margin (CM) calculations described in the "*Tool to calculate the emission factor for an electricity system*".

The selected methodology prescribes the baseline scenario; thus, no further analysis is required. The combined margin is calculated in Section B.6 below.

According to the ACM0002 (Version 20.0) and Project Standard (Version 02.0), the methodological tool "*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) is adopted to assess the continued validity of the baseline and to update the baseline. 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.

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

If the current baseline complies with all relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or the submission of the previous request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period, go to Step 1.2.

- There are no new national and/or sectoral policies that could affect the baseline scenario at the time of requesting renewal of the crediting period. The current baseline complies with all relevant mandatory national and/or sectoral policies. Hence in the absence of the project the electricity would still have been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "*Tool to calculate the emission factor for an electricity system*".

Step 1.2: Assess the impact of circumstances

Assess the impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions, without reassessing the baseline scenario.

In the situation where the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment, an assessment of the changes in market characteristics is required for the renewal of the crediting period.

- The baseline scenario identified at the validation of the project was the continuation of the current practice without any investment. Baseline emissions are primarily derived from the fossil fuel power plants in the CSPG. The total electricity generation is still mainly produced by fossil fuel power plants in CSPG in recent years. Therefore, market characteristics do not have impact on the baseline emissions.

Evaluate whether the conditions used to determine the baseline emissions in the previous crediting period are still valid. Assess the availability of new fuels or raw materials and the impact of electricity or fuel prices in the identification of the current practice for the baseline emissions.

- The conditions used to determine the baseline emissions in the previous crediting period are still valid. The availability of new fuels or raw materials or the level of fuel prices has no impact on the identification of the current practice for the baseline emissions. Presently the CSPG is dominated by the fossil fuel power plants. The availability of new fuels or raw materials or the level of fuel prices has no impact on the baseline emissions.

If the new circumstances make a continued validity of the current baseline not plausible, then the current baseline needs to be updated for the subsequent crediting period.

As there are no new circumstances that make a continued validity of the current baseline not plausible, the current baseline does not need to be updated for the second crediting period.

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

This sub-step should only be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology.

Assess whether the remaining technical lifetime of the equipment that would have continued to be used in the absence of the project, as determined in the renewal CDM-PDD, exceeds the crediting period for which renewal is requested.

Take into consideration the market penetration of different technologies. Evaluate the penetration rate of different technologies that are available in the market and evaluate how they could affect the baseline.

- As determined in the renewal CDM-PDD, the baseline scenario is that the 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 in CSPG, as reflected in the combined margin (CM) calculations described in the "*Tool to calculate the emission factor for an electricity system*". The projects proponents or third party (or parties) would not undertake an investment later due. The combined margin calculation automatically takes account of any issues regarding remaining technical lifetime or market penetration.

If the baseline scenario of the project activity is the continuation of use of the current equipment(s) without any investment and the projects proponents or third party(ies) will undertake an investment later, but before the end of a crediting period, then the current baseline needs to be updated for that crediting period or the crediting of emission reductions should be limited to the period before the baseline equipment would cease its operation.

Therefore, the current baseline does not need to be updated for the second crediting period.

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 B.6.

If the application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline as well as data and parameters are still valid for the subsequent crediting period, then this baseline, data and parameters can be used for the renewed crediting period. Otherwise, proceed to Step 2.

The original baseline scenario needs to be updated to incorporate the latest grid emission factor in accordance with the methodology.

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

This step is only applicable if any of the Steps 1.1, 1.2, 1.3 and/or 1.4 showed that the current baseline needs to be updated.

Step 2.1: Update the current baseline

Update the current baseline emissions for the subsequent crediting period, without reassessing the baseline scenario, based on the latest approved version of the methodology applicable to the project activity. The procedure should be applied in the context of the sectoral policies and circumstances that are applicable at the time of request for renewal of the crediting period.

As shown in step 1.1 above, in accordance with the procedures for renewal of the crediting period of a registered CDM project activity, the original baseline, as updated, remains valid taking new relevant national and/or sectoral policies and circumstances into account.

Step 2.2: Update the data and parameters

If the application of Step 1.4 showed that the data and/or parameter(s) that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, project participants should update all applicable data and parameters, following the guidance in Step 1.4.

As discussed above in step 1.4, the grid emission factor and all the values in its calculation are updated in section B.6.

Conclusion regarding the assessment of the validity of the original baseline scenario

In accordance with the procedures for renewal of the crediting period of a registered CDM project activity, the original baseline, as updated in accordance with step 2.2 in section B.6, remains valid taking new relevant national and/or sectoral policies and circumstances into account.

B.5. Demonstration of additionality

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Not applicable for the second crediting period.

In accordance with the procedures for renewal of the crediting period of a registered CDM project activity and the applied methodology, it does not require a reassessment of the baseline scenario or additionality, it is only required to assess whether the original project baseline is still valid or has been updated taking account of new data where applicable.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

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The methodology ACM0002 is applied in the context of the Project in the following four steps:

- First, calculate the project emissions;
- Second, calculate the baseline emissions;
- Third, calculate the leakage;
- Fourth, calculate the emission reductions.

I. Calculate the project emissions

The Project is a wind power project and no project emissions should be considered as per the methodology ACM0002, i.e., PE_y = 0 tCO_2e.

II. Calculate the baseline emissions

As per the methodology ACM0002, baseline emissions include only CO_2 emissions from electricity generation in China Southern Power Grid that the Project is connected to. The baseline emissions are to be calculated as follows:

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

Where,
BE_y is the baseline emissions in year y (tCO_2e);
$EG_{PJ,y}$ is the quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh);
$EF_{grid,CM,y}$ is the combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of *Tool to Calculate the Emission Factor for an Electricity System* (tCO_2e/MWh).

(1) Calculate the net electricity generation ($EG_{PJ,y}$)

The Project is the installation of a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the Project, so:

$$EG_{PJ,y} = EG_{facility,y} \quad (2)$$
$$EG_{facility,y} = EG_{PJtoGRID,y} \times EG_{GRIDtoPJ,y} \quad (3)$$

Where,
$EG_{PJ,y}$ is the quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh);
$EG_{facility,y}$ is the quantity of net electricity generation supplied by the Project to the grid in year y (MWh);
$EG_{PJtoGRID,y}$ is the electricity supplied by the Project to the grid in year y (MWh);
$EG_{GRIDtoPJ,y}$ is the electricity imported by the Project from the grid in year y (MWh).

(2) Calculate the emission factor for project electricity system ($EF_{grid,CM,y}$)

The combined margin emission factor ($EF_{grid,CM,y}$) of China Southern Power Grid, the relevant electricity system identified for the Project, is determined according to following steps:

Step 1. Identify the relevant electricity system

In accordance with Tool to Calculate the Emission Factor for an Electricity System, the relevant electricity system of the Project is identified according to the delineation of the project electricity system and connected electricity systems published by China's DNA.

Electricity generated by the Project will be delivered to China Southern Power Grid. According to 2017 Baseline Emission Factors for Regional Power Grids in China issued by China's DNA which provides the delineation of relevant electricity systems, China Southern Power Grid is the relevant electricity system of the Project. China Southern Power Grid is composed of Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid and Guizhou Power Grid.

There exists net electricity import from Central China Grid to China Southern Power Grid. Central China Grid is composed of Henan Power Grid, Hubei Power Grid, Hunan Power Grid, Jiangxi Power Grid, Sichuan Power Grid and Chongqing Power Grid. Four methods to calculate the emission factor of the net electricity import are provided in *Tool to Calculate the Emission Factor*

for an Electricity System. According to *2017 Baseline Emission Factors for Regional Power Grids in China*, the simple operating margin emission factor sourced from the electricity supplied by Central China Grid will be used as the emission factor of the net electricity import.

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

Option I (only grid power plants are included in the calculation) provided in Tool to Calculate the Emission Factor for an Electricity System is chosen to calculate the operating margin and build margin emission factor.

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

Four methods are provided in Tool to Calculate the Emission Factor for an Electricity System for the calculation of operating margin emission factor(s) ($EF_{grid,OM,y}$), they are

a) Simple OM, or
b) Simple adjusted OM, or
c) Dispatch data analysis OM, or
d) Average OM.

As per Tool to Calculate the Emission Factor for an Electricity System, referring to 2017 Baseline Emission Factors for Regional Power Grids in China, the method (a) simple OM is employed for calculation of the operating margin emission factor(s) ($EF_{grid,OM,y}$) of the Project.

As per Tool to Calculate the Emission Factor for an Electricity System, the method (a) simple OM only can be used when low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. Among the total electricity generation of China Southern Power Grid which the Project is connected to, the amount of low-cost/must run resources accounts for less than 50% of total grid generation in average of the recent years. Thus, the method (a) simple OM can be used to calculate the baseline emission factor of operating margin ($EF_{grid,OM,y}$) of the Project.

For the simple OM, the emission factor can be calculated using either of the two following data vintages:

- 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 emission 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 PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the 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 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.

For the Project, only grid power plants are included in the calculation. And the Ex ante option is adopted by the Project to determine the emission factor. Therefore, the emission factor is determined once at the validation stage and no monitoring and recalculation of the emission factor during the second crediting period is required.

The date of the publication of the most recent official data for the calculation of the emission factor prior to the start of validation was 20/12/2018.

Step 4. Calculate the operating margin emission factor ($EF_{grid,OMsimple,y}$) according to the selected method

Two options are provided in Tool to Calculate the Emission Factor for an Electricity System for the determination of the simple operating margin emission factor ($EF_{grid,OMsimple,y}$).

Option A: Based on the net electricity generation and a CO_2 emission factor of each unit, or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and the total fuel consumption of the relevant electricity system.

Since the data on the net electricity generation and CO_2 emission factor of each power unit in China Southern Power Grid are not available, Option A is not applicable to the Project. As summarized in Annex 3, 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. Therefore, 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 electricity system) is adopted to calculate the simple operating margin emission factor ($EF_{grid,OMsimple,y}$). The formula of $EF_{grid,OMsimple,y}$ calculation is

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y})}{EG_y} \quad (4)$$

$$EG_y = \sum_j GEN_{j,y} \times (1 - r_{j,y}) \quad (4\text{-a})$$

Where,
$EF_{grid,OMsimple,y}$ is the simple operating margin emission factor in year y (tCO_2e/MWh);
$FC_{i,y}$ is the amount of fuel i consumed in China Southern Power Grid in year y (mass or volume unit);
$NCV_{i,y}$ is the net calorific value (energy content) of fuel i in year y (GJ/mass or volume unit);
$EF_{CO2,i,y}$ is the emission factor of fuel i in year y (tCO_2e/GJ);
EG_y is the net electricity generated and delivered to the grid by all power sources serving China Southern Power Grid, not including low-cost/must-run power plants/units, in year y (MWh);
i are all fuel types combusted in power sources in China Southern Power Grid in year y;
y is the relevant year as per the data vintage chosen in Step 3;
$GEN_{j,y}$ is total power generation of province j of China Southern Power Grid in year y;
$r_{j,y}$ is auxiliary electricity consumption rate of province j of China Southern Power Grid in year y.

The data on electricity generation and auxiliary electricity consumption rate for calculating the operating margin emission factor ($EF_{grid,OM,y}$) are obtained from *China Electric Power Yearbook 2014-2016*. The data on different fuel consumptions for power generation and the net calorific values of the fuels are obtained from *China Energy Statistical Yearbook 2014-2016*. The data on electricity exchange capacity between the power grids are obtained from *Electric Industry Statistics Collection 2013-2015*. The emission factors of the fuels employed and carbon oxidation rate are obtained from Table 1.3 and Table 1.4 on page 1.21-1.24 of Volume 2 of *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. The lower values of the 95% confidence intervals in Table 1.4 are used for the emission factors of the fuels employed.

Since there exists net electricity import from Central China Grid to China Southern Power Grid, the simple operating margin emission factor sourced from the electricity supplied by Central China Grid will be used to as the emission factor of the net electricity import.

Referring to *2017 Baseline Emission Factors for Regional Power Grids in China*, the simple operating margin emission factor ($EF_{grid,OM,y}$) of China Southern Power Grid is 0.8367 tCO_2e/MWh.

Step 5. Identify the group of power units to be included in the build margin

According to Tool to Calculate the Emission Factor for an Electricity System, the sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (MWh) and that have been built most recently.

It is suggested the set of power units that comprises the larger annual generation should be used. Considering data availability, CDM EB accepts the following deviation in application of methodology[2]:

1) Use of capacity additions during the last several years for estimating the build margin emission factor for grid electricity.
2) Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Therefore, for the Project: First, calculate the share of different power generation technology in recent capacity additions. Second, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor using the efficiency level of the best technology commercially available in China.

According to *Tool to Calculate the Emission Factor for an Electricity System*, project participants shall choose between one of the following two options to calculate the build margin emission factor ($EF_{grid,BM,y}$).

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 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 crediting period to the DOE. 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 or, if information up to the 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 emission 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.

Option 1 is adopted by the Project.

Step 6. Calculate the build margin emission factor

[2] Http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

According to the methodology ACM0002, calculate the build margin emission factor ($EF_{grid,BM,y}$) according to *Tool to Calculate the Emission Factor for an Electricity System* using equation (5):

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \quad (5)$$

Where,
$EF_{grid,BM,y}$ is the build margin emission factor in year y (tCO_2e/MWh);
$FE_{EL,m,y}$ is the emission factor of power unit m in year y (tCO_2e/MWh);
$EG_{m,y}$ is the net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh).
m is the power units included in the build margin;
y is the most recent historical year for which power generation data are available.

As the data of installed capacity cannot be separated into coal fired, oil fired and gas fired currently, the build margin emission factor is calculated by the following steps and formula:

Step a. Calculate the power generation emissions of solid fuel, liquid fuel and gas fuel and each share in the total emissions based on *Energy Balance Table* of the most recent year.

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (6)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (7)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (8)$$

Where,
$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by province j in year(s) y;
$NCV_{i,y}$ is the net calorific value (energy content) of fuel i in year y (GJ/mass or volume unit);
$EF_{CO2,i,j,y}$ is the emission factor of fuel i (tCO_2e/GJ);
COAL, OIL and GAS are footnote group for solid fuels, liquid fuels and gas fuels.

Step b. Calculate the emission factor for thermal power of the grid based on the result of Step a and the efficiency level of the best technology commercially available in China.

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (9)$$

Where,
Where $EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ are emission factor proxies of efficiency level of the best coal fired, oil fired and gas fired power generation technology commercially available in China.

Step c. Calculate the build margin emission factor of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (10)$$

Where,
$CAP_{Total,y}$ is total capacity additions that are close to and exceed 20% of existing capacity;
$CAP_{Thermal,y}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net calorific values of the fuels are obtained from China Energy Statistical Yearbook 2016. The emission factors of the fuels employed are obtained from Table 1.3 and Table 1.4 on page 1.21-1.24 of Chapter 1, Volume 2 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The lower values of the 95% confidence intervals in Table 1.4 are used for the emission factors of the fuels employed.

Referring to *2017 Baseline Emission Factors for Regional Power Grids in China*, the build margin emission factor ($EF_{grid,BM,y}$) of China Southern Power Grid is 0.2476 tCO_2e/MWh.

Step 7. Calculate the combined margin emission factor

Based on *Tool to Calculate the Emission Factor for an Electricity System*, the combined margin emission factor ($EF_{grid,CM,y}$) is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$), as

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times \omega_{OM} + EF_{grid,BM,y} \times \omega_{BM} \quad (11)$$

According to *Tool to Calculate the Emission Factor for an Electricity System*, the weight ω_{OM} is 0.75 and the weight ω_{BM} is 0.25 for wind power projects. Therefore, the combined baseline emission factor, i.e. the baseline emission factor of the Project,

$EF_{grid,CM,y}$ = 0.8367 ×0.75+ 0.2476×0.25 = 0.689425 tCO_2e/MWh.

III. Calculate the leakage

According to the methodology ACM0002, the leakage of the Project is not considered, i.e. L_y = 0 tCO_2e.

IV. Calculate the emission reductions

The Project will generate emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants. The emission reductions (ER_y) of the Project during a given year y is the difference between the baseline emissions (BE_y) and the project emissions (PE_y). It is calculated as:

$$ER_y = BE_y - PE_y \quad (12)$$

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$FC_{i,y}$
Data unit	mass or volume unit
Description	The amount of fossil fuel i consumed in the project/connected electricity system in year y
Source of data	*China Energy Statistical Yearbook 2014-2016*
Value(s) applied	Same as used by the DNA for the official emission factor calculations
Choice of data or measurement methods and procedures	The data obtained from *China Energy Statistical Yearbook* issued by authorized entity in China are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	$NCV_{i,y}$
Data unit	GJ/mass or volume unit
Description	Net calorific value (energy content) of fuel type i in year y
Source of data	*China Energy Statistical Yearbook 2016*
Value(s) applied	Same as used by the DNA for the official emission factor calculations
Choice of data or measurement methods and procedures	The data obtained from *China Energy Statistical Yearbook* issued by authorized entity in China are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	$EF_{CO2,i,y}$
Data unit	tCO_2/GJ
Description	CO_2 emission factor of the fuel i used in year y
Source of data	*2006 IPCC Guideline for National Greenhouse Gas Inventories*
Value(s) applied	Same as used by the DNA for the official emission factor calculations
Choice of data or measurement methods and procedures	The data obtained from *2006 IPCC Guideline for National Greenhouse Gas Inventories* are reliable.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	EG_y
Data unit	MWh
Description	Net electricity generated and delivered in the project electricity system in year *y*
Source of data	*China Electric Power Yearbook 2014-2016*
Value(s) applied	Same as used by the DNA for the official emission factor calculations
Choice of data or measurement methods and procedures	Data accepted and used by the DNA for the official emission factor calculations.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	$EF_{Coal,Adv,y}$ / $EF_{Oil,Adv,y}$ / $EF_{Gas,Adv,y}$
Data unit	tCO_2/MWh
Description	Emission factor proxies of efficiency level of the best coal-fired, oil based and gas-based power generation technology commercially available in China
Source of data	Chinese DNA
Value(s) applied	Same as used by the DNA for the official emission factor calculations
Choice of data or measurement methods and procedures	Data accepted and used by the DNA for the official emission factor calculations.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	$CAP_{i,y}$
Data unit	MW
Description	Installed capacity of relevant power source connected to the grid in year y
Source of data	Chinese DNA
Value(s) applied	Same as used by the DNA for the official emission factor calculations
Choice of data or measurement methods and procedures	Data accepted and used by the DNA for the official emission factor calculations.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	ω_{OM}
Data unit	%
Description	Weighting of operating margin emissions factor
Source of data	"Tool to calculate the emission factor for an electricity system" (Version 07.0)
Value(s) applied	75
Choice of data or measurement methods and procedures	Follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	ω_{BM}
Data unit	%
Description	Weighting of build margin emissions factor
Source of data	"Tool to calculate the emission factor for an electricity system" (Version 07.0)
Value(s) applied	25
Choice of data or measurement methods and procedures	Follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	$EF_{grid,OMsimple,y}$
Data unit	tCO_2/MWh
Description	Simple operating margin CO2 emission factor in year *y*
Source of data	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Value(s) applied	0.8367
Choice of data or measurement methods and procedures	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build margin CO_2 emission factor in year *y*
Source of data	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Value(s) applied	0.2476
Choice of data or measurement methods and procedures	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor in year *y*
Source of data	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Value(s) applied	0.689425
Choice of data or measurement methods and procedures	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

B.6.3. Ex ante calculation of emission reductions

>>

I. Estimated project emissions:

The Project is a wind power project and no project emissions should be considered as per the methodology ACM0002, i.e. $PE_y = 0$ tCO_2e.

II. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

According to the FSR, the electricity delivered by the Project to the grid is estimated as 82,910 MWh per year. According to *2017 Baseline Emission Factors for Regional Power Grids in China*, the baseline emission factor of the Project is 0.689425 tCO_2e/MWh. Therefore, the annual baseline emissions of the Project are estimated as 57,160 tCO_2e.

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$ = 82,910×0.689425 = 57,160 tCO_2e

III. Estimated leakage:

As per the methodology ACM0002, the leakage of the Project is not considered, i.e. L_y = 0 tCO_2e.

IV. Estimated emission reductions:

As per formula (12), the annual emission reductions of the Project are 57,160 tCO_2e.

$ER_y = BE_y \times PE_y$ = 57,160 – 0 = 57,160 tCO_2e

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
31/12/2019-30/12/2020	57,160	0	0	57,160
31/12/2020-30/12/2021	57,160	0	0	57,160
31/12/2021-30/12/2022	57,160	0	0	57,160
31/12/2022-30/12/2023	57,160	0	0	57,160
31/12/2023-30/12/2024	57,160	0	0	57,160
31/12/2024-30/12/2025	57,160	0	0	57,160
31/12/2025-30/12/2026	57,160	0	0	57,160
Total	400,120	0	0	400,120
Total number of crediting years	7			
Annual average over the crediting period	57,160	0	0	57,160

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{facility,y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the Project to the grid in year y
Source of data	The data used in the PDD are obtained from the FSR of the Project. Actual data will be obtained through on-site measurement.
Value(s) applied	82,910
Measurement methods and procedures	Calculated monthly with on-site monitored data of $EG_{PJtoGRID,y}$ and $EG_{GRIDtoPJ,y}$ using the formula $EG_{facility,y} = EG_{PJtoGRID,y} - EG_{GRIDtoPJ,y}$.
Monitoring frequency	Continuously measurement and monthly recording
QA/QC procedures	Receipt(s) is used for crosscheck.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	$EG_{PJtoGRID,y}$
Data unit	MWh
Description	Electricity delivered by the Project to the grid in year y
Source of data	The data used in the PDD are obtained from the FSR of the Project. Actual data will be obtained through on-site measurement.

Value(s) applied	82,910
Measurement methods and procedures	Continuously measured by two bi-directional meters (one of which is for backup) installed on No.II 110 kV Transmission Line at the Step-up Substation at the Project Site and monthly recorded.
Monitoring frequency	Continuously measurement and monthly recording
QA/QC procedures	Receipt(s) is used for crosscheck.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	$EG_{GRIDtoPJ,y}$
Data unit	MWh
Description	Electricity imported by the Project from the grid in year y
Source of data	Assumed as zero in the PDD. Actual data will be obtained through on-site measurement.
Value(s) applied	0
Measurement methods and procedures	Continuously measured by two bi-directional meters (one of which is for backup) installed on No.II 110 kV Transmission Line at the Step-up Substation at the Project Site and monthly recorded.
Monitoring frequency	Continuously measurement and monthly recording
QA/QC procedures	Receipt(s) is used for crosscheck.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

B.7.2. Sampling plan

>>
N/A

B.7.3. Other elements of monitoring plan

>>
1. Monitored Data

The ex-ante determined baseline emission factor will be adopted. The electricity delivered by the Project to the grid ($EG_{PJtoGRID,y}$) and the electricity imported from the grid to the Project ($EG_{GRIDtoPJ,y}$) will be monitored.

The monitoring points of the Project are shown in Figure 5.

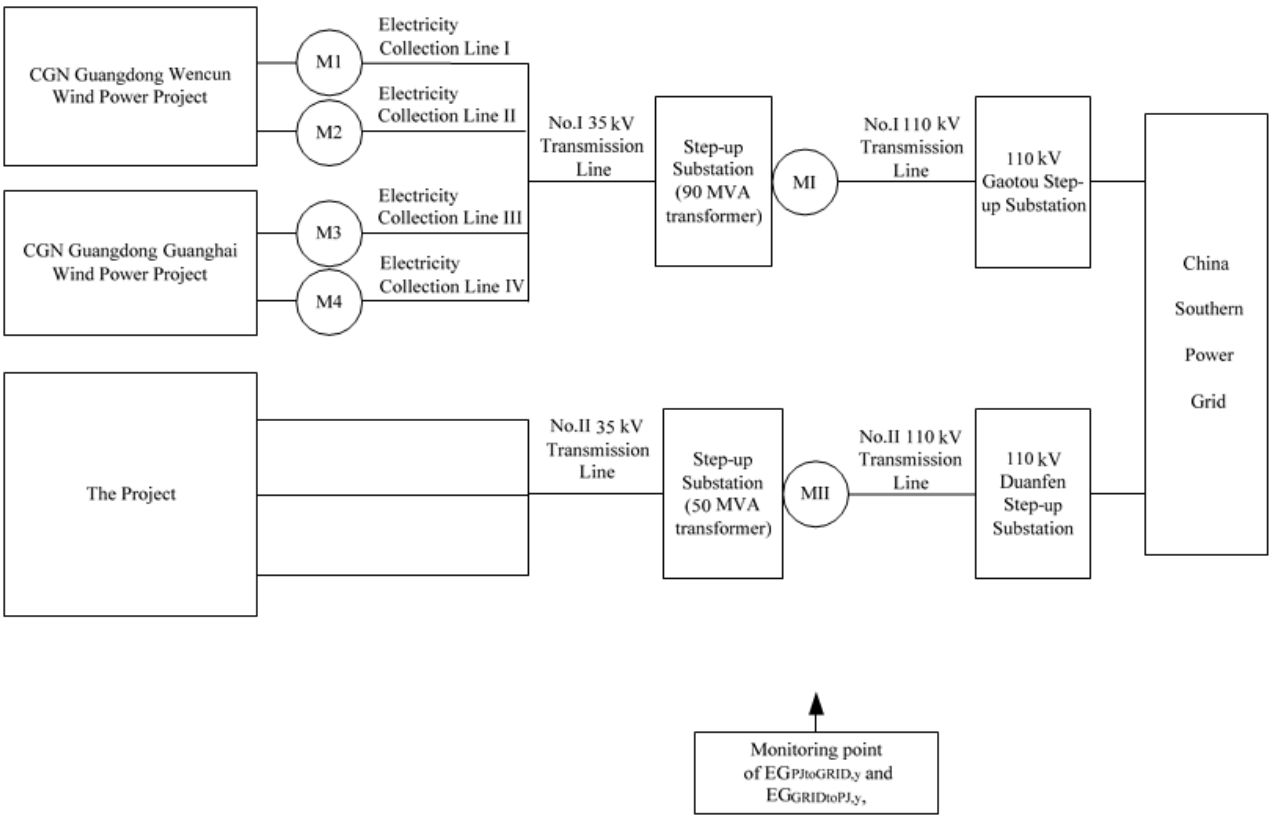

Figure 5. The monitoring points of the Project

2. Monitoring System Organization Chart

The monitoring system is shown in Figure 6 and implemented by the Project Owner.

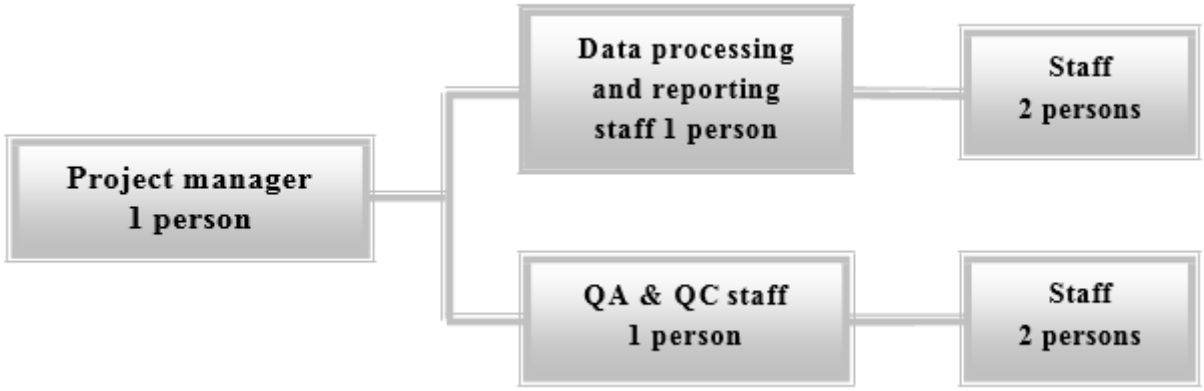

Figure 6. The monitoring system

The Project Manager is responsible for implementation and supervision of the monitoring activity and liaison in this CDM project. The data processing and reporting personnel are responsible for managing, processing and submitting data and two staff are responsible for supporting his work. The QA & QC personnel are responsible for calibration of meters and supervision of the whole process quality and two staff are responsible for supporting his work.

3. Installation of Meters

The electricity delivered by the Project to the grid ($EG_{PJtoGRID,y}$) will be measured continuously by two bi-directional meters (one main meter and one backup meter) installed on No.II 110 kV Transmission Line at the Step-up Substation at the Project Site and monthly recorded.

The electricity delivered by the grid to the Project ($EG_{GRIDtoPJ,y}$) will be measured continuously by two bi-directional meters (one main meter and one backup meter) installed on No.II 110 kV Transmission Line at the Step-up Substation at the Project Site and monthly recorded.

Receipt(s) is used to crosscheck $EG_{PJtoGRID,y}$ and $EG_{GRIDtoPJ,y}$. If there exists difference between the monitoring data and the data on receipt(s), the conservative values will be used to calculate emission reductions.

4. Precision of Meters

The measurement precision of the meters employed by the Project will be at least 0.5s.

5. Calibration of Meters

The meters of the Project will be calibrated once per year in line with Technical Administrative Code of Electric Energy Metering (DL/T448-2016).

6. Data Management System

- Particular staff will be appointed by the Project Owner to take the overall responsibility for monitoring emission reductions and keeping all the data collected as part of monitoring archived electronically.
- Electronic data and documents will be regularly copied and archived, and kept at least for two years after the end of the last crediting period or two years after the last issuance of CERs, whichever is later.
- Written data and documents will be copied and archived, and kept for at least two years after the end of the last crediting period or two years after the last issuance of CERs, whichever is later.

7. Quality Assurance and Quality Control Procedure

Particular QC staff will be appointed by the Project Owner to take the overall responsibility of calibrating monitoring equipments, managing and processing the monitored data according to QA/QC procedure provided in Section B.7.1. If something unusual, the Project Manager should be immediately reported.

Monitoring training will be arranged for relevant staff to ensure that they have a thorough understanding of the monitoring procedures. The monitoring training will include, inter alia, operation training courses prior to the commissioning of the equipments and periodical training courses during the operation period regarding maintenance.

8. Preparation for Verification

Besides the recorded data and the documents for crosscheck required in Section B.7.1, other documents will be prepared by the Project Owner for verification by the DOE including, but not limited to:

- PDD (registration version), including the electronic spreadsheets and supporting documents (assumptions, estimations, measurement, etc);
- Report on qualifications of persons responsible for monitoring and calculation;
- Report on quality control and quality assurance;
- Report on maintenance and calibration of meters;
- Report on project management record (including data collection and management system);
- Report on monitoring.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>
08/07/2010 (Civil Engineering Contract was signed.)

C.2. Expected operational lifetime of project activity

>>
20y-0m

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>>
A renewable crediting period is chosen. It is the second crediting period.

C.3.2. Start date of crediting period

>>
31/12/2019

C.3.3. Duration of crediting period

>>
7y-0m

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
The Environmental Impact Assessment Form was approved by Environmental Protection Bureau of Jiangmen City on September 30, 2009 (Document No. JHS[2009]126). According to the Environmental Impact Assessment Form, environmental impacts possibly caused by the Project and treatment measures adopted by the Project Owner are analyzed as follows:

Waste water

Waste water produced during the construction period and the operation period of the Project mainly includes rinsing water of the concrete mixing system, oily waste water of auxiliary facilities and domestic waste water of workers. The quantity of rinsing water of the concrete mixing system and oily waste water of auxiliary facilities is very small. Rinsing water of the concrete mixing system will be treated in sedimentation tanks and oily waste water of auxiliary facilities will be treated in oil separation and sedimentation tanks. After treatment, both rinsing water of the concrete mixing system and oily waste water of auxiliary facilities will meet the requirement of Discharge Limits of Water Pollutants (DB 44/26-2001) and will be used for watering road. Domestic waste water of the workers during the construction period will be treated in waste water treatment facilities and will be used for irrigation of crops or greening after satisfying safety standards. Waste water produced during the operation period of the Project is mainly domestic waste water of workers. The domestic waste water produced during the operation period will also be used for greening after treatment in waste water treatment facilities. Therefore, the Project will not have any negative impact on the surroundings.

Dust and exhaust gas

During the construction period of the Project, the generation of dust reentrainment is mainly from the concrete mixing system, road construction and transportation. By employing closed type

concrete mixing systems, bag type dust collectors and closed type transportation and taking measures such as covering the material piling areas and periodically watering, the Project will not have any impact on the surroundings. The exhaust gas generated during the operation period of the Project is mainly cooking fume from the kitchen of the substation. The cooking fume from the kitchen will be treated with high efficiency electrostatic eliminator. The exhaust gas discharged by the Project will meet the requirements of Emission Limit of Air Pollutants (DB44/27-2001) and Emission Standard of Cooking Fume (GB18483-2001) and will not have negative impact on surroundings.

Noise

Noises generated during the construction period of the Project stem from activities such as excavation and backfilling of earth for the foundation of wind turbines, piling, casting of the foundation platform, installation and transportation of the power generation equipments. The Project Owner will employ low noise equipments, strengthen the maintenance and conservation of equipments and limit the time of construction and transportation, in order to ensure that noises generated during the construction period will not have any negative impact on the acoustic environment at the Project Site. After attenuation, the noises will meet the requirement of Noise Limits for Construction Site (GB12523-90). During the operation period of the Project, noises will be generated mainly from operation of turbines. The distance between the Project Site and the village is more than 800 m. Therefore, the noises after attenuation will not impact local residents.

Solid waste

The solid waste produced during the construction period is mainly spoil, construction waste, domestic waste etc. The spoil will be transported to a dumping site and retaining walls will be constructed to prevent the loss of spoil. The construction waste will be uniformly collected for treatment and forbidden to be discarded at random. The domestic waste will be collected at the Project Site and then treated by local waste disposal system. During the operation period of the Project, the quantity of domestic waste will be very small. It will be collected and then transported and treated by local environmental sanitation administrative department. By taking the measures above, the solid waste produced in the Project will not have any impact on the surroundings.

Ecological impact

Construction area of the Project is located in hills and mountains, with no rare vegetation and animal. The temporary land occupation during the construction period will be recovered by taking vegetation recovery measures. Moreover, after the construction period, the land occupied by the foundation of turbines and packaged transformers will be recovered with greening measures. By taking measures of vegetation recovery, the Project will have no impact on local ecological environment. Moreover, the area of the Project Site is relatively small, so the operation of Project will not impact the animals or birds.

In summary, by means of measures of pollution avoidance and control as well as ecological recovery, the Project will not impact the environment.

D.2. Environmental impact assessment

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Environmental impacts of the Project are considered not significant by the Project Participants. Environmental impacts of the Project comply with relevant laws and regulations of the host country. Therefore, it is not necessary to provide additional information for the Project in this section.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

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Stakeholders of the Project are identified as local residents possibly impacted by the Project. In December 2010, a survey was conducted on the stakeholders of the Project, through distributing and collecting responses to a questionnaire.

The questionnaire is distributed to the local residents near the Project Site. They are of different ages and occupations, coming from different towns and villages. For the total 30 questionnaires distributed to the stakeholders, 30 returned with a response rate of 100%. According to the 30 questionnaires returned, the basic structure of the respondents is illustrated in Table 3.

Table 3. Structure of the respondents

Structure of gender		
Gender	No.	Percentage (%)
Male	23	77
Female	7	23

Structure of educational level		
Educational level	No.	Percentage (%)
Primary school	3	10
Junior middle school	15	50
Senior middle school and above	12	40

Structure of age		
Age	No.	Percentage (%)
Below 30	6	20
30~39	7	23
40~49	9	30
50 and above	8	27

The questionnaires mainly focus on the following issues:

- The stakeholders' knowledge about wind farms and wind power projects;
- Impacts possibly introduced by the construction of the Project from the view of stakeholders;
- The attitude of the stakeholders on the construction of the Project.

E.2. Summary of comments received

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According to the 30 questionnaires received:

- 30 respondents (100%) support the construction of the Project. 25 respondents (83%) understand or have a very good understanding of wind farms and wind power projects.
- 25 respondents (83%) think the construction of the Project will increase the income of residents at the Project Site; 23 respondents (77%) think the construction of the Project will increase employment opportunities at the Project Site; 25 respondents (83%) think the construction of the Project will improve the living standard of residents at the Project Site.
- 29 respondents (97%) think the construction of the Project will not impact the discharge of waste water at the Project Site; 1 respondent (3%) thinks the construction of the Project could possibly increase the discharge of waste water at the Project Site.
- 27 respondents (90%) think the construction of the Project will not impact the discharge of air pollutants at the Project Site; 3 respondents (10%) think the construction of the Project will decrease the discharge of air pollutants at the Project Site.
- 22 respondents (73%) think the construction of the Project could possibly increase the discharge of noises at the Project Site; 8 respondents (27%) think the construction of the Project will not impact the discharge of noises at the Project Site.
- 30 respondents (100%) think the construction of the Project will not impact the discharge of solid wastes at the Project Site.

E.3. Consideration of comments received

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We know from the results of questionnaire statistics that all the stakeholders understand and support the construction of the Project.

The issues of waste water and noise considered by the respondents and corresponding prevention and control measures have been analyzed in Section D.1 of the PDD. The Project Owner will take measures to ensure that there will be no waste water and noise pollution to the local environment.

Thus, there is no necessity to modify the Project in the aspect of design, construction and operation. The Project Owner will think much of the public comments and strictly implement the pollution prevention measures stated in the Environmental Impact Assessment Form.

SECTION F. Approval and authorization

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The letter of approval (LoA) from DNA of Germany was issued on 28/04/2019. Reference:
https://cdm.unfccc.int/filestorage/G/I/1/GI1CKW297MBPO38F6HUAVDNSYTL45J/5136_LoA_Germany_add_Statkraft.pdf?t=eEZ8cWJjN25ofDBzLFEpcCfBGT1XG_6YECIm

The letter of approval (LoA) from DNA of China was issued on 13/06/2011. Reference:
https://cdm.unfccc.int/filestorage/2/3/S/23S5LW7NOAYBKMXCIQ0Z8R69UEPFJ4/07%20China%20LoA_Duanfen%20project.pdf?t=VWZ8cWJjN29rfDCQoyu3gpRngdjv7J-ITClO

Appendix 1. Contact information of project participants

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Appendix 2. Affirmation regarding public funding

There is no public funding from Annex I Parties for the Project.

Appendix 3. Applicability of methodologies and standardized baselines

The applicability of the selected methodology is described in B.2.

Appendix 4. Further background information on ex ante calculation of emission reductions

All the details on ex ante calculation of emission reductions are described in B.6.

Appendix 5. Further background information on monitoring plan

No other additional information.

Appendix 6. Summary report of comments received from local stakeholders

N/A

Appendix 7. Summary of post-registration changes

The first crediting period is from 31/12/2012 to 30/12/2019, which was changed from 01/01/2012 to 31/12/2018.

Reference:
https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1314015932.81/view

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).

Version	*Date*	*Description*
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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